

**PURCHASE AGREEMENT**

**FUNDO ÚNICO DE PREVIDÊNCIA SOCIAL DO ESTADO DO RIO DE JANEIRO –  
RIOPREVIDÊNCIA**

**THE STATE OF RIO DE JANEIRO**

**RIO OIL FINANCE TRUST**

**BB SECURITIES LTD.**

**AND**

**BNP PARIBAS SECURITIES CORP.**

**Dated: April 12, 2018**

# PURCHASE AGREEMENT

## TABLE OF CONTENTS

SECTION 1.	Representations and Warranties.....	3
	(a) Representations and Warranties of the Sponsor, Issuer and RJS.....	3
	(b) Officer’s Certificates.....	18
SECTION 2.	Sale and Delivery to Initial Purchasers; Closing .....	18
	(a) Purchase and Sale of the Series 2018-1 Notes.....	18
	(b) Payment and Delivery of the Series 2018-1 Notes .....	19
	(c) Form of the Series 2018-1 Notes .....	19
	(d) Denominations; Registration .....	19
SECTION 3.	Covenants of the Issuer and the Sponsor .....	19
	(a) Offering Memorandum .....	19
	(b) Notice and Effect of Material Events.....	19
	(c) Amendments and Supplements to the Offering Memorandum .....	20
	(d) Qualification of the Series 2018-1 Notes for Offer and Sale.....	20
	(e) Rating of the Series 2018-1 Notes .....	20
	(f) Clearing Agencies .....	21
	(g) Use of Proceeds.....	21
	(h) Clear Market .....	21
	(i) Transfer Restrictions .....	21
	(j) U.S. Securities Laws .....	21
SECTION 4.	Payment of Fees and Reimbursement of Expenses .....	21
SECTION 5.	Conditions of Initial Purchasers’ Obligations.....	21
	(a) Opinion of Counsel for the Sponsor, the Issuer and the Indenture Trustee.....	22
	(b) Opinion of Counsel for Initial Purchasers .....	22
	(c) Opinion with respect to the Servicer, the Bond Administrator and the Brazilian Collateral Agent .....	22
	(d) Certificate of the Sponsor .....	22
	(e) Officers’ Certificate of the Issuer .....	23
	(f) Accountants’ Model Review Report.....	23
	(g) Accountants’ Comfort Letter .....	23
	(h) Bring-down Comfort Letter .....	23
	(i) Maintenance of Rating.....	23
	(j) Executed Transaction Documents.....	24
	(k) Transaction Documents .....	24
	(l) Issuer Organizational Documents .....	24
	(m) Evidence of Transaction Accounts .....	24
	(n) Independent Consultant Report.....	25

	(o)	Additional Documents .....	25
	(p)	Clearing Systems .....	25
	(q)	No Legal Impediment to Issuance and Sale.....	25
	(r)	Process Agent Acceptance.....	25
	(s)	Amended and Restated Pledge Agreement.....	25
	(t)	Annual Reporting.....	25
SECTION 6.		Subsequent Offers and Resales of the Series 2018-1 Notes .....	26
	(a)	Offer and Sale Procedures .....	26
	(b)	Covenants of the Issuer and the Sponsor .....	28
	(c)	Qualified Institutional Buyer .....	29
	(d)	Resale Pursuant to Rule 903 of Regulation S or Rule 144A .....	29
SECTION 7.		Indemnification .....	29
	(a)	Indemnification of Initial Purchasers.....	29
	(b)	Indemnification of the Issuer, the Sponsor and RJS .....	30
	(c)	Actions against Parties; Notification .....	30
SECTION 8.		Contribution .....	31
SECTION 9.		Representations, Warranties and Agreements to Survive.....	32
SECTION 10.		Termination of Agreement.....	32
	(a)	Termination; General .....	32
	(b)	Liabilities .....	33
SECTION 11.		Tax Disclosure .....	33
SECTION 12.		Consent to Jurisdiction; Appointment of Agent for Service of Process .....	33
SECTION 13.		WAIVER OF JURY TRIAL.....	35
SECTION 14.		Waiver of Immunities .....	35
SECTION 15.		Foreign Taxes.....	36
SECTION 16.		Judgment Currency .....	36
SECTION 17.		Notices .....	36
SECTION 18.		No Advisory or Fiduciary Relationship.....	37
SECTION 19.		Integration .....	37
SECTION 20.		Parties.....	37
SECTION 21.		GOVERNING LAW .....	38
SECTION 22.		Counterparts.....	38
SECTION 23.		Effect of Headings .....	38
SECTION 24.		Limited Recourse.....	38
SECTION 25.		No Petition Covenant.....	39
SECTION 26.		Severability .....	39

SECTION 27. Default by One Initial Purchaser.....	39
Schedule A: Pricing Information	
Schedule B: Initial Purchasers	
Schedule C: Disclosure Package; Additional Written Offering Communications; Permitted General Solicitations	
Exhibit A: Form of Independent Consultant Report	

April 12, 2018

## PURCHASE AGREEMENT

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BNP Paribas Securities Corp.  
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Ladies and Gentlemen:

The Fundo Único de Previdência Social do Estado do Rio de Janeiro – RIOPREVIDÊNCIA, an autonomous government agency (*autarquia*) of the government of the State of Rio de Janeiro (“RJS”) that is part of the RJS Secretary of State for Planning and Management (“RioPrevidência” or the “Sponsor”), RJS, and Rio Oil Finance Trust, a Delaware statutory trust (the “Issuer”), confirm in this letter agreement (this “Agreement”) their understanding with BB Securities Ltd. (“BB Securities”) and BNP Paribas Securities Corp. (“BNP Paribas”), as initial purchasers (the “Initial Purchasers”, which term shall also include any initial purchaser substituted as hereinafter provided in Section 27 hereof) with respect to the issuance and sale by the Issuer and the purchase by the Initial Purchasers of 8.200% Series 2018-1 Notes (the “Series 2018-1 Notes”).

The Series 2018-1 Notes are to be issued pursuant to an indenture dated as of June 20, 2014 and amended and restated as of November 11, 2014 (the “Existing Indenture”) among the Issuer, as issuer, Citibank, N.A., as indenture trustee (the “Indenture Trustee”), Planner Trustee Distribuidora de Títulos e Valores Mobiliários Ltda, as Brazilian collateral agent (the “Brazilian Collateral Agent”), and Banco do Brasil S.A., as bond administrator (the “Bond Administrator”), as amended by (i) the Waiver and Amendment Agreement, dated October 20, 2015, among the Issuer, the Bond Administrator, the Brazilian Collateral Agent, the Indenture Trustee, the Sponsor and RJS (the “First Waiver and Amendment Agreement”), (ii) the Second Waiver and Amendment Agreement, dated June 20, 2016, among the Issuer, the Bond Administrator, the Brazilian Collateral Agent, the Indenture Trustee, the Sponsor, RJS and Banco do Brasil, S.A., as the Oil Revenues Payment Agent (the “Oil Revenues Payment Agent”) (the “Second Waiver and Amendment Agreement”), (iii) the Third Waiver and Amendment Agreement, dated October 11, 2016, among the Issuer, the Bond Administrator, the Brazilian Collateral Agent, the Indenture Trustee, the Sponsor, RJS and the Oil Revenues Payment Agent (the “Third Waiver and Amendment Agreement”), (iv) the Fourth Rescission and Amendment Agreement, dated December 5, 2016, among the Issuer, the Bond Administrator, the Brazilian Collateral Agent and the Indenture Trustee (the “Fourth Rescission and Amendment Agreement”), (v) the Fifth Rescission and Amendment Agreement, dated December 4, 2017, among the Issuer, the Bond

Administrator, the Brazilian Collateral Agent and the Indenture Trustee (the “Fifth Rescission and Amendment Agreement”), and (vi) the Sixth Rescission, Waiver and Amendment Agreement, dated March 7, 2018, among the Issuer, the Bond Administrator, the Brazilian Collateral Agent and the Indenture Trustee (the “Sixth Rescission, Waiver and Amendment Agreement” and, together with the First Waiver and Amendment Agreement, the Second Waiver and Amendment Agreement, the Third Waiver and Amendment Agreement, the Fourth Rescission and Amendment Agreement and the Fifth Rescission and Amendment Agreement, the “Amendments”), to be supplemented by an indenture supplement dated April 19, 2018 (the “Series 2018-1 Indenture Supplement” and, together with the Existing Indenture and the Amendments, the “Indenture”). Capitalized terms used herein but not defined shall have the meanings given in the Indenture.

Each of the Sponsor and the Issuer understand that each Initial Purchaser proposes to make an offering of the Series 2018-1 Notes on the terms and in the manner set forth herein and agree that the Initial Purchasers may resell, subject to the conditions set forth herein, all or a portion of the Series 2018-1 Notes to purchasers (“Subsequent Purchasers”) at any time after this Agreement has been executed and delivered. The Series 2018-1 Notes are to be offered and sold through the Initial Purchasers without being registered under the United States Securities Act of 1933, as amended (the “Securities Act”), in reliance upon Rule 144A (“Rule 144A”) or Regulation S (“Regulation S”) of the rules and regulations promulgated under the Securities Act. Pursuant to the terms of the Series 2018-1 Notes and the Indenture, investors that acquire the Series 2018-1 Notes may only resell or otherwise transfer such Series 2018-1 Notes (a) if such Series 2018-1 Notes are hereafter registered under the Securities Act or (b) if an exemption is available from both (i) the registration requirements of the Securities Act and (ii) the requirements of the United States Investment Company Act of 1940, as amended (the “1940 Act”).

The Series 2018-1 Notes sold to qualified institutional buyers, as defined in and in reliance on Rule 144A (each, a “Qualified Institutional Buyer”), will initially be represented by beneficial interests in a single, permanent global certificate in fully registered form without interest coupons (the “Rule 144A Note”), which will be deposited with the Indenture Trustee, as custodian for, and registered in the name of a nominee of, The Depository Trust Company (“DTC”). The Series 2018-1 Notes sold outside the United States to persons who are not U.S. persons within the meaning of Regulation S will initially be represented by beneficial interests in a single, temporary global certificate in fully registered form without interest coupons (the “Temporary Regulation S Note”). After the expiration of the period which ends on the fortieth (40<sup>th</sup>) day after the later of the commencement of the offering and the Closing Time (as defined herein), holders of beneficial interests in the Temporary Regulation S Note may transfer such interests to interests in a single, permanent global note in fully registered form without interest coupons. The Temporary Regulation S Note will be deposited on or about the Closing Time with the Indenture Trustee, as custodian for, and registered in the name of a nominee of, DTC, for the account of Euroclear S.A./N.V., as operator of the Euroclear System (“Euroclear”) and Clearstream Banking, *société anonyme* (“Clearstream”).

Each of the Sponsor and the Issuer acknowledge that BB Securities is not a broker-dealer registered with the SEC, and therefore may not make sales of any Series 2018-1 Notes in the United States or to U.S. persons except in compliance with applicable U.S. laws and regulations. To the extent that BB Securities intends to effect sales of the Series 2018-1 Notes in the United States, it will do so only through Banco do Brasil Securities LLC or one or more U.S. registered broker-dealers, or otherwise as permitted by applicable U.S. law. BB Securities Asia Pte. Ltd. may be involved in sales of the notes in Asia.

Each of the Sponsor and the Issuer has prepared and delivered to each Initial Purchaser copies of a preliminary offering memorandum, dated April 4, 2018 (the “Preliminary Offering Memorandum”), and each of the Sponsor and the Issuer has prepared and will deliver to each Initial Purchaser, copies of a final offering memorandum, dated April 12, 2018 (the “Final Offering Memorandum”), each for use by such Initial Purchaser in connection with its solicitation of purchases of, or offering of, the Series 2018-1 Notes. “Offering Memorandum” means, with respect to any date or time referred to in this Agreement, the most recent offering memorandum (whether the Preliminary Offering Memorandum or the Final Offering Memorandum, or any amendment or supplement to either such document), including exhibits thereto and any documents incorporated therein by reference, which has been prepared and delivered by each of the Sponsor and the Issuer to the Initial Purchasers in connection with their solicitation of purchases of, or offering of, the Series 2018-1 Notes.

All references in this Agreement to financial statements and schedules and other information which is “contained,” “included” or “stated” in the Offering Memorandum (or other references of like import) shall be deemed to mean and include all such financial statements and schedules in the Offering Memorandum.

#### SECTION 1. Representations and Warranties.

(a) *Representations and Warranties of the Sponsor, Issuer and RJS.* Each of the Sponsor and the Issuer, and solely as to representations with respect to itself in (i)(D), (iv), (ix), (xii), (xiv), (xv), (xxix), (xxx), (xxxii), (xxxiii), (xxxiv) and (xxxviii) below, RJS, represents and warrants to each Initial Purchaser as of the date hereof and as of Closing Time referred to in Section 2(b) hereof, and agrees with each Initial Purchaser, as follows:

(i) Disclosure Package and Final Offering Memorandum. (A) As of the Applicable Time (as defined below), the Offering Memorandum as supplemented by the information included on Schedule A hereto (the “Pricing Information”) and each Additional Written Offering Communication (as defined below) or other information, if any, each identified in Schedule C hereto under the caption Disclosure Package and, all considered together (collectively, the “Disclosure Package”) did not, and as of the Closing Time will not, include any untrue statement of a material fact or omit any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading.

“Additional Written Offering Communication” means any written communication (as defined in Rule 405 under the Securities Act) that constitutes an offer to sell or a solicitation of an offer to buy the Series 2018-1 Notes other than the Preliminary Offering Memorandum, the Pricing Information or the Final Offering Memorandum (including, without limitation, any electronic road show relating to the Series 2018-1 Notes that constitutes such written communication).

“Applicable Time” means 5:20 p.m. (New York time) on April 12, 2018, or such other time as agreed among the Sponsor, the Issuer and the Initial Purchasers.

(B) Any Additional Written Offering Communication prepared, used or referred to by any of the Sponsor or the Issuer, when considered together with the Disclosure Package, at the time of its use did not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(C) Any General Solicitation (as defined below) that is not contained in any Additional Written Offering Communication, made by either the Sponsor or the Issuer in accordance with Section 6(a)(ii) or by any Initial Purchaser with the consent of the Sponsor or the Issuer, when considered together with the Disclosure Package, at the time when made or used did not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading.

“General Solicitation” means any offer to sell or solicitation of an offer to buy the Series 2018-1 Notes by any form of general solicitation or advertising (as those terms are used in Regulation D under the Securities Act).

(D) As of the Applicable Time, the information contained in the sections titled “Offering Memorandum Summary – State of Rio de Janeiro,” “Offering Memorandum Summary – Sponsor Refund and RJS Damages,” “Summary of Terms – Transaction Structure, Collateral and Principal Transaction Documents – Royalties Rights Agreement,” “State of Rio de Janeiro”, and “Further Provisions of the Series 2018-1 Notes and the Transaction Documents – The Royalties Rights Agreement” in the Disclosure Package (collectively, the “RJS Information”) did not, and as of the Closing Time will not, include any untrue statement of a material fact or omit any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading.

The representations and warranties in this subsection shall not apply to statements in or omissions from the Disclosure Package or the Final Offering Memorandum made in reliance upon and in conformity with written information furnished to the Sponsor or the Issuer by any Initial Purchaser expressly for use therein, it being understood that the only such information is set forth in Section 7(b) hereof.

(ii) Independent Accountants. The accountants who have certified the financial information included in the Disclosure Package and the



Final Offering Memorandum, are independent public accountants within the meaning of the Securities Act and the rules and regulations promulgated thereunder.

(iii) Financial Information. The financial information of the Sponsor and RJS included in the Disclosure Package and the Final Offering Memorandum, present fairly the financial position of the Sponsor and RJS, as applicable, at the dates indicated and the statement of operations for the period specified. The selected financial data and the summary financial information included in the Disclosure Package and the Final Offering Memorandum present fairly the information shown therein and have been compiled on a basis consistent with that of the corresponding financial statements from which such information was derived.

(iv) No Material Adverse Change. Since the respective dates as of which information is given in the Disclosure Package and the Final Offering Memorandum, except as otherwise stated therein, (A) there has been (v) no material adverse change, or any development that would reasonably be expected to result in a prospective material adverse change, in the condition, financial or otherwise, or in the earnings, business affairs or operations of the Sponsor, RJS or the Issuer, whether or not arising in the ordinary course of business, (w) no material adverse change, or any development that would reasonably be expected to result in a prospective material adverse change or material impairment with respect to the Assigned Oil Revenues or the Assigned Oil Revenue Rights, (x) no material impairment of the ability of each of the Issuer, the Sponsor and RJS to perform its obligations under the Transaction Documents to which it is a party, (y) no material impairment of the transactions contemplated by the Transaction Documents, including on the validity or enforceability against each of the Issuer, the Sponsor or RJS of any of the Transaction Documents to which it is a party, or (z) no material adverse change in the Collateral (collectively, or individually, a “Material Adverse Effect,”) and (B) there have been no transactions entered into by the Issuer or the Sponsor other than those in the ordinary course of business and those required under the Transaction Documents, which are material with respect to any of the Issuer or the Sponsor.

(v) Standing of the Issuer. The Issuer has been duly formed, is validly existing and is in good standing under the laws of Delaware. Each of the Sponsor and the Issuer has the power and authority to conduct its business as described in the Disclosure Package and the Final Offering Memorandum and to enter into and perform its respective obligations under this Agreement and the other Transaction Documents to which it is a party.

(vi) No Subsidiaries; Conduct of Business. The Issuer has not engaged in any business other than as described in the Offering Circular and has no subsidiaries.

(vii) Capitalization. The authorized capitalization of the Issuer is as set forth in the Disclosure Package and the Final Offering Memorandum.

(viii) No Employees. The Issuer has no employees.

(ix) Authorization of the Transaction Documents by the Sponsor, the Issuer and RJS. The Transaction Documents and all other relevant documents in connection therewith to which any of the Sponsor, the Issuer or RJS is a party, including this Agreement, have each been duly authorized by the Sponsor, the Issuer or RJS, as applicable, and, when executed and delivered by the Sponsor, the Issuer or RJS, as applicable, will constitute a valid and binding agreement of the Sponsor, the Issuer or RJS, as applicable, enforceable against the Sponsor, the Issuer or RJS, as applicable, in accordance with its terms, except as the enforcement thereof may be limited by bankruptcy, insolvency (including, without limitation, all laws relating to fraudulent transfers), reorganization, moratorium or similar laws affecting enforcement of creditors' rights generally and except as enforcement thereof is subject to general principles of equity (regardless of whether enforcement is considered in a proceeding in equity or at law).

(x) Authorization of the Series 2018-1 Notes. The Series 2018-1 Notes have been duly authorized and, at the Closing Time, will have been duly executed by the Issuer and, when authenticated, issued and delivered in the manner provided for in the Indenture and delivered against payment of the purchase price therefor as provided in this Agreement, will constitute valid and binding obligations of the Issuer, enforceable against the Issuer in accordance with their terms, except as the enforcement thereof may be limited by bankruptcy, insolvency (including, without limitation, all laws relating to fraudulent transfers) reorganization, moratorium or similar laws affecting enforcement of creditors' rights generally and except as enforcement thereof is subject to general principles of equity (regardless of whether enforcement is considered in a proceeding in equity or at law), and will be in the form contemplated by, and entitled to the benefits of, the Indenture.

(xi) Description of the Series 2018-1 Notes and the Transaction Documents. The Series 2018-1 Notes and the Transaction Documents will conform in all material respects to the respective statements relating thereto contained in the Disclosure Package and the Final Offering Memorandum.

(xii) Absence of Defaults and Conflicts. The Issuer is not in default in the performance or observance of any obligation, agreement, covenant or condition contained in any contract, indenture, mortgage, deed of trust, loan or credit agreement, note, lease or other agreement or instrument to which it is a party or by which it may be bound, or to which any of its property or assets is subject (collectively, “Agreements and Instruments”). The Sponsor is not in default in the performance or the observance of any obligation, agreement, covenant or condition contained in any Agreements and Instruments, to the extent that such default would reasonably be expected to result in a Material Adverse Effect. The execution, delivery and performance of this Agreement and the Transaction Documents and any other agreement or instrument entered into or issued or to be entered into or issued by the Issuer, the Sponsor or RJS, as applicable, in connection with the transactions contemplated hereby or thereby or in the Disclosure Package and the Final Offering Memorandum and the consummation of the transactions contemplated herein and in the Disclosure Package and the Final Offering Memorandum (including the issuance and sale of the Series 2018-1 Notes and the use of the proceeds from the sale of the Series 2018-1 Notes as described in the Disclosure Package and the Final Offering Memorandum under the caption “Use of Proceeds”) and compliance by each of the Issuer, the Sponsor and RJS with their respective obligations hereunder have been duly authorized by all necessary action (corporate or otherwise) and do not and will not, whether with or without the giving of notice or passage of time or both, conflict with or constitute a breach of, or default or Repayment Event (as defined below) under, or result in the creation or imposition of any lien, charge or encumbrance upon any property or assets of the Issuer or the Sponsor pursuant to the Agreements and Instruments, nor will such action result in any violation of the provisions of the Trust Agreement of the Issuer or any Applicable Law, statute, rule, regulation, judgment, order, writ or decree of any government, government instrumentality or court, domestic or foreign, having jurisdiction over the Issuer or the Sponsor or any of their assets, properties or operations. As used herein, a “Repayment Event” means any event or condition which gives the holder of any note, debenture or other evidence of indebtedness (or any person acting on such holder’s behalf) the right to require the repurchase, redemption or repayment of all or a portion of such indebtedness by the Issuer and the Sponsor.

(xiii) Absence of Manipulation. Neither the Sponsor, the Issuer nor any of their affiliates (as such term is defined in Rule 501(b) under the Securities Act (each, an “Affiliate”)) or any of their respective officers, directors or controlling persons, or any person acting on their or any of their behalf (other than the Initial Purchasers and their Affiliates, as to whom the Sponsor makes no representation) has taken, nor will the Sponsor, the Issuer or any Affiliate take, directly or indirectly, any action which is designed to or which has constituted or which would be expected to cause or result in stabilization or manipulation of the price of any security of the Issuer, the

Sponsor or their respective Affiliates to facilitate the sale or resale of the Series 2018-1 Notes.

(xiv) Absence of Further Requirements. No filing with, or authorization, approval, consent, license, order, registration, qualification or decree of, any court or Governmental Authority or agency is necessary or required for the performance by each of the Sponsor, the Issuer or RJS of its obligations hereunder, in connection with the offering, issuance or sale of the Series 2018-1 Notes hereunder or the consummation of the transactions contemplated by this Agreement or for the due execution, delivery or performance of the Transaction Documents and this Agreement to which any of the Issuer, the Sponsor and RJS is a party other than (a) the filing of the Amended and Restated Pledge Agreement, together with its sworn translation into Portuguese, with the competent Registry of Titles and Deeds in Brazil, in accordance with the provisions thereof; (b) the annual reporting of the sale, assignment and transfer of the Assigned Oil Revenues and Assigned Oil Revenue Rights to the RJS State Parliament, as required by RJS Law 6,112/2011; and (c) the filing of UCC financing statements with the District of Columbia Filing Office and the Delaware Filing Office.

(xv) Title to Property; Collateral. (A) The Sponsor had, immediately prior to the sale to the Issuer under the Bill of Sale and Royalties Rights Agreement, good and marketable title to and ownership of the Assigned Continuously Owned RioPrevi Oil Revenues and Assigned Continuously Owned RioPrevi Oil Revenue Rights. The Sponsor had, immediately prior to the sale to Banco do Brasil S.A. and Caixa Econômica Federal of the Initial Oil Revenues and the Initial Oil Revenue Rights, good and marketable title to and ownership of the Assigned Oil Revenues and the Assigned Oil Revenue Rights, all of which had been duly assigned and transferred by RJS to the Sponsor.

(B) The Assigned Continuously Owned RioPrevi Oil Revenues, the Assigned Continuously Owned RioPrevi Oil Revenue Rights, the Initial Oil Revenues and the Initial Oil Revenue Rights (collectively, the “Assigned Oil Revenues and Assigned Oil Revenue Rights”) are assignable under Brazilian law and were assigned to the Issuer as of the Closing Date. The assignment of the Assigned Oil Revenues and Assigned Oil Revenue Rights to the Issuer may not be set aside by the Sponsor or RJS and will not be subject to claims of creditors of either the Sponsor or RJS. The Issuer, as of the Closing Time, shall have good and marketable title to the Assigned Oil Revenues and Assigned Oil Revenue Rights.

(C) Except as described in paragraph (xiv) above, there is no further action required in Brazil or elsewhere to perfect the security interests of the Brazilian Collateral Agent and the Indenture Trustee over the Collateral. Subject to Permitted Liens, (i) the Amended and Restated Pledge Agreement

creates valid first rights, title and interest over the Assigned Oil Revenues and Assigned Oil Revenue Rights and the other Collateral referred to therein, in favor of the Brazilian Collateral Agent for the benefit of the Indenture Trustee for the benefit of the Secured Parties and (ii) the Indenture creates valid first rights, title and interest over the Collateral referred to therein, in favor of the Indenture Trustee for the benefit of the Secured Parties. The Collateral is not subject to any other lien, mortgage, pledge, fiduciary property, deposit arrangement, title retention, trust, encumbrance, security interest, assignment or other charge, or any other type of preferential arrangement, or any other type of transfer of title, priority or security agreement, including, without limitation, any agreement to give any of the foregoing or having the practical effect of the foregoing. No consent, authorization or approval of, or giving notice to, registration with or taking of any other action with respect to RJS or the Sponsor is necessary for the creation of the rights, title and interest over the Assigned Oil Revenues and Assigned Oil Revenue Rights and other Collateral in favor of the Brazilian Collateral Agent and the Indenture Trustee for the benefit of the Secured Parties.

(xvi) Accurate Disclosure. The statements in the Disclosure Package and the Final Offering Memorandum under the headings “Summary of Terms – Transaction Structure, Collateral and Principal Transaction Documents – Royalty & Special Participation Rights,” “Legal Framework for Oil and Gas Royalties Special Participations,” “Legal Framework for the Payment of *Precatórios*,” “Taxation” and “Certain Benefit Plan Considerations,” insofar as such statements summarize legal matters, agreements, documents or proceedings discussed therein, are accurate and fair summaries of such legal matters, agreements, documents or proceedings and present the information required to be shown.

(xvii) Statistical and Market-Related Data. Any statistical data relating to matters other than the Sponsor (including any market-related data) included in the Disclosure Package and the Final Offering Memorandum are based on or derived from sources that the Issuer and the Sponsor believe to be reliable and accurate, and, to the extent required, the Sponsor or the Issuer has obtained the written consent to the use of such data from such sources.

(xviii) Investment Company Act. The Issuer is not, and upon the issuance and sale of the Series 2018-1 Notes as herein contemplated and the pro forma application of the net proceeds therefrom as described in the Disclosure Package and the Final Offering Memorandum would not be, required to register as an “investment company” under the 1940 Act, in reliance on one or more exemptions or exclusions from the definition thereof, including Rule 3a-7 thereunder and the exception to the definition of “investment company” set forth in Section 3(a)(9) of the 1940 Act, and not

including the exemptions therefrom provided by Sections 3(c)(1) or 3(c)(7) of the 1940 Act.

(xix) Similar Offerings. None of the Sponsor, the Issuer nor any of their respective Affiliates or any person acting on their or any of their behalf (other than the Initial Purchasers and their Affiliates, as to whom the Sponsor makes no representation), has, directly or indirectly, solicited any offer to buy, sold or offered to sell or otherwise negotiated in respect of, or will solicit any offer to buy, sell or offer to sell or otherwise negotiate in respect of, in the United States or to any United States citizen or resident, any security which is or would be integrated with the sale of the Series 2018-1 Notes in a manner that would require the Series 2018-1 Notes to be registered under the Securities Act.

(xx) Rule 144A Eligibility. The Series 2018-1 Notes, once they are purchased by an entity not affiliated with the Issuer, will be eligible for resale pursuant to Rule 144A and will not be, at Closing Time, of the same class as securities listed on a national securities exchange registered under Section 6 of the United States Securities Exchange Act of 1934, as amended (the “Exchange Act”), or quoted in a U.S. automated interdealer quotation system.

(xxi) General Solicitation. None of the Sponsor, the Issuer, their Affiliates or any person acting on its or any of their behalf (other than the Initial Purchasers, as to whom the Sponsor makes no representation) has engaged or will engage, in connection with the offering of the Series 2018-1 Notes, in any form of General Solicitation other than those made with the prior written consent of the Initial Purchasers.

(xxii) No Registration Required. Subject to compliance by the Initial Purchasers with the representations and warranties of the Initial Purchasers and the procedures set forth in Section 6 hereof, it is not necessary in connection with the offer, sale and delivery of the offered the Series 2018-1 Notes to the Initial Purchasers and to each Subsequent Purchaser in the manner contemplated by this Agreement and the Offering Memorandum to register the Series 2018-1 Notes under the Securities Act or to qualify the Indenture under the United States Trust Indenture Act of 1939, as amended.

(xxiii) No Directed Selling Efforts. With respect to those offered the Series 2018-1 Notes sold in reliance on Regulation S, (A) none of the Sponsor, the Issuer, their respective Affiliates or any person acting on its or their behalf (other than the Initial Purchasers, as to whom the Sponsor makes no representation) has engaged or will engage in any directed selling efforts within the meaning of Regulation S and (B) each of the Sponsor, the Issuer and their respective Affiliates and any person acting on its or their behalf (other than the Initial Purchasers, as to whom the Sponsor makes no

representation) has complied and will comply with the offering restrictions requirement of Regulation S.

(xxiv) Anti-bribery Laws. Neither the Sponsor, the Issuer nor, to the knowledge of the Sponsor or the Issuer, any of their respective directors, officers, agents, employees, Affiliates or other persons acting on behalf of the Sponsor or the Issuer is aware of or has taken any action, directly or indirectly, that would result in a violation by such persons of any anti-bribery laws, including but not limited to (i) any law, rule, or regulation promulgated to implement the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, signed December 17, 1997 (the “Convention”), (ii) the U.S. Foreign Corrupt Practices Act of 1977, as amended, and the rules and regulations thereunder (the “FCPA”), (iii) Brazil’s Clean Company Act of 2014 (Law No. 12,846/2013, the “Clean Company Act”), (iv) Brazilian Federal Decree No. 8,420/2013 (“Decree 8,420”), (v) the Bribery Act 2010 of the United Kingdom (the “Bribery Act”), and (vi) any other law, rule or regulation of any locality of similar purpose and scope, including, without limitation, making use of the mails or any means or instrumentality of interstate commerce corruptly in furtherance of an offer, payment, promise to pay or authorization of the payment of any money, or other property, gift, promise to give, or authorization of the giving of anything of value to any “foreign official” (as such term is defined in the FCPA) or any foreign political party or official thereof or any candidate for foreign political office, in contravention of the Convention, the FCPA, the Clean Company Act, Decree 8,420, the Bribery Act and similar laws, rules or regulations and the Sponsor, the Issuer and, to the knowledge of each of the Sponsor and the Issuer, its Affiliates have conducted their businesses in compliance with the Convention, the FCPA, the Clean Company Act, Decree 8,420, the Bribery Act and similar laws, rules or regulations and have instituted and maintain policies and procedures designed to ensure, and which are reasonably expected to continue to ensure, continued compliance therewith.

(xxv) Money Laundering Laws. Each of the Sponsor and the Issuer, their respective Affiliates, and to the best knowledge of the Sponsor or the Issuer, any of their respective officers, directors, supervisors, managers, agents, or employees, has not violated, and its participation in the offering will not violate, any anti-money laundering laws, including but not limited to, applicable federal, state, international, foreign or other laws, regulations or government guidance regarding anti-money laundering, including, without limitation, Title 18 U.S. Code section 1956 and 1957, the Patriot Act, the Bank Secrecy Act, and international anti-money laundering principles or procedures by any intergovernmental group or organization, such as the Financial Action Task Force on Money Laundering, of which the United States is a member and with which designation the United States representative to the group or organization continues to concur, all as

amended, and any executive order, directive, or regulation pursuant to the authority of any of the foregoing, or any orders or licenses issued thereunder, and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Sponsor or the Issuer with respect to such anti-money laundering laws is pending or, to the best knowledge of each of the Sponsor and the Issuer, threatened.

(xxvi) OFAC. Neither the Sponsor, the Issuer nor, to the knowledge of each of the Sponsor and the Issuer, any director, officer, agent, employee, Affiliate or person acting on behalf of the Sponsor or the Issuer (i) is currently subject to any Sanctions (as defined below), (ii) undertakes any business with the government of or any person or entity in or that is organized under the laws of, or is directly or indirectly owned or controlled by, the government of any country or territory that is subject to any Sanctions (a “Sanctioned Country”), or (iii) is located, organized or resident in a Sanctioned Country. Neither the Sponsor nor the Issuer will directly or indirectly use the proceeds of the offering, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other person or entity, for the purpose of financing the activities of any person or entity, or in any country or territory that, at the time of such funding or facilitation, is subject to any Sanctions. For the past five years, the Sponsor and the Issuer have not knowingly engaged in and are not now knowingly engaged in any dealings or transactions with any person that at the time of the dealing or transaction is or was the subject or the target of Sanctions or with any Sanctioned Country.

“Sanctions” means any sanctions under the OFAC Regulations or any other restrictive measures or financial sanctions (including, for the avoidance of doubt, any sanctions or measures relating to any particular embargo, asset freezing) imposed by the United States of America, the United Nations, the European Union, the United Kingdom or any other relevant authority.

“OFAC Regulations” means the rules and regulations administered by the Office of Foreign Assets Control of the U.S. Treasury Department (OFAC).

(xxvii) Stamp Duty. Except for any tax as described in the Disclosure Package and the Final Offering Memorandum under the caption “Taxation–Certain Brazilian Tax Considerations”, no stamp or other issuance or transfer taxes or duties and no capital gains, income, or other taxes are payable to Brazil or any Brazilian Governmental Authority (a) in connection with the execution and/or delivery of the Transaction Documents or the enforcement of any thereof, (b) by or on behalf of the Initial Purchasers in connection with the offering, sale and/or delivery of the Series 2018-1 Notes to the Initial Purchasers or by the Initial Purchaser, to the initial subsequent purchasers (and the Initial Purchasers are not required as a result of such transactions to file any tax return in Brazil or with any taxing authority



thereof or therein or make any other filings with any Brazilian government or taxing authority thereof or therein if its income is not otherwise subject to Brazilian tax) or (c) with respect to any amounts paid by the Issuer or the Sponsor under the Transaction Documents.

(xxviii) Taxes. Except as described in the Disclosure Package and the Final Offering Memorandum and, in the case of payments to the Initial Purchasers under this Agreement, the taxes described in clauses (i) and (ii) of Section 15 hereof, payments made by the Issuer to holders under the Series 2018-1 Notes and the Indenture and by the Issuer to the Initial Purchasers under this Agreement will not be subject under the current laws of Brazil or any political subdivision thereof or therein to any withholdings or other charges for or on account of taxation.

(xxix) Choice of Law; Consent to Jurisdiction; Appointment of Agent to Accept Service of Process. The choice of the laws of the State of New York as the governing law of this Agreement, the Indenture (and any indenture supplement), the Servicing Agreement, the Trust Agreement, the Royalties Rights Agreement and the Series 2018-1 Notes is a valid choice of law under the laws of Brazil and any political subdivision thereof, and none of the Sponsor, the Issuer or RJS knows of any reason why the courts of Brazil would not give effect to such choice of law. Each of the Sponsor and RJS has the power to submit and pursuant to Section 12 of this Agreement has legally, validly, effectively and irrevocably submitted to arbitration administered by the International Centre for Dispute Resolution in accordance with its International Arbitration Rules (“International Arbitration”), to be held in New York County, New York with respect of any claim, causes of action or other dispute arising out of or related to this Agreement and has validly and irrevocably waived any objection to the final and binding determination of any such claim or cause of action by and before such an arbitral tribunal (any such arbitral tribunal, a “New York Arbitral Tribunal”). Each of the Sponsor, RJS and the Issuer hereby represents and warrants that it will not commence any action, litigation or proceeding of any kind, whether in law or equity, whether in contract or in tort or otherwise, against the Initial Purchasers in any way relating to this Agreement or the transactions relating hereto, in any forum other than International Arbitration in a New York Arbitral Tribunal. The Issuer hereby consents to the non-exclusive jurisdiction of the United States District Court and New York State courts located in New York County, New York (the “New York Courts”), agrees that any dispute under the Transaction Documents may be submitted to the jurisdiction of such courts and agrees that a final judgment in any such action, litigation or proceeding shall be conclusive and may be enforced in other jurisdictions by suit on the judgment or in any manner provided by law; *provided, however,* that if any dispute arises that involves the Issuer to which the Sponsor or RJS or both of them are parties, then the Issuer consents and agrees, and represents that it has the power to consent and agree

that such claim, cause of action or other dispute shall be resolved exclusively by International Arbitration before a New York Arbitral Tribunal, in a single arbitration proceeding involving all parties to this Agreement having any interest, right or obligation with respect thereto, or against whom any claim or cause of action is asserted. The Issuer has the power to designate, appoint and empower, and pursuant to Section 12 of this Agreement has legally, validly, effectively and irrevocably designated, appointed and empowered the Process Agent (as defined in Section 12 of this Agreement) for service of process in any legal suit, action or proceeding arising out of or related to this Agreement in any New York Court or New York Arbitral Tribunal and each of the Sponsor and RJS has irrevocably designated, appointed and empowered the Process Agent (as defined in Section 12 of this Agreement) for service of process in any legal suit, action or proceeding arising out of or related to this Agreement in the United States District Court for the Southern District of New York for the purpose of confirming or enforcing an arbitral award in the State of New York. Each of the Sponsor and RJS has consented to the jurisdiction of the United States District Court for the Southern District of New York for the limited purpose of confirming and/or enforcing an arbitral award rendered against them in New York.

(xxx) Waiver of Immunities. The Issuer and its obligations under the Transaction Documents to which it is a party, is subject to civil and commercial law and to suit and neither the Issuer nor any of its properties, assets or revenues have any right of immunity, on the grounds of sovereignty, from any legal action, suit or proceeding, from the giving of any relief in any such legal action, suit or proceeding, from setoff or counterclaim, from the jurisdiction of any Brazilian court, New York Court or New York Arbitral Tribunal, as the case may be, from service of process with respect to any proceeding in such court or arbitral tribunal, from attachment upon or prior to judgment, or from attachment in aid of execution of judgment, or from execution or enforcement of a judgment, or in connection with any other legal process or proceeding for the giving of any relief or for the enforcement of a judgment, in any such court or arbitral tribunal, with respect to its obligations or liabilities or any other matter under or arising out of or in connection with this Agreement or any other Transaction Document, and, to the extent that the Issuer or any of its respective properties, assets or revenues may have or may hereafter become entitled to any such right of immunity in any such court or arbitral tribunal in which proceedings may at any time be commenced, the Issuer waives, has waived or will waive such right to the extent permitted by law and has consented to the authority and jurisdiction of such court or arbitral tribunal to grant such relief. To the extent that each of the Sponsor and RJS may be, may have become or may hereafter become entitled to any right of immunity, on the grounds of sovereignty, from any legal action, suit or proceeding, from the giving of any relief in any such legal action, suit or proceeding, from setoff or counterclaim, from the jurisdiction of any Brazilian court, New York Court or New York Arbitral

Tribunal, as the case may be, from service of process with respect to any proceeding in such court or arbitral tribunal, or from execution or enforcement of a judgment, or in connection with any other legal process or proceeding for the giving of any relief or for the enforcement of a judgment, in any such court or arbitral tribunal, with respect to its obligations or liabilities or any other matter under or arising out of or in connection with this Agreement or any other Transaction Document, and, to the extent that it may have or may hereafter become entitled to any such right of immunity in any such court or arbitral tribunal in which proceedings may at any time be commenced, hereby waives, has waived or will waive such right (including, but not limited to, immunity arising under or pursuant to the U.S. Foreign Sovereign Immunities Act of 1976) in any arbitration or related court proceedings in connection with the confirmation or enforcement of an arbitral award to the extent permitted by law and has consented to the authority and jurisdiction of such court or arbitral tribunal to grant such relief; provided, that any such waiver shall not extend to any immunity on the alienation or attachment of assets located inside or outside of Brazil that it has solely as a result of its sovereign status, under Article 100 of the Civil Code of Brazil, including any limitations on the applicability of the enforcement process in Brazil for court-ordered payments (*precatórios judiciais*) pursuant to Article 100 of the Brazilian Federal Constitution.

(xxxi) Enforceability of New York Judgment; Arbitral Award. Except as described in the Disclosure Package and the Final Offering Memorandum (a) any final judgment for a fixed or readily calculable sum of money rendered by any court of the State of New York or of the United States located in the State of New York having jurisdiction under its own domestic laws in respect of the confirmation of an arbitral award and any suit, action or proceeding against the Sponsor, the Issuer or RJS based upon any of the Transaction Documents to which it is a party or the Series 2018-1 Notes would be declared enforceable against the Sponsor, the Issuer or RJS by the courts of Brazil without reexamination, review of the merits of the cause of action in respect of which the original judgment was given or relitigation of the matters adjudicated upon or payment of any stamp, registration or similar tax or duty; and (b) the recognition and enforcement of foreign arbitral awards rendered in the State of New York may be recognized and ratified by presenting such arbitral awards directly in Brazil to the Superior Court of Justice (“STJ”) without the need to first confirm the arbitral award by a New York Court, provided that the STJ determine that the following conditions have been satisfied with respect to such arbitral award: (A) the dispute involves rights that qualify as disposable economic rights; (B) the foreign arbitral award does not violate matters of Brazilian public policy or “good morals”; (C) the parties are capable; (D) the arbitration clause is not null in the view of the law of the country where the arbitral award was granted, or in the view of the law the parties chose to rule the dispute; (E) the adversary system was respected by the arbitrators, especially

where the respondent was notified about the appointment of the arbitrators or about the commencement of the arbitral proceeding; (F) the arbitral award does not exceed the limits provided by the arbitration clause; (G) the arbitration was instituted in accordance with the arbitration clause; (H) the award is final or has become binding on the parties; (I) the arbitration award was not annulled or suspended by the judicial courts of the country where it had been granted; (J) the arbitration award was not annulled or suspended by the judicial courts of the country where it had been granted; (K) the plaintiff presents a consularized and translated version of the arbitral award; and (L) the arbitral award was issued by the competent authority designated as such.

(xxxii) Enforcement and Validity under the Laws of Brazil. It is not necessary under the laws of Brazil or any political subdivision thereof or any authority or agency therein in order to enable a Subsequent Purchaser of the Series 2018-1 Notes or an owner of any interest therein to enforce its rights under the Series 2018-1 Notes or to enable the Initial Purchasers to enforce its rights under any of the Transaction Documents that it should, as a result solely of its holding of the Series 2018-1 Notes be licensed, qualified, or otherwise entitled to carry on business in Brazil or any political subdivision thereof or authority or agency therein; this Agreement, the other Transaction Documents to which each of the Sponsor, the Issuer and RJS is a party and the Series 2018-1 Notes are in proper legal form under the laws of Brazil and any political subdivision thereof or any authority or agency therein for the enforcement thereof against the Sponsor, the Issuer and RJS therein; and to ensure the legality, validity, enforceability or admissibility in evidence of any of the Transaction Documents in Brazil it is not necessary that the Transaction Documents be filed or recorded with any court or other authority in Brazil or any political subdivision thereof or any authority or agency therein or that any documentary, stamp or similar tax, imposition or charge be paid on or in respect of this Agreement, the other Transaction Documents or the Series 2018-1 Notes; provided that in order to be admissible as evidence in an enforcement action in the courts of Brazil, each such Transaction Document must be translated into Portuguese by a sworn translator and (a) the signatures of the parties thereto signed outside of Brazil shall have been notarized by a notary public licensed as such under the laws of the jurisdiction of signing; (b) the notarization must be legalized: (i) by the competent authority in accordance with the laws of the place of notarization, which authority must affix to the relevant document the Hague Apostille pursuant to the Convention Abolishing the Requirement of Legalization for Foreign Public Documents (“Apostille Convention”), if the country has ratified the Apostille Convention; or (ii) by a consular official of Brazil with jurisdiction over the place of signing (after any further legalization measures that may be required in accordance with the laws of the place of notarization), if the country has not ratified the Apostille Convention; and (b) each such Transaction Document shall have been registered with the

appropriate Registry of Titles and Deeds in Brazil, together with its sworn translation.

(xxxiii) Absence of Proceedings. Except as described in the Disclosure Package and the Final Offering Memorandum, there are no actions, suits or proceedings pending or, to the best of the knowledge of the Issuer, the Sponsor or RJS, threatened against or affecting the Issuer, RJS or the Sponsor, or any of its properties, in or before any court, arbitrator or other body, that could reasonably be expected to have a Material Adverse Effect on (i) the business, properties, condition (financial or otherwise) or results of operations of any of the Issuer, the Sponsor or RJS, (ii) the ability of the Issuer, the Sponsor or RJS, to perform its obligations under the Transaction Documents, or (iii) the validity or enforceability of any of the Transaction Documents or the rights or remedies of the Initial Purchasers.

(xxxiv) Ranking. Any claims against the Issuer, the Sponsor or RJS by any of the Initial Purchasers or the Indenture Trustee under the Transaction Documents will rank at least *pari passu* in priority of payment and in all other respects with the claims of other unsecured, unsubordinated creditors of the Issuer, the Sponsor or RJS.

(xxxv) Exchange Controls. Except as described in the Disclosure Package and the Final Offering Memorandum, principal, interest and other payments due or made on the Series 2018-1 Notes may be paid to the holder thereof in U.S. Dollars and all such payments made to holders thereof who are non-residents of Brazil shall be free and clear of any tax, duty withholding or deduction in Brazil or any political subdivision or taxing authority thereof or therein and without the necessity of obtaining any governmental authorization in Brazil or any political subdivision or taxing authority thereof or therein.

(xxxvi) Holdings. Except as described in the Disclosure Package and the Final Offering Memorandum, holders of the Series 2018-1 Notes will not be deemed resident, domiciled, carrying on business or subject to taxation in Brazil solely by reason of the execution, delivery, performance or enforcement of the Transaction Documents.

(xxxvii) Related Party Transactions. Except as described in the Disclosure Package and the Final Offering Memorandum, no material relationship, direct or indirect, exists between or among any of the Sponsor, the Issuer or any of their respective Affiliates, on the one hand, and any former or current director, officer, stockholder, customer or supplier of any of them (including any member of their immediate family), on the other hand, which would be material in the context of the issue and sale of the Series 2018-1 Notes.

(xxxviii) Solvency. Each of the Sponsor and RJS, as of the date hereof and immediately upon consummation of the transactions contemplated herein and in the Offering Memorandum (a) is not insolvent, will not be rendered insolvent under Brazilian law by virtue of the transactions effected by this Agreement and the Transaction Documents and is not entering into this Agreement with the actual intent to hinder, delay or defraud its present or future creditors, (b) is not incurring indebtedness, or payment obligations beyond its ability to pay, and (c) is able to realize on its assets and pay its indebtedness and other liabilities, (including, without limitation, contingent liabilities) as they come due.

(xxxix) Not Registered with the CVM. The Series 2018-1 Notes have not and will not be registered with the Brazilian Securities Commission (*Comissão de Valores Mobiliários*) (the “CVM”). The Series 2018-1 Notes (and beneficial interests therein) may not be offered or sold in Brazil except in circumstances that do not constitute a public offering or distribution under Brazilian laws and regulations.

(xl) Additional Representations. Each of the representations and warranties of each of the Issuer and the Sponsor set forth in the Transaction Documents to which it is a party is hereby incorporated by reference, is true and correct as of the date hereof (or such other date as is specified in such Transaction Documents).

(xli) Commodity Pool Operator Status. Neither the Issuer nor any Person acting on behalf of the Issuer has (a) claimed an exemption from registration under the United States Code of Federal Regulations pursuant to 17 CFR 4.7, or (b) registered with the Commodity Futures Trading Commission as a commodity pool operator in connection with the operation of a commodity pool.

(b) *Officer’s Certificates*. Any certificate signed by any officer of the Issuer or any public official of the Sponsor or RJS, as applicable, delivered to the Initial Purchasers shall be deemed a representation and warranty by the Sponsor and the Issuer to each Initial Purchaser as to the matters covered thereby.

## SECTION 2. Sale and Delivery to Initial Purchasers; Closing.

(a) *Purchase and Sale of the Series 2018-1 Notes*. On the basis of the representations and warranties herein contained and subject to the terms and conditions herein set forth, the Issuer agrees to sell, severally and not jointly, to the Initial Purchasers, and each Initial Purchaser agrees to purchase, severally and not jointly, from the Issuer, at the price set forth in Schedule B hereto, the aggregate principal amount of the Series 2018-1 Notes set forth in such Schedule B opposite the name of such Initial Purchaser, plus any additional principal amount of the Series 2018-1 Notes which such Initial Purchaser may become obligated to purchase pursuant to Section 27 hereof.

(b) *Payment and Delivery of the Series 2018-1 Notes.* Payment of the purchase price for the Series 2018-1 Notes shall be made at the office of Hogan Lovells US LLP, 875 Third Avenue, New York, New York 10022, or at such other place as shall be agreed upon by the Initial Purchasers and the Issuer, at 9:00 a.m. (New York time) on the fifth (5<sup>th</sup>) business day after the date hereof (unless postponed in accordance with the provisions of Section 27), or such other time not later than ten (10) business days after such date as shall be agreed upon by the Initial Purchasers and the Issuer (such time and date of payment and delivery being herein called the “Closing Time”), against delivery to the Indenture Trustee as custodian for DTC of (i) the Temporary Regulation S Note for the respective accounts of the DTC participants for Euroclear and Clearstream, as applicable, and (ii) the Rule 144A Notes.

(c) *Form of the Series 2018-1 Notes.* The Series 2018-1 Notes will be issued in registered form and, in the case of the Series 2018-1 Notes which are sold in transactions outside the United States in reliance on Regulation S, will be represented by interests in the Temporary Regulation S Notes and, in the case of the Series 2018-1 Notes which are sold in transactions in the U.S. to Qualified Institutional Buyers, will be represented by interests in the Rule 144A Notes. The Rule 144A Notes will be registered in the name of a nominee for DTC. The Temporary Regulation S Notes will be registered in the name of a nominee for DTC for the accounts of Euroclear and Clearstream, respectively. Individual definitive Notes representing the Series 2018-1 Notes in amounts of U.S.\$250,000 or higher integral multiples of U.S.\$1,000 will not be initially issued and will only be available in certain limited circumstances as described in the Indenture. The Rule 144A Notes and the Temporary Regulation S Notes shall each be made available for examination by the Initial Purchasers in the City of New York not later than 10:00 a.m. on the last Business Day prior to the Closing Time.

(d) *Denominations; Registration.* The Series 2018-1 Notes shall be in such denominations (U.S.\$250,000 or integral multiples of U.S.\$1,000 in excess thereof) and registered in the name of Cede & Co., as nominee of DTC. The certificates representing the Series 2018-1 Notes shall be made available for examination and packaging by the Initial Purchasers in the City of New York not later than 10:00 a.m. on the last Business Day prior to the Closing Time.

**SECTION 3. Covenants of the Issuer and the Sponsor.** Each of the Issuer and the Sponsor covenants with each Initial Purchaser as follows:

(a) *Offering Memorandum.* Each of the Issuer and the Sponsor, as promptly as possible, will furnish to each Initial Purchaser, without charge, such number of copies of the Offering Memorandum and any amendments and supplements thereto and documents incorporated by reference therein as such Initial Purchaser may reasonably request.

(b) *Notice and Effect of Material Events.* Each of the Issuer and the Sponsor will, as applicable, immediately notify each Initial Purchaser, and confirm such notice in writing, of (i) any filing made by it of information relating to the offering of the Series 2018-1 Notes with any securities exchange or any other regulatory body in the United States or any other jurisdiction, and (ii) prior to the completion of the placement of the offered the Series 2018-1 Notes by the Initial Purchasers as evidenced by a notice in writing from the Initial Purchasers to the Issuer and the Sponsor, any material changes in or affecting the condition, financial or

otherwise, or the earnings, business affairs, operations or business prospects of the Issuer, the Sponsor or RJS, as applicable, which (x) make any statement in the Disclosure Package, any Offering Memorandum or any Additional Written Offering Communication false or misleading or (y) are not disclosed in the Disclosure Package or the Offering Memorandum. In such event or if during such time any event shall occur as a result of which it is necessary, in the reasonable opinion of any of the Issuer or the Sponsor, their counsel, the Initial Purchasers or counsel for the Initial Purchasers, to amend or supplement the Offering Memorandum in order that the Offering Memorandum not include any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein not misleading in the light of the circumstances then existing, the Issuer and the Sponsor will, at its own expense, forthwith amend or supplement the Offering Memorandum by preparing and furnishing to each Initial Purchaser an amendment or amendments of, or a supplement or supplements to, the Offering Memorandum (in form and substance satisfactory in the reasonable opinion of counsel for the Initial Purchasers) so that, as so amended or supplemented, the Offering Memorandum will not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances existing at the time it is delivered to a Subsequent Purchaser, not misleading.

(c) *Amendments and Supplements to the Offering Memorandum.* Each of the Issuer and the Sponsor will advise each Initial Purchaser promptly of any proposal to amend or supplement the Offering Memorandum and will not affect such amendment or supplement if the Initial Purchasers disapprove of such amendment or supplement promptly after reasonable notice thereof. Neither the consent of the Initial Purchasers, nor the Initial Purchasers' delivery of any such amendment or supplement, shall constitute a waiver of any of the conditions set forth in Section 5 hereof. Each of the Issuer and the Sponsor represents and agrees that, unless it obtains the prior consent of the Initial Purchasers, it has not made and will not make any offer relating to the Series 2018-1 Notes by means of any offering materials other than the Offering Memorandum.

(d) *Qualification of the Series 2018-1 Notes for Offer and Sale.* Each of the Issuer and the Sponsor will use its best efforts, in cooperation with the Initial Purchasers, to qualify the Series 2018-1 Notes for offering and sale under the applicable securities laws of such states and other jurisdictions as the Initial Purchasers may designate and to maintain such qualifications in effect as long as required for the sale of the Series 2018-1 Notes; provided, however, that the Issuer and the Sponsor shall not be obligated to file any general consent to service of process (other than in the State of New York) or to qualify as a foreign corporation or as a dealer in securities, if applicable, in any jurisdiction in which it is not so qualified or to subject itself to taxation in respect of doing business in any jurisdiction in which it is not otherwise so subject.

(e) *Rating of the Series 2018-1 Notes.* Each of the Issuer and the Sponsor shall take or cause to be taken all reasonable action necessary to enable Standard & Poor's Financial Services LLC, a subsidiary of The McGraw-Hill Companies, Inc. ("S&P") and Fitch, Inc. and Fitch Ratings Ltd and any subsidiary of either of them with any successor in interest in such person ("Fitch") to provide their respective credit ratings of the Series 2018-1 Notes.



(f) *Clearing Agencies.* Each of the Issuer and the Sponsor will cooperate with the Initial Purchasers and use its best efforts to permit the Series 2018-1 Notes to be eligible for clearance and settlement through the facilities of DTC, Euroclear and Clearstream.

(g) *Use of Proceeds.* Each of the Issuer and the Sponsor will use the net proceeds received by it from the sale of the Series 2018-1 Notes in the manner specified in the Offering Memorandum under “Use of Proceeds.”

(h) *Clear Market.* Without the consent of the Initial Purchasers, none of the Sponsor or the Issuer shall, directly or indirectly, until 120 days after the Closing Time, market, issue, sell, contract to sell or grant any option to purchase or otherwise dispose of any additional Notes or other securities backed by the Assigned Oil Revenues and Assigned Oil Revenue Rights, except with respect to the issue and sale of the Series 2018-1 Notes hereunder.

(i) *Transfer Restrictions.* Until the expiration of one year after the original issuance of the offered Series 2018-1 Notes, the Issuer will, upon request, furnish to each of the Initial Purchasers and any holder of offered Series 2018-1 Notes a copy of the restrictions on transfer applicable to the Series 2018-1 Notes.

(j) *U.S. Securities Laws.* None of the Sponsor, the Issuer or any of their Affiliates, or any person acting on their behalf(s) (other than the Initial Purchasers) will, (i) engage in any form of General Solicitation in connection with any offer or sale of the Series 2018-1 Notes in the United States without the prior written consent of the Initial Purchasers and (ii) directly or indirectly, make offers or sales of any security, or solicit offers to buy any security, under circumstances that would require registration of the Series 2018-1 Notes under the Securities Act.

**SECTION 4. Payment of Fees and Reimbursement of Expenses.** Whether or not the sale of the Series 2018-1 Notes and the transactions contemplated herein are consummated, the Sponsor agrees to pay or reimburse the Initial Purchasers severally through BB Securities with respect to all fees and all reasonable expenses (including reasonable fees and disbursements of counsel) that shall be payable to the Initial Purchasers, or shall have been incurred by them, in connection with the proposed purchase and sale of the Series 2018-1 Notes and the transactions contemplated herein, in each case in accordance with the terms of the technical services agreement for the securitization of credit rights entered into by the Sponsor and BB Securities Limited on or about October 25, 2017. In addition, BB Securities agrees to reimburse BNP Paribas for its share of such fees and expenses in accordance with the terms of the services agreement dated on or about November 30, 2017 between BB Securities and BNP Paribas.

**SECTION 5. Conditions of Initial Purchasers’ Obligations.** The obligations of the several Initial Purchasers hereunder are subject to the accuracy of the representations and warranties of the Sponsor, the Issuer and RJS contained in Section 1 hereof or in certificates of any officer of the Issuer or in certificates of any public official of the Sponsor or RJS delivered pursuant to the provisions hereof, to the performance by each of the Sponsor and the Issuer of its covenants and other obligations hereunder, and to the following further conditions:

(a) *Opinion of Counsel for the Sponsor, the Issuer and the Indenture Trustee.* At Closing Time, the Initial Purchasers shall have received the favorable opinion and, with respect to (i) and (ii) herein, negative assurance letter, dated as of Closing Time, of (i) Campos Mello Advogados, counsel for the Sponsor as to Brazilian law matters, (ii) Clifford Chance LLP, counsel for the Sponsor as to U.S. law matters, and (iii) Alston & Bird LLP, counsel for the Indenture Trustee, in each case in form and substance satisfactory to counsel for the Initial Purchasers.

(b) *Opinion of Counsel for Initial Purchasers.* At Closing Time, the Initial Purchasers shall have received the favorable opinion and negative assurance letter, dated as of Closing Time, of (i) Hogan Lovells US LLP (with respect to such matters that the Initial Purchasers may reasonably request), counsel for the Initial Purchasers as to U.S. law matters and (ii) Cescon, Barrieu, Flesch & Barreto Advogados, counsel for the Initial Purchasers as to Brazilian law matters, in form and substance satisfactory to the Initial Purchasers. In giving such opinion such counsel may rely, as to all matters governed by the laws of jurisdictions other than the law of the State of New York and the federal law of the United States, upon the opinions of counsel satisfactory to the Initial Purchasers. Such counsel may also state that, insofar as such opinion involves factual matters, they have relied, to the extent they deem proper, upon certificates of officers of the Issuer and certificates of public officials of the Sponsor or RJS.

(c) *Opinion with respect to the Servicer, the Bond Administrator and the Brazilian Collateral Agent.* At Closing Time, the Initial Purchasers shall have received the favorable opinion, dated as of Closing Time, of (i) Hogan Lovells US LLP as to U.S. law matters regarding the Servicer, the Bond Administrator and the Brazilian Collateral Agent, and (ii) Cescon, Barrieu, Flesch & Barreto Advogados as to Brazilian law matters regarding the Servicer, the Bond Administrator and the Brazilian Collateral Agent, each in form and substance satisfactory to the Initial Purchasers.

(d) *Certificate of the Sponsor.* At Closing Time, there shall not have been, since the date hereof or since the date as of which information is given in the Disclosure Package and the Final Offering Memorandum (exclusive of any amendments or supplements thereto subsequent to the date of this Agreement), any change which constitutes a Material Adverse Effect, and the Initial Purchasers shall have received a certificate of an authorized public official of the Sponsor, dated as of the Closing Time, to the effect that (i) there has been no change which constitutes a Material Adverse Effect, (ii) the representations and warranties in Section 1(a) hereof are true and correct with the same force and effect as though expressly made at and as of the Closing Time (or such other date as specified therein), (iii) to such official's knowledge: (A) as of the Applicable Time, the Disclosure Package did not include any untrue statement of a material fact and did not omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, and (B) as of the Closing Time, the Final Offering Memorandum does not include any untrue statement of a material fact and does not omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, (iv) the Sponsor have complied with all agreements and satisfied all conditions on their part to be performed or satisfied at or prior to the Closing Time, and (v) all conditions precedent to the issuance of an additional Series of Securities shall have been satisfied at or prior to the Closing Time.

(e) *Officers' Certificate of the Issuer.* At Closing Time, there shall not have been, since the date hereof or since the date as of which information is given in the Disclosure Package and the Final Offering Memorandum (exclusive of any amendments or supplements thereto subsequent to the date of this Agreement), any change which constitutes a Material Adverse Effect, and the Initial Purchasers shall have received a certificate of an Authorized Officer of the Issuer, dated as of the Closing Time, to the effect that (i) there has been no change which constitutes a Material Adverse Effect, (ii) to the Issuer's knowledge: (A) as of the Applicable Time, the Disclosure Package did not include any untrue statement of a material fact and did not omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, and (B) as of the Closing Time, the Final Offering Memorandum does not include any untrue statement of a material fact and does not omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, (iii) the Issuer has complied with all agreements and satisfied all conditions on its part to be performed or satisfied at or prior to the Closing Time, and (iv) all conditions precedent to the issuance of an additional Series of Securities shall have been satisfied at or prior to the Closing Time.

(f) *Accountants' Model Review Report.* (i) At the time of the execution of this Agreement, the Initial Purchasers shall have received from Ernst & Young Assessoria Empresarial Ltd., a report dated such date, in form and substance satisfactory to the Initial Purchasers, with respect to the financial model prepared for purposes of the transactions contemplated herein.

(g) *Accountants' Comfort Letter.* At the time of the execution of this Agreement, the Initial Purchasers shall have received from Maciel Auditores S/S, with respect to the Sponsor's financial statements for the years ended December 31, 2015, 2016 and 2017, a letter dated such date, in form and substance satisfactory to the Initial Purchasers, containing statements and information of the type ordinarily included in accountants' "comfort letters" to Initial Purchasers with respect to certain financial information contained in the Offering Memorandum.

(h) *Bring-down Comfort Letter.* At Closing Time, the Initial Purchasers shall have received from Maciel Auditores S/S a letter, dated as of Closing Time, to the effect that they reaffirm the statements made in its respective letter furnished pursuant to subsection (g) of this Section 5, except that the specified cut-off date referred to shall be a date not more than three (3) Business Days prior to the Closing Time.

(i) *Maintenance of Rating.* At Closing Time, the Series 2018-1 Notes shall be rated at least "BB-" by S&P and "BB-" by Fitch on their international rating scales, and the Issuer shall have delivered to the Initial Purchasers a letter dated as of the Closing Time, from each such rating agency, or other evidence satisfactory to the Initial Purchasers, confirming that the Series 2018-1 Notes have such ratings; and since the date of this Agreement, there shall not have occurred a downgrading in the rating assigned to the Series 2018-1 Notes by such rating agencies, and no such rating agencies shall have publicly announced that it has under surveillance of review, with possible negative implications, its ratings of the Series 2018-1 Notes.

(j) *Executed Transaction Documents.* At Closing Time, the Initial Purchasers shall have received a certification from each of an Authorized Officer of the Issuer and an authorized public official of the Sponsor, in form and substance satisfactory to counsel for the Initial Purchasers, stating that (i) the following documents continue to be in full force and effect, and have not been restated, modified, amended, or terminated since the Closing Date, except as to such amendments delivered in connection with the issuance of the Series 2018-1 Notes: (A) the Bill of Sale, (B) the Initial Oil Revenue and Rights Bill of Sale, (C) the Banco do Brasil Oil Revenue and Rights Bill of Sale, (D) the Caixa Oil Revenue and Rights Bill of Sale, (E) the Indenture, (F) the Royalties Rights Agreement, (G) the Servicing Agreement, (H) the Trust Agreement, (I) the Royalty Agreements, and (J) the consent of the Sponsor to the sale of the Assigned Continuously Owned RioPrevi Oil Revenues and Assigned Continuously Owned RioPrevi Oil Revenue Rights by the Sponsor to the Issuer, as necessary to permit the transactions contemplated by the Transaction Documents; (ii) the filed copies of (A) the initial financing statement naming the Issuer, as debtor and the Indenture Trustee, for the benefit of the Secured Parties, as secured party, filed in the Delaware Filing Office, (B) the initial financing statement naming the Rio Petróleo SPE S/A Companhia Securitizadora de Créditos Financeiros, as debtor and the Issuer, as secured party, filed in the District of Columbia Filing Office, and (C) the initial financing statement naming the Sponsor, as debtor and the Issuer, as secured party, filed with the District of Columbia Filing Office, are in full force and effect, and have not been amended or terminated; (iii) no Event of Default has occurred and is continuing; (iv) the representations and warranties set forth in the Transaction Documents continue to be true and correct; and (v) with respect to each Transaction Document, there has been no change in the facts and circumstances since the date of delivery of such Transaction Document that would affect the validity or enforceability of such Transaction Document.

(k) *Transaction Documents.* At Closing Time, the Initial Purchasers shall have received, in form and substance reasonably satisfactory to counsel for the Initial Purchasers, certified copies of the Series 2018-1 Notes, the Series 2018-1 Indenture Supplement and the Amended and Restated Pledge Agreement in each case, including all amendments thereto.

(l) *Issuer Organizational Documents.* At Closing Time, the Issuer shall have furnished to the Initial Purchasers, (i) a certification by an Authorized Officer thereof as of the Closing Time that the execution, sale and delivery of the Series 2018-1 Notes, the delivery, execution and performance of this Agreement, the Series 2018-1 Indenture Supplement, the Amended and Restated Pledge Agreement and any other documents executed by or on behalf of the Issuer in connection with the transactions contemplated thereby are authorized by the Trust Agreement or other organizational documents of the Issuer as in effect on the date hereof; (ii) certified copies of its organizational documents; and (iii) certified copies of power of attorney and signature circulars pursuant to which Authorized Officers or agents of such entities shall execute this Agreement, the Series 2018-1 Indenture Supplement, the Series 2018-1 Notes, and the Amended and Restated Pledge Agreement.

(m) *Evidence of Transaction Accounts.* At Closing Time, the Initial Purchasers shall have received evidence from the Indenture Trustee and the Bond Administrator, as applicable, in form and substance reasonably satisfactory to counsel for the Initial Purchasers, that (i) each of the Transaction Accounts established pursuant to the Indenture have been maintained in

accordance with the terms of the Indenture, and (ii) each of the Transaction Accounts to be established pursuant to the Series 2018-1 Indenture Supplement shall have been established.

(n) *Independent Consultant Report.* The Initial Purchasers shall have received from Wood Mackenzie, an independent consultant, a report that contains a review and assessment of the then actual and forecasted Oil Revenues and RJS Oil Revenues, together with a letter granting permission for the use of such report in the Offering Memorandum, in form and substance satisfactory to the Initial Purchasers (the form of which is attached hereto as Exhibit A).

(o) *Additional Documents.* At Closing Time, counsel for the Initial Purchasers shall have been furnished with such documents and opinions as they may reasonably require for the purpose of enabling them to pass upon the issuance and sale of the Series 2018-1 Notes as herein contemplated, or in order to evidence the accuracy of any of the representations or warranties, or the fulfillment of any of the conditions, herein contained.

(p) *Clearing Systems.* The Series 2018-1 Notes shall be eligible for clearing and settlement through the facilities of DTC, Euroclear and Clearstream, as applicable.

(q) *No Legal Impediment to Issuance and Sale.* No action shall have been taken and no rule, regulation or order shall have been enacted, adopted or issued by any governmental or regulatory authority that would, as of the Closing Time, prevent the issuance or sale of the Series 2018-1 Notes.

(r) *Process Agent Acceptance.* At the time of the execution of this Agreement, the Initial Purchasers shall have received a letter from National Corporate Research confirming its acceptance to serve as the Process Agent (as defined in Section 12 hereof) for each of the Sponsor, the Issuer and RJS.

(s) *Amended and Restated Pledge Agreement.* The Initial Purchasers shall have received evidence, in form and substance satisfactory to counsel for the Initial Purchasers, of the registration of the Amended and Restated Pledge Agreement, together with its sworn translation into Portuguese, with the competent Registry of Titles and Deeds in Brazil made on or before the Series Closing Date.

(t) *Annual Reporting.* The Initial Purchasers shall have received evidence, in form and substance satisfactory to counsel for the Initial Purchasers that the annual reporting of the sale, assignment and transfer of the Assigned Oil Revenues and Assigned Oil Revenue Rights to the RJS State Parliament as required by RJS Law 6,112/2011 has been made.

(u) *Change of Law.* At or prior to the Closing Time, the Initial Purchasers shall have received confirmation of (i) the effectiveness of both amendment n. 70 of the Constitution of RJS and of State Supplementary Law n. 178 of December 20, 2017, the effect of which is to subordinate amounts payable by RJS to *Fundo Estadual de Conservação Ambiental e Desenvolvimento Urbano* – FECAM to the RioPrevi Oil Revenues; and (ii) the effectiveness of Federal Law No. 13,609 of January 10, 2018, the effect of which is to eliminate the requirement that the RJS Oil Revenues Dedicated Account must be in the name of RJS.

If any condition specified in this Section 5 shall not have been fulfilled when and as required to be fulfilled, this Agreement may be terminated by the Initial Purchasers by notice to the Issuer at any time at or prior to the Closing Time, and such termination shall be without liability of any party to any other party except as provided in Section 4 and except that Sections 7, 8 and 12 shall survive any such termination and remain in full force and effect.

SECTION 6. Subsequent Offers and Resales of the Series 2018-1 Notes.

(a) *Offer and Sale Procedures.* Each of the Initial Purchasers (covenants of each Initial Purchaser being applicable solely to it), the Sponsor and the Issuer hereby establish and agree to observe the following procedures in connection with the offer and sale of the Series 2018-1 Notes:

(i) Offers and Sales. Offers and sales of the Series 2018-1 Notes shall be made to such persons and in such manner as is contemplated in the Offering Memorandum. Each Initial Purchaser severally agrees that it will not offer, sell or deliver any of the Series 2018-1 Notes in any jurisdiction except under circumstances that will result in compliance with the Applicable Laws thereof, and that it will take at its own expense whatever action is required to permit its purchase and resale of the Series 2018-1 Notes in such jurisdictions.

(ii) General Solicitation. No General Solicitation that is not in the Additional Written Offering Communication other than a General Solicitation listed on Schedule C hereto or those made with the prior written consent of the Initial Purchasers has been or will be used in the United States in connection with the offering or sale of the Series 2018-1 Notes.

(iii) Subsequent Purchaser Notification. Each Initial Purchaser will take reasonable steps to inform, and cause each of its Affiliates to take reasonable steps to inform, persons acquiring Series 2018-1 Notes from the Initial Purchasers or their Affiliates, as the case may be, in the United States that the Series 2018-1 Notes (A) have not been and will not be registered under the Securities Act, (B) are being sold to them without registration under the Securities Act in reliance on Rule 144A or in accordance with another exemption from registration under the Securities Act, as the case may be, and (C) may not be offered, sold or otherwise transferred except (1) to the Issuer, (2) outside the United States in accordance with Regulation S, or (3) inside the United States in accordance with (x) Rule 144A to a person whom the seller reasonably believes is a Qualified Institutional Buyer that is purchasing such Series 2018-1 Notes for its own account or for the account of a Qualified Institutional Buyer to whom notice is given that the offer, sale or transfer is being made in reliance on Rule 144A or (y) pursuant to another available exemption from registration under the Securities Act; provided that such reasonable steps may include providing a copy of the Disclosure Package and Final Offering Memorandum, as amended and supplemented at

the date of such delivery, to such persons acquiring Series 2018-1 Notes from the Initial Purchasers or their Affiliates in the United States. Furthermore, the Initial Purchasers will take reasonable steps to inform, and cause each of their Affiliates to take reasonable steps to inform, the persons acquiring Series 2018-1 Notes from the Initial Purchasers or any of their Affiliates, as the case may be, that the Series 2018-1 Notes may not be offered or sold in Brazil except in circumstances that do not constitute a public offering or distribution under Brazilian laws and regulations; provided that such reasonable steps may include providing a copy of a copy of the Disclosure Package and Final Offering Memorandum, as amended and supplemented at the date of such delivery, to such persons acquiring Series 2018-1 Notes from the Initial Purchasers or their Affiliates.

(iv) FSMA. In relation to the United Kingdom, such Initial Purchaser (a) has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of section 21 of the Financial Services and Markets Act 2000 (“FSMA”)) in circumstances in which section 21 of FSMA does not apply to the Issuer and (b) has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to any Series 2018-1 Notes in, from or otherwise involving the United Kingdom.

(v) Minimum Principal Amount. No sale of the Series 2018-1 Notes to any one Subsequent Purchaser will be for less than U.S.\$250,000 principal amount and integrals of U.S.\$1,000 in excess thereof, and no Series 2018-1 Note will be issued in a smaller principal amount.

(vi) Restrictions on Transfer. The transfer restrictions and the other provisions set forth in the Offering Memorandum under the headings “Transfer Restrictions,” including the legends required thereby, shall apply to the Series 2018-1 Notes except as otherwise agreed by the Sponsor, the Issuer and the Initial Purchasers.

(vii) Delivery of Disclosure Package and Final Offering Memorandum. The Initial Purchasers will deliver to each purchaser of the Series 2018-1 Notes, in connection with its original distribution of the Series 2018-1 Notes, a copy of the Disclosure Package and Final Offering Memorandum, as amended and supplemented at the date of such delivery.

(viii) MIFID Product Governance Rules. Solely for the purposes of the requirements of Article 9(8) of the MIFID Product Governance rules under EU Delegated Directive 2017/593 (the “Product Governance Rules”) regarding the mutual responsibilities of manufacturers under the Product Governance Rules:

(A) BB Securities (the “Manufacturer”) acknowledges that it understands the responsibilities conferred upon it under the Product Governance Rules relating to each of the product approval process, the target market and the proposed distribution channels as applying to the Series 2018-1 Notes and the related information set out in the Offering Memorandum in connection with the Series 2018-1 Notes; and

(B) the Sponsor and the Issuer note the application of the Product Governance Rules and acknowledge the target market and distribution channels identified as applying to the Series 2018-1 Notes by the Manufacturer and the related information set out in the Offering Memorandum in connection with the Series 2018-1 Notes.

(b) *Covenants of the Issuer and the Sponsor.* Each of the Issuer and the Sponsor covenants with each of the Initial Purchasers as follows:

(i) Integration. Each of the Issuer and the Sponsor agrees that it will not and will cause its Affiliates not to, directly or indirectly, solicit any offer to buy, sell or make any offer or sale of, or otherwise negotiate in respect of, securities of the Issuer or the Sponsor of any class if, as a result of the doctrine of “integration” referred to in Rule 502 under the Securities Act, such offer or sale would render invalid (for the purpose of (i) the sale of the offered Series 2018-1 Notes by the Issuer to the Initial Purchasers, (ii) the resale of the offered Series 2018-1 Notes by the Initial Purchasers to Subsequent Purchasers or (iii) the resale of the offered Series 2018-1 Notes by such Subsequent Purchasers to others) the exemption from the registration requirements of the Securities Act provided by Section 4(a)(2) thereof or by Rule 144A or by Regulation S thereunder or otherwise.

(ii) Rule 144A Information. Each of the Issuer and the Sponsor agrees that, in order to render the offered Series 2018-1 Notes eligible for resale pursuant to Rule 144A under the Securities Act, while any of the offered Series 2018-1 Notes remain outstanding, it will make available, upon request, to any holder of offered Series 2018-1 Notes or prospective purchasers of the Series 2018-1 Notes the information specified in Rule 144A(d)(4), unless the Issuer or the Sponsor furnishes information to the U.S. Securities and Exchange Commission (the “Commission”) pursuant to Section 13 or 15(d) of the Exchange Act or is exempt from reporting pursuant to Rule 12g3-2(b) under the Exchange Act.

(iii) Restriction on Repurchases. Until the expiration of one year after the original issuance of the offered Series 2018-1 Notes, each of the Sponsor and the Issuer will not, and will cause its Affiliates not to, resell any offered Series 2018-1 Notes which are “restricted securities” (as such term is defined under Rule 144(a)(3) under the Securities Act), whether as beneficial owner or otherwise (except as agent acting as a securities broker



on behalf of and for the account of customers in the ordinary course of business in unsolicited broker's transactions).

(c) *Qualified Institutional Buyer.* Each Initial Purchaser severally and not jointly represents and warrants to, and agrees with, the Sponsor and the Issuer that it is a Qualified Institutional Buyer and an "accredited investor" within the meaning of Rule 501(a) under the Securities Act. Each Initial Purchaser represents that it will sell the Series 2018-1 Notes to be sold under Rule 144A to Persons that are or that it reasonably believes is a Qualified Institutional Buyer that can make the representations set forth in Section "Transfer Restrictions" of the Offering Memorandum.

(d) *Resale Pursuant to Rule 903 of Regulation S or Rule 144A.* Each Initial Purchaser understands that the offered Series 2018-1 Notes have not been and will not be registered under the Securities Act and may not be offered or sold within the United States or to, or for the account or benefit of, U.S. persons except in accordance with Regulation S under the Securities Act or pursuant to an exemption from the registration requirements of the Securities Act. Each Initial Purchaser severally represents and agrees, that, except as permitted by Section 6(a) above, it has offered and sold the Series 2018-1 Notes and will offer and sell the Series 2018-1 Notes (i) as part of their distribution at any time and (ii) otherwise until forty (40) days after the later of the date upon which the offering of the Series 2018-1 Notes commences and Closing Time, only in accordance with Rule 903 of Regulation S, Rule 144A under the Securities Act or another applicable exemption from the registration requirements of the Securities Act. Accordingly, neither the Initial Purchasers, their Affiliates nor any persons acting on their behalf have engaged or will engage in any directed selling efforts with respect to Series 2018-1 Notes sold hereunder pursuant to Regulation S, and the Initial Purchasers, their affiliates and any person acting on their behalf have complied and will comply with the offering restriction requirements of Regulation S.

#### SECTION 7. Indemnification.

(a) *Indemnification of Initial Purchasers.* Each of the Sponsor, the Issuer and RJS jointly and severally agrees to indemnify and hold harmless each Initial Purchaser, the directors, officers, employees, affiliates and agents of each Initial Purchaser and each person who controls any Initial Purchaser within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act against any and all losses, claims, damages or liabilities, joint or several, to which they or any of them may become subject under the Securities Act, the Exchange Act or other U.S. federal or state or foreign statutory law or regulation, at common law or otherwise, insofar as such losses, claims, damages or liabilities (or actions in respect thereof):

(i) arise out of or are based upon any untrue statement or alleged untrue statement of a material fact contained in any Preliminary Offering Memorandum, the Disclosure Package, the Final Offering Memorandum (or any amendment or supplement thereto) or any Additional Written Offering Communication (with respect to RJS, only as to the RJS Information), or

(ii) arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein (with respect to RJS, only as to the RJS Information), in the light of the circumstances under which they were made, not misleading,

and agrees, in each case, to reimburse each such indemnified party, as incurred, for any legal or other expenses reasonably incurred by them in connection with investigating or defending any such loss, claim, damage, liability or action; provided, however, that the Issuer, the Sponsor and RJS will not be liable in any such case to the extent that any such loss, claim, damage or liability arises out of or is based upon any such untrue statement or alleged untrue statement or omission or alleged omission made in any Preliminary Offering Memorandum, the Disclosure Package, the Final Offering Memorandum (or any amendment or supplement thereto) or any Additional Written Offering Communication in reliance upon and in conformity with written information furnished to the Sponsor and the Issuer by any Initial Purchaser specifically for inclusion therein, it being understood that the only such information is set forth in Section 7(b) hereof. This indemnity agreement will be in addition to any liability that the Sponsor, the Issuer and RJS may otherwise have.

(b) *Indemnification of the Issuer, the Sponsor and RJS.* Each Initial Purchaser, severally and not jointly, agrees to indemnify and hold harmless the Sponsor, the Issuer and RJS, each of their respective directors, each of their respective officers, each of their respective employees, affiliates and agents and each person who controls either the Sponsor, the Issuer or RJS within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, to the same extent as the foregoing indemnity from the Sponsor, the Issuer and RJS to each Initial Purchaser, but only with reference to written information relating to such Initial Purchaser furnished to the Sponsor and the Issuer by such Initial Purchaser specifically for inclusion in any Preliminary Offering Memorandum, the Disclosure Package, the Final Offering Memorandum (or any amendment or supplement thereto) or any Additional Written Offering Communication. This indemnity agreement will be in addition to any liability that any Initial Purchaser may otherwise have. Each of the Sponsor, the Issuer and RJS acknowledges that the following statements set forth in “Plan of Distribution” constitute the only information furnished in writing by the Initial Purchasers for inclusion in any Preliminary Offering Memorandum, the Disclosure Package, the Final Offering Memorandum (or any amendment or supplement thereto): (i) the fourth paragraph, (ii) the fifth paragraph, (iii) the seventh paragraph solely with respect to BB Securities, (iv) the third, fourth and fifth sentences of the ninth paragraph, (v) the eleventh paragraph, and (vi) the twelfth paragraph.

(c) *Actions against Parties; Notification.* Promptly after receipt by an indemnified party under this Section 7 of notice of the commencement of any action, such indemnified party will, if a claim in respect thereof is to be made against the indemnifying party under this Section 7, notify the indemnifying party in writing of the commencement thereof; but the failure so to notify the indemnifying party (i) will not relieve it from liability under Section 7(a) or 7(b) hereof unless and to the extent such failure results in the forfeiture by the indemnifying party of substantial rights and defenses and (ii) will not, in any event, relieve the indemnifying party from any obligations to any indemnified party other than the indemnification obligation provided in

Section 7(a) or 7(b) hereof. The indemnifying party shall, upon written request of the indemnified party, retain counsel (including local counsel) reasonably satisfactory to the indemnified party and any others the indemnified party may designate to represent the indemnified party (and any other parties so designated by the indemnified party) in any action for which indemnification is sought and shall pay the fees and disbursements of such counsel related to such proceeding. Notwithstanding the indemnifying party's election to appoint counsel (including local counsel) to represent the indemnified party in an action, the indemnified party shall have the right to employ separate counsel (including local counsel), and the indemnifying party shall bear the reasonable fees, costs and expenses of such separate counsel if (i) the use of counsel chosen by the indemnifying party to represent the indemnified party would present such counsel with a conflict of interest; (ii) the actual or potential defendants in, or targets of, any such action (including any impleaded parties) include both the indemnified party and the indemnifying party and the indemnified party shall have reasonably concluded that there may be legal defenses available to it that are different from or additional to those available to the indemnifying party; (iii) the indemnifying party shall not have employed counsel reasonably satisfactory to the indemnified party to represent the indemnified party within a reasonable time after notice of the institution of such action; or (iv) the indemnifying party shall authorize the indemnified party to employ separate counsel at the expense of the indemnifying party. An indemnifying party will not, without the prior written consent of the indemnified parties, settle or compromise or consent to the entry of any judgment with respect to any pending or threatened claim, action, suit or proceeding in respect of which indemnification or contribution may be sought hereunder (whether or not the indemnified parties are actual or potential parties to such claim or action) unless such settlement, compromise or consent (1) includes an unconditional release of each indemnified party from all liability arising out of such claim, action, suit or proceeding and (2) does not include a statement as to, or admission of, fault culpability or failure to act by or on behalf of the indemnified party.

SECTION 8. Contribution. In the event that the indemnity provided in Section 7 hereof is unavailable to or insufficient to hold harmless an indemnified party for any reason, the Sponsor, the Issuer and RJS jointly and severally agree, and the Initial Purchasers severally agree to contribute to the aggregate losses, claims, damages and liabilities (including legal or other expenses reasonably incurred in connection with investigating or defending any loss, claim, damage, liability or action) (collectively "Losses") to which the Sponsor, the Issuer, RJS and one or more of the Initial Purchasers may be subject in such proportion as is appropriate to reflect the relative benefits received by the Sponsor, the Issuer and RJS on the one hand and by the Initial Purchasers on the other from the offering of the Series 2018-1 Notes. If the allocation provided by the immediately preceding sentence is unavailable for any reason, the Sponsor, the Issuer, RJS and the Initial Purchasers severally shall contribute in such proportion as is appropriate to reflect not only such relative benefits but also the relative fault of the Sponsor, the Issuer and RJS on the one hand and the Initial Purchasers on the other in connection with the statements or omissions that resulted in such Losses, as well as any other relevant equitable considerations. Benefits received by the Sponsor, the Issuer and RJS shall be deemed to be equal to the total net proceeds from the offering (before deducting expenses) received by the Sponsor and the Issuer, and benefits received by the Initial Purchasers shall be deemed to be equal to the total purchase discounts and commissions. Relative fault shall be determined by reference to, among other things, whether any untrue or alleged untrue statement of a material fact or the omission or

alleged omission to state a material fact relates to information provided by the Sponsor, the Issuer and RJS on the one hand or the Initial Purchasers on the other, the intent of the parties and their relative knowledge, access to information and opportunity to correct or prevent such untrue statement or omission. The Sponsor, the Issuer, RJS and the Initial Purchasers agree that it would not be just and equitable if contribution were determined by pro rata allocation or any other method of allocation that does not take account of the equitable considerations referred to above. Notwithstanding the provisions of this Section 8, in no event shall an Initial Purchaser be required to contribute any amount in excess of the amount by which the total discounts and commissions received by such Initial Purchaser with respect to the offering of the Series 2018-1 Notes exceeds the amount of any damages that such Initial Purchaser has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission. In addition, notwithstanding the provisions of this Section 8, no person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. For purposes of this Section 8, each person who controls an Initial Purchaser within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act and each director, officer, employee, affiliate and agent of an Initial Purchaser shall have the same rights to contribution as such Initial Purchaser, and each person who controls the Sponsor, the Issuer and RJS within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act and each officer and director of the Sponsor, the Issuer and RJS shall have the same rights to contribution as the Sponsor, the Issuer and RJS, subject in each case to the applicable terms and conditions of this Section 8.

SECTION 9. Representations, Warranties and Agreements to Survive. All representations, warranties, indemnities and agreements contained in this Agreement or in certificates of officers of the Issuer and public official of the Sponsor and RJS submitted pursuant hereto shall remain operative and in full force and effect, regardless of (i) any investigation made by or on behalf of any Initial Purchaser or its Affiliates or selling agents, any person controlling any Initial Purchaser, its officers or directors or any person controlling the Issuer or any Governmental Authority controlling the Sponsor, (ii) delivery of and payment for the Series 2018-1 Notes and (iii) any termination of this Agreement.

SECTION 10. Termination of Agreement.

(a) *Termination; General.* The Initial Purchasers may terminate this Agreement, by notice to the Sponsor, the Issuer and RJS, if at the sole discretion of the Initial Purchasers at any time at or prior to Closing Time (i) if there has been, since the time of execution of this Agreement or since the date as of which information is given in the Preliminary Offering Memorandum, the Disclosure Package and the Final Offering Memorandum (exclusive of any amendments or supplements thereto subsequent to the date of this Agreement), any change in the condition, financial or otherwise, or in the earnings, business affairs, operations of the Sponsor or the Issuer, which, in the sole judgment of the Initial Purchasers with respect to the sale of the Series 2018-1 Notes, is material and adverse and makes it impracticable or inadvisable to proceed with completion of the offering or the sale of and payment for the Series 2018-1 Notes, or (ii) if there has occurred any material adverse change in the financial markets in the United States, Brazil or the international financial markets, any outbreak of hostilities or escalation

thereof, terrorist attack, declaration by the United States of a national emergency or war, or other calamity or crisis or any change or development involving a prospective change in national or international political, financial or economic conditions, in each case the effect of which is such as to make it, in the sole judgment of the Initial Purchasers, impracticable or inadvisable to market the Series 2018-1 Notes or to enforce contracts for the sale of the Series 2018-1 Notes, or (iii) the Final Offering Memorandum is amended or supplemented and the Initial Purchasers have disapproved of such amendment or supplement in accordance with Section 3(c) hereof; (iv) if trading generally on the New York Stock Exchange, NYSE MKT or in the NASDAQ System or B3 S.A. has been suspended or materially limited, or minimum or maximum prices for trading have been fixed, or maximum ranges for prices have been required, by any of said exchanges or by such system or by order of the Commission, the Financial Industry Regulatory Authority or any other governmental authority, or (v) a material disruption has occurred in commercial banking or securities settlement or clearance services in the United States or Brazil or with respect to Clearstream or Euroclear systems in Europe, or (vi) a Brazilian Governmental Authority that either directly or indirectly authorizes, or authorized, the sale of the Assigned Oil Revenues and the Assigned Oil Revenue Rights, the issuance of the Series 2018-1 Notes, the transactions contemplated in this Agreement and the other transactions contemplated in the Transaction Documents has changed to prohibit, in any respect, the issue of the Series 2018-1 Notes, to impair, in any respect, the rights conveyed by the sale of the Assigned Continuously Owned RioPrevi Oil Revenues and Assigned Continuously Owned RioPrevi Oil Revenue Rights by the Sponsor to the Issuer, this Agreement or the transactions contemplated hereby or in the other Transaction Documents; or (vii) if a banking moratorium has been declared by the relevant authorities in the United States, New York or Brazil.

(b) *Liabilities.* If this Agreement is terminated pursuant to this Section, such termination shall be without liability of any party to any other party except for the liability of the Sponsor and the Issuer as provided in Section 4 hereof, and provided further that Sections 7, 8, 12, 13, 14, 15, 16 and 21 shall survive such termination and remain in full force and effect.

SECTION 11. Tax Disclosure. Notwithstanding any other provision of this Agreement, immediately upon commencement of discussions with respect to the transactions contemplated hereby, each of the Sponsor (and each public official, representative, or other agent of the Sponsor) and the Issuer (and each employee, representative, or other agent of the Issuer) may disclose to any and all persons, without limitation of any kind, the tax treatment and tax structure of the transactions contemplated by this Agreement and all materials of any kind (including opinions or other tax analyses) that are provided to the Sponsor or the Issuer relating to such tax treatment and tax structure. For purposes of the foregoing, the term “tax treatment” is the purported or claimed federal income tax treatment of the transactions contemplated hereby, and the term “tax structure” includes any fact that may be relevant to understanding the purported or claimed federal income tax treatment of the transactions contemplated hereby.

SECTION 12. Dispute Resolution Forum; Consent to Jurisdiction; Appointment of Agent for Service of Process.

The Issuer hereby irrevocably consents and submits to the non-exclusive jurisdiction of the New York Courts in any action or proceeding arising out of or relating to this Agreement and

the Issuer hereby irrevocably agrees that all disputes in respect of such action or proceeding may be submitted to the jurisdiction of such courts and agrees that a final judgment in any such action, litigation or proceeding shall be conclusive and may be enforced in other jurisdictions by suit on the judgment or in any other manner provided by law and irrevocably waives any objection it may now or hereafter have as to the venue of such suit, action or proceeding brought in such a court or that such court is an inconvenient forum. Nothing herein shall affect any right that the Initial Purchasers may otherwise have to bring any action or proceeding arising out of or related to this Agreement against the Issuer or its properties in any other court of competent jurisdiction. Any disputes or conflicts with respect to or arising from this Agreement or the transactions related hereto to which either the Sponsor or RJS or both is a party or parties, or become parties, shall be resolved exclusively by and submitted for final and binding determination only to International Arbitration before a New York Arbitral Tribunal. To the extent any such International Arbitration is brought by or against the Sponsor or RJS, if as and to the extent appropriate, the Issuer may be joined thereto or may join therein, and for these purposes the Issuer irrevocably consents to exclusive resolution and determination of any such dispute by such International Arbitration. Each of the Sponsor, RJS and the Issuer hereby irrevocably and unconditionally agrees that it will not commence any action, litigation or proceeding of any kind or description, whether in law or equity, whether in contract or in tort or otherwise, against the Initial Purchasers in any way relating to this Agreement or the transactions relating hereto, in any forum other than a New York Arbitral Tribunal or in the case of the Issuer only, as to a dispute that does not involve the Sponsor or RJS, the New York Courts. Each of the Issuer, Sponsor and RJS hereby consents to the jurisdiction of the New York Courts for the limited purpose of confirming and/or enforcing an arbitral award rendered against them in New York.

The Sponsor and RJS hereby irrevocably designates, appoints and empowers Cogency (the "Process Agent"), with offices on the date hereof at 10 East 40th Street, 10th Floor, New York, NY, 10016, United States, as its designee, appointee and agent to receive, accept and acknowledge for and on its behalf, and its properties, assets and revenues, service of any and all legal process, summons, notices and documents that may be served in any action or proceeding arising out of or relating to this Agreement brought against it in any International Arbitration or the United States District Court for the Southern District of New York for the purpose of confirming or enforcing an arbitral award in the State of New York and that may be made on such designee, appointee and agent in accordance with legal procedures prescribed for such arbitral tribunal or courts. The Issuer hereby irrevocably designates, appoints and empowers the Process Agent as its designee, appointee and agent to receive, accept and acknowledge for and on its behalf, and its properties, assets and revenues, service of any and all legal process, summons, notices and documents that may be served in any action or proceeding brought against it in any International Arbitration, or any action, suit or proceeding brought against it in any New York Court arising out of or relating to this Agreement and that may be made on such designee, appointee and agent in accordance with legal procedures prescribed for such arbitral tribunal or courts. If for any reason such designee, appointee and agent hereunder shall cease to be available to act as such, each of the Sponsor, the Issuer and RJS agrees to designate a new designee, appointee and agent in the County of New York on the terms and for the purposes of this Section 12 satisfactory to the Initial Purchasers. Each of the Sponsor, the Issuer and RJS further hereby irrevocably consents and agrees to the service of any and all legal process,

summons, notices and documents in any such action, suit or proceeding against it by (i) serving a copy thereof upon the relevant agent for service of process referred to in this Section 12 (whether or not the appointment of such agent shall for any reason prove to be ineffective or such agent shall accept or acknowledge such service); provided that such agent for service of process shall be required to deliver by overnight courier prepaid or by hand delivery any such legal process, summons, notices or documents with respect to each of the Sponsor and RJS at the offices of the Attorney General for the State of Rio de Janeiro (*Procurador Geral do Estado*) Procuradoria Geral do Estado do Rio de Janeiro, Rua do Carmo, n.º 27 – Centro – CEP: 20011-900, Rio de Janeiro – RJ, Brazil, Attention: Procurador do Estado (“Office of the RJS Attorney General”) or (ii) by mailing copies thereof by registered or certified air mail, postage prepaid, to the Sponsor or RJS, each at the Office of the RJS Attorney General or to the Issuer at the address specified in or designated pursuant to this Agreement; provided, that if such service of any legal process, summons, notices and documents, with respect to RJS or the Sponsor is issued or delivered in connection with any action or proceeding brought in any court, then such service of legal process, summons, notices and documents to the Office of the RJS Attorney General shall be delivered by any means permissible under Brazilian law. The Issuer agrees that the failure of any such designee, appointee and agent to give any notice of such service to it shall not impair or affect in any way the validity of such service or any judgment rendered in any action or proceeding based thereon. Nothing herein shall in any way be deemed to limit the ability of the Initial Purchasers to serve any such legal process, summons, notices and documents in any other manner permitted by Applicable Law. The provisions of this Section 12 shall survive any termination of this Agreement, in whole or in part.

**SECTION 13. WAIVER OF JURY TRIAL.** EACH OF THE SPONSOR, THE ISSUER AND RJS HEREBY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHT TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

**SECTION 14. Waiver of Immunities.** To the extent that the Sponsor, the Issuer and RJS may have or may hereafter become entitled to, or have attributed to them, any right of immunity, on the grounds of sovereignty or otherwise, from any legal action, suit or proceeding, from set off or counterclaim, from the jurisdiction of any Brazilian court, New York Court or New York Arbitral Tribunal, from service of process with respect to any proceeding in any such court or arbitral tribunal, or from execution of a judgment, or in connection with any other legal process or proceeding for the giving of any relief or for the enforcement of any judgment, in any such court or arbitral tribunal in which proceedings may at any time be commenced, with respect to their obligations, liabilities or any other matter under or arising out of or in connection with this Agreement, (i) the Issuer hereby irrevocably and unconditionally waives and agrees not to plead or assert any such immunity and consents to the authority and jurisdiction of such court or arbitral tribunal to grant such relief, and (ii) each of the Sponsor and RJS hereby irrevocably and unconditionally waives and agrees not to plead or claim any such immunity (including, but not limited to, immunity arising under or pursuant to the U.S. Foreign Sovereign Immunities Act of 1976) in any International Arbitration or proceedings to confirm or enforce an arbitral award and consents to the authority and jurisdiction of such court or arbitral tribunal to grant such relief; provided, that any such waiver shall not extend to any immunity on the alienation or attachment

of assets located inside or outside of Brazil that it has solely as a result of its sovereign status, under Article 100 of the Civil Code of Brazil, including any limitations on the applicability of the enforcement process in Brazil for court-ordered payments (*precatórios judiciais*) pursuant to Article 100 of the Brazilian Federal Constitution.

**SECTION 15. Foreign Taxes.** All payments by each of the Sponsor and the Issuer to the Initial Purchasers hereunder shall be made free and clear of, and without deduction or withholding for or on account of, any and all present and future income, stamp or other taxes, levies, imposts, duties, charges, fees, deductions or withholdings, now or hereinafter imposed, levied, collected, withheld or assessed by Brazil or any other jurisdiction in which either each of the Sponsor or the Issuer has an office from which payment is made or deemed to be made, excluding (i) any such tax imposed by reason of an Initial Purchaser having some connection with Brazil other than its participation as Initial Purchaser hereunder, and (ii) any income, franchise or other similar tax on the overall net income of any Initial Purchaser imposed by the United States or by the State of New York or any political subdivision of the United States or of the State of New York (all such non-excluded taxes, "Foreign Taxes"). If any Foreign Taxes are payable with respect to payments by each of the Sponsor and the Issuer to the Initial Purchasers hereunder, then amounts payable under this Agreement shall be increased to such amount as is necessary to yield to the Initial Purchasers an amount which, after withholding, deduction, or other payment on account of all Foreign Taxes (including all Foreign Taxes payable on such increased payments) equals the amount that would have been payable if no Foreign Taxes applied.

**SECTION 16. Judgment Currency.** Each of the Sponsor, the Issuer and RJS jointly and severally agrees to indemnify the Initial Purchasers, and the Initial Purchasers severally agree to indemnify each of the Sponsor, the Issuer and RJS against any loss incurred by such indemnified party as a result of any judgment or order being given or made for any amount due hereunder and such judgment or order being expressed and paid in a currency (the "Judgment Currency") other than United States dollars and as a result of any variation as between (i) the rate of exchange at which the United States dollar amount is converted into the Judgment Currency for the purpose of such judgment or order, and (ii) the spot rate of exchange in The City of New York at which the Initial Purchasers or the Sponsor, the Issuer or RJS, as the case may be, on the date of such judgment or order or the date of payment thereof, are able to purchase United States dollars with the amount of the Judgment Currency actually received by the Initial Purchasers or the Sponsor, the Issuer or RJS, as the case may be. The foregoing indemnity shall constitute a separate and independent obligation of each of the Sponsor, the Issuer, RJS and the Initial Purchasers and shall continue in full force and effect notwithstanding any such judgment or order as aforesaid. The term "spot rate of exchange" shall include any premiums and costs of exchange payable in connection with the purchase of, or conversion into, United States dollars.

**SECTION 17. Notices.** All notices and other communications hereunder shall be in writing and shall be deemed to have been duly given if mailed or transmitted by any standard form of telecommunication. Notices to the Initial Purchasers shall be directed to (i) BB Securities Ltd., 4<sup>th</sup> Floor, Pinnars Hall, 105-108 Old Broad Street, London EC2N 1ER United Kingdom, Fax: + (44) 207 796 0863, Attention: Operations Department and (ii) BNP Paribas Securities Corp., 787 Seventh Avenue, New York, New York 10019, Attention: Syndicate Desk,



Tel. +1 (212) 841-2871. Notices to the Issuer shall be directed to it at Puglisi & Associates, 850 Library Avenue, Suite 204, Newark, Delaware 19711. Notices to the Sponsor shall be directed to it at Fundo Único de Previdência Social dos Servidores do Rio de Janeiro – Rioprevidência, Rua da Quintanda, 106, 3º andar, Centro, Rio de Janeiro – RJ, CEP: 20091-005, Attention: Executive Directorate, Fax: +55-21 23325358. Notices to RJS shall be directed to it at Avenida Presidente Vargas 670 – 19º andar – Gabinete do Secretário, Rio de Janeiro – RJ, CEP: 20071-001, Attention: Avenida Presidente Vargas 670 – 19º andar – Gabinete do Secretário, Tel: +55-21 2334-4511.

**SECTION 18. No Advisory or Fiduciary Relationship.** Each of the Sponsor and the Issuer acknowledges and agrees that (a) the purchase and sale of the Series 2018-1 Notes pursuant to this Agreement, including the determination of the offering price of the Series 2018-1 Notes and any related discounts and commissions, is an arm’s-length commercial transaction between each of the Sponsor and the Issuer, on the one hand, and the Initial Purchasers, on the other hand, (b) in connection with the offering contemplated hereby and the process leading to such transaction each Initial Purchaser is and has been acting solely as a principal and is not the agent or fiduciary of the Sponsor or the Issuer, or their respective stockholders, creditors, employees or any other party, (c) no Initial Purchaser has assumed or will assume an advisory or fiduciary responsibility in favor of the Sponsor or the Issuer with respect to the offering contemplated hereby or the process leading thereto (irrespective of whether such Initial Purchaser has advised or is currently advising the Sponsor or the Issuer on other matters) and no Initial Purchaser has any obligation to the Sponsor or the Issuer with respect to the offering contemplated hereby except the obligations expressly set forth in this Agreement, (d) the Initial Purchasers and their respective affiliates may be engaged in a broad range of transactions that involve interests that differ from those of each of the Sponsor or the Issuer, and (e) the Initial Purchasers have not provided any legal, accounting, regulatory or tax advice with respect to the offering contemplated hereby and each of the Sponsor and the Issuer has consulted its own legal, accounting, regulatory and tax advisors to the extent it deemed appropriate.

**SECTION 19. Integration.** This Agreement supersedes all prior agreements and understandings (whether written or oral) between any of the Sponsor, the Issuer or RJS and the Initial Purchasers, or any of them, with respect to the subject matter hereof.

**SECTION 20. Parties.** This Agreement shall inure to the benefit of and be binding upon the Initial Purchasers and each of the Sponsor, the Issuer and RJS and their respective successors. Nothing expressed or mentioned in this Agreement is intended or shall be construed to give any person, firm or corporation, other than the Initial Purchasers, the Sponsor, the Issuer and RJS and their respective successors and the controlling persons and officers and directors referred to in Sections 7 and 8 and their heirs and legal representatives, any legal or equitable right, remedy or claim under or in respect of this Agreement or any provision herein contained. This Agreement and all conditions and provisions hereof are intended to be for the sole and exclusive benefit of the Initial Purchasers, the Sponsor, the Issuer and RJS and their respective successors, and said controlling persons and officers and directors and their heirs and legal representatives, and for the benefit of no other person, firm or corporation. No purchaser of the

Series 2018-1 Notes from any Initial Purchaser shall be deemed to be a successor by reason merely of such purchase.

SECTION 21. GOVERNING LAW. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW YORK WITHOUT REGARD TO THE CONFLICTS OF LAW PROVISIONS THEREOF (OTHER THAN SECTION 5-1401 OF THE NEW YORK GENERAL OBLIGATIONS LAW).

SECTION 22. Counterparts. This Agreement may be executed in any number of counterparts (including by PDF or fax), each of which shall be deemed to be an original, but all such counterparts shall together constitute one and the same Agreement.

SECTION 23. Effect of Headings. The Section headings herein are for convenience only and shall not affect the construction hereof.

SECTION 24. Limited Recourse.

(a) Each party hereto hereby agrees that the Issuer's obligations hereunder shall be limited recourse obligations of the Issuer, with recourse being limited to the Collateral in the priority and at the times for payment set forth in the Indenture and any related supplement. Such obligations shall not be obligations or responsibilities of, or guaranteed by, any other person, including the trustee under the Trust Agreement. None of the directors, shareholders, officers, delegates, employees or agents of the Issuer, the trustee under the Trust Agreement or any of their Affiliates shall be personally liable to make any payments on such obligations. The Issuer will have no material assets available for payments on such obligations other than the assets comprising the Collateral. After the Collateral has been fully realized and exhausted pursuant to the Indenture and the other Transaction Documents (including all rights against the Sponsor in connection therewith), all sums due but still unpaid in respect of the Issuer's obligations hereunder shall be extinguished, and the other parties hereto shall not have the right to proceed against the Issuer, the owner trustee under the Trust Agreement or any of their Affiliates or any of their respective directors, shareholders, officers, employees or agents for the satisfaction of any monetary claim or for any deficiency judgment remaining after foreclosure of any property included in the Collateral.

(b) It is expressly understood and agreed by the parties hereto that (i) this Agreement is executed and delivered on behalf of the Issuer by Wilmington Trust, National Association (the "Owner Trustee"), not individually or personally, but solely as trustee of the Issuer in the exercise of the powers and authority conferred and vested in it, (ii) the representations, covenants, undertakings and agreements herein made on the part of the Issuer are made and intended not as personal representations, undertakings and agreements by the Owner Trustee but are made and intended for the purpose of binding only the Issuer, (iii) nothing herein contained shall be construed as creating any liability on the Owner Trustee individually or personally, to perform any covenant either expressed or implied contained herein, all such liability, if any, being expressly waived by the parties hereto and by any Person claiming by, through or under the parties hereto, and (iv) under no circumstances shall the Owner Trustee be personally liable for the payment of any indebtedness or expenses of the Issuer or be liable for the breach or failure of any obligation, duty (including fiduciary duty, if any) representation, warranty or

covenant made or undertaken by the Issuer under this Agreement or any other related document. The Owner Trustee has made no investigation as to the accuracy or completeness of any representations and warranties made by the Issuer or any other Person in this Agreement.

**SECTION 25. No Petition Covenant.** Notwithstanding any prior termination of this Agreement, each party hereto agrees that they shall not, before the date that the then applicable preference period under Brazilian and U.S. law has expired after all the Notes (including all interest and premium, if any, thereon) have been paid in full, acquiesce, petition or otherwise invoke or cause the Issuer to invoke the process of any court or other Governmental Authority for the purpose of commencing or sustaining a case against the Issuer under any bankruptcy, insolvency or similar law or appointing a receiver, liquidator, assignee, trustee, custodian, sequestrator or other similar official of the Issuer or any substantial part of its property, or ordering the winding up or liquidating of the affairs of the Issuer.

**SECTION 26. Severability.** If any provision of this Agreement is prohibited or held to be invalid, illegal or unenforceable in any jurisdiction, the parties hereto agree to the fullest extent permitted by law that (i) the validity, legality and enforceability of the other provisions in such jurisdictions shall not be affected or impaired thereby, and (ii) any such prohibition, invalidity, illegality or unenforceability shall not render such provision prohibited, invalid, illegal or unenforceable in any other jurisdiction.

**SECTION 27. Default by One Initial Purchaser.** If one of the Initial Purchasers shall fail at Closing Time to purchase the Series 2018-1 Notes which it is obligated to purchase under this Agreement (the “Defaulted Notes”), the non-defaulting Initial Purchaser shall have the right, within 24 hours thereafter, to make arrangements for it to purchase all, but not less than all, of the Defaulted Notes in such amounts as may be agreed upon and upon the terms herein set forth; if, however, the non-defaulting Initial Purchaser shall not have completed such arrangements within such 24-hour period, then:

(a) if the number of Defaulted Notes does not exceed 10% of the aggregate principal amount of the Series 2018-1 Notes to be purchased hereunder, the non-defaulting Initial Purchaser shall be obligated to purchase the full amount thereof in the proportion that its underwriting obligations hereunder bear to the underwriting obligations, or

(b) if the number of Defaulted Notes exceeds 10% of the aggregate principal amount of the Series 2018-1 Notes to be purchased hereunder, this Agreement shall terminate without liability on the part of the non-defaulting Initial Purchaser.

No action taken pursuant to this Section shall relieve the defaulting Initial Purchaser from liability in respect of its default.

In the event of any such default which does not result in a termination of this Agreement, either the non-defaulting Initial Purchaser, the Issuer, the Sponsor or RJS shall have the right to postpone Closing Time for a period not exceeding seven (7) days in order to effect any required changes in the Offering Memorandum or in any other documents or arrangements. As used

herein, the term “Initial Purchaser” includes any person substituted for an Initial Purchaser under this Section.

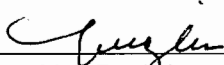
*[Remainder of page intentionally left blank; Signature Pages follow]*

If the foregoing is in accordance with your understanding of our agreement, please sign and return to the Issuer, the Sponsor and RJS a counterpart hereof, whereupon this instrument, along with all counterparts, will become a binding agreement between the Initial Purchasers and the Issuer, the Sponsor and RJS in accordance with its terms.

Very truly yours,

RIO OIL FINANCE TRUST,

By: Puglisi & Associates, not in its individual capacity, but solely as Administrator

By:   
Name: Donald J. Puglisi  
Title: Managing Director

FUNDO ÚNICO DE PREVIDÊNCIA SOCIAL DO  
ESTADO DO RIO DE JANEIRO –  
RIOPREVIDÊNCIA

By: \_\_\_\_\_  
Name:  
Title:

THE STATE OF RIO DE JANEIRO

By: \_\_\_\_\_  
Name:  
Title:

If the foregoing is in accordance with your understanding of our agreement, please sign and return to the Issuer, the Sponsor and RJS a counterpart hereof, whereupon this instrument, along with all counterparts, will become a binding agreement between the Initial Purchasers and the Issuer, the Sponsor and RJS in accordance with its terms.

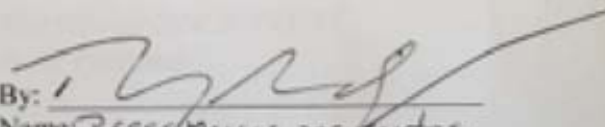
Very truly yours,

RIO OIL FINANCE TRUST.

By: Wilmington Trust, National Association, not in its individual capacity but solely as owner trustee pursuant to the Trust Agreement

By: \_\_\_\_\_  
Name:  
Title:

FUNDO ÚNICO DE PREVIDÊNCIA SOCIAL DO  
ESTADO DO RIO DE JANEIRO -  
RIOPREVIDÊNCIA

By:   
Name: REGES MOISÉS DOS SANTOS  
Title: DIRECTOR-PRESIDENTE

THE STATE OF RIO DE JANEIRO

By: \_\_\_\_\_  
Name:  
Title:

If the foregoing is in accordance with your understanding of our agreement, please sign and return to the Issuer, the Sponsor and RJS a counterpart hereof, whereupon this instrument, along with all counterparts, will become a binding agreement between the Initial Purchasers and the Issuer, the Sponsor and RJS in accordance with its terms.

Very truly yours,

RIO OIL FINANCE TRUST,

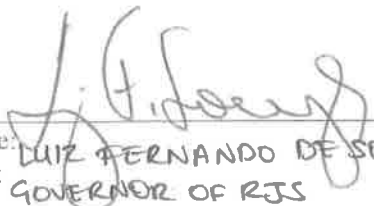
By: Wilmington Trust, National Association, not in its individual capacity but solely as owner trustee pursuant to the Trust Agreement

By: \_\_\_\_\_  
Name:  
Title:

FUNDO ÚNICO DE PREVIDÊNCIA SOCIAL DO  
ESTADO DO RIO DE JANEIRO –  
RIOPREVIDÊNCIA

By: \_\_\_\_\_  
Name:  
Title:

THE STATE OF RIO DE JANEIRO

By:   
Name: LUIZ FERNANDO DE SOUZA  
Title: GOVERNOR OF RJS

*(Signature Page to Note Purchase Agreement)*

CONFIRMED AND ACCEPTED,  
as of the date first above written:

BB SECURITIES LTD.

By:  \_\_\_\_\_  
Name: Admilson Garcia  
Title: Managing Director

  
Boris Skulczuk  
Director

BNP PARIBAS SECURITIES CORP.

By: \_\_\_\_\_  
Name:  
Title:



CONFIRMED AND ACCEPTED,  
as of the date first above written:

BB SECURITIES LTD.

By: \_\_\_\_\_  
Name:  
Title:

BNP PARIBAS SECURITIES CORP.

By:  \_\_\_\_\_  
Name:  
Title:

**ROGER KIM**  
**MANAGING DIRECTOR**

## PRICING INFORMATION

**US\$600,000,000 8.200% Series 2018-1 Notes**

April 12, 2018

Issuer:	Rio Oil Finance Trust, a Delaware statutory trust	
Rating*:	Series 2018-1 Notes: BB- S&P, BB- Fitch	
Transaction Format:	Rule 144A / Regulation S	
Joint Lead Managers:	BB Securities Ltd. and BNP Paribas Securities Corp.	
Currency:	US Dollars	
Principal Amount:	US\$600,000,000	
Coupon:	8.200%	
Expected Final Maturity Date:	April 6, 2028	
Price at Issue:	100.000% of principal amount	
Yield to Maturity:	8.200%	
Day Count:	30 day months and 360 day years	
Pricing Date:	April 12, 2018	
Settlement Date:	April 19, 2018 (T+5 settlement)	
Interest Commencement Date:	July 6, 2018	
Scheduled Principal Amount:	Principal payments on the Series 2018-1 Notes will be made quarterly	
Interest Payment Dates:	Quarterly, on January 6 <sup>th**</sup> , April 6 <sup>th**</sup> , July 6 <sup>th**</sup> and October 6 <sup>th**</sup> (together with principal payments where applicable), commencing July 6, 2018	
Issue Denominations:	Minimum denominations of (i) US\$250,000 and integral multiples of US\$1,000 in excess thereof for Series 2018-1 Notes offered pursuant to Rule 144A and (ii) US\$250,000 and integral multiples of US\$1,000 in excess thereof for Series 2018-1 Notes offered pursuant to Regulation S	
Identification Numbers:	<b>CUSIP</b>	<b>ISIN</b>
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	Rule 144A Notes.....	76716XAC6 US76716XAC65
	Regulation S Notes .....	U76673AC3 USU76673AC39

Sch A-1

Listing:

Luxembourg Stock Exchange

Amortization Schedule:	<u>Payment Date</u>	<u>Fractional Percentage of the Class Initial Principal Balance</u>
	April 2018	0.00%
	July 2018	0.00%
	October 2018	0.00%
	January 2019	0.00%
	April 2019	0.00%
	July 2019	0.00%
	October 2019	0.00%
	January 2020	0.00%
	April 2020	0.00%
	July 2020	1.00%
	October 2020	1.00%
	January 2021	1.00%
	April 2021	1.00%
	July 2021	1.61%
	October 2021	1.61%
	January 2022	1.61%
	April 2022	1.61%
	July 2022	2.22%
	October 2022	2.22%
	January 2023	2.22%
	April 2023	2.22%
	July 2023	2.83%
	October 2023	2.83%
	January 2024	2.83%
	April 2024	2.83%
	July 2024	3.44%
	October 2024	3.44%
	January 2025	3.44%
	April 2025	3.44%
	July 2025	4.05%
	October 2025	4.05%
	January 2026	4.05%
	April 2026	4.05%
	July 2026	4.66%
	October 2026	4.66%
	January 2027	4.66%

Sch A-2

April 2027	4.66%
July 2027	5.19%
October 2027	5.19%
January 2028	5.19%
April 2028	5.19%

The information contained in this notice is subject to, and in making an investment decision you should rely on, the detailed description of the Series 2018-1 Notes contained in the Preliminary Offering Memorandum, dated April 4, 2018 (the “Offering Memorandum”) relating to the Series 2018-1 Notes, as supplemented by this final pricing term sheet. The Offering Memorandum contains, among other things, a description of the risks involved in investing in the Series 2018-1 Notes.

This notice shall not constitute an offer to sell or a solicitation of an offer to buy, nor shall there be any sale of the Series 2018-1 Notes in any state or jurisdiction in which such offer, solicitation or sale would be unlawful. The Series 2018-1 Notes will be offered to Qualified Institutional Buyers in reliance on Rule 144A under the Securities Act of 1933, as amended, and to non-U.S. persons in offshore transactions outside the United States in accordance with Regulation S thereunder. The Series 2018-1 Notes have not been registered under the Securities Act or any state securities laws, and may not be offered or sold in the United States or to U.S. persons absent registration or an applicable exemption from the registration requirements.

Solely for the purposes of each manufacturer’s product approval process, the target market assessment in respect of the Series 2018-1 Notes has led to the conclusion that: (i) the target market for the Series 2018-1 Notes is eligible counterparties and professional clients only, each as defined in Directive 2014/65/EU (as amended, “MiFID II”); and (ii) all channels for distribution of the Series 2018-1 Notes to eligible counterparties and professional clients are appropriate. Any person subsequently offering, selling or recommending the Series 2018-1 Notes (a “distributor”) should take into consideration each manufacturer’s target market assessment; however, a distributor subject to MiFID II is responsible for undertaking its own target market assessment in respect of the Series 2018-1 Notes (by either adopting or refining each manufacturer’s target market assessment) and determining appropriate distribution channels.

The Series 2018-1 Notes are not intended to be offered, sold or otherwise made available to and should not be offered, sold or otherwise made available to any retail investor in the European Economic Area (“EEA”). For these purposes, a retail investor means a person who is one (or more) of: (i) a retail client as defined in point (11) of Article 4(1) of MiFID II; or (ii) a customer within the meaning of Directive 2002/92/EC (as amended, the “Insurance Mediation Directive”), where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II. Consequently no key information document required by Regulation (EU) No 1286/2014 (as amended, the “PRIIPs Regulation”) for offering or selling the Series 2018-1 Notes or otherwise making them available to retail investors in the EEA has been prepared and therefore offering or selling the Series 2018-1 Notes or otherwise making them available to any retail investor in the EEA may be unlawful under the PRIIPs Regulation.

\*A securities rating is not a recommendation to buy, sell or hold securities and may be subject to revision or withdrawal at any time.

\*\* If a Business Day, otherwise, the next Business Day.

ANY DISCLAIMER OR OTHER NOTICES THAT MAY APPEAR BELOW ARE NOT APPLICABLE TO THIS COMMUNICATION AND SHOULD BE DISREGARDED, SUCH DISCLAIMERS OR OTHER NOTICES WERE AUTOMATICALLY GENERATED AS A RESULT OF THIS COMMUNICATION BEING SENT VIA BLOOMBERG OR ANOTHER EMAIL SYSTEM.

SCHEDULE B

Initial Purchasers

1. The purchase price to be paid by the Initial Purchasers for the Series 2018-1 Notes shall be 100% of the principal amount thereof.
2. The allocation between the Initial Purchasers is:

<u>Name of Initial Purchaser</u>	<u>Principal Amount of Series 2018-1 Notes</u>
BB Securities Ltd.	\$300,000,000
BNP Paribas Securities Corp.	\$300,000,000
<hr/>	
Total	\$600,000,000

## SCHEDULE C

### A. Disclosure Package

1. Preliminary Offering Memorandum dated April 4, 2018.
2. Pricing Information in the form set forth on Schedule A hereto (the "Pricing Term Sheet") dated April 12, 2018.

### B. Additional Written Offering Communications

1. Investor Presentation dated April 4, 2018

### C. Permitted General Solicitations

[None]

EXHIBIT A

INDEPENDENT CONSULTANT REPORT AND RELIANCE LETTER,  
TO BE DELIVERED PURSUANT TO SECTION 5(n)

Exh A-1





# Oil Royalties Securitization Bond Offering (2018)

3<sup>RD</sup> APRIL, 2018



# Oil Royalties Securitization Bond Offering (2018)

## Purpose of Report

This report has been prepared for BNP Paribas Securities Corp. and BB Securities Ltd. by Wood Mackenzie Limited. The report is intended to be used as part of the proposed Bond Offering for RioPrevidência and will be provided to potential investors in the Bond Offering.

The information upon which this report is based has come from Wood Mackenzie's published databases which have been supplemented by publicly available historical data from the Agência Nacional do Petróleo ("ANP"). The opinions expressed in this report are those of Wood Mackenzie. They have been arrived at following careful consideration and enquiry but we do not guarantee their fairness, completeness or accuracy. The opinions, as of this date, are subject to change. We do not accept any liability for your reliance upon them.



## Introduction

Wood Mackenzie Ltd has been mandated by BNP Paribas Securities Corp. and BB Securities Ltd. to provide a report showing the cash flows that will accrue to RioPrevidência as a result of Royalty and Special Participation payments arising from production of oil and gas offshore Rio de Janeiro State.

This report has been prepared for potential investors who may wish to invest in a bond offering in March 2018 that will be secured by the above-mentioned Royalty and Special Participation payments (the "Bond Offering").

In this report we detail the methodology and assumptions that we use to provide information on future Royalties and Special Participation payments. We show the data that we use and the results of our analysis which details the Royalty and Special Participation payments by field and in aggregate for the period from 2017 until 2029.

## Wood Mackenzie

Wood Mackenzie is the most comprehensive source of knowledge about the world's energy and metals industries. We analyse and advise on every stage along the value chain - from discovery to delivery - to provide clients with the commercial insight that makes them stronger.

We assess, and place a value on, thousands of individual assets and companies around the world. Alongside this we evaluate economic indicators as well as market supply, demand and price trends. With more than 500 professionals in over 25 offices worldwide, we analyse the assets, markets and companies operating upstream and downstream; in oil, gas, coal, carbon, chemicals, metals and power generation.

Our expertise gives our clients the confidence to define their strategy, identify new opportunities, evaluate the markets they operate in and improve their performance against peers. We are the only information provider that combines depth with breadth, allowing us to provide a genuinely reliable top-level view of industry trends and their implications.

Wood Mackenzie's reputation has been built on the quality of our proprietary analysis. It informs both our asset appraisal and top-level analysis of wider market trends, as well as underpinning our bespoke consulting services. We are consistently rated ahead of our competition for accuracy, reliability and integrity. Above all, clients value us for our in-depth industry knowledge.

Having in-house teams dedicated to every sector of energy and metals means we are the only provider with an integrated perspective across the entire industry. The constant flow of analysis and ideas between each of our teams magnifies the commercial value we bring to clients. As a result, our clients gain the confidence they need to develop effective strategies in an increasingly interdependent energy world.

Working closely with senior teams within our clients, we also provide cutting-edge commentary on topical issues of commercial significance to our clients. We deliver these market perspectives regularly as published articles and through a series of summit event discussions.



## Methodology

### Data Sources

To enable us to forecast the future Royalty and Special Participation payments we have used the Wood Mackenzie published dataset. As part of our research publications, Wood Mackenzie provides forecasts for production and costs for fields across the Brazilian continental shelf.

As our field analyses form part of our existing published research databases they are unbiased. In our field data we include our forecasts of future liquids and gas production and capital and operating costs. Our macro-economic data such as oil price and inflation rates are based upon the forecasts of our economics team.

Wood Mackenzie's regional analysts conduct extensive and detailed research into the oil and gas industries in every country covered in each region. This takes place for both the broad industry-wide topics such as gas supply and demand issues and the more detailed research into specific oil and gas field discoveries and developments. To do this, a wide variety of sources are used, some examples of which are (but are not limited to):

- Interviews with energy company and government contacts. Wood Mackenzie aims to interact with operators of upstream assets on an annual basis in all regions and countries. This takes place, most often, on a face-to-face basis in the relevant country or state. Wherever possible, this interaction is extended to all of the other non-operating company participants, sometimes including royalty owners, in any particular asset. Meetings are also held with contacts in the service sector, other investors, and relevant government and regulatory organisations.
- Government publications and other regulatory information. In many countries and states, the relevant regulatory authorities publish an annual review of energy activities. This may contain, for example, details of licensing rounds, licences awarded and relinquished, wells drilled and their outcome, production, the status of production and transportation facilities, processing volumes, permit data, completion information, and any new legislation impacting the energy sector. We also review other regulatory authority information, such as websites, press releases, impact studies and historical databases.
- Company annual reports and other company documentation. Wood Mackenzie regularly reviews all key energy company annual reports, investor presentations and SEC or other stock exchange (e.g. ASX, SEDAR) filings. In addition, we review other energy company sources of information, such as websites and press releases.
- General and industry-specific media. Our analysts regularly review general media and a wide variety of industry-specific publications. We also attend conferences, trade shows, forums, and educational workshops hosted by professional organisations.
- Third party commercial data providers. There are occasions when we purchase specific data directly from third parties. NB: Wood Mackenzie has used INCOTEC data to identify locations of specific fields, licence blocks and infrastructure in Russia.
- Academic material. Research conducted by universities, trade consortia, and professionally-affiliated groups such as the SPE and AAPG is also used. Where applicable, it can be applied in our models to help develop our asset-specific views.

These various sources provide the basis of the information used by Wood Mackenzie's research analysts to derive their view of likely future production and corresponding reserves and cost estimates for specific assets and/or groups of assets.

### Validation of Analyses

Our data are subject to a rigorous integrity checking and quality control process. We have developed a comprehensive set of checks, which are carried out on a regular basis, at a field, play, basin, country, region, and global level.

Using publicly available information, together with information gathered from energy company interviews, Wood Mackenzie's analysts complete a draft of each upstream asset report. In an important part of the updating process, where possible, these drafts are forwarded to operators and other stakeholders in any particular asset for comment.

This stage of the process is designed to ensure that each report is as accurate as possible, within the limits of what may be differing interpretations of a development among the various equity holders. The final analysis produced is always Wood Mackenzie's view of the most likely development scenario, set of operating conditions, and performance metrics in an asset. It may not necessarily reflect the view of the operator, partners or other parties.

### Comparison with ANP and Petrobras datasets

The future dataset is based on Wood Mackenzie's forecasts of production and costs and the timing of when new developments will commence. We have reconciled our historical dataset with the data published by the ANP on its website.



The ANP website provides data on a field by field basis showing the following:

- Oil and gas prices in Reais (R\$) per cubic metre
- Oil and gas production on a monthly basis in cubic metres
- The rate of royalty that applies to each field
- Royalty payments on a monthly basis
- Special Participation payments on a quarterly basis

We have used Wood Mackenzie's in-house Global Economic Model (GEM) to generate our future expectations of Royalty and Special Participation payments. The data that we hold are based upon individual fields or groupings of fields. For the purposes of our analysis we have aggregated certain field areas into groupings in line with the approach used by the operator of those assets, Petrobras. We have also compared our data in Brazil with that provided by Petrobras in its 2018 – 2022 Business Plan.

## Data Inputs

In the following parts of this section we detail our approach to arriving at the future Royalties and Special Participations streams, covering the following:

- Oil prices
- Gas prices
- Inflation

## Oil Prices

ANP provides data on its website (at <http://www.anp.gov.br/?id=534>) of the historical prices that were used to calculate Royalties and Special Participation payments for each of the producing fields in Brazil.

Fiscal Decree No. 2.705 of 3 August 1998 (known as the Government Take Decree) established fiscal arrangements in the petroleum sector. Among its provisions, the Decree states that the oil royalty will be based on "Market Value". Market Value is defined as the greater of the sales price or the "minimum value". ANP Portaria No. 206 of 2000 (an update of No. 155 of 1998) details the methodology for calculating the minimum value applicable to each oil field and is based on oil quality. The minimum value is related to a selection of international crude and products prices, including Brent and various fuel oils and gas oils.

From January 2018 ANP Portaria No. 703 of September 2017 (which implements Decree No. 9.042 of 2017) has introduced a new crude reference price for each oil field. This new price mechanism will be gradually introduced over the next five years, commencing in 2018. In 2018 the price used in the calculation of royalty and Special Participations will be 80% of the old minimum price (MW 206) and 20% of the new reference price (PRP). The proportion of the new reference price included will be increased by each year as shown in the table below.

Period	Reference Price of Oil
2018	80% MW 206 + 20% PRP
2019	60% MW 206 + 40% PRP
2020	40% MW 206 + 60% PRP
2021	20% MW 206 + 80% PRP
From 2022	100% PRP

The new reference price calculation methodology is largely based on the same principles as previously used with several key alterations. The main changes that impact the prices used to calculate royalties and SPT include the following changes:

- Under the new decree the price calculation formula includes an additional discount based on the content of sulphur, nitrogen and the TAN number of each specific crude. This has a negative impact on crudes which have higher than normal levels of those contaminants.
- The calculation now uses three product prices where previously the calculation used five product prices. This has an impact on all of the field specific crudes, but in particular appears to negatively impact fields with low sulphur content (<0.35%) because they will use 3.5% Fuel Oil rather than 1.0% Fuel oil, and the former typically trades at a US\$3-4/bbl discount compared to the latter (this discount is likely to increase in the future).
- Each of the field specific crudes and the Brent Reference Crude is allocated a percentage split in light, medium and heavy oil products. The split in these products is based on the boiling points of the crude at given temperature ranges, meaning that comparisons can be made between each specific crude and the Brent Reference Crude. Under the new decree the temperature range used to assess the split in light, medium and heavy products has now changed. In general this has resulted in a higher percentage of heavy crude products across nearly all the Rio State fields, causing the heavy product percentage to increase by approximately 5% for the lower API fields and by 10-15% for the higher API fields. The Brent



Reference Crude has also seen an increase of around 20%. Because Brent has had a larger percentage increase than the vast majority of fields this will have a positive impact on the reference prices of each crude.

We have applied the new the price calculation methodology to a selection of Rio State fields under various product price scenarios, the results from this showed that the new price methodology had a positive impact to oil reference prices across nearly all Rio State fields analysed. In addition we found that for a sample of twenty Rio State fields the average discount to Brent was slightly lower in January 2018 when compared to December 2017. Therefore in our opinion the new reference price formula will not lead to a reduction in the assessed price and hence royalties and Special Participations in total for oil production in Rio State, though a limited number of the fields may have a lower price in certain circumstances.

During the course of public consultation on the new proposals ANP published a report in August 2017 estimating the impact on total payments of royalty and Special Participations of transitioning to the new reference price. The impact on payments over the next five years is shown in the tables 1, 2 and 3 below (data converted to US\$ million using FX rate quoted by ANP – R\$3.44 / US\$). In their analysis, ANP assumed a Brent price of US\$57.1/bbl.

**Table 1 Impact of New Reference Price on Royalty per ANP**

Year	ANP 206/2000 US\$ Million	New Resolution US\$ Million	Transition US\$ Million	Difference US\$ Million	Percentage Increase
2018	5,013	5,172	5,045	32	0.6%
2019	6,030	6,175	6,088	58	1.0%
2020	6,402	6,543	6,486	85	1.3%
2021	6,415	6,565	6,535	120	1.9%
2022	6,913	7,118	7,118	205	3.0%

**Table 2 Impact of New Reference Price on Special Participations per ANP**

Year	ANP 206/2000 US\$ Million	New Resolution US\$ Million	Transition US\$ Million	Difference US\$ Million	Percentage Increase
2018	6,965	7,217	7,015	50	0.7%
2019	8,121	8,375	8,222	102	1.3%
2020	7,945	8,179	8,085	140	1.8%
2021	7,234	7,439	7,398	163	2.3%
2022	6,737	6,976	6,976	239	3.5%

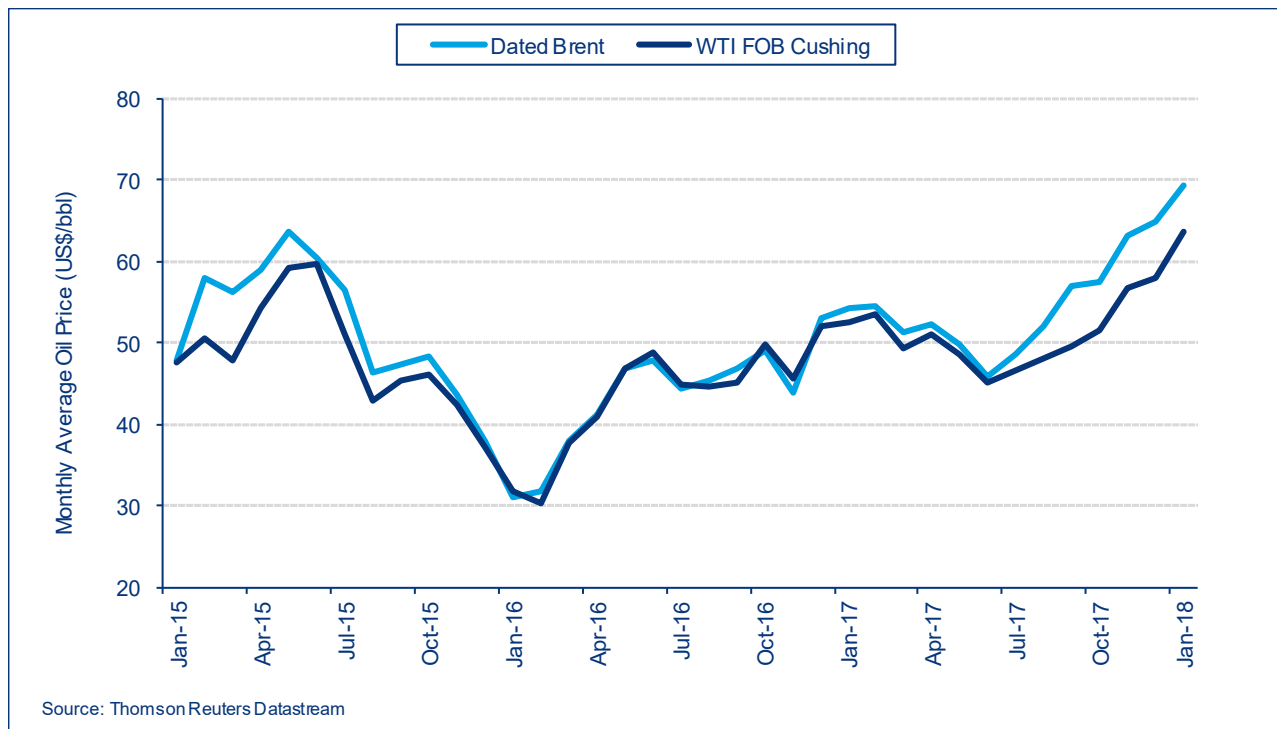
**Table 3 Combined Impact of New Reference Price per ANP**

Year	ANP 206/2000 US\$ Million	New Resolution US\$ Million	Transition US\$ Million	Difference US\$ Million	Percentage Increase
2018	11,978	12,389	12,060	82	0.7%
2019	14,150	14,550	14,310	160	1.1%
2020	14,347	14,722	14,572	225	1.6%
2021	13,649	14,004	13,933	284	2.1%
2022	13,651	14,094	14,094	443	3.2%

Note: the data in the above tables is for total oil and gas production in Brazil whereas the data in the rest of the report is shown only for production within Rio de Janeiro State.

The data provided by ANP shows that by 2022 (first year of full implementation) the new reference price potentially increases royalty and Special Participations by just over 3% and thus represents a potential upside to the amounts we have shown in this report.

Since differentials can vary as the level of the oil price changes we have limited our review of the differentials to Brent from January 2015 onwards. We have made the comparison with Brent rather than WTI, because WTI has become partially disconnected with other leading marker crudes since mid-2017 partly as a result of increasing tight oil production in the USA.


**Chart 1 Historical Brent and WTI Oil Prices**


For each field or field grouping, the average price differential to Brent for the period from January 2017 to December 2017 has been applied to the future pricing assumptions, although to limit the number of different pricing options we have used eight primary Brent differential cases to cover all of the currently producing fields. Details of each of the differentials used are shown in Table 1.

There are however a few instances where we have not relied solely upon the average of the historical price assumptions:

### Recent start-ups

It is common that early in a field's life the price received differs from the long-term price it will achieve. The effect of this difference on the price used to calculate Royalties and Special Participations will be dampened as a result of the dual pricing basis of the calculation of the price published on the ANP's website. However, we have reviewed the average differentials for these more recent developments to determine whether they are in line with our expectations on long term price differentials.

Our calculation of the potential future long-term price is therefore based upon the differential for similar crudes, based upon quality and location of the crude.

### New Developments

As with recent start-ups, we have compared the expected price differential with similar developments to arrive at a price differential that in our opinion will apply in the long term to such developments.

Tables 4 and 5 list the oil price assumptions that we are using for future oil production. Historical averages are based upon ANP data for the period from January to December 2017.

We have grouped future discounts to Brent into the following eight categories:

- Brent less 5%
- Brent less 7%
- Brent less 10%
- Brent less 12%
- Brent less 15%
- Brent less 17%
- Brent less 20%
- Brent less 22%

The prices quoted on the ANP website are in R\$/cubic metre and we have converted these to US\$/bbl to undertake our analysis.



Table 4 Oil Price Assumptions - Current Producing Fields

Field	Field Grouping	Historical Average Discount to Brent	Future Brent Discount Assumption
ALBACORA		-15.9%	-15%
ALBACORA LESTE		-20.1%	-20%
BARRACUDA		-14.6%	-15%
BERBIGAO		-9.9%	-10%
BIJUPIRA		-10.1%	-10%
BUZIOS		-6.7%	-7%
MARIMBA	Campos Basin Central Pole	-15.1%	-15%
PIRAUNA	Campos Basin Central Pole	-14.3%	-15%
CARAPEBA	Campos Basin North East Pole	-15.1%	-15%
GAROUPA	Campos Basin North East Pole	-15.1%	-15%
PARGO	Campos Basin North East Pole	-15.1%	-15%
VERMELHO	Campos Basin North East Pole	-15.2%	-15%
ANEQUIM	Campos Basin North Pole	-15.1%	-15%
BAGRE	Campos Basin North Pole	-15.1%	-15%
CHERNE	Campos Basin North Pole	-15.1%	-15%
CONGRO	Campos Basin North Pole	-15.1%	-15%
CORVINA	Campos Basin North Pole	-15.1%	-15%
GAROUPINHA	Campos Basin North Pole	-15.1%	-15%
MALHADO	Campos Basin North Pole	-15.1%	-15%
NAMORADO	Campos Basin North Pole	-15.1%	-15%
NE NAMORADO	Campos Basin North Pole	NO DATA	-15%
PARATI	Campos Basin North Pole	-15.1%	-15%
VIOLA	Campos Basin North Pole	-15.1%	-15%
BADEJO	Campos Basin South Pole	-14.0%	-15%
BICUDO	Campos Basin South Pole	-14.0%	-15%
BONITO	Campos Basin South Pole	-15.1%	-15%
ENCHOVA	Campos Basin South Pole	-15.1%	-15%
ENCHOVA OESTE	Campos Basin South Pole	-15.1%	-15%
LINGUADO	Campos Basin South Pole	-15.1%	-15%
PAMPO	Campos Basin South Pole	-15.1%	-15%
TRILHA	Campos Basin South Pole	-14.0%	-15%
CARATINGA	Caratinga Area	-16.0%	-15%
ESPADARTE	Espadarte Area	-19.2%	-20%
FRADE		-12.6%	-12%
ITAPU	Itapu	-7.0%	-7%
PEO-1BRSA1146RJS_lara_Entorno_CCO	lara Entorno	NO DATA	-10%
LULA	Lula-Iracema	-7.0%	-7%
MARLIM		-17.7%	-17%
MARLIM LESTE		-15.4%	-15%
MARLIM SUL		-17.2%	-17%
OESTE DE ATAPU		-9.9%	-10%
PAPA TERRA		-22.3%	-22%
PEREGRINO		-22.0%	-22%
POLVO		-18.1%	-17%
RONCADOR		-17.5%	-17%
SALEMA		-9.5%	-10%
SEPIA		-14.8%	-15%
SURURU		-10.6%	-10%
TAMBAU		-4.4%	-5%
TARTARUGA VERDE		-15.1%	-15%
TUBARAO AZUL		-15.1%	-15%
TUBARAO MARTELO		-16.5%	-17%
URUGUA		-4.5%	-5%
VOADOR		-17.3%	-17%



**Table 5 Oil Price Assumptions - Fields without ANP historical oil price dataset**

Field	Field Grouping	Future Brent Discount Assumption
MERO	Libra	-7%
SUL DE LULA		-7%
Atlanta		-22%
BM-C-33		-5%
Maromba		-22%
Oliva		-22%
Sepia Leste		-15%
Buzios (Surplus)		-7%
Iara Entorno (Surplus)		-10%
Itapu (Surplus)		-7%
Sepia (Surplus)		-15%

### Brent Price Assumption

Wood Mackenzie's Brent price assumption used herein is the price assumption which was used in our published research databases for the 2018 1<sup>st</sup> Quarter update (released in early February) and assumes a long-term price assumption of US\$65/bbl flat real long term (in 2018 terms). Prices for the period 2018-2021 reflect an average of forward curve data when the assumption was set (December 2017)

In considering downside sensitivities, we have run a US\$50/bbl (flat real 2018 terms) oil price assumption and calculated the future Royalty and Special Participation payments at this price assumption.

Table 6 shows the future base case and US\$50/bbl price assumptions in nominal (escalated) terms.

**Table 6 Brent Oil Price Assumption**

	Brent Price Assumption (US\$/bbl)	
	Base Case	US\$50/bbl Case
2018	61.00	61.00
2019	58.00	58.00
2020	57.00	57.00
2021	68.98	53.06
2022 and onwards	Prices are escalated in line with our inflation assumption of 2% per annum	

### Gas Prices

The ANP also provides historical gas price information on its website. Table 7 gives details of the historical pricing used by the ANP for gas. The table shows a comparison of the average prices from January 2015 to December 2017 on a field by field basis and compares the price with the average for all fields.

In certain fields, some or all of the gas is used on the platform for fuel use and the ANP determines the price to apply for such fuel gas. Accordingly, the range for gas prices varies significantly. For the different "Pole" field groupings, we have generally used a blended average.

For the purposes of Royalty and Special Participations the ANP calculates a maximum gas price ("Maximum Price"). This is an index comprised of international benchmarks for five different qualities of gas: Henry Hub, propane, butane, natural gasoline, and C5+. The ANP uses a weighted average of the concession area's production and these benchmarks to calculate the Maximum Price. This value is applied to concessions with no sales gas, or to those which do not provide their average market price for the relevant period. As the Maximum Price is always much higher than the average market price, using this Index would skew Royalty and Special Participation payments in favour of the government. Therefore, for the purposes of this report, Wood Mackenzie uses a weighted average of city gate and power plant prices in Brazil to depict local market conditions. The pricing differentials for the various concession areas were categorised into 13 pricing groups. To reflect concessions paying the Maximum Price, we currently model two fields which we have confirmed with the operator that have no sales gas and pay a premium of 200% to the weighted



average. Future fields with no sales gas will use this price differential category. Other concessions which have yet to produce gas, but that will have gas sales, are tagged with differentials of analogue fields.

**Table 7 Gas Price Assumptions - Current Producing Fields**

Field	Field Grouping	Historical Average Premium/Discount to Average Price	Future Relationship to Average Price
ALBACORA		20%	20%
ALBACORA LESTE		-18%	-10%
BARRACUDA		35%	40%
BERBIGAO		59%	40%
BIJUPIRA		-44%	-40%
BUZIOS		-13%	-20%
MARIMBA	Campos Basin Central Pole	16%	30%
PIRAUNA	Campos Basin Central Pole	31%	30%
CARAPEBA	Campos Basin North East Pole	52%	40%
GAROUPA	Campos Basin North East Pole	7%	40%
PARGO	Campos Basin North East Pole	75%	40%
VERMELHO	Campos Basin North East Pole	-23%	40%
ANEQUIM	Campos Basin North Pole	1%	10%
BAGRE	Campos Basin North Pole	2%	10%
CHERNE	Campos Basin North Pole	12%	10%
CONGRO	Campos Basin North Pole	3%	10%
CORVINA	Campos Basin North Pole	5%	10%
GAROUPINHA	Campos Basin North Pole	8%	10%
MALHADO	Campos Basin North Pole	10%	10%
NAMORADO	Campos Basin North Pole	26%	10%
NE NAMORADO	Campos Basin North Pole	0%	10%
PARATI	Campos Basin North Pole	1%	10%
VIOLA	Campos Basin North Pole	1%	10%
BADEJO	Campos Basin South Pole	4%	0%
BICUDO	Campos Basin South Pole	-16%	0%
BONITO	Campos Basin South Pole	-3%	0%
ENCHOVA	Campos Basin South Pole	-2%	0%
ENCHOVA OESTE	Campos Basin South Pole	-14%	0%
LINGUADO	Campos Basin South Pole	-9%	0%
PAMPO	Campos Basin South Pole	14%	0%
TRILHA	Campos Basin South Pole	-1%	0%
CARATINGA	Caratinga Area	30%	40%
ESPADARTE	Espadarte Area	38%	30%
FRADE		-60%	-60%
ITAPU	Itapu	191%	200%
PEO-1BRSA1146RJS_lara_Entorno_CCO	lara Entorno	0%	-10%
LULA	Lula-Iracema	-16%	-10%
MARLIM		-5%	0%
MARLIM LESTE		39%	40%
MARLIM SUL		20%	30%
OESTE DE ATAPU		190%	200%
PAPA TERRA		23%	30%
PEREGRINO		179%	200%
POLVO		107%	100%
RONCADOR		7%	10%
SALEMA		-45%	-40%
SEPIA		48%	10%
SURURU		230%	200%
TAMBAU		-29%	-30%
TARTARUGA VERDE		58%	60%
TUBARAO AZUL		55%	60%
TUBARAO MARTELO		82%	100%
URUGUA		-27%	-20%
VOADOR		108%	100%



**Table 8 Gas Price Assumptions - Fields without an ANP historical gas price dataset**

<b>Field</b>	<b>Field Grouping</b>	<b>Future Relationship to Average Price</b>
MERO	Libra	-30%
SUL DE LULA		0%
BM-C-33		-60%
Maromba		0%
Oliva		0%
Sepia Leste		-60%
Buzios (Surplus)		-30%
Iara Entorno (Surplus)		-30%
Itapu (Surplus)		-30%
Sepia (Surplus)		-30%

### **Inflation**

We assume inflation of 2% per annum for future oil prices and costs.



## Calculation of Royalties and Special Participations

There are two categories of payment which we are providing forecasts for in this report: Royalties and Special Participations. In this section we provide details of the basis of calculation of each of these levels of government take and the approach that we use to arrive at the future payments.

### Royalties

Royalties are calculated monthly on production from each field. The amount of royalty payable is calculated as follows:

- $\text{Royalty} = \text{Value of Production} * \text{Royalty Rate}$

The Value of the Production is equal to the sum of the value of oil and the value of gas production.

- $\text{Value of Oil Production} = \text{Volume of Oil production from the field during the month in cubic metres multiplied by the oil reference price in R\$/m}^3$
- $\text{Value of Gas Production} = \text{Volume of Gas production from the field during the month in cubic metres multiplied by the gas reference price in R\$/m}^3$

Reference prices are determined by Articles 7 and 8 of Decree No. 2.705/1998, which regulates Law No. 9.478/1997 (Petroleum Act). This has been amended by Decree No. 9.042/2017 (see section on Oil Prices for further details).

The standard royalty rate for fields taxed under the concession regime is 10%, although this may be reduced to a minimum of 5% taking account of factors including geological risks and production expectations. A list of royalty rates by field is included in table B-5 of the Appendices. For fields taxed under a Production Sharing Contract ("PSC") the royalty rate is 15%.

Royalties are paid on the last day of the month following the month in which the royalty arises.

### Special Participations

Special Participations are calculated on a field by field basis and are charged on the gross revenues of the field less:

- Royalties;
- Exploration investments;
- Operating costs;
- Depreciation;
- Provision for abandonment; and
- Other payments comprising R&D Obligation and Landowner Override

Special Participations are chargeable on a sliding scale, which varies according to the location of the field (onshore, shallow water or deep water) and its level of production. In addition, there are reduced payments for the first three years of the field life. The tax reduction is measured from the first day of production. The relevant rates are listed in tables 9 and 10.

The rates themselves are calculated based on production in each of the production bands. Therefore, the profits attributable to the lowest production bands will be charged to Special Participations at the minimum rates. As production rises, the profits attributable to the incremental production will be subject to higher rates of Special Participations.

The assets issued to Petrobras under the Transfer of Rights ("TOR") agreement of September 2010 are not subject to Special Participations, though the fields are subject to 10% Royalty. The same applies to the Libra field which was licensed in November 2013 by a consortium of five companies under Brazil's new PSC fiscal system. We also assume that volumes in excess of the contracted amount for the TOR fields will be taxed under the PSC system.

**Table 9** Special Participation Rates (%) - Offshore <400m water depth

Shallow	mcm/qtr	000 b/d	Year 1	Year 2	Year 3	Years 4+
less than	300	20.7	-	-	-	-
less than	500	34.4	-	-	-	10
less than	750	51.7	-	-	10	10
less than	900	62.0	-	10	10	20
less than	950	65.4	10	10	10	20
less than	1200	82.7	10	10	20	20
less than	1350	93.0	10	20	20	30
less than	1400	96.4	20	20	20	30
less than	1600	110.2	20	20	30	30
less than	1650	113.7	20	20	30	30
less than	1800	124.0	20	30	30	35
less than	1850	127.4	30	30	30	35
less than	2100	144.7	30	30	35	35
less than	2250	155.0	30	35	35	40
less than	2300	158.4	35	35	35	40
less than	2550	175.7	35	35	40	40
less than	2700	186.0	35	40	40	40
more than	2700	186.0	40	40	40	40

**Table 10** Special Participation Rates (%) - Offshore >400m water depth

Deepwater	mcm/qtr	000 b/d	Year 1	Year 2	Year 3	Years 4+
less than	450	31.0	-	-	-	-
less than	750	51.7	-	-	-	10
less than	900	62.0	-	-	10	10
less than	1050	72.3	-	-	10	20
less than	1200	82.7	-	10	10	20
less than	1350	93.0	-	10	20	20
less than	1500	103.3	10	10	20	30
less than	1650	113.7	10	20	20	30
less than	1800	124.0	10	20	30	30
less than	1950	134.3	20	20	30	35
less than	2100	144.7	20	30	30	35
less than	2250	155.0	20	30	35	35
less than	2400	165.3	30	30	35	40
less than	2550	175.7	30	35	35	40
less than	2700	186.0	30	35	40	40
less than	2850	196.3	35	35	40	40
less than	3150	217.0	35	40	40	40
more than	3150	217.0	40	40	40	40

### Allocation of Payments

Royalties and Special Participations are allocated proportionately to different governments and agencies. Law 12734 ("Law 12734") changes the distribution of Royalties and Special Participations. Law 12734 was voted upon in November 2012 but the Supreme Court granted a preliminary injunction, currently suspending the effects of Law 12734. We have accordingly presented two cases for the payments received by Rio de Janeiro State:

- I. The existing distribution rates are assumed to apply to the entire forecast period
- II. Law 12734 is assumed to be applied retrospectively from January 2014

Under the existing rules for offshore fields in the Concession regime, the regional State receives 30% of the Royalties below 5% and 22.5% of Royalties above 5%. The same rules apply to fields allocated to Petrobras under the Transfer of Rights ("TOR") agreement of 2010 (the forecast includes five fields under this category – Buzios, Iara Entorno, Itapu, Sepia and Sul de Lula). For offshore fields licensed under the PSC regime, the State of Rio de Janeiro's share of Royalties is 22% (Libra and surplus volumes at the ToR fields are in this category and included in the forecast).

The regional State's share of Special Participations payments is 40% for Concession fields (the TOR and PSC fields do not pay Special Participations).



Law 12734 reduces the Royalties payable to the regional State to 20% for Concession and TOR fields, whilst for PSC fields the rate is unaffected. The regional state's share of Special Participations changes over time as shown in table 11 below (we have assumed that the new rates commence in January 2014).

**Table 11 Regional State share of Special Participation Payments (Law 12734)**

	2014	2015	2016	2017	2018	2019	2020 +
Regional State Share	34.0%	32.0%	29.0%	26.0%	24.0%	22.0%	20.0%

The forecasted Royalties and Special Participations payments accruing to Rio de Janeiro State for the base case oil price (before and after the application of Law 12734) are shown in Tables 12 to 15.

**Table 12 Rio de Janeiro State Royalty Receipts (existing rules) – US\$65/bbl case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
<b>Concession Fields</b>													
Post-salt fields													
base royalty (< 5%)	257	307	306	307	362	359	354	337	315	285	230	176	142
excess royalty (> 5%)	191	228	227	227	269	265	257	241	224	201	161	122	98
	448	535	533	534	631	624	611	578	539	485	391	298	240
Pre-salt fields													
base royalty (< 5%)	239	320	364	387	454	452	467	480	512	507	486	460	426
excess royalty (> 5%)	179	239	273	289	340	339	350	360	384	380	364	345	320
	418	559	637	676	794	791	816	840	896	888	850	805	746
<b>Petrobras Capitalisation Fields</b>													
base royalty (< 5%)	8	22	76	150	248	299	345	381	381	379	381	389	292
excess royalty (> 5%)	6	17	57	113	186	225	259	286	286	284	286	292	219
	13	39	132	263	435	524	603	667	667	663	667	681	510
<b>PSC Fields</b>													
base royalty (< 5%)	0	9	8	11	37	98	167	256	352	460	560	658	780
excess royalty (> 5%)	0	17	15	23	74	196	335	512	705	919	1,120	1,316	1,560
	1	26	23	34	110	294	502	768	1,057	1,379	1,679	1,974	2,340
<b>Total Royalty net to Rio State</b>	<b>880</b>	<b>1,159</b>	<b>1,325</b>	<b>1,506</b>	<b>1,971</b>	<b>2,232</b>	<b>2,532</b>	<b>2,853</b>	<b>3,160</b>	<b>3,415</b>	<b>3,588</b>	<b>3,758</b>	<b>3,836</b>

**Table 13 Rio de Janeiro State Special Participations Receipts (existing rules) – US\$65/bbl case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
<b>Concession Fields</b>													
Post-salt fields													
	249	352	352	381	561	561	522	481	432	336	248	182	128
Pre-salt fields													
	1,041	1,438	1,613	1,722	2,256	2,224	2,268	2,290	2,171	2,090	1,934	1,807	1,531
<b>Total SPT net to Rio State</b>	<b>1,289</b>	<b>1,790</b>	<b>1,965</b>	<b>2,103</b>	<b>2,817</b>	<b>2,784</b>	<b>2,790</b>	<b>2,772</b>	<b>2,602</b>	<b>2,425</b>	<b>2,182</b>	<b>1,989</b>	<b>1,658</b>

**Table 14 Rio de Janeiro State Royalty Receipts (Law 12734 applied from January 2014) – US\$65/bbl case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 Applied from 2014												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
<b>Concession Fields</b>													
Post-salt fields													
base royalty (< 5%)	171	205	204	205	242	239	236	224	210	190	153	117	95
excess royalty (> 5%)	170	203	201	202	239	235	228	215	200	178	143	108	87
	341	407	406	406	481	475	464	439	409	368	297	226	182
Pre-salt fields													
base royalty (< 5%)	160	213	243	258	303	301	311	320	341	338	324	307	284
excess royalty (> 5%)	159	213	242	257	302	301	311	320	341	338	324	307	284
	319	426	485	515	605	602	622	640	682	676	648	613	568
<b>Petrobras Capitalisation Fields</b>													
base royalty (< 5%)	5	15	50	100	166	200	230	254	254	253	254	260	194
excess royalty (> 5%)	5	15	50	100	166	200	230	254	254	253	254	260	194
	10	30	101	200	331	399	460	508	508	505	508	519	389
<b>PSC Fields</b>													
base royalty (< 5%)	0	9	8	11	37	98	167	256	352	460	560	658	780
excess royalty (> 5%)	0	17	15	23	74	196	335	512	705	919	1,120	1,316	1,560
	1	26	23	34	110	294	502	768	1,057	1,379	1,679	1,974	2,340
<b>Total Royalty net to Rio State</b>	<b>671</b>	<b>889</b>	<b>1,014</b>	<b>1,155</b>	<b>1,527</b>	<b>1,770</b>	<b>2,048</b>	<b>2,355</b>	<b>2,657</b>	<b>2,929</b>	<b>3,132</b>	<b>3,332</b>	<b>3,479</b>


**Table 15 Rio de Janeiro State Special Participation Receipts (Law 12734 applied from January 2014) – US\$65/bbl case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 Applied from 2014												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields	162	211	194	190	281	280	261	241	216	168	124	91	64
Pre-salt fields	676	863	887	861	1,128	1,112	1,134	1,145	1,085	1,045	967	903	765
<b>Total SPT net to Rio State</b>	<b>838</b>	<b>1,074</b>	<b>1,081</b>	<b>1,051</b>	<b>1,409</b>	<b>1,392</b>	<b>1,395</b>	<b>1,386</b>	<b>1,301</b>	<b>1,213</b>	<b>1,091</b>	<b>995</b>	<b>829</b>

The forecasted Royalty and Special Participation payments accruing to Rio de Janeiro State for the US\$50/bbl oil price case (before and after the application of Law 12734) are shown in Tables 16 to 19.

**Table 16 Rio de Janeiro State Royalty Receipts (existing rules) – US\$50/bbl case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields													
base royalty (< 5%)	257	307	306	307	279	276	272	259	242	219	177	135	109
excess royalty (> 5%)	191	228	227	227	207	204	198	186	173	155	124	94	75
	448	535	533	534	486	480	470	445	415	374	301	229	185
Pre-salt fields													
base royalty (< 5%)	239	320	364	387	350	348	359	370	394	390	374	354	328
excess royalty (> 5%)	179	239	273	289	262	261	269	277	295	293	280	266	246
	418	559	637	676	611	608	628	647	689	683	654	620	574
Petrobras Capitalisation Fields													
base royalty (< 5%)	8	22	76	150	191	230	265	293	293	292	293	300	224
excess royalty (> 5%)	6	17	57	112	143	173	199	220	220	219	220	225	168
	13	39	132	262	334	403	464	513	513	511	514	524	393
PSC Fields													
base royalty (< 5%)	0	9	8	11	28	75	129	197	271	354	431	506	600
excess royalty (> 5%)	0	17	15	23	57	151	257	394	542	707	861	1,012	1,200
	1	26	23	34	85	226	386	591	814	1,061	1,292	1,519	1,800
<b>Total Royalty net to Rio State</b>	<b>880</b>	<b>1,159</b>	<b>1,325</b>	<b>1,506</b>	<b>1,516</b>	<b>1,718</b>	<b>1,948</b>	<b>2,195</b>	<b>2,431</b>	<b>2,628</b>	<b>2,761</b>	<b>2,892</b>	<b>2,952</b>

**Table 17 Rio de Janeiro State Special Participation Receipts (existing rules) – US\$50/bbl case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields	249	352	352	381	271	271	263	239	208	164	111	69	41
Pre-salt fields	1,041	1,438	1,613	1,722	1,426	1,396	1,422	1,434	1,343	1,295	1,184	1,068	904
<b>Total SPT net to Rio State</b>	<b>1,289</b>	<b>1,790</b>	<b>1,965</b>	<b>2,103</b>	<b>1,698</b>	<b>1,668</b>	<b>1,685</b>	<b>1,673</b>	<b>1,551</b>	<b>1,459</b>	<b>1,295</b>	<b>1,137</b>	<b>945</b>

**Table 18 Rio de Janeiro State Royalty Receipts (Law 12734 applied from January 2014) – US\$50/bbl case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 Applied from 2014												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields													
base royalty (< 5%)	171	205	204	205	186	184	182	173	162	146	118	90	73
excess royalty (> 5%)	170	203	201	202	184	181	176	165	154	137	110	83	67
	341	407	406	406	370	365	357	338	315	283	228	174	140
Pre-salt fields													
base royalty (< 5%)	160	213	243	258	233	232	239	246	263	260	249	236	219
excess royalty (> 5%)	159	213	242	257	233	232	239	246	262	260	249	236	219
	319	426	485	515	466	464	478	493	525	520	499	472	437
Petrobras Capitalisation Fields													
base royalty (< 5%)	5	15	50	100	127	154	177	195	196	194	196	200	150
excess royalty (> 5%)	5	15	50	100	127	154	177	195	196	194	196	200	150
	10	30	101	200	255	307	354	391	391	389	391	400	299
PSC Fields													
base royalty (< 5%)	0	9	8	11	28	75	129	197	271	354	431	506	600
excess royalty (> 5%)	0	17	15	23	57	151	257	394	542	707	861	1,012	1,200
	1	26	23	34	85	226	386	591	814	1,061	1,292	1,519	1,800
<b>Total Royalty net to Rio State</b>	<b>671</b>	<b>889</b>	<b>1,014</b>	<b>1,155</b>	<b>1,175</b>	<b>1,362</b>	<b>1,576</b>	<b>1,812</b>	<b>2,045</b>	<b>2,254</b>	<b>2,410</b>	<b>2,564</b>	<b>2,676</b>


**Table 19 Rio de Janeiro State Special Participation Receipts (Law 12734 applied from January 2014) – US\$50/bbl case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 Applied from 2014												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields	162	211	194	190	136	136	132	119	104	82	56	35	21
Pre-salt fields	676	863	887	861	713	698	711	717	672	647	592	534	452
<b>Total SPT net to Rio State</b>	<b>838</b>	<b>1,074</b>	<b>1,081</b>	<b>1,051</b>	<b>849</b>	<b>834</b>	<b>843</b>	<b>837</b>	<b>775</b>	<b>729</b>	<b>648</b>	<b>568</b>	<b>473</b>

The forecasted Royalty and Special Participation payments accruing to Rio de Janeiro State for the production downside case (before and after the application of Law 12734) are shown in Tables 20 to 23.

**Table 20 Rio de Janeiro State Royalty Receipts (existing rules) – Production downside case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields													
base royalty (< 5%)	257	276	276	276	326	323	318	303	283	256	207	158	128
excess royalty (> 5%)	191	205	204	205	242	238	231	217	202	181	145	110	88
	448	482	480	481	568	561	550	520	485	437	352	268	216
Pre-salt fields													
base royalty (< 5%)	239	288	328	348	409	407	420	432	461	457	437	414	384
excess royalty (> 5%)	179	215	245	260	306	305	315	324	345	342	328	310	288
	418	504	573	608	715	712	735	756	806	799	765	724	671
Petrobras Capitalisation Fields													
base royalty (< 5%)	8	20	68	135	223	269	310	343	343	341	343	350	262
excess royalty (> 5%)	6	15	51	101	168	202	233	257	257	256	257	263	197
	13	35	119	236	391	471	543	600	600	597	601	613	459
PSC Fields													
base royalty (< 5%)	0	8	7	10	33	88	151	230	317	414	504	592	702
excess royalty (> 5%)	0	15	14	20	66	176	301	461	634	827	1,008	1,184	1,404
	1	23	20	31	99	264	452	691	952	1,241	1,512	1,776	2,106
<b>Total Royalty net to Rio State</b>	<b>880</b>	<b>1,043</b>	<b>1,192</b>	<b>1,356</b>	<b>1,774</b>	<b>2,009</b>	<b>2,279</b>	<b>2,567</b>	<b>2,844</b>	<b>3,074</b>	<b>3,229</b>	<b>3,382</b>	<b>3,452</b>

**Table 21 Rio de Janeiro State Special Participation Receipts (existing rules) – Production downside case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 is not applied												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields	249	256	256	282	425	428	410	374	337	263	189	133	88
Pre-salt fields	1,041	1,203	1,344	1,434	1,906	1,876	1,912	1,931	1,819	1,741	1,593	1,486	1,245
<b>Total SPT net to Rio State</b>	<b>1,289</b>	<b>1,459</b>	<b>1,600</b>	<b>1,716</b>	<b>2,332</b>	<b>2,304</b>	<b>2,322</b>	<b>2,305</b>	<b>2,155</b>	<b>2,004</b>	<b>1,782</b>	<b>1,620</b>	<b>1,333</b>

**Table 22 Rio de Janeiro State Royalty Receipts (Law 12734 applied from January 2014) – Production downside case**

Royalty Payments	Rio de Janeiro State share of Royalties - Law 12734 Applied from 2014												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm	US\$ mm
Concession Fields													
Post-salt fields													
base royalty (< 5%)	171	184	184	184	217	215	212	202	189	171	138	106	85
excess royalty (> 5%)	170	182	181	182	215	212	205	193	180	161	129	97	78
	341	367	365	366	433	427	418	395	369	331	267	203	164
Pre-salt fields													
base royalty (< 5%)	160	192	218	232	273	271	280	288	307	304	291	276	256
excess royalty (> 5%)	159	192	218	231	272	271	280	288	307	304	291	276	256
	319	384	437	463	545	542	560	576	614	609	583	552	512
Petrobras Capitalisation Fields													
base royalty (< 5%)	5	13	45	90	149	180	207	229	229	227	229	234	175
excess royalty (> 5%)	5	13	45	90	149	180	207	229	229	227	229	234	175
	10	27	91	180	298	359	414	457	457	455	458	467	350
PSC Fields													
base royalty (< 5%)	0	8	7	10	33	88	151	230	317	414	504	592	702
excess royalty (> 5%)	0	15	14	20	66	176	301	461	634	827	1,008	1,184	1,404
	1	23	20	31	99	264	452	691	952	1,241	1,512	1,776	2,106
<b>Total Royalty net to Rio State</b>	<b>671</b>	<b>800</b>	<b>913</b>	<b>1,040</b>	<b>1,375</b>	<b>1,593</b>	<b>1,843</b>	<b>2,119</b>	<b>2,392</b>	<b>2,636</b>	<b>2,819</b>	<b>2,999</b>	<b>3,131</b>





**Table 23 Rio de Janeiro State Special Participation Receipts (Law 12734 applied from January 2014) – Production downside case**

SPT Payments	Rio de Janeiro State share of SPT - Law 12734 Applied from 2014												
	2017 US\$ mm	2018 US\$ mm	2019 US\$ mm	2020 US\$ mm	2021 US\$ mm	2022 US\$ mm	2023 US\$ mm	2024 US\$ mm	2025 US\$ mm	2026 US\$ mm	2027 US\$ mm	2028 US\$ mm	2029 US\$ mm
Concession Fields													
Post-salt fields	162	154	141	141	213	214	205	187	168	132	94	67	44
Pre-salt fields	676	722	739	717	953	938	956	966	909	870	796	743	622
<b>Total SPT net to Rio State</b>	<b>838</b>	<b>875</b>	<b>880</b>	<b>858</b>	<b>1,166</b>	<b>1,152</b>	<b>1,161</b>	<b>1,153</b>	<b>1,078</b>	<b>1,002</b>	<b>891</b>	<b>810</b>	<b>666</b>

## Field Coverage

Wood Mackenzie's extensive coverage of upstream assets covers those fields that are in production and under development as well as future developments, where development approval has not yet been granted. The future developments include fields categorised as "Probable Developments", which in the view of Wood Mackenzie are likely to be developed within the short to medium term. Wood Mackenzie's databases contain models for fields in production, under development and probable developments.

### Technical Reserves

Other discoveries which are listed as "Technical" (or Contingent Resources) represent fields where the likelihood and timing of development is less certain.

Technical reserves are defined as reserves that have been discovered but are currently not considered commercial. This may be due, for example, to low levels of recoverable reserves, perceived technical difficulties with a development, low product quality or the lack of available markets (e.g. "stranded gas" deposits). However, the status of technical reserves may change due to numerous factors such as from economic factors to technological developments.

Wood Mackenzie splits technical reserves into two categories as follows:

- Potential reserves: These are fields that we expect to be developed at some point for commercial purposes under current costs and price projections, but significant uncertainty remains over the nature and timing of their development.
- Resources: These are fields that we do not expect to be developed under current costs and price projections. To be commercial, these fields require a breakthrough in technology, a step change in price, new fiscal terms or infrastructure that is not currently expected to be built.

Fields may be classified as Technical if, for example, there are uncertainties over whether the assets are economically recoverable using existing technologies or alternatively, these assets may be recent discoveries that have not currently been fully appraised.

Due to the uncertainty surrounding when and if such Technical discoveries will be developed, we have not included them within our forecast of future Royalties and Special Participations. Table B-6 in Appendix B includes a list of these Technical discoveries located in Rio de Janeiro State. It is likely that a number of these fields will be developed in the future and they may generate Royalties and Special Participations in the period up to 2029. As such, these will represent an upside on the Royalty and Special Participation streams shown in this report.

### Field Groupings

In our coverage of the assets, on occasion, a number of fields are grouped into a field grouping area for ease of review. However, to allow for the accurate calculation of Special Participations individual fields are dis-aggregated to enable accurate calculation of the Special Participations.

Table 24 lists the fields held in Wood Mackenzie's Upstream databases as being commercial, together with their status as "In production", "Under development" or "Probable development". The fields are shown individually, but are also listed where relevant within Wood Mackenzie's field area grouping.

## Asset Modelling

### Reserves and Production

Wood Mackenzie's estimates of oil and gas reserves and production are based on our view of likely future production. Wood Mackenzie does not conduct independent reservoir studies or engineering assessments. Rather, we make an independent analysis of production forecasts provided by operators and/or partners (where available), integrated with our own view of other commercial factors such as demand, infrastructural availability, costs etc. We validate this assessment by comparing this to data from analogous fields in the same basin or region.

Our estimates are broadly equivalent to company proved plus probable (P+P or 2P) reserve and production estimates. We take this approach, as opposed to basing asset modelling on a proved (1P) reserves basis, because the 2P reserve case is believed to represent the "most likely" future outcome for each asset. For those assets where reserve upside is known to exist, for example,



where isolated sections of a reservoir have yet to be drilled, this will be noted in the text (such reserves are usually classified as "possible" or 3P reserves by the companies).

Any forecast costs and resultant reserves/production profiles associated with these 3P reserves will not, however, be included in our cash flow analysis. In many cases, Wood Mackenzie will classify a discovery as a Probable Development before a company has booked the reserves under the applicable stock exchange rules, for example, the SEC in the US. This is particularly true for gas discoveries, which Wood Mackenzie may classify as commercial before a gas sales contract has been agreed upon. Considering this, and the fact that SEC/annual report figures generally report proved (1P) reserves, Wood Mackenzie's published entitlement reserves are likely to exceed SEC reported reserves.

### Capital and Operating Costs

Wood Mackenzie uses capital and operating expenditure forecasts associated with our "2P" view of reserves and production for an asset or group of assets.

- **Capital Costs:** These include, where appropriate, costs for production facilities, processing equipment, subsea facilities, development drilling, pipelines, offshore loading facilities, terminals, any "other" capital costs, and finally any abandonment costs.
- **Operating Costs:** These include, where appropriate, fixed and variable costs for field operations, transportation (non-tariff), leasing, insurance and G&A. Additionally, they include any tariffs paid to other assets for transportation and/or processing production.

### Transfer of Rights Assets

The Government granted Petrobras six areas in the pre-salt play in September 2010 under the TOR agreement for an initial price of US\$42.5 billion, on the assumption that the areas contained 5 billion of oil equivalent reserves. On 9th May 2014, Petrobras announced that following completion of well 4-BRSA1226-RJS (the third well on the lara Entorno block) it had completed the exploration drilling required under the TOR agreement (16 wells were required to be drilled over the six areas transferred to Petrobras).

Under the TOR agreement the reserves and value of each block are to be re-evaluated upon declaration of commerciality. Petrobras has declared commerciality on all six blocks, and these are listed below with the relevant field names in brackets.

- Franco (Búzios)
- Sul de Tupi (Sul de Lula)
- Florim (Itapu)
- Sul de Guará (Sul de Sapinhoá)
- Nordeste de Tupi (Sépia)
- Entorno de lara (Norte de Berbigão, Sul de Berbigão, Norte de Sururu, Sul de Sururu and Atapu)

Franco and Sul de Tupi were declared commercial on 19<sup>th</sup> December 2013, whilst Florim, Sul de Guará and Nordeste de Tupi were declared commercial on 3<sup>rd</sup> September 2014. Entorno de lara was declared commercial on 29<sup>th</sup> December 2014 and at the same time Petrobras confirmed that the recoverable volumes at the discoveries exceed the contracted 5bnboe.

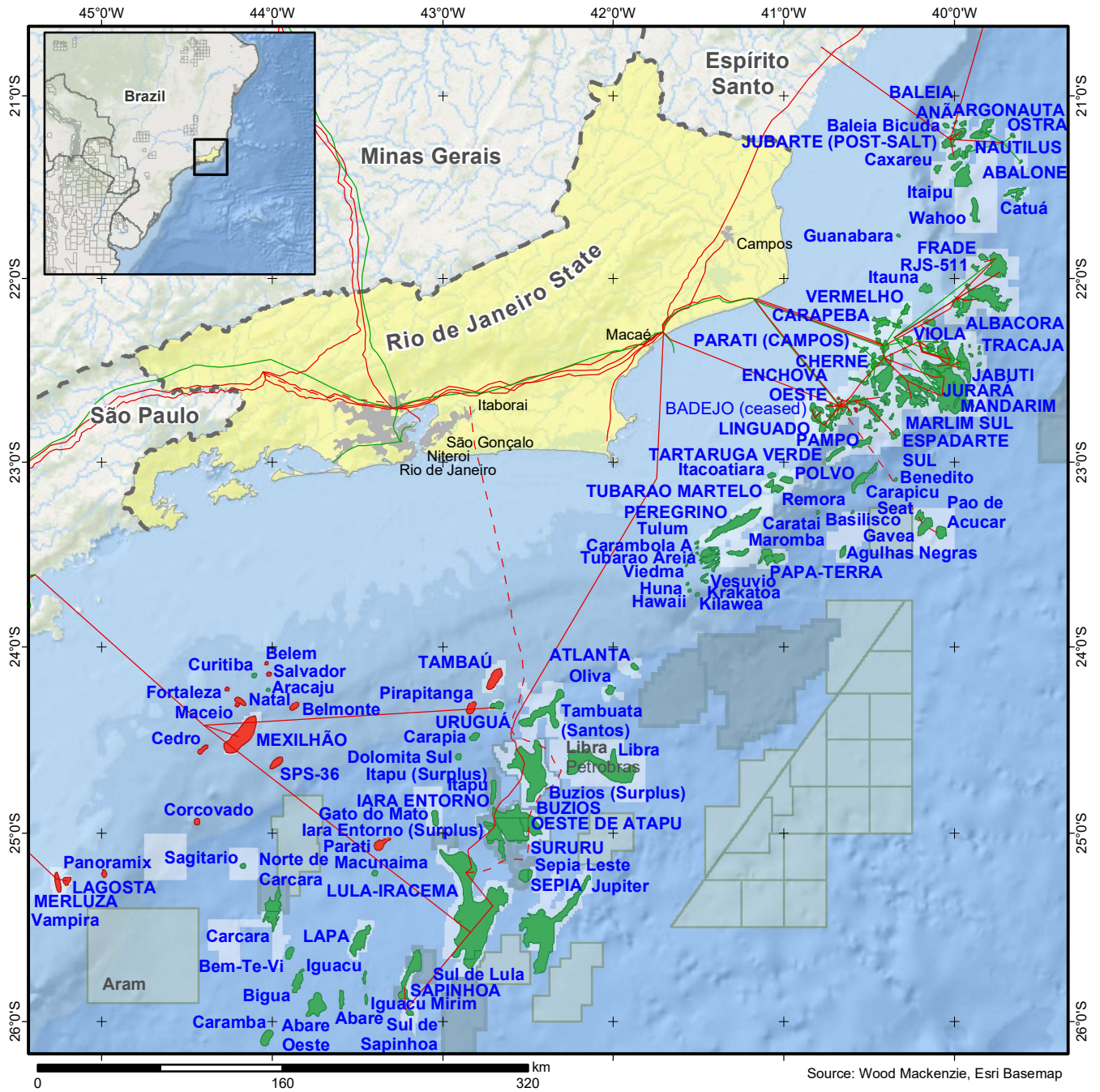
If the valuations are higher than the initial US\$42.5bn price paid then Petrobras will either pay the difference to the Government or reduce the volume to be produced. As of the date of this report the outcome of the revaluation is not known and we have assumed no detrimental impact on the timing of development of the assets granted under the TOR that we currently regard as commercial, Búzios, lara Entorno, Itapu, Sepia and Sul de Lula.


**Table 24 Summary field listing**

Field Grouping	Individual Field	Basin	Type	Status	Pre- or Post-Salt	Fiscal Terms
Albacora Area	Albacora	Campos	Oil	Onstream	Post-salt	Concession
Albacora Area	Fomo	Campos	Oil	Probable Development	Pre-salt	Concession
	Albacora Leste	Campos	Oil	Onstream	Post-salt	Concession
Barracuda Area	Barracuda	Campos	Oil	Onstream	Post-salt	Concession
Barracuda Area	Nautilus (pre-salt)	Campos	Oil	Onstream	Pre-salt	Concession
Bijupirá-Salema	Bijupira	Campos	Oil	Onstream	Post-salt	Concession
Bijupirá-Salema	Salema	Campos	Oil	Onstream	Post-salt	Concession
BM-C-33	Gavea	Campos	Oil	Probable Development	Pre-salt	Concession
BM-C-33	Pao de Acucar	Campos	Oil	Probable Development	Pre-salt	Concession
BM-C-33	Seat	Campos	Oil	Probable Development	Pre-salt	Concession
BS-4	Atlanta	Santos	Oil	Under Development	Post-salt	Concession
BS-4	Oliva	Santos	Oil	Probable Development	Post-salt	Concession
BS-500 Pole	Tambau	Santos	Gas	Onstream	Post-salt	Concession
BS-500 Pole	Urugua	Santos	Oil & Gas	Onstream	Post-salt	Concession
	Buzios	Santos	Oil	Under Development	Pre-salt	ToR
	Buzios (Surplus)	Santos	Oil	Probable Development	Pre-salt	PSC
Campos Basin Central Pole	Marimba	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin Central Pole	Marimba Leste	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin Central Pole	Pirauna	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin NE Pole	Carapeba	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin NE Pole	Garoupa	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin NE Pole	Pargo	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin NE Pole	Vermelho	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Anequim	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Bagre	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Cherne	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Congro	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Corvina	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Garoupinha	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Malhado	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Namorado	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Parati (Campos)	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin North Pole	Viola	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Badejo	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Bicudo	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Bonito	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Enchova	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Enchova Oeste	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Linguado	Campos	Oil	Onstream	Post-salt	Concession
Campos Basin South Pole	Pampo	Campos	Oil	Onstream	Pre-salt	Concession
Campos Basin South Pole	Trilha	Campos	Oil	Onstream	Pre-salt	Concession
Caratinga Area	Caratinga	Campos	Oil	Onstream	Post-salt	Concession
Caratinga Area	Carimbe (pre-salt)	Campos	Oil	Onstream	Pre-salt	Concession
Espadarte Area	Espadarte Sul	Campos	Oil	Onstream	Post-salt	Concession
	Frade	Campos	Oil	Onstream	Post-salt	Concession
lara	Berbigao	Santos	Oil	Under Development	Pre-salt	Concession
lara	Oeste de Atapu	Santos	Oil	Under Development	Pre-salt	Concession
lara	Sururu	Santos	Oil	Under Development	Pre-salt	Concession
	lara Entorno	Santos	Oil & Gas	Under Development	Pre-salt	ToR
	lara Entorno (Surplus)	Santos	Oil	Probable Development	Pre-salt	PSC
	Itapu	Santos	Oil	Probable Development	Pre-salt	ToR
	Itapu (Surplus)	Santos	Oil	Probable Development	Pre-salt	PSC
	Libra	Santos	Oil	Probable Development	Pre-salt	PSC
	Lula-Iracema	Santos	Oil & Gas	Onstream	Pre-salt	Concession
Marlim Area	Brava	Campos	Oil	Onstream	Pre-salt	Concession
Marlim Area	Marlim	Campos	Oil	Onstream	Post-salt	Concession
Marlim Leste Area	Jabuti	Campos	Oil	Onstream	Post-salt	Concession
Marlim Leste Area	Marlim Leste	Campos	Oil	Onstream	Post-salt	Concession
Marlim Leste Area	Tracaja	Campos	Oil	Onstream	Pre-salt	Concession
Marlim Sul Area	Jurara	Campos	Oil	Onstream	Post-salt	Concession
Marlim Sul Area	Mandarim	Campos	Oil	Onstream	Post-salt	Concession
Marlim Sul Area	Marlim Sul	Campos	Oil	Onstream	Post-salt	Concession
Marlim Sul Area	Mucua	Campos	Oil	Onstream	Post-salt	Concession
	Maromba	Santos	Oil	Probable Development	Post-salt	Concession
	Papa-Terra	Campos	Oil	Onstream	Post-salt	Concession
	Peregrino	Campos	Oil	Onstream	Post-salt	Concession
	Polvo	Campos	Oil	Onstream	Post-salt	Concession
	Roncador	Campos	Oil	Onstream	Post-salt	Concession
	Sepia	Santos	Oil	Probable Development	Pre-salt	ToR
	Sepia (Surplus)	Santos	Oil	Probable Development	Pre-salt	PSC
	Sepia Leste	Santos	Oil	Probable Development	Pre-salt	Concession
	Sul de Lula	Santos	Oil	Probable Development	Pre-salt	ToR
	Tartaruga Verde	Campos	Oil	Onstream	Post-salt	Concession
	Tubarao Martelo	Campos	Oil	Onstream	Post-salt	Concession
	Voador	Campos	Oil	Onstream	Post-salt	Concession



Map of fields located Offshore Rio de Janeiro State





## Appendix A – Future Production and Payments

In this section of the report, we show Wood Mackenzie's forecast of future production plus Royalty and Special Participation payments.

### Future Production

**Table A-1 Forecasted Oil Production (000 b/d)**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	50	70	75	55	47	39	32	28	24	20	17	-	-
Albacora Leste	49	46	39	34	29	25	22	19	17	-	-	-	-
Atlanta	-	11	21	18	16	29	58	71	70	66	57	50	43
Barracuda Area	51	49	46	40	34	29	25	21	18	16	13	11	10
Berbigao	-	30	84	105	99	94	101	93	84	82	93	83	73
Bijupira	9	15	14	12	9	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	83	107	102	98	91
Buzios	2	60	222	396	500	525	527	530	513	505	497	498	470
Campos Basin Central Pole	14	11	10	9	9	8	7	6	5	-	-	-	-
Campos Basin North East Pole	16	15	13	12	11	10	9	7	5	-	-	-	-
Campos Basin North Pole	21	21	19	18	16	14	13	11	10	9	-	-	-
Campos Basin South Pole	21	19	17	15	13	12	10	9	-	-	-	-	-
Caratinga Area	29	26	25	31	25	21	17	14	12	10	-	-	-
Espadarte Area	3	2	-	-	-	-	-	-	-	-	-	-	-
Frade	19	41	33	36	50	43	25	21	21	20	-	-	-
Iara Entorno	-	10	30	96	135	135	143	187	199	196	194	203	-
Itapu	22	-	-	-	-	30	96	129	122	116	109	100	90
Lula-Iracema	740	884	1,029	1,101	1,071	1,053	1,053	1,052	983	894	794	704	619
Marlim	141	136	122	110	99	89	80	72	65	58	52	-	-
Marlim Leste Area	67	91	82	74	67	60	54	49	44	39	35	-	-
Marlim Sul	165	142	128	115	103	93	84	75	68	61	-	-	-
Maromba	-	-	-	-	-	-	-	-	6	24	49	50	41
Oeste de Atapu	-	-	-	-	-	-	15	42	52	49	47	44	40
Oliva	-	-	-	-	-	-	5	9	15	24	24	21	17
Papa-Terra	10	19	16	23	49	88	104	87	73	59	50	42	35
Peregrino	67	63	64	71	85	89	88	84	77	72	67	64	61
Polvo	8	6	5	4	4	-	-	-	-	-	-	-	-
Roncador	245	259	301	337	329	335	329	314	295	251	214	183	157
Salema	4	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	43	108	128	121	115	108	98	88	79
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	13
Sul de Lula	-	-	-	-	-	-	-	-	-	-	15	29	28
Sururu	-	-	-	6	12	12	11	11	16	46	78	116	110
Tambau	-	-	-	-	-	-	-	-	-	-	-	-	-
Tartaruga Verde	10	26	87	126	120	102	87	74	63	53	45	38	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	8	6	7	5	4	-	-	-	-	-	-	-	-
Urugua	11	11	9	8	7	7	-	-	-	-	-	-	-
Voador	2	2	2	1	1	1	1	1	1	1	1	-	-
Libra	1	25	20	15	85	230	387	551	669	806	966	1,131	1,243
Buzios (Surplus)	-	10	-	10	30	96	165	261	389	528	658	748	789
Iara Entorno (Surplus)	-	-	12	24	23	22	21	49	126	169	176	188	385
Itapu (Surplus)	-	-	-	-	-	-	-	13	12	24	23	34	44
Sepia (Surplus)	-	-	-	-	-	15	36	40	38	49	58	66	61
<b>Total</b>	<b>1,784</b>	<b>2,109</b>	<b>2,534</b>	<b>2,909</b>	<b>3,125</b>	<b>3,410</b>	<b>3,730</b>	<b>4,047</b>	<b>4,286</b>	<b>4,462</b>	<b>4,532</b>	<b>4,588</b>	<b>4,498</b>



Table A-2 Forecasted Gas Production (mmcf/d)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	29	27	26	22	19	15	13	11	10	8	7	-	-
Albacora Leste	26	24	20	18	15	13	11	10	9	-	-	-	-
Atlanta	-	3	5	5	4	7	15	18	18	17	15	13	11
Barracuda Area	26	24	23	19	17	14	12	10	9	8	6	5	5
Berbigao	-	16	44	55	53	50	53	49	44	44	49	44	39
Bijupira	4	7	6	6	4	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	413	500	490	482	476
Buzios	3	32	51	316	410	431	433	435	421	415	408	409	386
Campos Basin Central Pole	6	1	1	1	1	0	0	0	0	-	-	-	-
Campos Basin North East Pole	3	3	3	3	3	2	2	2	2	-	-	-	-
Campos Basin North Pole	14	16	15	13	12	10	9	8	7	7	-	-	-
Campos Basin South Pole	16	17	15	13	11	10	8	7	-	-	-	-	-
Caratinga Area	15	13	13	15	13	10	9	7	6	5	-	-	-
Espadarte Area	1	1	-	-	-	-	-	-	-	-	-	-	-
Frade	8	17	13	15	20	18	10	9	9	8	-	-	-
Iara Entorno	-	-	16	51	72	71	76	99	105	104	103	108	-
Itapu	10	-	-	-	-	18	57	76	72	69	64	45	40
Lula-Iracema	667	624	720	765	744	731	720	716	668	606	538	477	419
Marlim	69	67	61	55	50	45	40	36	32	29	26	-	-
Marlim Leste Area	36	32	29	26	23	21	19	17	15	14	12	-	-
Marlim Sul	118	140	130	120	112	104	97	90	85	80	-	-	-
Maromba	-	-	-	-	-	-	-	-	8	8	9	9	9
Oeste de Atapu	-	-	-	-	-	-	8	22	28	26	25	23	21
Oliva	-	-	-	-	-	-	1	2	4	6	6	5	5
Papa-Terra	2	4	3	4	9	17	20	17	14	11	10	8	7
Peregrino	4	3	3	4	4	5	5	4	4	4	4	3	3
Polvo	1	1	0	0	0	0	-	-	-	-	-	-	-
Roncador	220	214	244	271	263	270	265	251	233	197	168	143	122
Salema	3	3	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	19	159	193	183	173	162	148	133	119
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	36
Sul de Lula	-	-	-	-	-	-	-	-	-	-	10	19	18
Sururu	-	-	-	3	7	6	6	6	8	25	41	61	58
Tambau	2	3	2	1	1	1	-	-	-	-	-	-	-
Tartaruga Verde	4	16	17	17	17	17	17	16	16	16	16	16	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	0	1	1	0	0	-	-	-	-	-	-	-	-
Urugua	48	40	29	22	20	16	-	-	-	-	-	-	-
Voador	3	2	2	2	1	1	1	1	1	1	1	-	-
Libra	3	6	6	10	25	47	74	91	107	128	150	172	175
Buzios (Surplus)	-	14	-	14	16	79	127	205	295	410	516	599	632
Iara Entorno (Surplus)	-	16	40	49	47	45	60	78	119	156	157	165	313
Itapu (Surplus)	-	-	-	-	-	-	-	7	7	14	13	20	26
Sepia (Surplus)	-	-	-	-	-	22	54	61	57	73	88	100	93
<b>Total</b>	<b>1,339</b>	<b>1,384</b>	<b>1,539</b>	<b>1,917</b>	<b>2,011</b>	<b>2,255</b>	<b>2,413</b>	<b>2,545</b>	<b>2,999</b>	<b>3,150</b>	<b>3,078</b>	<b>3,059</b>	<b>3,012</b>



## Future Royalty Payments

Using Wood Mackenzie's Economic Model and field data, we have generated the future Royalties that we forecast will be payable on the fields located in Rio de Janeiro State.

To enable a determination of the royalties that will be allocated to RioPrevidência, we have divided the royalty streams into royalties up to the 5% base royalty rate (Table A-4) and royalties in excess of the 5% royalty rate (Table A-5). Also included is a summary table (Table A-3) showing the total annual forecasted Royalty payments for each field or field grouping.

**Table A-3 Forecasted Royalty Payments 2017-2029 (US\$ million)**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	90	139	141	103	105	88	75	66	58	51	44	-	-
Albacora Leste	82	85	69	59	61	54	48	42	38	-	-	-	-
Atlanta	-	19	35	30	31	58	121	151	150	145	129	114	102
Barracuda Area	91	99	89	76	78	68	59	52	45	40	34	30	27
Berbigao	-	63	167	205	235	228	249	233	215	215	248	225	203
Bijupira	20	31	28	23	22	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	325	418	411	406	391
Buzios	4	129	445	812	1,242	1,330	1,364	1,397	1,379	1,387	1,390	1,421	1,369
Campos Basin Central Pole	25	21	18	17	18	17	16	14	11	-	-	-	-
Campos Basin North East Pole	27	28	24	22	24	22	20	15	12	-	-	-	-
Campos Basin North Pole	38	43	37	34	36	33	31	28	26	23	-	-	-
Campos Basin South Pole	37	39	33	29	31	28	25	23	-	-	-	-	-
Caratinga Area	49	48	45	54	54	45	38	32	27	23	-	-	-
Espadarte Area	4	4	-	-	-	-	-	-	-	-	-	-	-
Frade	34	82	62	67	111	99	59	50	52	51	-	-	-
Iara Entorno	-	20	60	188	320	325	352	470	510	513	518	554	-
Itapu	47	-	-	-	-	83	272	373	361	350	335	302	277
Lula-Iracema	1,500	1,939	2,145	2,256	2,655	2,662	2,712	2,762	2,635	2,442	2,212	2,001	1,795
Marlim	243	264	226	200	218	200	183	168	154	141	130	-	-
Marlim Leste Area	121	182	156	138	150	138	126	116	106	98	90	-	-
Marlim Sul	296	298	256	227	248	228	211	194	179	166	-	-	-
Maromba	-	-	-	-	-	-	-	-	15	55	110	115	96
Oeste de Atapu	-	-	-	-	-	-	37	105	133	129	125	120	111
Oliva	-	-	-	-	-	-	10	20	32	52	54	47	41
Papa-Terra	15	34	27	38	99	181	218	187	159	132	113	97	83
Peregrino	105	112	107	118	171	181	182	177	166	158	151	146	143
Polvo	13	11	9	8	8	0	-	-	-	-	-	-	-
Roncador	440	524	578	636	751	781	782	761	728	631	548	478	418
Salema	7	8	6	5	4	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	94	257	310	301	291	278	258	237	217
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	38
Sul de Lula	-	-	-	-	-	-	-	-	-	-	42	83	81
Sururu	-	-	-	12	29	28	27	26	41	121	208	315	304
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	18	54	161	227	263	229	199	173	151	132	115	101	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	14	11	13	9	8	-	-	-	-	-	-	-	-
Urugua	25	25	20	17	18	17	-	-	-	-	-	-	-
Voador	4	4	3	3	3	2	2	2	1	1	1	-	-
Libra	3	79	60	45	304	833	1,430	2,074	2,571	3,157	3,859	4,606	5,160
Buzios (Surplus)	-	34	-	32	109	362	633	1,021	1,551	2,151	2,735	3,177	3,414
Iara Entorno (Surplus)	-	3	43	77	89	86	88	196	492	672	715	776	1,616
Itapu (Surplus)	-	-	-	-	-	-	-	48	47	96	93	142	189
Sepia (Surplus)	-	-	-	-	-	54	131	151	146	191	232	270	256
<b>Total</b>	<b>3,353</b>	<b>4,433</b>	<b>5,062</b>	<b>5,761</b>	<b>7,586</b>	<b>8,716</b>	<b>10,010</b>	<b>11,425</b>	<b>12,807</b>	<b>14,017</b>	<b>14,898</b>	<b>15,762</b>	<b>16,329</b>



Table A-4 Forecasted Royalty Payments 2017-2029 (US\$ million) – 5% base payments

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	70	70	51	52	44	38	33	29	25	22	-	-
Albacora Leste	41	43	35	29	31	27	24	21	19	-	-	-	-
Atlanta	-	12	22	19	20	37	78	97	96	93	83	73	65
Barracuda Area	46	50	45	38	39	34	29	26	23	20	17	15	13
Berbigao	-	31	83	102	118	114	124	116	108	108	124	112	101
Bijupira	10	16	14	12	11	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	163	209	205	203	196
Buzios	2	65	222	406	621	665	682	698	689	693	695	710	684
Campos Basin Central Pole	13	11	9	8	9	9	8	7	5	-	-	-	-
Campos Basin North East Pole	14	14	12	11	12	11	10	8	6	-	-	-	-
Campos Basin North Pole	19	21	19	17	18	17	15	14	13	12	-	-	-
Campos Basin South Pole	19	20	16	14	15	14	13	11	-	-	-	-	-
Caratinga Area	26	26	24	29	29	24	20	17	15	12	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	41	31	33	56	50	30	25	26	25	-	-	-
Iara Entorno	-	10	30	94	160	163	176	235	255	257	259	277	-
Itapu	23	-	-	-	-	42	136	186	181	175	168	151	139
Lula-Iracema	750	970	1,073	1,128	1,328	1,331	1,356	1,381	1,317	1,221	1,106	1,000	898
Marlim	121	132	113	100	109	100	92	84	77	71	65	-	-
Marlim Leste Area	61	91	78	69	75	69	63	58	53	49	45	-	-
Marlim Sul	148	149	128	113	124	114	105	97	90	83	-	-	-
Maromba	-	-	-	-	-	-	-	-	8	27	55	57	48
Oeste de Atapu	-	-	-	-	-	-	19	52	67	65	63	60	56
Oliva	-	-	-	-	-	-	7	13	21	33	35	30	26
Papa-Terra	8	17	13	19	49	90	109	93	79	66	57	49	42
Peregrino	53	56	53	59	85	90	91	89	83	79	76	73	71
Polvo	7	6	5	4	4	0	-	-	-	-	-	-	-
Roncador	220	262	289	318	376	391	391	380	364	315	274	239	209
Salema	4	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	47	128	155	150	146	139	129	118	109
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	19
Sul de Lula	-	-	-	-	-	-	-	-	-	-	21	42	40
Sururu	-	-	-	6	14	14	14	13	20	61	104	158	152
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	27	81	114	131	114	99	87	76	66	58	50	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	6	7	4	4	-	-	-	-	-	-	-	-
Urugua	14	14	11	10	11	9	-	-	-	-	-	-	-
Voador	3	2	2	2	2	1	1	1	1	1	1	-	-
Libra	1	26	20	15	101	278	477	691	857	1,052	1,286	1,535	1,720
Buzios (Surplus)	-	11	-	11	36	121	211	340	517	717	912	1,059	1,138
Iara Entorno (Surplus)	-	1	14	26	30	29	29	65	164	224	238	259	539
Itapu (Surplus)	-	-	-	-	-	-	-	16	16	32	31	47	63
Sepia (Surplus)	-	-	-	-	-	18	44	50	49	64	77	90	85
<b>Total</b>	<b>1,680</b>	<b>2,204</b>	<b>2,522</b>	<b>2,862</b>	<b>3,718</b>	<b>4,147</b>	<b>4,645</b>	<b>5,156</b>	<b>5,629</b>	<b>5,993</b>	<b>6,203</b>	<b>6,408</b>	<b>6,412</b>





Table A-5 Forecasted Royalty Payments 2017-2029 (US\$ million) – payments above 5% base

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	70	70	51	52	44	38	33	29	25	22	-	-
Albacora Leste	41	43	35	29	31	27	24	21	19	-	-	-	-
Atlanta	-	7	12	11	11	21	43	54	54	52	46	41	36
Barracuda Area	46	50	45	38	39	34	29	26	23	20	17	15	13
Berbigao	-	31	83	102	118	114	124	116	108	108	124	112	101
Bijupira	10	16	14	12	11	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	163	209	205	203	196
Buzios	2	65	222	406	621	665	682	698	689	693	695	710	684
Campos Basin Central Pole	13	11	9	8	9	9	8	7	5	-	-	-	-
Campos Basin North East Pole	14	14	12	11	12	11	10	8	6	-	-	-	-
Campos Basin North Pole	19	21	19	17	18	17	15	14	13	12	-	-	-
Campos Basin South Pole	19	20	16	14	15	14	13	11	-	-	-	-	-
Caratinga Area	23	22	21	25	25	21	18	15	12	10	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	41	31	33	56	50	30	25	26	25	-	-	-
Iara Entorno	-	10	30	94	160	163	176	235	255	257	259	277	-
Itapu	23	-	-	-	-	42	136	186	181	175	168	151	139
Lula-Iracema	750	970	1,073	1,128	1,328	1,331	1,356	1,381	1,317	1,221	1,106	1,000	898
Marlim	121	132	113	100	109	100	92	84	77	71	65	-	-
Marlim Leste Area	61	91	78	69	75	69	63	58	53	49	45	-	-
Marlim Sul	148	149	128	113	124	114	105	97	90	83	-	-	-
Maromba	-	-	-	-	-	-	-	-	8	27	55	57	48
Oeste de Atapu	-	-	-	-	-	-	19	52	67	65	63	60	56
Oliva	-	-	-	-	-	-	4	7	12	19	19	17	15
Papa-Terra	8	17	13	19	49	90	109	93	79	66	57	49	42
Peregrino	53	56	53	59	85	90	91	89	83	79	76	73	71
Polvo	7	6	5	4	4	0	-	-	-	-	-	-	-
Roncador	220	262	289	318	376	391	391	380	364	315	274	239	209
Salema	3	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	47	128	155	150	146	139	129	118	109
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	19
Sul de Lula	-	-	-	-	-	-	-	-	-	-	21	42	40
Sururu	-	-	-	6	14	14	14	13	20	61	104	158	152
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	27	81	114	131	114	99	87	76	66	58	50	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	6	7	4	4	-	-	-	-	-	-	-	-
Urugua	10	11	9	7	8	7	-	-	-	-	-	-	-
Voador	2	1	1	1	1	1	1	1	1	1	1	-	-
Libra	2	53	40	30	203	555	953	1,383	1,714	2,105	2,573	3,071	3,440
Buzios (Surplus)	-	23	-	21	73	242	422	680	1,034	1,434	1,823	2,118	2,276
Iara Entorno (Surplus)	-	2	29	51	59	57	58	131	328	448	477	517	1,078
Itapu (Surplus)	-	-	-	-	-	-	-	32	31	64	62	95	126
Sepia (Surplus)	-	-	-	-	-	36	88	101	97	127	155	180	170
<b>Total</b>	<b>1,673</b>	<b>2,229</b>	<b>2,540</b>	<b>2,898</b>	<b>3,869</b>	<b>4,569</b>	<b>5,365</b>	<b>6,269</b>	<b>7,178</b>	<b>8,024</b>	<b>8,696</b>	<b>9,353</b>	<b>9,917</b>



## Future Special Participation Payments

Using Wood Mackenzie's Economic Model and field data, we have generated the future Special Participation payments that we forecast will be payable on the fields located in Rio de Janeiro State. Table A-6 lists only those fields where we forecast future Special Participation payments.

Over the period to 2027 we are forecasting a number of new fields that start to become eligible for Special Participation payments.

**Table A-6 Forecasted Special Participation Payments 2017-2029 (US\$ million)**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	20	63	70	27	23	12	4	-	-	-	-	-	-
Albacora Leste	14	14	7	2	0	-	-	-	-	-	-	-	-
Atlanta	-	-	-	-	-	-	-	19	34	30	17	12	7
Barracuda Area	17	19	15	8	5	0	-	-	-	-	-	-	-
Berbigao	-	-	65	161	187	162	199	166	127	119	170	133	102
Bijupira	-	-	-	-	-	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	80	314	378	452	406
Caratinga Area	1	-	-	1	-	-	-	-	-	-	-	-	-
Espadarte Area	-	-	-	-	-	-	-	-	-	-	-	-	-
Frade	-	-	-	1	21	14	-	-	-	-	-	-	-
Lula-Iracema	2,601	3,590	3,961	4,143	5,447	5,392	5,469	5,558	5,179	4,755	4,217	3,696	3,122
Marlim	97	137	77	43	62	40	25	14	4	-	-	-	-
Marlim Leste Area	-	-	-	-	14	11	7	4	2	-	-	-	-
Marlim Sul	193	181	117	81	113	88	64	44	35	0	-	-	-
Maromba	-	-	-	-	-	-	-	-	-	-	5	20	11
Oeste de Atapu	-	-	-	-	-	-	-	-	40	36	32	27	20
Oliva	-	-	-	-	-	-	-	-	-	-	-	-	-
Papa-Terra	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrino	-	-	-	-	24	71	72	65	54	44	38	34	32
Polvo	-	-	-	-	-	-	-	-	-	-	-	-	-
Roncador	281	471	570	633	952	1,040	1,056	1,010	923	750	554	388	268
Salema	-	-	-	-	-	-	-	-	-	-	-	-	-
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	37	210	177
Tartaruga Verde	-	-	30	157	194	131	80	50	27	15	7	1	-
<b>Total</b>	<b>3,223</b>	<b>4,474</b>	<b>4,911</b>	<b>5,257</b>	<b>7,043</b>	<b>6,961</b>	<b>6,975</b>	<b>6,929</b>	<b>6,506</b>	<b>6,063</b>	<b>5,455</b>	<b>4,973</b>	<b>4,146</b>

Note: Buzios, Iara Entorno, Itapu, Libra, Sepia and Sul de Lula are exempt from Special Participation

## Downside Risks

The future royalty and Special Participation payments shown in the previous tables have been generated using the base Wood Mackenzie dataset. This dataset reflects our current assumptions on a range of factors, including timing of field start-up, production profiles, cost levels and oil and gas prices.

Were there to be changes in these variables the amount of payments accruing to Rio de Janeiro State could increase or decrease. We have, therefore, run two downside cases to show the extent to which changes in assumptions could affect future levels of Royalties and Special Participations.

We have run a low price case that reduces the Brent oil price assumption to \$US50/bbl long term flat real (2018 terms) to illustrate the effect of a reduction in crude prices. Gas prices are calculated as a function of the Brent oil price assumption, therefore gas prices have also been reduced in the low price case.

In addition, we have also run field specific sensitivities. The bulk of the growth in production in Rio de Janeiro State will be driven by the pre-salt fields such as Buzios, Iara, Libra and Lula. The (ongoing) successful appraisal drilling and initial production performance of the pre-salt fields is reducing the uncertainties around long-term pre-salt reservoir performance, and we therefore consider the biggest risk to our production forecast to be project delays. Given the scale of the pre-salt projects and the local content rules, tremendous strain will be placed on Brazil's domestic service sector, particularly its shipyards. To generate our downside case, we assume that the delivery of some production facilities will be delayed, particularly at projects with new facilities scheduled to come onstream in the second half of the decade; this primarily impacts the pre-salt projects.

The following tables show the effects of the different downside cases on the future Royalty and Special Participation payments:

- US\$50/bbl oil price
- Production reduction sensitivity – base less 10% from 2018



## US\$50/bbl Oil Price Sensitivity

Table A-7 Forecasted Royalty Payments 2017-2029 (US\$ million) – US\$50/bbl Case

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	90	139	141	103	81	68	58	51	45	39	34	-	-
Albacora Leste	82	85	69	59	47	42	37	33	29	-	-	-	-
Atlanta	-	19	35	30	24	45	93	116	115	112	99	88	78
Barracuda Area	91	99	89	75	60	52	45	40	35	31	26	23	21
Berbigao	-	63	167	205	181	176	191	179	166	166	191	173	156
Bijupira	20	31	28	23	17	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	251	322	317	313	302
Buzios	4	129	445	812	956	1,024	1,049	1,075	1,061	1,067	1,070	1,093	1,053
Campos Basin Central Pole	25	21	18	17	14	13	12	11	8	-	-	-	-
Campos Basin North East Pole	27	28	24	22	18	17	15	12	9	-	-	-	-
Campos Basin North Pole	38	43	37	34	28	26	23	21	20	18	-	-	-
Campos Basin South Pole	37	39	33	28	23	21	19	17	-	-	-	-	-
Caratinga Area	49	48	45	54	41	35	29	25	21	17	-	-	-
Espadarte Area	4	4	-	-	-	-	-	-	-	-	-	-	-
Frade	34	82	62	67	86	76	45	38	40	39	-	-	-
Iara Entorno	-	20	60	188	246	250	271	362	393	395	398	426	-
Itapu	47	-	-	-	-	64	210	287	278	269	258	233	214
Lula-Iracema	1,500	1,939	2,145	2,256	2,043	2,048	2,087	2,125	2,027	1,879	1,702	1,539	1,381
Marlim	243	264	226	200	167	154	141	129	119	109	100	-	-
Marlim Leste Area	121	182	155	137	115	106	97	89	82	75	69	-	-
Marlim Sul	296	298	256	227	191	176	162	149	138	127	-	-	-
Maromba	-	-	-	-	-	-	-	-	12	42	85	88	74
Oeste de Atapu	-	-	-	-	-	-	28	81	102	99	96	92	86
Oliva	-	-	-	-	-	-	8	15	25	40	42	36	31
Papa-Terra	15	33	27	38	76	139	168	144	122	102	87	75	64
Peregrino	105	112	107	118	131	139	140	136	128	121	116	113	110
Polvo	13	11	9	8	6	0	-	-	-	-	-	-	-
Roncador	440	524	578	636	578	601	602	586	560	485	422	368	321
Salema	7	8	6	5	3	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	72	198	239	231	224	214	198	182	167
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	29
Sul de Lula	-	-	-	-	-	-	-	-	-	-	32	64	62
Sururu	-	-	-	12	22	22	21	20	31	93	160	243	234
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	18	54	161	227	202	176	153	133	116	101	89	78	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	14	11	13	9	6	-	-	-	-	-	-	-	-
Urugua	25	25	20	17	14	13	-	-	-	-	-	-	-
Voador	4	4	3	2	2	2	1	1	1	1	1	-	-
Libra	3	79	60	46	234	641	1,100	1,595	1,977	2,429	2,968	3,543	3,969
Buzios (Surplus)	-	34	-	32	84	279	487	785	1,193	1,655	2,104	2,444	2,627
Iara Entorno (Surplus)	-	3	43	77	68	66	67	151	379	517	550	597	1,244
Itapu (Surplus)	-	-	-	-	-	-	-	37	36	74	71	109	146
Sepia (Surplus)	-	-	-	-	-	42	101	116	112	147	179	208	197
<b>Total</b>	<b>3,353</b>	<b>4,433</b>	<b>5,062</b>	<b>5,761</b>	<b>5,837</b>	<b>6,707</b>	<b>7,702</b>	<b>8,791</b>	<b>9,855</b>	<b>10,785</b>	<b>11,464</b>	<b>12,128</b>	<b>12,564</b>

**Table A-8 Forecasted Royalty Payments 2017-2029 (US\$ million) – 5% base payments - US\$50/bbl Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	70	70	51	40	34	29	25	22	19	17	-	-
Albacora Leste	41	43	35	29	24	21	18	16	15	-	-	-	-
Atlanta	-	12	22	19	15	29	60	74	74	72	64	56	50
Barracuda Area	45	50	45	38	30	26	23	20	17	15	13	12	10
Berbigao	-	31	83	102	91	88	96	90	83	83	95	87	78
Bijupira	10	16	14	12	8	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	125	161	158	157	151
Buzios	2	65	222	406	478	512	525	537	530	533	535	547	527
Campos Basin Central Pole	13	11	9	8	7	7	6	5	4	-	-	-	-
Campos Basin North East Pole	13	14	12	11	9	8	8	6	5	-	-	-	-
Campos Basin North Pole	19	21	19	17	14	13	12	11	10	9	-	-	-
Campos Basin South Pole	19	20	16	14	12	11	10	9	-	-	-	-	-
Caratinga Area	26	26	24	29	22	19	16	13	11	9	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	41	31	33	43	38	23	19	20	19	-	-	-
Iara Entomo	-	10	30	94	123	125	135	181	196	198	199	213	-
Itapu	23	-	-	-	-	32	105	143	139	135	129	116	107
Lula-Iracema	750	970	1,072	1,128	1,022	1,024	1,043	1,063	1,014	939	851	770	691
Marlim	121	132	113	100	84	77	70	65	59	54	50	-	-
Marlim Leste Area	61	91	78	69	58	53	49	45	41	38	34	-	-
Marlim Sul	148	149	128	113	95	88	81	75	69	64	-	-	-
Maromba	-	-	-	-	-	-	-	-	6	21	42	44	37
Oeste de Atapu	-	-	-	-	-	-	14	40	51	50	48	46	43
Oliva	-	-	-	-	-	-	5	10	16	26	27	23	20
Papa-Terra	8	17	13	19	38	70	84	72	61	51	44	37	32
Peregrino	53	56	53	59	66	70	70	68	64	61	58	56	55
Polvo	6	6	4	4	3	0	-	-	-	-	-	-	-
Roncador	220	262	289	318	289	301	301	293	280	243	211	184	161
Salema	4	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	36	99	119	116	112	107	99	91	84
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	14
Sul de Lula	-	-	-	-	-	-	-	-	-	-	16	32	31
Sururu	-	-	-	6	11	11	10	10	16	47	80	121	117
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	27	81	114	101	88	77	67	58	51	44	39	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	6	7	4	3	-	-	-	-	-	-	-	-
Urugua	14	14	11	10	8	7	-	-	-	-	-	-	-
Voador	3	2	2	2	1	1	1	1	1	1	1	-	-
Libra	1	26	20	15	78	214	367	532	659	810	989	1,181	1,323
Buzios (Surplus)	-	11	-	11	28	93	162	262	398	552	701	815	876
Iara Entomo (Surplus)	-	1	14	26	23	22	22	50	126	172	183	199	415
Itapu (Surplus)	-	-	-	-	-	-	-	12	12	25	24	36	49
Sepia (Surplus)	-	-	-	-	-	14	34	39	37	49	60	69	66
<b>Total</b>	<b>1,680</b>	<b>2,204</b>	<b>2,522</b>	<b>2,862</b>	<b>2,861</b>	<b>3,191</b>	<b>3,574</b>	<b>3,968</b>	<b>4,332</b>	<b>4,611</b>	<b>4,773</b>	<b>4,931</b>	<b>4,934</b>

**Table A-9 Forecasted Royalty Payments 2017-2029 (US\$ million) – payments above 5% base - US\$50/bbl Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	70	70	51	40	34	29	25	22	19	17	-	-
Albacora Leste	41	43	35	29	24	21	18	16	15	-	-	-	-
Atlanta	-	7	12	11	9	16	33	42	41	40	36	32	28
Barracuda Area	45	50	45	38	30	26	23	20	17	15	13	12	10
Berbigao	-	31	83	102	91	88	96	90	83	83	95	87	78
Bijupira	10	16	14	12	8	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	125	161	158	157	151
Buzios	2	65	222	406	478	512	525	537	530	533	535	547	527
Campos Basin Central Pole	13	11	9	8	7	7	6	5	4	-	-	-	-
Campos Basin North East Pole	13	14	12	11	9	8	8	6	5	-	-	-	-
Campos Basin North Pole	19	21	19	17	14	13	12	11	10	9	-	-	-
Campos Basin South Pole	19	20	16	14	12	11	10	9	-	-	-	-	-
Caratinga Area	23	22	21	25	19	16	14	11	10	8	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	41	31	33	43	38	23	19	20	19	-	-	-
Iara Entomo	-	10	30	94	123	125	135	181	196	198	199	213	-
Itapu	23	-	-	-	-	32	105	143	139	135	129	116	107
Lula-Iracema	750	970	1,072	1,128	1,022	1,024	1,043	1,063	1,014	939	851	770	691
Marlim	121	132	113	100	84	77	70	65	59	54	50	-	-
Marlim Leste Area	61	91	78	69	58	53	49	45	41	38	34	-	-
Marlim Sul	148	149	128	113	95	88	81	75	69	64	-	-	-
Maromba	-	-	-	-	-	-	-	-	6	21	42	44	37
Oeste de Atapu	-	-	-	-	-	-	14	40	51	50	48	46	43
Oliva	-	-	-	-	-	-	3	5	9	14	15	13	11
Papa-Terra	8	17	13	19	38	70	84	72	61	51	44	37	32
Peregrino	53	56	53	59	66	70	70	68	64	61	58	56	55
Polvo	6	6	4	4	3	0	-	-	-	-	-	-	-
Roncador	220	262	289	318	289	301	301	293	280	243	211	184	161
Salema	3	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	36	99	119	116	112	107	99	91	84
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	14
Sul de Lula	-	-	-	-	-	-	-	-	-	-	16	32	31
Sururu	-	-	-	6	11	11	10	10	16	47	80	121	117
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	27	81	114	101	88	77	67	58	51	44	39	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	6	7	4	3	-	-	-	-	-	-	-	-
Urugua	10	11	9	7	6	5	-	-	-	-	-	-	-
Voador	2	1	1	1	1	1	1	1	0	0	0	-	-
Libra	2	53	40	30	156	427	733	1,063	1,318	1,619	1,979	2,362	2,646
Buzios (Surplus)	-	23	-	21	56	186	325	524	796	1,103	1,403	1,630	1,751
Iara Entomo (Surplus)	-	2	29	51	45	44	45	101	252	345	367	398	829
Itapu (Surplus)	-	-	-	-	-	-	-	25	24	49	48	73	97
Sepia (Surplus)	-	-	-	-	-	28	67	77	75	98	119	139	131
<b>Total</b>	<b>1,673</b>	<b>2,229</b>	<b>2,540</b>	<b>2,898</b>	<b>2,977</b>	<b>3,516</b>	<b>4,128</b>	<b>4,824</b>	<b>5,523</b>	<b>6,174</b>	<b>6,691</b>	<b>7,197</b>	<b>7,630</b>

**Table A-10 Forecasted Special Participation Payments 2017-2029 (US\$ million) - US\$50/bbl Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	20	63	70	27	15	7	2	-	-	-	-	-	-
Albacora Leste	14	14	7	2	0	-	-	-	-	-	-	-	-
Atlanta	-	-	-	-	-	-	-	-	-	-	-	3	1
Barracuda Area	17	19	15	8	2	0	-	-	-	-	-	-	-
Berbigao	-	-	65	161	126	107	132	111	84	77	112	89	68
Bijupira	-	-	-	-	-	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	42	193	231	274	243
Caratinga Area	1	-	-	1	-	-	-	-	-	-	-	-	-
Espadarte Area	-	-	-	-	-	-	-	-	-	-	-	-	-
Frade	-	-	-	1	12	8	-	-	-	-	-	-	-
Lula-Iracema	2,601	3,590	3,961	4,143	3,440	3,384	3,422	3,475	3,204	2,941	2,595	2,250	1,848
Marlim	97	137	77	43	7	-	-	-	-	-	-	-	-
Marlim Leste Area	-	-	-	-	-	-	-	-	-	-	-	-	-
Marlim Sul	193	181	117	81	41	29	17	8	5	-	-	-	-
Maromba	-	-	-	-	-	-	-	-	-	-	-	-	-
Oeste de Atapu	-	-	-	-	-	-	-	-	28	24	22	18	14
Oliva	-	-	-	-	-	-	-	-	-	-	-	-	-
Papa-Terra	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrino	-	-	-	-	-	8	26	23	18	12	10	8	8
Polvo	-	-	-	-	-	-	-	-	-	-	-	-	-
Roncador	281	471	570	633	485	551	570	543	486	395	268	162	93
Salema	-	-	-	-	-	-	-	-	-	-	-	-	-
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	-	37	88
Tartaruga Verde	-	-	30	157	116	75	42	23	10	3	-	-	-
<b>Total</b>	<b>3,223</b>	<b>4,474</b>	<b>4,911</b>	<b>5,257</b>	<b>4,244</b>	<b>4,169</b>	<b>4,213</b>	<b>4,183</b>	<b>3,877</b>	<b>3,646</b>	<b>3,238</b>	<b>2,842</b>	<b>2,363</b>

Table A-11 aggregates the outputs from the previous tables to show the annual reduction of Royalty and Special Participation payments in the event that the Brent oil price is US\$50/bbl long term rather than US\$65/bbl long term assumption used in the base case.

**Table A-11 Royalties and Special Participations 2017-2029 (US\$ million) Base Case v US\$50/bbl Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Royalties Base case	3,353	4,433	5,062	5,761	7,586	8,716	10,010	11,425	12,807	14,017	14,898	15,762	16,329
Royalties US\$50/bbl	3,353	4,433	5,062	5,761	5,837	6,707	7,702	8,791	9,855	10,785	11,464	12,128	12,564
<b>Reduction in Royalties</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,749</b>	<b>2,009</b>	<b>2,308</b>	<b>2,634</b>	<b>2,952</b>	<b>3,231</b>	<b>3,435</b>	<b>3,634</b>	<b>3,765</b>
Special Participations Base case	3,223	4,474	4,911	5,257	7,043	6,961	6,975	6,929	6,506	6,063	5,455	4,973	4,146
Special Participations US\$50/bbl	3,223	4,474	4,911	5,257	4,244	4,169	4,213	4,183	3,877	3,646	3,238	2,842	2,363
<b>Reduction in Special Participations</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,798</b>	<b>2,792</b>	<b>2,762</b>	<b>2,746</b>	<b>2,629</b>	<b>2,416</b>	<b>2,217</b>	<b>2,131</b>	<b>1,783</b>



## Production Downside Sensitivity – 10% reduction from 2018

Tables A-12 to A-15 show the effect of the reduced production sensitivity.

**Table A-12 Forecasted Royalty Payments 2017-2029 (US\$ million) – Production Downside Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	90	125	127	92	94	79	68	60	52	46	39	-	-
Albacora Leste	82	77	62	53	55	49	43	38	34	-	-	-	-
Atlanta	-	17	31	27	28	52	109	136	135	131	116	103	91
Barracuda Area	91	89	80	68	70	61	53	46	41	36	30	27	24
Berbigao	-	57	150	184	212	205	224	209	194	194	223	202	182
Bijupira	20	28	25	21	20	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	293	376	370	366	352
Buzios	4	116	400	731	1,118	1,197	1,227	1,257	1,241	1,248	1,251	1,279	1,232
Campos Basin Central Pole	25	19	17	15	17	15	14	12	10	-	-	-	-
Campos Basin North East Pole	27	25	22	19	21	20	18	14	11	-	-	-	-
Campos Basin North Pole	38	38	33	30	33	30	27	25	23	21	-	-	-
Campos Basin South Pole	37	35	29	26	27	25	22	20	-	-	-	-	-
Caratinga Area	49	44	40	49	48	41	34	29	24	20	-	-	-
Espadarte Area	4	4	-	-	-	-	-	-	-	-	-	-	-
Frade	34	73	56	60	100	89	53	45	47	46	-	-	-
Iara Entorno	-	18	54	169	288	293	317	423	459	462	466	498	-
Itapu	47	-	-	-	-	75	245	335	325	315	302	272	250
Lula-Iracema	1,500	1,745	1,930	2,030	2,390	2,395	2,441	2,486	2,371	2,197	1,991	1,801	1,615
Marlim	243	238	203	180	196	180	165	151	139	127	117	-	-
Marlim Leste Area	121	163	140	124	135	124	114	104	96	88	81	-	-
Marlim Sul	296	268	230	204	223	206	190	175	161	149	-	-	-
Maromba	-	-	-	-	-	-	-	-	14	49	99	103	86
Oeste de Atapu	-	-	-	-	-	-	33	94	120	116	113	108	100
Oliva	-	-	-	-	-	-	9	18	29	47	49	42	37
Papa-Terra	15	30	24	34	89	163	196	168	143	119	102	87	75
Peregrino	105	101	96	106	154	163	164	160	150	142	136	132	129
Polvo	13	10	8	7	7	0	-	-	-	-	-	-	-
Roncador	440	471	521	572	676	703	704	685	655	567	493	430	376
Salema	7	7	5	4	4	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	84	231	279	270	262	250	232	213	195
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	34
Sul de Lula	-	-	-	-	-	-	-	-	-	-	38	75	72
Sururu	-	-	-	11	26	25	24	24	37	109	187	284	274
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	18	48	145	205	236	206	179	156	136	119	104	91	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	14	10	12	8	7	-	-	-	-	-	-	-	-
Urugua	25	22	18	15	17	15	-	-	-	-	-	-	-
Voador	4	3	3	2	2	2	2	2	1	1	1	-	-
Libra	3	71	54	41	274	750	1,287	1,866	2,313	2,841	3,473	4,145	4,644
Buzios (Surplus)	-	31	-	29	98	326	570	919	1,396	1,936	2,461	2,859	3,073
Iara Entorno (Surplus)	-	3	39	69	80	77	79	177	443	605	644	698	1,455
Itapu (Surplus)	-	-	-	-	-	-	-	44	42	86	84	128	170
Sepia (Surplus)	-	-	-	-	-	49	118	136	132	172	209	243	230
<b>Total</b>	<b>3,353</b>	<b>3,989</b>	<b>4,556</b>	<b>5,185</b>	<b>6,828</b>	<b>7,845</b>	<b>9,009</b>	<b>10,283</b>	<b>11,526</b>	<b>12,615</b>	<b>13,408</b>	<b>14,186</b>	<b>14,696</b>

**Table A-13 Forecasted Royalty Payments 2017-2029 (US\$ million) – 5% base payments – Production Downside Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	63	63	46	47	40	34	30	26	23	20	-	-
Albacora Leste	41	38	31	26	28	24	22	19	17	-	-	-	-
Atlanta	-	11	20	17	18	34	70	87	87	84	74	66	59
Barracuda Area	45	45	40	34	35	30	27	23	20	18	15	13	12
Berbigao	-	28	75	92	106	103	112	105	97	97	111	101	91
Bijupira	10	14	12	10	10	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	146	188	185	183	176
Buzios	2	58	200	365	559	599	614	628	620	624	626	639	616
Campos Basin Central Pole	13	10	8	7	8	8	7	6	5	-	-	-	-
Campos Basin North East Pole	13	13	11	10	11	10	9	7	5	-	-	-	-
Campos Basin North Pole	19	19	17	15	16	15	14	13	11	11	-	-	-
Campos Basin South Pole	19	18	15	13	14	12	11	10	-	-	-	-	-
Caratinga Area	26	23	22	26	26	22	18	16	13	11	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	37	28	30	50	45	27	22	23	23	-	-	-
Iara Entorno	-	9	27	85	144	146	158	212	230	231	233	249	-
Itapu	23	-	-	-	-	38	123	168	162	157	151	136	125
Lula-Iracema	750	873	965	1,015	1,195	1,198	1,220	1,243	1,186	1,099	995	900	808
Marlim	121	119	102	90	98	90	82	76	69	64	58	-	-
Marlim Leste Area	61	82	70	62	67	62	57	52	48	44	40	-	-
Marlim Sul	148	134	115	102	112	103	95	87	81	74	-	-	-
Maromba	-	-	-	-	-	-	-	-	7	25	50	52	43
Oeste de Atapu	-	-	-	-	-	-	17	47	60	58	56	54	50
Oliva	-	-	-	-	-	-	6	11	19	30	31	27	23
Papa-Terra	8	15	12	17	44	81	98	84	71	60	51	44	37
Peregrino	53	50	48	53	77	81	82	80	75	71	68	66	64
Polvo	6	5	4	3	3	0	-	-	-	-	-	-	-
Roncador	220	236	260	286	338	351	352	342	328	284	247	215	188
Salema	4	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	42	116	140	135	131	125	116	106	98
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	17
Sul de Lula	-	-	-	-	-	-	-	-	-	-	19	37	36
Sururu	-	-	-	6	13	13	12	12	18	55	93	142	137
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	24	73	102	118	103	89	78	68	59	52	45	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	5	6	4	4	-	-	-	-	-	-	-	-
Urugua	14	13	10	9	10	9	-	-	-	-	-	-	-
Voador	3	2	2	1	1	1	1	1	1	1	1	-	-
Libra	1	24	18	14	91	250	429	622	771	947	1,158	1,382	1,548
Buzios (Surplus)	-	10	-	10	33	109	190	306	465	645	820	953	1,024
Iara Entorno (Surplus)	-	1	13	23	27	26	26	59	148	202	215	233	485
Itapu (Surplus)	-	-	-	-	-	-	-	15	14	29	28	43	57
Sepia (Surplus)	-	-	-	-	-	16	39	45	44	57	70	81	77
<b>Total</b>	<b>1,680</b>	<b>1,984</b>	<b>2,270</b>	<b>2,576</b>	<b>3,346</b>	<b>3,732</b>	<b>4,180</b>	<b>4,641</b>	<b>5,066</b>	<b>5,393</b>	<b>5,582</b>	<b>5,768</b>	<b>5,771</b>




**Table A-14 Forecasted Royalty Payments 2017-2029 (US\$ million) – payments above 5% – Production Downside Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	45	63	63	46	47	40	34	30	26	23	20	-	-
Albacora Leste	41	38	31	26	28	24	22	19	17	-	-	-	-
Atlanta	-	6	11	10	10	19	39	49	48	47	42	37	33
Barracuda Area	45	45	40	34	35	30	27	23	20	18	15	13	12
Berbigao	-	28	75	92	106	103	112	105	97	97	111	101	91
Bijupira	10	14	12	10	10	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	146	188	185	183	176
Buzios	2	58	200	365	559	599	614	628	620	624	626	639	616
Campos Basin Central Pole	13	10	8	7	8	8	7	6	5	-	-	-	-
Campos Basin North East Pole	13	13	11	10	11	10	9	7	5	-	-	-	-
Campos Basin North Pole	19	19	17	15	16	15	14	13	11	11	-	-	-
Campos Basin South Pole	19	18	15	13	14	12	11	10	-	-	-	-	-
Caratinga Area	23	20	19	22	22	19	16	13	11	9	-	-	-
Espadarte Area	2	2	-	-	-	-	-	-	-	-	-	-	-
Frade	17	37	28	30	50	45	27	22	23	23	-	-	-
Iara Entorno	-	9	27	85	144	146	158	212	230	231	233	249	-
Itapu	23	-	-	-	-	38	123	168	162	157	151	136	125
Lula-Iracema	750	873	965	1,015	1,195	1,198	1,220	1,243	1,186	1,099	995	900	808
Marlim	121	119	102	90	98	90	82	76	69	64	58	-	-
Marlim Leste Area	61	82	70	62	67	62	57	52	48	44	40	-	-
Marlim Sul	148	134	115	102	112	103	95	87	81	74	-	-	-
Maromba	-	-	-	-	-	-	-	-	7	25	50	52	43
Oeste de Atapu	-	-	-	-	-	-	17	47	60	58	56	54	50
Oliva	-	-	-	-	-	-	3	6	10	17	17	15	13
Papa-Terra	8	15	12	17	44	81	98	84	71	60	51	44	37
Peregrino	53	50	48	53	77	81	82	80	75	71	68	66	64
Polvo	6	5	4	3	3	0	-	-	-	-	-	-	-
Roncador	220	236	260	286	338	351	352	342	328	284	247	215	188
Salema	3	4	3	2	2	-	-	-	-	-	-	-	-
Sepia	-	-	-	-	42	116	140	135	131	125	116	106	98
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	17
Sul de Lula	-	-	-	-	-	-	-	-	-	-	19	37	36
Sururu	-	-	-	6	13	13	12	12	18	55	93	142	137
Tambau	0	0	0	0	0	0	-	-	-	-	-	-	-
Tartaruga Verde	9	24	73	102	118	103	89	78	68	59	52	45	-
Tubarao Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	7	5	6	4	4	-	-	-	-	-	-	-	-
Urugua	10	9	8	6	7	6	-	-	-	-	-	-	-
Voador	2	1	1	1	1	1	1	1	1	0	0	-	-
Libra	2	47	36	27	183	500	858	1,244	1,542	1,894	2,315	2,764	3,096
Buzios (Surplus)	-	20	-	19	65	217	380	612	931	1,291	1,641	1,906	2,048
Iara Entorno (Surplus)	-	2	26	46	53	52	53	118	295	403	429	466	970
Itapu (Surplus)	-	-	-	-	-	-	-	29	28	57	56	85	113
Sepia (Surplus)	-	-	-	-	-	33	79	91	88	114	139	162	153
<b>Total</b>	<b>1,673</b>	<b>2,006</b>	<b>2,286</b>	<b>2,608</b>	<b>3,482</b>	<b>4,113</b>	<b>4,828</b>	<b>5,642</b>	<b>6,460</b>	<b>7,222</b>	<b>7,826</b>	<b>8,418</b>	<b>8,925</b>

**Table A-15 Forecasted Special Participation Payments 2017-2029 (US\$ million) – Production Downside Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Albacora	20	45	51	20	16	7	0	-	-	-	-	-	-
Albacora Leste	14	9	4	0	-	-	-	-	-	-	-	-	-
Atlanta	-	-	-	-	-	-	-	-	18	18	11	8	4
Barracuda Area	17	13	10	4	2	-	-	-	-	-	-	-	-
Berbigao	-	-	42	121	139	118	148	122	97	91	124	102	75
Bijupira	-	-	-	-	-	-	-	-	-	-	-	-	-
BM-C-33	-	-	-	-	-	-	-	-	48	226	284	351	312
Caratinga Area	1	-	-	-	-	-	-	-	-	-	-	-	-
Espadarte Area	-	-	-	-	-	-	-	-	-	-	-	-	-
Frade	-	-	-	-	13	9	-	-	-	-	-	-	-
Lula-Iracema	2,601	3,003	3,314	3,464	4,627	4,572	4,633	4,707	4,370	4,008	3,545	3,092	2,586
Marlim	97	94	47	21	37	22	12	4	-	-	-	-	-
Marlim Leste Area	-	-	-	-	-	-	-	0	-	-	-	-	-
Marlim Sul	193	127	78	50	79	58	41	28	21	-	-	-	-
Maromba	-	-	-	-	-	-	-	-	-	-	1	15	7
Oeste de Atapu	-	-	-	-	-	-	-	-	30	26	23	19	13
Oliva	-	-	-	-	-	-	-	-	-	-	-	-	-
Papa-Terra	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrino	-	-	-	-	-	32	49	45	37	29	25	22	20
Polvo	-	-	-	-	-	-	-	-	-	-	-	-	-
Roncador	281	357	442	491	770	849	865	825	748	602	432	289	190
Salema	-	-	-	-	-	-	-	-	-	-	-	-	-
Sepia Leste	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	6	152	125
Tartaruga Verde	-	-	13	116	147	93	58	33	17	9	3	-	-
<b>Total</b>	<b>3,223</b>	<b>3,648</b>	<b>4,000</b>	<b>4,289</b>	<b>5,830</b>	<b>5,760</b>	<b>5,806</b>	<b>5,764</b>	<b>5,388</b>	<b>5,010</b>	<b>4,454</b>	<b>4,049</b>	<b>3,332</b>

Table A-16 aggregates the outputs from the previous tables to show the annual reduction of royalty and Special Participation payments in the event that the production of the fields is 10% lower than the base case.

**Table A-16 Royalties and Special Participations 2017-2029 (US\$ million) Base Case v Production Downside Case**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Royalties Base case	3,353	4,433	5,062	5,761	7,586	8,716	10,010	11,425	12,807	14,017	14,898	15,762	16,329
Royalties Production Downside	3,353	3,989	4,556	5,185	6,828	7,845	9,009	10,283	11,526	12,615	13,408	14,186	14,696
<b>Reduction in Royalties</b>	<b>-</b>	<b>443</b>	<b>506</b>	<b>576</b>	<b>759</b>	<b>872</b>	<b>1,001</b>	<b>1,143</b>	<b>1,281</b>	<b>1,402</b>	<b>1,490</b>	<b>1,576</b>	<b>1,633</b>
Special Participations Base case	3,223	4,474	4,911	5,257	7,043	6,961	6,975	6,929	6,506	6,063	5,455	4,973	4,146
Special Participations Production Downside	3,223	3,648	4,000	4,289	5,830	5,760	5,806	5,764	5,388	5,010	4,454	4,049	3,332
<b>Reduction in Special Participations</b>	<b>-</b>	<b>826</b>	<b>911</b>	<b>968</b>	<b>1,213</b>	<b>1,201</b>	<b>1,170</b>	<b>1,165</b>	<b>1,118</b>	<b>1,053</b>	<b>1,001</b>	<b>924</b>	<b>814</b>



## Appendix B

The ANP provides the monthly average prices that are used to calculate Royalties and Special Participations on its website <http://www.anp.gov.br/?id=534>.

In tables B-1 and B-2, the ANP dataset is converted to annual averages in R\$/m<sup>3</sup> for oil and natural gas respectively.

In table B-3, the oil price data is converted into US\$/bbl and in table B-4, the natural gas price data is converted into US\$/mcf. Conversion factors for oil of 6.29 bbl = 1 cubic metre and for gas of 35.31 cubic feet = 1 cubic metre. Average monthly exchange rate data has been sourced from Thomson Reuters DataStream.

**Table B-1 Annual Average Oil Prices R\$/bbl**

Field	2014	2015	2016	2017
Albacora	199.7	133.4	117.6	145.7
Albacora Leste	196.1	123.4	108.4	138.5
Barracuda	201.7	136.5	120.3	147.8
Berbigao	147.5	155.8	131.5	187.8
Bijupira	220.9	158.6	132.4	155.6
Buzios	229.0	160.2	134.0	167.1
Marimba	201.0	135.4	119.4	147.0
Pirauna	201.0	134.5	119.4	162.9
Carapeba	201.0	135.4	119.4	147.0
Garoupa	201.0	135.4	119.4	147.0
Fargo	201.0	135.4	119.4	147.0
Vermelho	201.0	135.4	119.4	155.6
Anequim	201.0	135.4	119.4	147.0
Bagre	201.0	135.3	119.4	147.0
Cherne	201.0	135.4	119.4	147.0
Congro	201.0	135.4	119.4	147.0
Corvina	201.0	135.4	119.4	147.0
Garoupinha	178.5	135.4	119.4	147.0
Malhado	201.0	135.4	119.4	147.0
Namorado	201.0	135.4	119.4	147.0
Ne Namorado			124.2	
Parati	201.0	135.4	119.4	147.0
Viola	201.0	135.4	119.4	159.0
Badejo	201.0	135.4	109.3	179.3
Bicudo	201.0	134.5	106.5	179.3
Bonito	201.0	133.6	119.4	147.0
Enchova	201.0	133.6	119.4	147.0
Enchova Oeste	201.0	133.6	119.4	147.0
Linguado	201.0	135.4	119.4	147.0
Pampo	201.0	135.4	119.4	147.0
Trilha	201.0	135.4	109.3	179.3
Caratinga	199.6	133.3	117.4	145.5
Espadarte	194.1	125.1	110.3	140.0
Frade	212.0	136.5	124.4	151.1
Itapu			136.6	160.9
Iara Entorno	261.9			
Lula	218.7	154.1	135.5	160.9
Marlim	197.5	128.9	113.5	142.6
Marlim Leste	200.4	134.5	118.6	146.5
Marlim Sul	196.4	127.6	112.3	143.4
Oeste De Atapu		144.0	131.5	187.8
Papa Terra	192.7	119.5	100.5	134.6
Peregrino	192.5	129.2	105.8	135.2
Polvo	209.5	141.3	118.5	141.8
Roncador	198.8	129.5	114.1	142.9
Salema	221.6	159.6	133.9	156.7
Sepia		132.4	115.6	177.6
Sururu				170.0
Tambau	227.4	205.9	143.4	165.4
Tartaruga Verde	183.5	125.0	119.4	147.0
Tubarao Azul	199.1	135.3	121.1	177.0
Tubarao Martelo	196.9	140.1	121.5	149.0
Urugua	226.7	197.5	145.8	174.9
Voador		132.0	113.5	154.8

**Table B-2 Annual Average Gas Prices R\$/mcf**

Field	2014	2015	2016	2017
Albacora	21.10	16.00	16.39	19.72
Albacora Leste	17.89	10.74	11.10	13.95
Barracuda	21.85	18.54	17.40	22.58
Berbigao	17.41			24.76
Bijupira	7.10	7.07	7.05	10.22
Buzios	52.12	14.40	10.95	12.63
Marimba	20.24	15.36	15.81	19.06
Pirauna	22.37	16.86	17.28	22.83
Carapeba	25.65	19.09	19.56	27.51
Garoupa	20.03	11.83	15.63	18.85
Pargo	31.63	23.44	23.69	28.79
Vermelho	13.16	10.67	10.62	12.14
Anequim	17.51	13.50	13.84	16.47
Bagre	17.91	13.87	14.09	16.68
Cherne	17.40	13.48	15.61	19.29
Congro	17.95	13.92	14.10	16.62
Corvina	18.27	14.03	14.41	17.21
Garoupinha	17.05	14.33	14.79	17.82
Malhado	19.11	14.55	15.03	18.12
Namorado	22.32	16.99	17.15	20.38
Ne Namorado				
Parati	17.50	13.51	13.83	16.44
Viola	17.09	13.20	13.51	17.07
Badejo	18.84	14.61	13.26	19.45
Bicudo	14.87	11.64	12.13	14.85
Bonito	16.76	13.04	13.30	15.68
Enchova	17.18	13.50	13.47	15.62
Enchova Oeste	14.71	11.66	11.78	13.70
Linguado	20.17	13.05	13.44	16.69
Pampo	17.75	13.71	16.01	19.61
Trilha	17.92	13.96	12.65	18.54
Caratinga	22.87	17.17	17.40	22.02
Espadarte	31.34	23.24	17.79	19.38
Frade	5.81	5.14	5.36	6.86
Itapu			34.25	46.10
Iara Entorno				
Lula	13.22	10.24	10.55	15.96
Marlim	16.42	12.90	12.99	15.11
Marlim Leste	25.18	20.07	18.76	21.53
Marlim Sul	16.28	13.58	18.95	18.91
Oeste De Atapu		38.15		55.34
Papa Terra		16.84	16.78	19.47
Peregrino	51.49	37.21	37.48	46.38
Polvo	48.48	26.55	27.53	35.79
Roncador	20.87	15.29	15.11	16.08
Salema	10.12	7.55	6.83	9.82
Sepia		34.92	12.95	18.57
Sururu				50.89
Tambau	12.52	9.96	9.72	11.29
Tartaruga Verde	36.81	19.21	20.14	28.84
Tubarao Azul	22.52	18.94		27.52
Tubarao Martelo	25.70	21.94	24.96	29.35
Urugua	12.35	10.12	10.07	11.34
Voador		28.64	27.49	35.54

**Table B-3 Annual Average Oil Prices US\$/bbl**

<b>Field</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Albacora	85.5	40.7	34.2	45.7
Albacora Leste	84.0	37.7	31.5	43.4
Barracuda	86.4	41.6	34.9	46.3
Berbigao	55.7	40.1	39.3	57.7
Bijupira	94.3	48.4	38.3	48.8
Buzios	102.8	47.6	39.0	52.2
Marimba	86.1	41.3	34.7	46.1
Pirauna	86.1	41.6	34.7	50.8
Carapeba	86.1	41.3	34.7	46.1
Garoupa	86.1	41.3	34.7	46.1
Pargo	86.1	41.3	34.7	46.1
Vermelho	86.1	41.3	34.7	48.8
Anequim	86.1	41.3	34.7	46.1
Bagre	86.1	40.4	34.7	46.1
Cherne	86.1	41.3	34.7	46.1
Congro	86.1	41.3	34.7	46.1
Corvina	86.1	41.3	34.7	46.1
Garoupinha	73.7	41.3	34.7	46.1
Malhado	86.1	41.3	34.7	46.1
Namorado	86.1	41.3	34.7	46.1
Ne Namorado			37.1	
Parati	86.1	41.3	34.7	46.1
Viola	86.1	41.3	34.7	49.8
Badejo	86.1	41.3	29.9	55.1
Bicudo	86.1	41.6	29.5	55.1
Bonito	86.1	40.5	34.7	46.1
Enchova	86.1	40.5	34.7	46.1
Enchova Oeste	86.1	40.5	34.7	46.1
Linguado	86.1	41.3	34.7	46.1
Pampo	86.1	41.3	34.7	46.1
Trilha	86.1	41.3	29.9	55.1
Caratinga	85.5	40.6	34.1	45.6
Espadarte	83.1	38.2	32.1	43.9
Frade	90.5	41.6	36.0	47.4
Itapu			41.7	50.5
Iara Entorno	112.3			
Lula	93.6	46.9	39.3	50.5
Marlim	84.6	39.3	33.0	44.7
Marlim Leste	85.8	41.0	34.4	45.9
Marlim Sul	84.1	38.9	32.7	44.9
Oeste De Atapu		38.8	39.3	57.7
Papa Terra	82.3	36.4	29.3	42.2
Peregrino	82.3	39.3	30.7	42.4
Polvo	89.5	43.1	34.4	44.4
Roncador	85.1	39.5	33.2	44.8
Salema	94.6	48.7	38.7	49.1
Sepia		39.5	33.6	54.6
Sururu				52.6
Tambau	97.6	61.1	41.5	51.9
Tartaruga Verde	77.0	39.6	34.7	46.1
Tubarao Azul	85.2	43.1	36.2	54.4
Tubarao Martelo	84.3	45.9	36.6	46.8
Urugua	96.8	59.9	42.3	54.9
Voador		38.6	33.0	48.5

**Table B-4 Annual Average Gas Prices US\$/mcf**

Field	2014	2015	2016	2017
Albacora	9.00	4.85	4.74	6.18
Albacora Leste	7.66	3.25	3.21	4.37
Barracuda	9.33	5.61	5.04	7.08
Berbigao	6.58			7.60
Bijupira	3.03	2.14	2.03	3.19
Buzios	23.39	4.32	3.19	3.95
Marimba	8.63	4.65	4.58	5.98
Pirauna	9.55	5.10	5.00	7.12
Carapeba	10.95	5.78	5.66	8.63
Garoupa	8.55	3.51	4.52	5.91
Pargo	13.51	7.09	6.85	9.03
Vermelho	5.61	3.24	3.08	3.81
Anequim	7.47	4.09	4.01	5.17
Bagre	7.64	4.11	4.08	5.23
Cherne	7.42	4.08	4.54	6.05
Congro	7.66	4.22	4.08	5.21
Corvina	7.79	4.25	4.17	5.40
Garoupinha	7.00	4.34	4.28	5.59
Malhado	8.15	4.41	4.35	5.68
Namorado	9.53	5.14	4.96	6.38
Ne Namorado				
Parati	7.46	4.09	4.00	5.16
Viola	7.29	4.00	3.91	5.35
Badejo	8.03	4.24	3.52	5.97
Bicudo	6.34	3.58	3.00	4.56
Bonito	7.15	3.95	3.85	4.92
Enchova	7.33	4.07	3.90	4.90
Enchova Oeste	6.27	3.52	3.41	4.29
Linguado	8.72	3.36	3.49	5.21
Pampo	7.57	4.15	4.65	6.15
Trilha	7.64	4.06	3.36	5.69
Caratinga	9.72	5.23	5.02	6.90
Espadarte	13.39	7.03	5.09	6.08
Frade	2.47	1.56	1.55	2.15
Itapu			10.67	14.46
Iara Entorno				
Lula	5.63	3.11	3.06	5.00
Marlim	7.00	3.91	3.76	4.74
Marlim Leste	10.77	6.02	5.42	6.75
Marlim Sul	6.94	4.09	5.51	5.94
Oeste De Atapu		10.26		16.99
Papa Terra	9.36	5.10	4.86	
Peregrino	22.01	11.25	10.84	14.54
Polvo	20.71	8.07	7.96	11.23
Roncador	8.94	4.63	4.38	5.04
Salema	4.30	2.29	1.96	3.06
Sepia		10.38	3.73	5.70
Sururu				15.76
Tambau	5.36	2.98	2.81	3.54
Tartaruga Verde	15.65	6.05	5.83	9.03
Tubarao Azul	9.60	6.02		8.45
Tubarao Martelo	10.93	7.13	7.51	9.23
Urugua	5.26	3.07	2.92	3.56
Voador		8.28	7.95	11.13



**Table B-5 Royalties Rate by Field**

Field Grouping	Individual field	Basin	Type	Status	Royalty Rate (%)	SP Location
Albacora Area	Albacora	Campos	Oil	Onstream	10.0%	Deepwater
Albacora Area	Forno	Campos	Oil	Probable Development	10.0%	Shallow water
	Albacora Leste	Campos	Oil	Onstream	10.0%	Deepwater
Barracuda Area	Barracuda	Campos	Oil	Onstream	10.0%	Deepwater
Barracuda Area	Nautilus (pre-salt)	Campos	Oil	Onstream	10.0%	Deepwater
Bijupirá-Salema	Bijupira	Campos	Oil	Onstream	10.0%	Deepwater
Bijupirá-Salema	Salema	Campos	Oil	Onstream	9.7%	Deepwater
BM-C-33	Gavea	Campos	Oil	Probable Development	10.0%	Deepwater
BM-C-33	Pao de Acucar	Campos	Oil	Probable Development	10.0%	Deepwater
BM-C-33	Seat	Campos	Oil	Probable Development	10.0%	Deepwater
BS-4	Atlanta	Santos	Oil	Under Development	7.8%	Deepwater
BS-4	Oliva	Santos	Oil	Probable Development	7.8%	Deepwater
BS-500 Pole	Tambau	Santos	Gas	Onstream	8.7%	Deepwater
BS-500 Pole	Urugua	Santos	Oil & Gas	Onstream	8.7%	Deepwater
	Buzios	Santos	Oil	Under Development	10.0%	Deepwater
	Buzios (Surplus)	Santos	Oil	Probable Development	15.0%	Deepwater
Campos Basin Central Pole	Marimba	Campos	Oil	Onstream	10.0%	Deepwater
Campos Basin Central Pole	Marimba Leste	Campos	Oil	Onstream	10.0%	Deepwater
Campos Basin Central Pole	Pirauna	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin NE Pole	Carapeba	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin NE Pole	Garoupa	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin NE Pole	Pargo	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin NE Pole	Vermelho	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Anequim	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Bagre	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Cherne	Campos	Oil	Onstream	8.7%	Shallow water
Campos Basin North Pole	Congro	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Corvina	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Garoupinha	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Malhado	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Namorado	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Parati (Campos)	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin North Pole	Viola	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Badejo	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Bicudo	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Bonito	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Enchova	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Enchova Oeste	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Linguado	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Pampo	Campos	Oil	Onstream	10.0%	Shallow water
Campos Basin South Pole	Trilha	Campos	Oil	Onstream	10.0%	Shallow water
Caratinga Area	Caratinga	Campos	Oil	Onstream	9.3%	Deepwater
Caratinga Area	Carimbe (pre-salt)	Campos	Oil	Onstream	9.3%	Deepwater
Espadarte Area	Espadarte Sul	Campos	Oil	Onstream	10.0%	Deepwater
	Frade	Campos	Oil	Onstream	10.0%	Deepwater
lara	Berbigao	Santos	Oil	Under Development	10.0%	Deepwater
lara	Oeste de Atapu	Santos	Oil	Under Development	10.0%	Deepwater
lara	Sururu	Santos	Oil	Under Development	10.0%	Deepwater
	lara Entorno	Santos	Oil & Gas	Under Development	10.0%	Deepwater
	lara Entorno (Surplus)	Santos	Oil	Probable Development	15.0%	Deepwater
	Itapu	Santos	Oil	Probable Development	10.0%	Deepwater
	Itapu (Surplus)	Santos	Oil	Probable Development	15.0%	Deepwater
	Libra	Santos	Oil	Probable Development	15.0%	Deepwater
	Lula-Iracema	Santos	Oil & Gas	Onstream	10.0%	Deepwater
Marlim Area	Brava	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Area	Marlim	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Leste Area	Jabuti	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Leste Area	Marlim Leste	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Leste Area	Tracaja	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Sul Area	Jurara	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Sul Area	Mandarim	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Sul Area	Marlim Sul	Campos	Oil	Onstream	10.0%	Deepwater
Marlim Sul Area	Mucua	Campos	Oil	Onstream	10.0%	Deepwater
	Maromba	Santos	Oil	Probable Development	10.0%	Shallow water
	Papa-Terra	Campos	Oil	Onstream	10.0%	Deepwater
	Peregrino	Campos	Oil	Onstream	10.0%	Shallow water
	Polvo	Campos	Oil	Onstream	10.0%	Shallow water
	Roncador	Campos	Oil	Onstream	10.0%	Deepwater
	Sepia	Santos	Oil	Probable Development	10.0%	Deepwater
	Sepia (Surplus)	Santos	Oil	Probable Development	15.0%	Deepwater
	Sepia Leste	Santos	Oil	Probable Development	10.0%	Deepwater
	Sul de Lula	Santos	Oil	Probable Development	10.0%	Deepwater
	Tartaruga Verde	Campos	Oil	Onstream	10.0%	Deepwater
	Tubarao Martelo	Campos	Oil	Onstream	10.0%	Shallow water
	Voador	Campos	Oil	Onstream	8.2%	Deepwater





## List of Other Discoveries (Contingent Resources)

Table B-6 lists discoveries that have been made in Rio de Janeiro State but have no plans for development. Unlike those fields we categorise as "Probable" developments which we envisage development commencing within the next three to five years, the development of these assets is less certain. Accordingly, we do not include these assets in our forecast of future Royalty or Special Participation payments. It is likely that some of these discoveries will be developed in the future and accordingly, they may offer upside to the revenue streams shown within this report.

**Table B-6 List of Other discoveries**

Grouping	Discovery	Basin	Type	Discovery Date	Pre- or Post-Salt	Water Depth (m)
	Abacate	Santos	Oil	Mar-10	Post-salt	25
	Abare	Santos	Oil	Dec-11	Pre-salt	2,156
	Abare Oeste	Santos	Oil	Sep-09	Pre-salt	2,164
	Agulhas Negras	Campos	Oil	Aug-14	Pre-salt	2,437
	Aracaju	Santos	Oil & Gas	Oct-10	Post-salt	172
	Basilisco	Campos	Oil	Feb-15	Post-salt	2,214
	Bauna Sul	Santos	Oil	Jan-11	Post-salt	400
	Belem	Santos	Gas	Aug-10	Post-salt	134
	Belmonte	Santos	Gas	Nov-05	Post-salt	380
	Bem-Te-Vi	Santos	Oil	May-08	Pre-salt	2,139
	Bigua	Santos	Oil	Dec-11	Pre-salt	2,180
BS-500 Pole	Carapia	Santos	Oil & Gas	Aug-02	Post-salt	1,200
BS-500 Pole	Pirapitanga	Santos	Gas	Dec-01	Post-salt	1,207
BS-500 Pole	Tambuata (Santos)	Santos	Oil & Gas	Aug-99	Post-salt	1,595
Campos Basin Central Pole	RJS-450	Campos	Gas	Feb-92	Post-salt	375
Campos Basin North Pole	RJS-211	Campos	Oil	Apr-82	Post-salt	218
	Caramba	Santos	Oil	Dec-07	Pre-salt	2,234
	Carambola B	Santos	Oil	Mar-11	Post-salt	130
	Carapicu	Campos	Oil	Aug-00	Post-salt	2,010
Caratinga Area	Carimbe (post-salt)	Campos	Oil	Sep-10	Post-salt	1,027
	Caravela	Santos	Oil	Jun-92	Post-salt	195
	Caravela Sul	Santos	Oil	Dec-91	Post-salt	200
	Cavalo Marinho	Santos	Oil & Gas	Sep-01	Post-salt	195
	Cedro	Santos	Gas/condensate	Apr-05	Post-salt	334
	Corcovado	Santos	Gas/condensate	May-09	Pre-salt	818
	Curitiba	Santos	Oil	Jan-13	Post-salt	143
	Dolomita Sul	Santos	Oil	May-12	Pre-salt	1,747
Espadarte Area	RJS-424	Campos	Oil	Nov-92	Post-salt	1,100
Espadarte Area	RJS-508	Campos	Oil	Nov-95	Post-salt	1,105
Espadarte Area	RJS-509A	Campos	Oil	Jan-96	Post-salt	962
	Estrela do Mar	Santos	Oil	Apr-90	Post-salt	155
	Fortaleza	Santos	Gas/condensate	Oct-11	Pre-salt	155
	Gato do Mato	Santos	Oil	Nov-10	Pre-salt	2,011
	Guaiama	Santos	Oil & Gas	Aug-07	Post-salt	147
	Iguacu	Santos	Oil	Apr-09	Pre-salt	2,140
	Iguacu Mirim	Santos	Oil	Aug-13	Pre-salt	2,158
	Ilha Bela	Santos	Gas	Jul-08	Post-salt	468
	Jupiter	Santos	Oil & Gas	Jul-08	Pre-salt	2,187
	Maceio	Santos	Gas/condensate	Sep-11	Post-salt	185
	Macunaima	Santos	Oil	Feb-11	Pre-salt	2,134
Marlim Leste Area	MLL-13	Campos	Oil	Mar-04	Post-salt	933
Marlim Leste Area	MLL-4	Campos	Oil	Aug-03	Post-salt	1,223
Marlim Leste Area	RJS-445	Campos	Oil	Aug-98	Post-salt	1,807
Marlim Leste Area	RJS-446	Campos	Oil & Gas	Dec-94	Post-salt	1,415
Marlim Leste Area	RJS-553	Campos	Oil	Sep-00	Post-salt	2,444
Marlim Leste Area	RJS-597	Campos	Oil & Gas	Feb-03	Post-salt	1,072
	Natal	Santos	Gas/condensate	Aug-10	Post-salt	180
	Panoramix	Santos	Gas	May-09	Post-salt	161
	Parati	Santos	Gas/condensate	Oct-06	Pre-salt	2,039
	Piracuca	Santos	Gas/condensate	Mar-09	Post-salt	156
	Poraque Alto	Campos	Oil	Jul-17	Pre-salt	1,108
	RJS-511	Campos	Oil & Gas	Oct-96	Post-salt	980
	Salvador	Santos	Gas	May-11	Post-salt	151
	SPS-36	Santos	Gas/condensate	Nov-03	Post-salt	912
	Tubarao	Santos	Gas/condensate	Feb-88	Post-salt	147
	Tucura	Campos	Oil	Dec-11	Post-salt	523
	Vampira	Santos	Oil & Gas	Aug-09	Post-salt	140
	Xerelete	Campos	Oil	Jan-01	Post-salt	2,483



## Historical Production Data

The following tables list annual average daily oil and gas production volumes for the period 2014 to 2017 (as provided by the ANP on its website). ANP publishes data on a monthly basis in cubic metres and we have converted oil volumes into bbl at a rate 6.29 bbl/m<sup>3</sup> and gas into cubic feet at a rate of 35.314 cf/m<sup>3</sup>.

**Table B-7 ANP Published Oil Production Data by Field – 2014 to 2017 (000 b/d)**

Field	ANP dataset (000 b/d)			
	2014	2015	2016	2017
Albacora	56.0	49.9	48.7	50.3
Albacora Leste	56.3	58.6	61.4	49.4
Barracuda Area	86.9	78.4	55.2	50.5
Berbigao	14.0	0.0	-	-
Bijupira	10.4	8.8	8.0	9.4
Buzios	0.0	6.5	8.9	2.0
Campos Basin Central Pole	20.9	22.4	19.0	13.7
Campos Basin North East Pole	23.1	22.9	19.1	15.6
Campos Basin North Pole	35.0	32.5	27.0	20.9
Campos Basin South Pole	29.7	23.9	23.2	20.5
Caratinga Area	39.2	37.1	29.4	29.4
Espadarte Area	12.2	12.9	7.4	2.6
Frade	24.9	23.3	22.4	19.3
Iara Entorno	0.1	7.8	0.1	-
Itapu	-	-	0.0	22.2
Libra	-	-	-	0.9
Lula-Iracema	166.7	327.0	527.4	740.4
Marlim	181.9	185.0	162.4	141.4
Marlim Leste Area	117.3	99.9	83.6	66.9
Marlim Sul	241.2	163.2	159.4	164.8
Papa-Terra	24.8	17.4	15.0	9.6
Peregrino	74.5	72.5	62.3	66.9
Polvo	9.7	8.4	8.1	7.8
Roncador	276.0	334.4	282.5	244.5
Salema	10.3	7.3	3.6	3.7
Sepia	-	0.1	9.5	-
Tambau	0.0	0.0	0.1	0.0
Tartaruga Verde	6.3	4.9	14.2	10.2
Tubarao Azul	3.3	2.2	-	-
Tubarao Martelo	12.4	11.2	6.0	7.9
Urugua	9.5	14.9	12.9	11.0
Voador	-	1.8	2.7	2.4
<b>Total</b>	<b>1,543</b>	<b>1,635</b>	<b>1,679</b>	<b>1,784</b>

**Table B-8 ANP Published Gas Production Data by Field – 2014 to 2017 (mmcf)**

Field	ANP Dataset (mmcf)			
	2014	2015	2016	2017
Albacora	29.1	29.3	29.0	28.8
Albacora Leste	31.6	45.9	32.2	26.4
Barracuda Area	40.9	38.6	28.2	26.0
Berbigao	5.9	-	-	-
Bijupira	4.2	3.3	3.7	3.9
Buzios	0.0	8.0	11.1	2.5
Campos Basin Central Pole	9.2	10.1	8.3	5.8
Campos Basin North East Pole	4.7	4.1	3.7	3.1
Campos Basin North Pole	16.2	16.6	10.8	13.8
Campos Basin South Pole	22.2	26.9	24.3	15.9
Caratinga Area	18.8	18.9	15.7	15.4
Espadarte Area	2.5	2.5	1.5	0.6
Frade	9.3	8.9	9.0	8.3
Iara Entorno	0.1	9.3	0.1	-
Itapu	-	-	0.0	10.2
Libra	-	-	-	2.4
Lula-Iracema	106.8	194.4	335.4	667.4
Marlim	90.1	90.0	79.2	69.2
Marlim Leste Area	77.0	64.2	44.2	36.1
Marlim Sul	162.2	104.3	103.6	117.7
Papa-Terra	4.3	2.4	3.2	2.0
Peregrino	3.3	3.6	3.1	3.5
Polvo	1.0	0.9	0.8	0.7
Roncador	188.8	238.8	229.3	219.4
Salema	7.3	5.0	2.6	2.8
Sepia	-	0.0	9.2	-
Tambau	9.1	2.2	8.4	2.0
Tartaruga Verde	2.8	2.1	5.0	3.7
Tubarao Azul	0.6	0.4	-	-
Tubarao Martelo	1.2	0.6	0.3	0.4
Urugua	54.6	75.7	84.9	48.3
Voador	-	1.8	2.5	2.7
<b>Total</b>	<b>904</b>	<b>1,009</b>	<b>1,089</b>	<b>1,339</b>



## Historical Royalty Payments

The following tables lists royalty payments on a monthly basis (as provided by the ANP on its website). The data in the following tables is shown in millions of R\$. The US\$ monthly summations have been calculated by Wood Mackenzie using average exchange rates for the relevant month. The field names are those used by the ANP.

**Table B-9 ANP Published Royalty Data by Field – 2014 (R\$ million and US\$ million)**

Field	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to December
Albacora	41.8	37.3	39.3	37.4	39.0	36.4	37.1	36.5	33.8	34.4	30.7	25.8	429.5
Albacora Leste	35.8	35.2	41.5	38.3	39.5	36.4	37.8	35.1	36.0	32.8	29.9	24.0	422.3
Atapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Anequim	0.5	0.5	0.6	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	4.2
Badejo	0.5	0.5	0.4	0.5	0.6	0.3	0.4	0.5	0.5	0.6	0.6	0.3	5.7
Bagre	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.2	0.2	0.1	0.1	0.1	1.4
Barracuda	72.4	64.1	67.0	61.1	63.5	61.5	56.4	58.0	54.9	50.2	30.5	38.0	677.6
Berbigão	-	-	-	-	-	7.4	18.6	15.8	17.6	18.5	16.8	11.2	105.9
Bicudo	2.8	3.0	3.4	2.3	2.4	2.0	2.1	2.0	2.1	1.7	1.9	1.5	27.0
Bijupira	0.0	5.3	6.0	7.8	6.7	9.1	11.2	5.9	8.6	8.8	7.3	7.3	84.0
Bonito	3.8	2.5	5.7	4.1	3.5	2.6	3.2	3.3	3.2	3.2	3.8	3.0	41.9
Búzios	-	-	-	0.4	-	-	-	-	-	-	-	-	0.4
Carapeba	7.0	6.2	7.0	6.8	7.2	7.0	5.8	6.0	6.6	5.9	5.1	4.7	75.3
Caratinga	22.7	19.0	21.6	18.9	20.5	29.2	27.0	25.5	26.4	25.1	22.2	18.7	276.7
Cherne	8.2	8.0	8.7	7.7	8.9	8.3	6.7	7.7	7.1	5.8	5.0	4.2	86.5
Congro	1.4	1.4	1.5	1.2	1.9	1.9	1.5	1.7	1.7	0.8	0.8	0.4	16.1
Coral	-	-	-	-	-	-	-	-	-	-	-	-	-
Corvina	2.7	2.4	2.7	2.2	2.8	2.7	2.6	2.6	2.3	2.2	1.8	0.6	27.6
Enchova	1.4	0.9	1.9	0.9	0.9	0.8	0.8	0.9	0.8	0.6	0.7	0.5	10.9
Enchova Oeste	2.4	1.4	2.9	2.4	2.5	2.5	2.6	2.5	2.5	1.8	2.1	1.8	27.4
Espadarte	5.7	3.5	7.8	7.4	7.5	5.4	6.1	7.9	10.1	9.9	8.6	6.6	86.6
Frade	14.6	10.5	10.6	18.6	19.4	19.2	17.9	20.3	15.8	17.6	13.0	15.7	193.0
Garoupa	2.8	2.5	2.5	2.3	2.1	2.0	2.1	3.1	2.8	2.5	2.2	2.2	29.2
Garoupinha	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.6
Iara Entorno	0.2	0.6	-	-	-	-	-	-	-	-	-	-	0.8
Itapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Linguado	0.9	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	4.0
Lula	122.0	128.0	115.9	90.9	100.0	109.0	106.9	119.7	119.9	129.3	102.3	114.1	1,358.0
Malhado	3.4	3.2	3.3	2.8	3.2	2.8	2.7	2.3	1.7	1.3	1.0	0.5	28.4
Marimba	12.9	12.2	10.0	11.8	11.6	12.0	11.4	11.3	11.3	9.1	14.4	10.5	138.6
Marlim	131.2	114.3	112.6	119.9	126.0	122.8	123.5	120.3	118.7	88.4	97.4	84.9	1,360.1
Marlim Leste	86.9	80.1	85.1	77.1	85.3	83.2	88.5	86.5	73.3	70.7	62.7	49.6	929.0
Marlim Sul	199.1	177.3	184.7	165.3	158.4	169.0	163.9	151.6	143.7	131.5	106.9	90.2	1,841.7
Mero	-	-	-	-	-	-	-	-	-	-	-	-	-
Moréia	-	-	-	-	-	-	-	-	-	-	-	-	-
Namorado	9.1	8.3	8.5	7.4	8.1	7.6	8.4	7.8	7.1	0.8	4.7	5.2	83.1
Ne Namorado	-	-	-	-	-	-	-	-	-	-	-	-	-
Oeste De Atapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Pampo	11.4	10.5	10.9	9.2	9.7	9.3	9.9	9.8	9.4	8.3	7.2	6.2	111.6
Papa-Terra	8.7	10.8	10.4	9.7	18.3	21.0	19.4	20.0	16.6	17.3	11.9	12.4	176.6
Parati	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	1.9
Pargo	1.3	1.3	1.7	1.8	2.0	1.9	2.0	1.7	1.5	1.6	1.6	1.2	19.7
Peregrino	34.5	46.7	50.9	44.7	49.3	46.3	45.2	45.8	46.2	45.5	38.0	34.3	527.4
Pirauna	1.6	1.6	2.0	1.7	1.6	1.8	1.8	1.8	1.6	1.5	1.3	1.2	19.5
Polvo	8.6	6.9	5.4	7.0	7.2	6.6	7.1	6.1	6.2	6.6	3.6	5.0	76.4
Roncador	193.2	166.1	181.6	153.1	172.4	176.2	192.6	189.3	187.8	196.8	160.5	146.2	2,115.7
Salema	-	4.1	8.1	8.8	7.4	9.5	9.9	5.0	7.5	9.1	6.2	6.9	82.4
Sépia	-	-	-	-	-	-	-	-	-	-	-	-	-
Sul De Lula	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	-	-	-
Tambaú	0.4	0.5	0.6	0.4	0.3	-	0.0	0.6	0.5	0.3	0.3	-	4.0
Tartaruga Verde	-	-	-	-	-	-	6.7	9.6	8.3	8.5	6.8	6.0	45.8
Trilha	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.1	2.9
Tubarão Azul	-	2.4	3.1	2.6	2.6	2.6	2.4	2.1	1.9	1.7	1.5	1.3	24.3
Tubarão Martelo	8.3	7.5	8.0	7.4	8.2	7.7	7.5	7.5	8.9	8.2	6.3	4.9	90.4
Uruguá	7.3	7.1	7.2	7.1	8.1	8.5	8.4	7.9	7.5	6.3	6.4	7.2	88.9
Vermelho	4.0	3.1	3.8	3.8	4.0	3.8	4.6	4.8	4.0	4.1	3.9	3.2	47.3
Viola	1.3	1.0	0.8	0.9	0.9	0.8	0.8	0.6	0.5	0.5	0.5	0.4	9.0
Voador	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total R\$</b>	<b>1,073.4</b>	<b>999.0</b>	<b>1,046.4</b>	<b>954.8</b>	<b>1,014.7</b>	<b>1,038.4</b>	<b>1,064.8</b>	<b>1,048.5</b>	<b>1,018.0</b>	<b>971.0</b>	<b>829.7</b>	<b>758.7</b>	<b>11,817.4</b>
<b>Total US\$</b>	<b>450.6</b>	<b>419.5</b>	<b>449.7</b>	<b>427.4</b>	<b>456.6</b>	<b>464.4</b>	<b>478.7</b>	<b>462.3</b>	<b>436.1</b>	<b>396.7</b>	<b>325.3</b>	<b>286.7</b>	<b>5,054.0</b>



Table B-10 ANP Published Royalty Data by Field – 2015 (R\$ million and US\$ million)

Field	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to December
Albacora	18.4	21.7	25.1	26.9	25.8	22.7	9.6	11.3	26.0	27.1	22.7	21.2	258.6
Albacora Leste	18.4	18.4	22.9	24.6	30.9	23.8	17.4	22.5	25.3	31.0	24.2	20.5	280.2
Atapu	-	-	-	0.1	9.0	7.7	8.1	5.8	7.9	8.1	2.3	0.1	49.1
Anequim	0.2	0.2	0.3	0.3	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.3	2.5
Badejo	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Bagre	0.0	-	-	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.1	1.0
Barracuda	26.2	32.2	37.6	42.0	45.2	38.8	39.0	31.9	33.9	37.4	29.3	24.6	418.1
Berbigão	-	-	-	-	-	-	-	-	0.1	0.2	-	-	0.3
Bicudo	1.0	1.0	1.4	2.0	2.1	1.9	1.6	1.3	1.6	-	0.1	1.7	15.8
Bijupira	4.8	4.6	2.7	1.0	5.3	4.0	5.3	5.4	5.5	3.8	4.0	5.0	51.5
Bonito	2.5	3.0	2.8	3.1	3.1	0.6	0.9	3.4	4.0	3.7	0.9	1.3	29.2
Búzios	-	-	6.0	4.3	1.3	7.7	8.2	4.6	4.2	4.4	1.6	-	42.3
Carapeba	3.0	3.8	4.1	4.3	5.1	5.2	4.8	3.9	4.3	4.8	3.9	3.5	50.5
Caratinga	13.5	15.2	17.2	17.2	18.6	17.5	16.6	13.4	12.4	13.4	10.4	13.0	178.3
Cherne	2.7	3.4	3.7	4.4	5.4	5.2	3.7	4.4	4.8	5.1	1.6	3.1	47.6
Congro	0.8	1.1	0.9	1.2	1.2	1.3	1.1	1.2	1.4	1.5	0.6	1.0	13.1
Coral	-	-	-	-	-	-	-	-	-	-	-	-	-
Corvina	1.0	1.3	1.5	1.7	1.8	1.6	1.3	1.4	1.6	1.6	0.5	1.2	16.3
Enchova	0.4	0.5	0.3	0.4	0.3	-	0.1	0.7	1.2	0.9	0.0	0.8	5.7
Enchova Oeste	1.3	1.5	1.5	1.6	1.7	-	0.2	1.7	2.0	2.0	0.2	1.2	14.9
Espadarte	4.8	5.4	5.8	6.5	6.9	5.6	5.0	4.6	4.7	4.9	3.7	3.1	61.1
Frade	8.2	9.8	11.5	11.5	12.9	6.8	10.4	9.2	9.3	11.0	7.8	7.9	116.3
Garoupa	1.7	2.1	2.3	2.3	1.4	0.3	2.0	1.7	1.8	1.7	1.3	1.2	19.9
Garoupinha	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.9
Iara Entomo	-	-	-	-	-	-	-	-	-	-	-	-	-
Itapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Linguado	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	2.0
Lula	107.3	115.2	147.1	158.3	170.9	158.4	165.6	173.1	176.6	176.6	170.3	182.9	1,902.3
Malhado	0.7	0.8	0.7	1.3	2.1	1.8	1.4	1.3	1.5	1.4	0.5	0.8	14.2
Marimba	7.0	7.1	8.6	12.3	13.2	12.3	10.0	8.2	8.9	7.7	5.8	6.3	107.4
Marlim	62.3	68.3	86.9	86.9	94.2	72.1	82.4	66.8	79.7	84.8	64.7	60.9	910.1
Marlim Leste	36.2	47.3	53.7	49.6	55.9	46.6	47.4	40.1	40.5	42.8	40.1	35.3	535.6
Marlim Sul	57.9	69.0	77.9	73.4	82.5	70.3	71.4	63.5	68.4	71.5	54.7	49.2	809.6
Mero	-	-	-	-	-	-	-	-	-	-	-	-	-
Moréia	-	-	-	-	-	-	-	-	-	-	-	-	-
Namorado	3.1	4.3	5.4	6.0	6.6	5.2	5.7	5.1	4.9	5.7	1.7	4.2	57.9
Ne Namorado	-	-	-	-	-	-	-	-	-	-	-	-	-
Oeste De Atapu	-	-	-	-	-	-	-	0.1	0.1	-	-	-	0.1
Pampo	4.2	4.3	5.2	5.6	6.3	6.0	6.0	5.2	5.7	5.5	3.2	4.7	61.9
Papa-Terra	6.2	8.3	9.8	4.5	5.8	5.3	5.1	6.0	7.2	5.8	5.5	6.3	75.9
Parati	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	1.2
Pargo	0.8	0.9	1.1	1.2	1.6	1.4	1.2	1.0	1.1	1.2	0.9	0.8	13.2
Peregrino	21.3	29.2	33.2	13.9	24.4	32.5	36.4	32.1	30.8	30.3	27.3	32.9	344.4
Pirauna	1.0	1.2	1.1	1.0	1.3	1.2	0.8	0.8	0.4	0.0	0.4	0.7	9.9
Polvo	4.2	3.3	4.2	3.8	4.4	4.0	2.7	3.7	3.5	4.0	2.7	3.5	44.1
Roncador	111.1	130.5	157.1	157.8	166.9	177.9	174.7	146.6	113.4	150.2	124.1	105.1	1,715.5
Salema	5.0	4.4	2.6	1.4	5.9	5.2	4.7	4.4	3.4	2.2	1.9	1.8	42.9
Sépia	-	-	-	-	-	-	0.1	0.1	-	-	-	-	0.3
Sul De Lula	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	-	-	-
Tambaú	-	0.0	0.1	-	0.1	-	0.1	-	-	0.1	0.4	0.0	0.8
Tartaruga Verde	4.3	4.9	5.5	0.1	-	-	-	-	-	-	3.4	4.5	22.7
Trilha	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Tubarão Azul	0.9	1.1	1.4	1.5	1.7	1.6	1.7	1.3	0.0	-	-	-	11.2
Tubarão Martelo	4.5	3.8	5.6	4.9	5.7	5.3	6.0	3.9	-	-	-	-	39.8
Uruguá	6.4	10.4	10.8	9.5	10.8	9.2	11.1	11.3	4.8	12.3	12.0	9.6	118.2
Vermelho	1.9	2.5	2.6	2.8	3.2	3.0	2.9	2.5	2.9	3.1	2.3	2.1	31.6
Viola	0.3	0.4	0.9	0.9	0.6	0.2	0.9	0.8	1.1	1.3	1.1	0.9	9.5
Voador	-	-	-	0.2	0.4	1.8	0.8	0.3	1.7	1.4	1.0	1.1	8.7
<b>Total R\$</b>	<b>556.3</b>	<b>642.9</b>	<b>769.4</b>	<b>753.1</b>	<b>843.5</b>	<b>773.0</b>	<b>775.5</b>	<b>707.1</b>	<b>708.9</b>	<b>771.2</b>	<b>639.4</b>	<b>624.5</b>	<b>8,564.8</b>
<b>Total US\$</b>	<b>211.1</b>	<b>228.2</b>	<b>244.8</b>	<b>247.0</b>	<b>275.8</b>	<b>248.2</b>	<b>240.3</b>	<b>201.2</b>	<b>181.4</b>	<b>199.3</b>	<b>168.9</b>	<b>160.8</b>	<b>2,606.9</b>



Table B-11 ANP Published Royalty Data by Field – 2016 (R\$ million and US\$ million)

Field	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to December
Albacora	9.8	11.2	3.2	19.8	24.3	21.0	19.0	18.7	21.1	26.5	24.7	35.3	234.4
Albacora Leste	16.0	16.7	19.5	19.2	23.6	23.5	22.5	21.9	22.1	23.3	20.8	26.4	255.4
Atapu	0.1	0.1	-	-	-	-	-	-	-	-	-	-	0.3
Anequim	0.2	0.2	0.2	0.2	0.2	0.0	0.2	0.2	0.1	0.1	0.0	0.1	1.9
Badejo	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	0.1
Bagre	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.5
Barracuda	18.6	18.9	21.4	18.4	25.5	24.7	21.3	21.8	20.5	20.6	20.9	27.0	259.6
Berbigão	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicudo	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5
Bijupira	4.1	2.7	3.4	3.4	2.4	3.1	3.7	3.7	3.7	3.3	3.4	2.5	39.4
Bonito	2.4	2.6	2.8	2.8	3.2	3.0	2.7	2.6	2.7	3.0	3.1	3.5	34.3
Búzios	1.3	4.7	0.0	-	1.6	-	1.7	6.9	6.1	7.0	6.9	14.8	50.9
Carapeba	2.9	3.0	3.2	3.2	3.5	3.1	2.9	2.9	2.8	3.3	1.9	3.5	36.1
Caratinga	6.1	7.4	6.1	6.6	13.6	13.3	12.4	12.6	11.8	12.6	11.5	15.2	129.1
Cherne	2.9	3.0	3.1	3.3	3.3	2.5	4.2	4.1	3.5	2.5	3.4	4.1	39.8
Congro	0.8	0.7	0.7	0.9	1.0	1.0	0.8	0.7	0.8	0.8	0.7	0.9	9.9
Coral	-	-	-	-	-	-	-	-	-	-	-	-	-
Corvina	0.9	0.9	1.0	1.0	0.9	0.9	0.8	0.6	0.5	0.5	0.6	0.6	9.1
Enchova	0.7	0.8	0.8	0.9	1.2	1.0	0.7	0.9	1.1	1.3	1.2	1.7	12.3
Enchova Oeste	1.1	1.1	1.3	1.3	1.5	1.4	1.2	1.1	1.2	0.6	0.6	0.7	13.2
Espadarte	2.3	2.3	2.7	2.5	2.9	2.8	1.9	2.7	2.6	2.8	1.9	3.1	30.4
Frade	10.4	6.3	7.5	7.1	8.7	9.7	8.9	9.8	8.3	8.6	8.4	10.3	103.9
Garoupa	1.0	1.1	1.1	1.3	1.5	1.4	1.3	1.2	1.2	1.1	0.8	1.6	14.4
Garoupinha	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0
Iara Entomo	-	-	-	-	-	-	-	-	-	-	-	-	-
Itapu	-	-	-	-	-	-	-	0.1	-	-	-	-	0.1
Linguado	0.1	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Lula	141.7	150.3	170.9	122.9	205.2	238.2	241.0	253.0	282.3	301.1	297.0	398.2	2,801.8
Malhado	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7	0.5	0.4	0.5	5.5
Marimba	5.2	5.3	5.8	6.0	7.3	6.8	6.8	6.8	7.1	6.9	6.3	7.9	78.2
Marlim	42.1	39.8	48.0	55.2	71.6	73.2	64.6	60.4	58.5	65.3	58.1	78.9	715.7
Marlim Leste	29.2	23.0	22.5	31.7	38.2	39.1	36.8	34.7	34.8	36.0	27.6	38.9	392.6
Marlim Sul	40.8	39.7	47.1	51.0	56.8	63.4	63.6	67.9	67.0	75.8	72.7	89.5	735.3
Mero	-	-	-	-	-	-	-	-	-	-	-	-	-
Moréia	-	-	-	-	-	-	-	-	-	-	-	-	-
Namorado	2.7	3.1	2.7	3.3	3.0	3.4	3.0	3.3	3.0	3.3	2.9	3.7	37.5
Ne Namorado	-	-	-	-	-	-	-	-	-	-	-	-	-
Oeste De Atapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Pampo	3.9	2.2	0.7	4.6	6.1	5.9	5.2	1.5	5.3	5.4	5.4	6.9	53.1
Papa-Terra	3.3	3.2	4.8	4.6	5.4	4.8	4.9	4.8	4.8	5.2	4.6	6.3	56.5
Parati	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.9
Pargo	0.7	0.7	0.7	0.8	1.0	0.8	0.8	0.9	0.8	1.0	0.6	1.2	10.1
Peregrino	21.2	14.4	14.1	6.1	26.2	26.5	23.1	22.8	24.2	27.9	16.3	25.0	247.8
Pirauna	0.7	0.7	0.7	0.6	0.8	0.8	0.8	0.8	0.7	0.8	0.8	1.0	9.3
Polvo	2.3	1.8	2.5	2.7	3.6	3.5	3.2	3.5	2.7	3.4	2.9	4.1	36.2
Roncador	85.5	88.3	94.3	99.9	125.2	124.3	110.0	105.8	108.7	120.0	108.6	130.6	1,301.2
Salema	1.2	1.0	1.0	0.9	2.5	2.2	1.9	1.7	1.6	1.4	1.5	1.1	17.9
Sépia	-	1.2	6.7	6.0	7.2	8.2	7.1	7.8	0.2	-	-	-	44.5
Sul De Lula	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	-	-	-	-	-	-	-	-	-
Tambaú	0.1	0.3	0.1	0.3	0.4	0.4	0.3	0.4	0.3	0.1	0.0	-	2.8
Tartaruga Verde	4.1	4.1	4.9	5.0	5.9	6.0	5.8	5.7	5.6	6.2	5.8	7.0	66.1
Trilha	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	0.0
Tubarão Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarao Martelo	-	-	0.4	-	-	-	3.3	3.4	3.3	3.4	3.4	3.8	21.0
Uruguá	6.7	7.0	5.9	7.0	7.9	8.2	9.1	7.7	7.1	5.3	6.6	7.3	85.9
Vermelho	1.7	1.9	2.2	2.7	3.0	2.8	2.5	1.7	1.4	1.6	1.0	1.6	24.0
Viola	0.6	0.6	0.8	0.9	1.0	0.8	0.9	1.0	1.1	1.0	0.8	1.0	10.5
Voador	0.8	0.4	0.5	1.0	1.0	1.0	1.0	0.9	1.1	1.1	1.1	1.3	11.2
<b>Total R\$</b>	<b>477.2</b>	<b>473.5</b>	<b>515.9</b>	<b>505.9</b>	<b>698.9</b>	<b>732.8</b>	<b>702.9</b>	<b>709.7</b>	<b>732.2</b>	<b>790.7</b>	<b>735.6</b>	<b>967.2</b>	<b>8,042.5</b>
<b>Total US\$</b>	<b>117.8</b>	<b>119.3</b>	<b>139.4</b>	<b>142.0</b>	<b>197.1</b>	<b>214.0</b>	<b>214.5</b>	<b>221.2</b>	<b>225.0</b>	<b>248.1</b>	<b>219.6</b>	<b>288.5</b>	<b>2,346.5</b>



Table B-12 ANP Published Royalty Data by Field – 2017 (R\$ million and US\$ million)

Field	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to December
Albacora	34.3	26.2	27.5	21.9	26.9	23.4	22.5	18.1	22.7	19.7	19.6	21.0	283.7
Albacora Leste	21.7	22.4	22.8	21.5	23.2	21.6	22.0	20.3	18.9	19.5	22.8	23.2	260.0
Atapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Anequim	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.4	0.2	0.3	0.3	0.2	3.3
Badejo	-	-	-	-	-	-	-	-	-	-	-	-	-
Bagre	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.7
Barracuda	25.3	24.9	25.3	19.9	10.6	22.1	22.8	22.9	25.3	30.1	33.3	33.8	296.2
Berbigão	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicudo	-	-	-	-	-	-	-	-	-	-	-	-	-
Bijupira	4.7	4.7	4.9	4.7	5.1	4.3	3.6	2.9	4.2	4.9	5.6	4.4	54.1
Bonito	3.3	2.7	1.7	1.5	1.6	1.5	1.5	1.9	1.7	1.1	2.8	3.3	24.6
Búzios	12.6	-	0.1	0.2	0.1	-	-	-	-	-	-	-	13.0
Carapeba	3.2	2.5	2.8	3.1	2.9	2.5	2.7	3.2	3.3	3.4	4.2	4.1	37.8
Caratinga	13.2	12.6	12.4	11.8	10.6	12.6	12.6	13.0	12.9	14.0	15.2	15.5	156.3
Cherne	4.3	3.9	3.5	2.7	3.9	2.9	3.4	3.3	1.2	3.3	4.2	4.7	41.4
Congro	0.8	0.6	0.6	0.8	0.7	0.8	0.7	0.8	0.5	0.7	0.5	0.8	8.5
Coral	-	-	-	-	-	-	-	-	-	-	-	-	-
Corvina	0.4	0.0	0.5	0.5	0.6	0.6	0.5	0.6	0.2	0.4	0.6	0.7	5.6
Enchova	1.6	1.7	1.6	1.2	1.1	0.9	0.8	1.2	1.4	1.0	1.2	1.2	15.0
Enchova Oeste	0.5	0.6	1.1	1.1	1.0	1.3	1.2	1.3	1.4	1.3	1.5	1.9	14.1
Espadarte	2.5	1.8	0.9	1.0	0.8	0.8	0.9	0.9	0.8	1.0	1.0	0.8	13.4
Frade	9.4	9.3	9.6	8.5	9.8	7.7	8.5	7.4	8.5	10.1	9.3	10.6	108.6
Garoupa	1.4	1.2	1.4	1.2	1.4	1.1	1.0	0.9	1.2	1.6	2.0	2.2	16.5
Garoupinha	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	1.4
Iara Entomo	-	-	-	-	-	-	-	-	-	-	-	-	-
Itapu	-	2.0	14.6	14.6	15.0	14.1	15.4	15.5	15.4	16.8	18.8	2.1	144.4
Linguado	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Lula	405.5	334.7	317.1	325.6	356.3	361.2	386.2	341.3	417.2	460.7	516.5	526.7	4,748.9
Malhado	0.4	0.2	0.1	0.3	0.6	0.6	0.7	0.7	0.3	0.6	0.2	0.4	5.1
Marimba	0.8	4.8	7.6	6.2	7.3	5.9	6.4	6.6	6.9	6.9	8.1	7.4	74.9
Marlim	80.7	66.4	60.3	57.6	66.2	44.2	58.4	49.6	62.0	73.9	79.1	76.9	775.3
Marlim Leste	37.0	30.0	30.4	32.4	34.3	28.2	29.0	28.3	34.9	37.0	24.0	37.6	383.2
Marlim Sul	70.1	73.3	72.2	70.9	79.4	72.1	74.9	78.6	73.4	87.6	92.2	96.7	941.4
Mero	-	-	-	-	-	-	-	-	-	-	-	-	-
Moréia	-	-	-	-	-	-	-	-	-	-	-	-	-
Namorado	4.7	3.8	3.8	2.9	3.6	3.3	2.6	2.5	2.5	2.8	3.8	3.8	40.1
Ne Namorado	-	-	-	-	-	-	-	-	-	-	-	-	-
Oeste De Atapu	-	-	-	-	-	-	-	-	-	-	-	-	-
Pampo	5.3	5.9	5.8	5.3	5.6	5.2	5.3	5.7	4.7	4.9	6.1	6.1	66.0
Papa-Terra	6.1	4.7	4.9	3.6	4.9	3.3	3.6	3.5	3.4	4.0	3.8	2.3	48.0
Parati	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.3
Pargo	1.3	1.0	0.9	0.9	1.0	1.0	1.0	1.1	1.0	0.9	1.1	1.1	12.3
Peregrino	31.9	30.9	12.4	23.0	30.9	25.2	30.0	28.0	29.3	29.7	29.1	34.0	334.3
Pirauna	1.1	0.9	-	-	-	-	-	-	-	-	-	-	2.0
Polvo	4.0	3.0	3.4	3.3	3.4	3.0	3.0	3.2	3.3	3.6	4.0	3.9	41.2
Roncador	129.5	113.2	109.5	105.9	106.4	102.2	103.1	114.1	115.4	124.6	135.6	143.7	1,403.3
Salema	1.7	1.7	1.8	1.8	1.8	1.5	1.4	1.8	2.0	2.0	2.2	1.6	21.3
Sépia	-	-	-	-	-	-	-	-	-	-	-	-	-
Sul De Lula	-	-	-	-	-	-	-	-	-	-	-	-	-
Sururu	-	-	-	-	0.2	-	-	-	0.2	0.0	-	-	0.4
Tambaú	0.0	0.0	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.1	-	-	0.8
Tartaruga Verde	6.6	5.8	6.0	5.6	5.7	5.2	5.1	3.4	3.6	3.9	4.1	2.1	57.1
Trilha	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarão Azul	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubarão Martelo	3.4	3.2	3.7	3.4	3.1	3.6	2.4	2.5	2.2	2.6	2.8	3.4	36.4
Uruguá	6.9	5.9	7.2	7.0	6.4	5.8	5.2	5.9	5.7	6.2	5.4	6.8	74.6
Vermelho	2.0	1.6	1.5	1.4	2.0	1.6	1.6	1.5	1.5	1.4	1.8	1.5	19.4
Viola	1.3	1.1	1.1	0.8	0.5	0.4	0.7	0.6	0.4	0.2	-	-	7.2
Voador	0.9	1.1	0.8	1.1	1.0	1.0	1.0	0.8	1.2	1.2	1.4	1.1	12.7
<b>Total R\$</b>	<b>941.0</b>	<b>811.1</b>	<b>782.6</b>	<b>776.3</b>	<b>836.6</b>	<b>793.4</b>	<b>842.1</b>	<b>794.6</b>	<b>891.1</b>	<b>984.6</b>	<b>1,064.7</b>	<b>1,087.7</b>	<b>10,605.8</b>
<b>Total US\$</b>	<b>294.4</b>	<b>261.2</b>	<b>250.1</b>	<b>247.5</b>	<b>261.0</b>	<b>240.9</b>	<b>262.5</b>	<b>252.2</b>	<b>284.4</b>	<b>308.5</b>	<b>326.3</b>	<b>334.7</b>	<b>3,323.6</b>



## Reconciliation between ANP and Wood Mackenzie Historical Datasets

## Royalty

Table B-13 shows the differences between the historical Royalty payments calculated by Wood Mackenzie's model and the ANP published datasets. The Wood Mackenzie model calculates on an annual basis and results are shown for the period 2014 to 2017.

In comparison to the total Royalties paid, the total differences are small, amounting to approximately 1% of the total Royalty payments over the four years. Differences likely arise in part from rounding, but also from differences in the use of monthly exchange rates versus annual exchange rates in the conversion of Royalties.

**Table B-13 Reconciliation of ANP published Royalties and Wood Mackenzie calculated values**

Field	ANP Dataset (US\$mm)				WoodMac (US\$mm)				Difference (US\$mm)			
	2014	2015	2016	2017	2014	2015	2016	2017	2014	2015	2016	2017
Albacora	183	78	67	89	183	78	64	90	(1)	(1)	3	(1)
Albacora Leste	180	84	73	82	180	85	73	82	(1)	(1)	1	(1)
Barracuda Area	288	126	74	93	286	124	74	91	2	1	0	2
Berbigao	45	0	-	-	49	0	-	-	(4)	(0)	-	-
Bijupira	36	15	11	17	36	16	11	20	(0)	(0)	0	(3)
Buzios	0	13	15	4	0	13	14	4	(0)	0	1	(0)
Campos Basin Central Pole	67	35	25	24	69	36	25	25	(2)	(0)	0	(1)
Campos Basin North East Pole	73	35	24	27	74	35	24	27	(1)	(0)	(0)	(0)
Campos Basin North Pole	110	49	33	36	114	51	35	38	(3)	(2)	(2)	(2)
Campos Basin South Pole	98	39	33	38	100	40	32	37	(1)	(1)	1	0
Caratinga Area	118	54	37	49	120	55	37	49	(2)	(1)	0	(0)
Espadarte Area	37	18	9	4	38	18	9	4	(1)	(0)	0	(0)
Frade	82	35	30	34	83	36	30	34	(1)	(1)	(0)	0
Iara Entorno	0	15	0	-	0	14	0	-	0	1	(0)	-
Itapu	-	-	0	45	-	-	0	47	-	-	(0)	(1)
Libra	-	-	-	-	-	-	-	3	-	-	-	(3)
Lula-Iracema	578	571	803	1,489	588	576	776	1,500	(10)	(5)	27	(11)
Marlim	579	273	205	243	625	334	201	243	(47)	(61)	4	0
Marlim Leste Area	395	161	112	120	415	160	112	121	(19)	1	0	(1)
Marlim Sul	784	243	211	295	777	232	206	296	7	11	5	(1)
Papa-Terra	75	23	16	15	79	30	16	15	(3)	(7)	0	(0)
Peregrino	224	103	71	105	225	105	69	105	(1)	(1)	2	(0)
Polvo	33	13	10	13	32	13	11	13	0	(0)	(1)	(0)
Roncador	900	515	373	440	914	517	369	440	(13)	(1)	4	(0)
Salema	35	13	5	7	36	13	5	7	(0)	0	0	(0)
Sepia	-	0	13	-	-	0	13	-	-	(0)	0	-
Tambau	2	0	1	0	2	0	1	0	(0)	0	0	0
Tartaruga Verde	19	7	19	18	20	7	19	18	(0)	(0)	0	(0)
Tubarao Azul	10	3	-	-	10	3	-	-	0	0	-	-
Tubarao Martelo	38	12	6	11	41	19	8	14	(2)	(7)	(2)	(2)
Urugua	38	35	25	23	38	36	25	25	(0)	(0)	0	(1)
Voador	-	3	3	4	-	2	3	4	-	0	0	(0)
<b>Total</b>	<b>5,029</b>	<b>2,572</b>	<b>2,304</b>	<b>3,325</b>	<b>5,133</b>	<b>2,649</b>	<b>2,261</b>	<b>3,353</b>	<b>(104)</b>	<b>(77)</b>	<b>44</b>	<b>(29)</b>





## Special Participations

In Table B-14, we identify the differences between the historical datasets of ANP and Wood Mackenzie. Certain assets are aggregated for the purposes of calculating royalties. However, because the chargeable entity is a licence concession, then for the purposes of calculating Special Participations, fields need to be aggregated only where they are within the same concession area.

The fields located within the four different Campos Pole areas are therefore treated separately for the purposes of calculating Special Participations. We do not however forecast any future Special Participation payments from fields located within those areas.

**Table B-14 Reconciliation of ANP Published Special Participations and Wood Mackenzie Calculated Values**

Field	ANP Dataset (US\$mm)				WoodMac (US\$mm)				Difference (US\$mm)			
	2014	2015	2016	2017	2014	2015	2016	2017	2014	2015	2016	2017
Albacora	42	5	1	10	61	15	10	20	(19)	(10)	(9)	(10)
Albacora Leste	59	35	10	11	47	5	14	14	12	30	(4)	(3)
Barracuda Area	212	57	8	6	203	53	10	17	9	4	(2)	(11)
Caratinga Area	17	6	-	1	23	5	0	1	(5)	0	(0)	(0)
Espadarte Area	-	-	-	2	-	-	-	-	-	-	-	2
Lula-Iracema	906	870	1,123	3,221	733	702	791	2,601	173	168	332	620
Marlim	668	110	38	114	879	280	20	97	(211)	(170)	18	17
Marlim Leste Area	404	70	4	3	349	-	-	-	54	70	4	3
Marlim Sul	1,467	154	95	205	1,314	54	11	193	153	99	84	12
Peregrino	69	0	-	2	117	6	-	-	(48)	(6)	-	2
Roncador	1,718	762	283	396	1,514	435	366	281	204	327	(83)	115
Urugua	-	-	-	0	-	-	-	-	-	-	-	0
<b>Total</b>	<b>5,561</b>	<b>2,070</b>	<b>1,563</b>	<b>3,970</b>	<b>5,240</b>	<b>1,557</b>	<b>1,223</b>	<b>3,223</b>	<b>322</b>	<b>512</b>	<b>340</b>	<b>747</b>

Note: ANP data per online tool shows SPT of US\$217 million for Anequim in Q4 2014 (part to Campos Basin North Pole field grouping). However, the field was not included in the Q4 and its production is below the level that triggers SPT. We assume that this SPT liability must be the result of an audit finding and does not relate to 2014 production and thus have excluded it from the above table.

Most of the assets show differences between the Wood Mackenzie dataset and the ANP published values, and there is no consistent pattern as to whether the Wood Mackenzie data is higher or lower than the ANP data. This is perhaps unsurprising since Special Participations are calculated on the basis of field profits. The ANP only provides deductions on a quarterly basis for each field, with no further detail shown. It is not therefore possible to determine how the Wood Mackenzie deductions relate to those disclosed by the ANP. Excluding Lula, for the years shown in the above table the Wood Mackenzie estimates for Special Participations are 9% lower than those published by the ANP.

Our data for Lula is lower than that published by ANP and we have investigated potential reasons for the difference. A key issue is that Lula is a giant field that is going to be exploited by ten separate FPSOs which are being brought onstream over a number of years and the capital costs incurred by end 2017 were very large (in our model over US\$38 billion). Thus, differences in actual costs incurred or the exact timing of when those costs are eligible to be depreciated (depreciation commences when that asset has been put into use) could have a significant impact on the magnitude of the difference in SPT shown in the above table. Also, FPSO costs are depreciated over 20 years rather than the usual ten-year period and what is deemed to be FPSO costs (over and above the vessel cost itself) may be different to the split we have in our model. We have assumed that abandonment provisions have been claimed once production commenced but the legislation is not explicit on the exact calculation of the provision each year and thus could be different from that in our model.



## Reconciliation with Petrobras Production Data

In addition to the reconciliation with the historical ANP published data, we have also compared data, both historical and future with that published by Petrobras. Since Petrobras is the largest player within the Brazilian upstream industry this analysis allows us to compare the Wood Mackenzie dataset with that of Petrobras. The data is published by Petrobras on an annual basis and is not provided on a field by field basis. Additionally, the production numbers are for all of the Brazilian production of Petrobras and are not sub-divided by state. As Wood Mackenzie's database covers all Brazilian production this gives a further, albeit high-level point of comparison.

Table B-15 sets out the results of the comparison between the Wood Mackenzie and Petrobras datasets. Petrobras does not provide forecasts for each year, but it did provide a production outlook chart from which we have interpolated the annual data.

**Table B-15 Reconciliation of Wood Mackenzie and Petrobras Oil and Gas Production**

<b>Wood Mackenzie</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
Oil ('000 b/d)	1,947	2,057	2,073	2,100	2,215	2,493	2,778	2,874	3,039
Gas (mmcf/d)	1,557	1,607	1,532	1,835	1,743	1,711	1,954	1,859	1,883
<i>Source: Wood Mackenzie Upstream Data Tool</i>									
<b>Petrobras</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
Oil ('000 b/d)	2,034	2,128	2,144	2,150	2,100	2,650	2,750	2,800	2,900
Gas (mmcf/d)	2,207	2,249	2,218	3,000	3,000	3,000	3,000	3,000	3,000
<i>Source: Company Reports, Petrobras 2018 - 2022 Business Plan</i>									

The table shows that our liquids production forecast is broadly in line with that of Petrobras. The Petrobras forecast includes the potential impact of the ongoing disposal campaign but they have not disclosed what assets are assumed to be sold and the timing of such sales. This helps to explain why our forecast by 2022 is higher than that of Petrobras. Also, Petrobras liquids production includes NGL volumes which are extracted in mid-stream activities, however, these are not included in the Wood Mackenzie database – we estimate that the additional NGLs add approximately 60-65 kboed to the Petrobras forecast.

The Wood Mackenzie gas volumes in the above table are shown on a sales basis rather than a production basis. We have estimated that consumed/flared volumes would increase our sales volumes by 45 – 55% which would bring our forecast in to line with that of Petrobras.



## Appendix C

In this section of the report we provide, summary information for those assets that are forecasted to pay Special Participations for the period from 2017 to 2029, and the significant ToR fields plus Libra.

### Albacora

#### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Albacora	Sep 1984
Licence: Albacora, Area: 492 km <sup>2</sup>	Phase 1 Production Started	Sep 1987
Water Depth: 380 - 590m	Phase 2 Production Started	Sep 1996
	Issue Date	06 Aug 1998
	Peak Oil Production (156,920 b/d)	1999
	Peak Gas Production (63 mmcfd)	2003
	Discovery Date: Forno	Oct 2011
	Final Expiry	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Paleogene\Oligocene\Rupelian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
1,038.2 mmbbl Oil	Gravity (°API)	19 - 29
348.5 bcf Sales Gas	Total Acid No. (mg KOH/g)	0.1
<b>Remaining Reserves at 01/01/2018</b>	Calorific Value (btu/scf)	980
148.7 mmbbl Oil		
39.1 bcf Sales Gas		

#### Summary

Albacora was one of the first major deepwater developments undertaken by Petrobras. Its discovery in 1984, along with Marlim in the following year, led Petrobras to focus its offshore exploration on the deepwater turbidite sandstones, achieving excellent results with discoveries such as Roncador and Marlim Sul.

Given the water depths across the field, Petrobras decided to develop it on a phased basis, with the shallower southerly part of the field being brought onstream first through a pilot project in 1987. Follow-up phases saw the development of the deeper, northern parts of the field, and the expansion of the southerly development. Oil production peaked at just over 156,000 b/d in 1999 and has generally been in decline since. As a result, Petrobras' efforts have been focused on mitigating this decline.

#### Key Issues

##### Reserves upside

Petrobras has been carrying out a near-field exploration campaign in the Campos basin since 2009. This campaign has been targeting deep prospects identified within existing production concessions, both in pre-salt and the post-salt carbonates. These discoveries are very easy to monetise and deliver a high rate of return for Petrobras as they can be developed via existing production infrastructure. Petrobras made a pre-salt discovery at Albacora in 2011, with potential reserves of 50 million barrels of oil. As production has been in decline, the pre-salt discovery could represent a significant increase in reserves.

##### Redevelopment plan

Albacora is being redeveloped through at least 14 wells. The ANP is also asking Petrobras to ensure sufficient water injection capacity through 2023.

In addition, there is a commitment to carry out an extended well test ("EWT") of the pre-salt Forno prospect. Petrobras foresees the installation of the FPSO Cidade de Rio das Ostras to produce for 12 months, starting on the mid-2018. Only the EWT volumes from Forno are included in our production forecast.

The Albacora contract runs until 2025, but we expect it to be extended.



## Albacora Leste

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date	28 Mar 1986
Licence: Albacora Leste, Area: 554 km <sup>2</sup>	Pilot Start-up	Jun 1998
Water Depth: 1500m	Issue Date	06 Aug 1998
	Full-field Start-up	Apr 2006
	Peak Gas Production (36 mmcf/d)	2009
	Peak Oil Production (159,910 b/d)	2007
	Final Expiry	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	90.00
	Repsol Sinopec Brasil	10.00
<b>Primary Reservoir(s):</b>		
Neogene\Miocene\Aquitanian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
440 mmbbl Oil	Gravity (°API)	12 - 26
110 bcf Sales Gas	Total Acid No. (mg KOH/g)	2.8
<b>Remaining Reserves at 01/01/2018</b>	Sulphur (%)	0.6
84 mmbbl Oil	CO <sub>2</sub> (%)	2.7
17 bcf Sales Gas		

### Summary

Albacora Leste is a large and challenging oil and gas development located in the deep waters of the Campos basin. The field lies immediately to the east of the Albacora field, but its oil is more acidic and considerably heavier. Additionally, the great bulk of reserves lie in water depths of over 1,000 metres, making it technically challenging. The field's development has suffered numerous delays. The initial delay was caused by protracted negotiations during the 1990s as Petrobras sought a partner to develop the field. A further delay was caused during the construction of the production facility. Development work finally got underway in 2002 following a four-year pilot test.

The field is being exploited using the P-50 FPSO, which has a production capacity of 180,000 b/d. The start-up of production from the field took place amid much political fanfare, as this was the event that heralded Brazil becoming self-sufficient in oil.

### Key Issues

#### Reserves upside potential

Production from the conventional reservoirs at Albacora Leste has suffered setbacks and is in decline, but there are two possible sources for upside. In the eastern portion of the field, significant quantities of heavy oil have been found. However, the heavy nature (12 to 13° API) of the crude, coupled with the water depths in the eastern portion of the field (in excess of 1,500 metres) make any development technologically challenging. With numerous promising pre-salt opportunities currently under development, exploitation of this heavy oil may fall low on Petrobras' priority list.

In addition, pre-salt reserves have been identified at the Creal B prospect beneath the main Albacora Leste reservoirs. Further appraisal is required to prove up the commerciality of the pre-salt, but given the light nature of the pre-salt oil and the presence of infrastructure (with available capacity), it is likely that this will take priority over any effort to produce heavy oil in the east. Two wells so far have been drilled into the pre-salt to ascertain the reservoir's potential.

#### ANP seeks renewed Campos basin output

In an effort to boost national production, the ANP has been negotiating with Petrobras the possibility of setting new development plans for 11 fields in the Campos basin, including Albacora Leste. The national regulator may seek to secure commitments for additional investment and drilling in the field to arrest production decline. However, with numerous pre-salt opportunities and significant financial constraints, Petrobras may not be disposed to make significant increases in investment.



## BS-4, Atlanta & Oliva

### Key Facts

Under Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date: Oliva	16 Dec
Licences: Oliva, Atlanta, Area: 219 km <sup>2</sup>		1993
Water Depth: 1500 - 1557m	Discovery Date: Atlanta	10 Apr
		2001
	Issue Date	27 Dec
		2006
	Expected Startup: Atlanta	2018
	Peak Oil Production (89,580 b/d)	2026
	Expected Startup: Oliva	2023
	Final Expiry	26 Dec
		2033
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Queiroz Galvao E&P	Dommo Energia	40.00
	Barra Energia	30.00
	Queiroz Galvao E&P	30.00
<b>Primary Reservoir(s):</b>		
Paleogene\Eocene\Ypresian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
310 mmbbl Oil	Gravity (°API)	14
25 bcf Sales Gas	Sulphur (%)	0.1
<b>Remaining Reserves at 01/01/2018</b>	Total Acid No. (mg KOH/g)	6 - 10
310 mmbbl Oil	Viscosity (cP)	180 - 250
25 bcf Sales Gas		

### Summary

The development of Atlanta and Oliva is Queiroz Galvão Exploração e Produção's ("QGEP") first operated project. Both fields lie within the former BS-4 exploration licence area. The complex geology and heavy nature of the oil will make the development challenging. The field is expected to enter production in 2018.

The ANP approved the development plans of Atlanta and Oliva in 2013. Atlanta is the anchor development, with Oliva as a satellite field. QGEP plans to develop the Atlanta field using subsea wells via a leased 30,000 b/d FPSO during the first three to five years. After that an 100,000 b/d FPSO is planned to replace the smaller FPSO.

The Oliva field is in an earlier stage of development and still needs to be appraised. Oliva wells will be tied-back to Atlanta's FPSO as capacity becomes available.

### Key Issues

#### A challenging development

There are a number of factors that make the development of Atlanta and Oliva challenging. The oil in both fields is heavy, highly viscous and very acidic, presenting flow assurance issues and increasing processing costs on the FPSO. Furthermore, the reservoirs are shallow (only 800 metres below the seabed), which means the rock is unconsolidated, presenting sand control issues. Moreover, the fields are remote from infrastructure and lie in ultra-deep waters.

#### Pre-salt exploration upside

A pre-salt prospect called Piapara has been identified beneath Atlanta, although no announcements have been made regarding its potential size. In 2014, the consortium analysed 3D seismic of the prospect. However, with the partners' current focus on the development of the Atlanta and Oliva fields, and with the financially-constrained Óleo e Gás Participações ("OGPar") as a partner, exploration drilling on Piapara is unlikely to take place in the short-term.

#### Dommo Energia financial constraints

In December 2013, the ANP announced that OGPar, former OGX and now renamed Dommo Energia, had 15 days to pay a debt of approximately US\$31 million to the other participants of the block. If OGPar had failed to clear the outstanding amount, it could have been penalised by being permanently removed from the block. The debt was paid and the ANP ruled that OGPar must demonstrate monthly that it is current with its financial obligations. Nonetheless, OGPar's financial struggles prevent the consortium to advance faster in the project.



In September 2017, OGPar formally changed its name to Dommo Energia in an attempt to rebuild the company after the bankruptcy process. The company has re-emerged with only one active producing asset, the Tubarão Martelo field and also has a 40% stake in the Atlanta field.

### Dommo Energia farms down stake in BS-4

Dommo Energia (former OGX) announced in October 2017 that it sold 30% of its stake in the block to Azibras, a subsidiary of Seacrest Group. The Bermuda-based company will pay outstanding Dommo Energia debts, plus capital costs leading up to first oil, totalling approximately US\$33 million, as well as contingent payments in the amount of approximately US\$30 million.

Dommo will continue to hold a 10% stake in the area. The negotiation still depends on the approval of the Brazilian authorities, including Cade and ANP.

### FPSO Petrojarl I prepares to start production

After several problems with the project and many changes, the FPSO Petrojarl I, converted by Teekay, is now ready for its trip to Brazil. The production platform will sail from the Aldel shipyard in Norway and head for the Atlanta field and it is scheduled to come on stream in the first quarter of 2018.



## Barracuda Area

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date - Barracuda	May 1990
Licence: Barracuda, Area: 253 km <sup>2</sup>	Start-up: Pilot Phase	Sep 1997
Water Depth: 800 - 873m	Issue Date	06 Aug 1998
	Start-up: Full field development	Dec 2004
	Peak Oil Production (163,900 b/d)	2006
	Peak Gas Production (59 mmcf/d)	2006
	Discovery Date - Nautilus (pre-salt)	Feb 2010
	Final Expiry	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Paleogene\Eocene\Ypresian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
690 mmbbl Oil	Gravity (°API)	25
178 bcf Sales Gas	Calorific Value (btu/scf)	980
<b>Remaining Reserves at 01/01/2018</b>	Sulphur (%)	0.5
117 mmbbl Oil		
7 bcf Sales Gas		

### Summary

The Barracuda Area is located in the south-central Campos basin, comprising the deepwater Barracuda oil field and the pre-salt Nautilus discovery.

From 1997-2002, Barracuda and the nearby Caratinga field (see separate analysis) shared an FPSO during a pilot production phase. However, the fields are separate and are taxed under different ring fences. The permanent facilities on Barracuda came online in December 2004 via the P-43 FPSO. Initial production performance at the field was better than expected and peak monthly production was achieved in February 2006 at 178,000 b/d. An eastern extension of the field has subsequently been developed through the Caratinga P-48 FPSO. The field is now in decline, although development drilling and the development of the pre-salt reservoir have mitigated the decreasing production. Sales gas is piped northwest via a 22-kilometre, 12-inch pipeline to the shallow water PNA-1 platform on Namorado, and then to shore.

### Key Issues

#### Deep carbonates and pre-salt opportunities

Across the Campos basin, Petrobras has identified both post- and pre-salt deeper exploration targets in existing fields that underlie the traditionally productive turbidite sands. They are contained in the deeper limestones of the Macaé formation (which is productive in the shallower water areas of the Campos basin). The Macaé is Early Cretaceous (Albian) in age and is primarily composed of oolitic carbonate shoals. Although reservoir properties are poorer than in the Carapebus, the oil is generally light.

In 2010, Petrobras drilled the 6-BRSA-752A-RJS well targeting the deep carbonate Nautilus prospect. The well discovered oil in post-salt sandstones. Reserves were estimated at 25 million barrels. An additional pre-salt accumulation was discovered by the same well at a depth of around 4,340 metres. The accumulation is an extension of the pre-salt discovery made at the nearby Caratinga field. Combined reserves for this second accumulation were estimated at 97 million barrels of oil.



## Iara (Berbigao, Sururu & Oeste de Atapu)

### Key Facts

Under Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	Sep 2008
Licences: Oeste de Atapu, Berbigao, Sururu, Area: 355 km <sup>2</sup>	Expected Startup: Berbigao	2018
Water Depth: 2224 - 2230m	Expected Startup: Sururu	2020
	Expected Startup: Oeste de Atapu	2021
	Peak Gas Production (92 mmcf/d)	2028
	Peak Oil Production (242,370 b/d)	2028
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	42.50
	Shell	25.00
	Total	22.50
	Petrogal Brasil	10.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
1,169 mmbbl Oil	Gravity (°API)	25 - 28
382 bcf Sales Gas	CO <sub>2</sub> (%)	25
<b>Remaining Reserves at 01/01/2018</b>		
1,164 mmbbl Oil		
382 bcf Sales Gas		

### Summary

Iara is comprised of three significant pre-salt accumulations: Berbigão, Sururu and Oeste de Atapu. It was discovered in 2008 and lies within the core pre-salt cluster area in the Santos basin, close to Lula-Iracema. The field has been extensively appraised by eight wells and the operator, Petrobras, conducted an EWT in 2014.

In December 2014, Petrobras declared commerciality for the Iara and Iara Entorno (see separate analysis) blocks, delimiting three separate accumulations and each extends beyond the Iara block boundary into the Iara Entorno area. The three fields, from West to East, are Berbigão, with Berbigão North and South located in the Iara Entorno area, Sururu, with Sururu North and South in the Iara Entorno Area, and Atapu, with Oeste de Atapu located in the Iara block and the main Atapu formation located in Iara Entorno. Since all three accumulations overlap both the Iara and Iara Entorno blocks, they will need to be unitised.

Original Petrobras plans aimed for a 2017 start-up of commercial production. As a result of the FPSO construction delays, first oil was rescheduled for 2018.

We expect that three of the eight replicant FPSOs commissioned by Petrobras will be deployed at the area. Two leased FPSOs will complement the development of the area. The 150,000 b/d FPSOs will be shared with the Iara Entorno area fields. Sales gas will be evacuated via pipelines linking the cluster area to processing plants at Caraguatatuba (Sao Paulo State), Cabiúnas and Itaboraí (Rio de Janeiro State).

### Key Issues

#### Total deepens strategic partnership with Petrobras

On 21 December 2016, Total acquired stakes in two of Petrobras' pre-salt deepwater licences in the Santos basin: a 22.5% interest in the Iara field complex and a 35% operated interest in the Lapa field. This deal aligns with Petrobras' strategy to farm down or divest technically challenging, high-cost assets. This acquisition is part of a wider strategic collaboration that includes the option for Petrobras to take a 20% stake in the Perdido Belt deepwater exploration Block 2 in Mexico, acquisition by Total of two gas-fired power plants able to generate 322 MW, shared use of the Bahia LNG regasification terminal, joint studies in the exploration of the Equatorial Margin and Santos basin, and collaboration on the development of subsea and seismic processing technology. The Iara deal closed in January 2018.

#### De-risking the play

The drilling results to date in the pre-salt cluster area have been excellent. Initial production rates in excess of 30,000 b/d have been achieved, and sustained production averaging over 20,000 b/d has been attained by the longest producing wells at Lula-Iracema and Sapinhoá fields. Drilling thus far at Iara has confirmed favourable reservoir characteristics at Berbigão and Atapu, although Sururu's lower permeability presents a challenge.





### Complex unitisation

In its declaration of commerciality, Petrobras identified three separate accumulations, with each reservoir lying across both lara and lara Entorno blocks. It resulted in the creation of eight fields sitting in separate ring-fences. These fields will need to be unitised before exploitation can begin. The lara Entorno area presents further complications. In September 2010, part of the field's reserves, 600 million barrels of oil equivalent, was transferred to Petrobras as part of the Transfer of Rights (TOR) agreement. However, an additional 2.5 - 4.0bnboe were discovered. These volumes will also require an unitisation agreement with the lara and lara Entorno areas.



## BM-C-33 (Gavea, Pao de Acucar & Seat)

### Key Facts

Probable Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Seat	22 Feb
Licence: BM-C-33, Area: 708 km <sup>2</sup>		2010
Water Depth: 2667 - 2788m	Discovery Date: Gavea	13 May
		2011
	Discovery Date: Pao de Acucar	08 Mar
		2012
	Expected Startup	Jan 2025
	Peak Oil Production (27,390 b/d)	2026
<b>Operator</b>	<b>Participants</b>	%
Statoil	Repsol Sinopec Brasil	35.00
	Statoil	35.00
	Petrobras	30.00
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
62 mmbbl Oil	Gravity (°API)	34 - 42
406 mmbbl Cond		
3,057 bcf Sales Gas		
<b>Remaining Reserves at 01/01/2018</b>		
62 mmbbl Oil		
406 mmbbl Cond		
3,057 bcf Sales Gas		

### Summary

The Pão de Açúcar field is the largest pre-salt discovery in the Campos basin. It is a gas and condensate field located in the southeast of the basin within the BM-C-33 licence area, which also contains the Gávea and Seat pre-salt finds. Gávea also proved to be a gas and condensate field while Seat is an oil field.

The development concept is still far from decided. The most likely development concept is a 120,000 b/d FPSO capable of processing 15 MMm<sup>3</sup>/d of gas. There will be a pipeline connecting Gávea and Seat to the Pão de Açúcar FPSO and another pipeline connecting the Pão de Açúcar FPSO to shore.

### Key Issues

#### The largest pre-salt find in the Campos basin

The three discoveries on BM-C-33 are important because they prove the extension of the pre-salt beyond the Santos basin into the southern part of the Campos basin, with Pão de Açúcar being the largest pre-salt find in the basin. Appraisal work is required, but the initial results were positive enough for the block partners to announce it held reserves of around 700 million barrels of condensate, 300 million barrels of oil and 3 tcf of gas.

#### Statoil assumes BM-C-33 operations

In agreement with its licence partners, Statoil has assumed operatorship of the BM-C-33. This is part of a global strategic agreement with Repsol.



## Frade

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Frade	04 Dec 1986
Licence: Frade, Area: 167 km <sup>2</sup>	Discovery Date: RJS-511	06 Oct 1996
Water Depth: 980 - 1128m	Issue Date	06 Aug 1998
	Joint venture contract	08 Jul 1999
	Production Started	Jun 2009
	Peak Oil Production (71,480 b/d)	2011
	Final Expiry	31 Dec 2041
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Chevron	Chevron	51.74
	Petrobras	30.00
	INPEX Offshore North Campos	18.26
<b>Primary Reservoir(s):</b>		
Paleogene\Oligocene\Rupelian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
199 mmbbl Oil	Gravity (°API)	20
27 bcf Sales Gas	Total Acid No. (mg KOH/g)	0.1
<b>Remaining Reserves at 01/01/2018</b>	Calorific Value (btu/scf)	1,045.6
106 mmbbl Oil		
12 bcf Sales Gas		

### Summary

Located in the northern Campos basin, this modest-sized oil field was discovered by Petrobras in 1986. However, it remained undeveloped for over 20 years due to its deepwater location and heavy oil. Frade was one of the development projects farmed out by Petrobras to foreign/private companies in 1998/1999, and a Texaco-led group was awarded the contract in 1999.

Development initially suffered setbacks due to delays in drilling two commitment appraisal wells and also due to the low oil price environment in the early part of the last decade. However, more robust oil prices bolstered the field's economics, and Chevron announced the Final Investment Decision (FID) in June 2006. The field was brought onstream in June 2009.

Oil production is offloaded from the FPSO into shuttle tankers and gas is piped to the Roncador field, where it is sold to Petrobras. Frade has a pipeline to both import and export gas. Later in Frade's life, once its gas production is not sufficient to supply the gas-lift and power generation systems, it is expected to import gas from Roncador.

### Key issues

#### Oil spill suspended production

In November 2011, Chevron encountered an unexpectedly high-pressure zone while drilling the 9-RJS-FR-50DP appraisal well. The pressure in the reservoirs at Frade was considered normal until water injection increased the pore pressure in the N560 reservoir. The 9-FR-50DP-RJS well plan did not account for the increased pressure, and as a result, a kick occurred. The higher than expected pressures, together with a long open-hole section and a shallow last casing seat, resulted in the fracturing of the formation at around 700 metres below the sea bed during the attempts to control the inflow of fluids. The fracture allowed the well fluids to flow from the well, and it is estimated that 3,700 barrels of oil seeped to the seabed.

Initially, it was thought that the leak had been contained, but further seeps emerged in March 2012, leading the ANP to order the shut-in of the field to allow the incident to be fully investigated. After 12 months, in April 2013, the operator received approval to resume production from six wells, two of which were only onstream for two months. Production from the other four wells has continued into 2014, and in April 2014, the operator received approval to resume production from the remaining wells.

#### Frade's licence extended until 2041

The ANP has approved the extension of Frade's concession contract until 2041. Chevron had to commit to new investments in the field. The new plans will include two additional development phases. Phase 2 includes a 4D seismic campaign to monitor the reservoir and identify new drilling sites, and drilling of six new wells by 2026. Phase 3 will run from 2026 to 2041 and plans will depend on the results of Phase 2.



## Lula-Iracema

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	Oct 2006
Licence: Lula, Area: 1,690 km <sup>2</sup>	First Oil (Lula Pilot EWT)	01 May 2009
Water Depth: 2150m	Lula Pilot Start-up	Oct 2010
	First Gas Sales	May 2011
	Iracema Start-up	Oct 2014
	Peak Oil Production (1,101,280 b/d)	2020
	Peak Gas Production (611 mmcf/d)	2020
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	65.00
	Shell	25.00
	Petrogal Brasil	10.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
5,836 mmbbl Oil	Gravity (°API)	28.8
2,899 bcf Sales Gas	Viscosity (cP)	1.1
<b>Remaining Reserves at 01/01/2018</b>	GOR (scf/bbl)	1,470
5,093 mmbbl Oil	CO <sub>2</sub> (%)	2 - 20
2,463 bcf Sales Gas		

### Summary

Lula-Iracema is a giant pre-salt oil and gas field located in the Santos basin and is one of the world's largest deepwater finds. It has opened a new frontier in Brazil that has yielded billions of barrels of reserves and will drive production growth for years to come. The development of the field is being fast-tracked, but the complexity and size of the project means that it will take years to reach peak oil production. There are major technical and commercial challenges associated with the pre-salt and Petrobras is dedicating significant resources to solve them.

#### Lula

The initial phase of development started in 2009 and has been dedicated to gaining better knowledge of the reservoir and well productivity. It comprised four extended well tests (EWTs), followed by two large-scale, long-term pilot projects started in 2010 and in 2013 using 100,000 and 120,000 b/d FPSOs.

Full development will involve the phased start-up of six additional FPSOs. In addition to the two pilot FPSOs, two leased FPSOs were installed in 2016. These will be followed by three 'replicant' FPSOs owned by Petrobras arriving in 2017 and 2018. Each facility (except for the pilot FPSOs) has a processing capacity of 150,000 b/d of oil. A final leased FPSO, likely an 80,000 b/d, is expected in 2023 to develop the fringe areas of the field.

#### Iracema

Iracema will be developed using two FPSOs. The first 150,000 b/d FPSO began operations in October 2014. The second FPSO began operations in August 2015.

### Key Issues

#### Long-term productivity

Well productivity at Lula-Iracema has exceeded initial expectations. The longest producing wells have delivered more than 20,000 b/d over four years, with decline rates at 5% per year or less and minimum water production. This leads to high well EUR, reducing the total number of wells required to develop each phase. The majority of the wells are good performing vertical or low angle deviated wells; the use of horizontal wells represents an upside. However, long-term productivity still represents a risk. Once water-breakthrough occurs, higher decline rates will develop. Hence, we factor higher decline rates in the later years of production.

#### FPSO delivery schedule

Despite the low local content requirements set for the BM-S-11 contract, high targets were set internally by Petrobras. As part of an initiative to foster the local industry, initial plans were to deploy four replicant FPSOs with construction of the hull, most of the topside modules and integration work carried out in Brazil. The shipyard industry was not able to respond in a timely manner and delays in the construction started to mount. In 2014, the Lava-Jato bribery scandal investigation compounded these problems, implicating several important contractors and restricting their access to credit.



As a result, parts of the contracts were cancelled and some of the work was transferred to Asian shipyards. In 2015, Petrobras acknowledged the delays, and the fourth 'replicant' FPSO was substituted by a leased vessel.

### Gas infrastructure

The Lula-Iracema area gas will be exported through three high capacity offshore pipelines. The construction of these lines suffered some setbacks due to the lengthy environmental licencing process and modifications to the original layout in an effort to reduce costs. The first pipeline - Rota 1, 10 Mcmd (350mmcf) capacity - came online in 2011 and the second - Rota 2, 13 Mcmd (460 mmcf) - became operational in 2016. Some of the original delays have been addressed for the third pipeline - Rota 3, 18 Mcmd (640 mmcf) - and is now expected to come onstream in 2019. The three pipelines will also serve other ongoing giant developments in the pre-salt cluster area. As total associated gas production potential from these fields is much higher than total transport and onshore processing capacity, high rates of gas re-injection is expected across all developments.

Problems with the completion of the onshore gas processing unit that will receive gas from the Rota 3 pipeline at the COMPERJ petrochemical complex in Rio de Janeiro may delay the start-up of the line. The original contract with the consortium building the processing unit was cancelled in 2015 and Petrobras held a new tender in 2017. The Chinese company Shandong Kerui placed the lowest bid and is expected to complete the construction. Although Petrobras has been looking for partners to complete the COMPERJ petrochemical complex, the company expects to be able to finish works in the gas processing plant itself.

### Reservoir connectivity with Iracema

An ongoing issue associated with the development of Lula and Iracema has been whether the reservoirs are connected. Commerciality of the Tupi field was declared on 29 December 2010, at which point the field was renamed Lula. The declaration identified Iracema to be a separate structure and as such, Petrobras argued that the two fields should be in separate tax ring-fences. However, the ANP has rejected this assertion and considers the fields to be a single accumulation within the same tax ring-fence. The block partners appealed this decision, which has a negative impact on the economics of the project since Brazil's Special Participation Tax (SPT) rate is based on the field's production level.

After the ANP rejected the appeal, the consortium turned to the International Chamber of Commerce in May 2014 to arbitrate the dispute. In June 2014, a Brazilian judge issued an injunction against appealing to the Chamber. As a result, the matter appears to be finally resolved in favour of the ANP, although Petrobras has said it will continue to seek avenues to protest the decision.

We do not anticipate any delays to the project schedule as a result of this dispute. As a result of the Brazilian court's decision, we now model the two fields together as one ring-fenced asset.



## Marlim

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Marlim	Feb 1985
Licence: Marlim, Area: 279 km <sup>2</sup>	Production Started: Marlim	Mar 1991
Water Depth: 648 - 990m	Issue Date	06 Aug 1998
	Peak Oil Production (586,320 b/d)	2002
	Peak Gas Production (154 mmcf/d)	2002
	Discovery Date: Brava	Dec 2010
	Final Expiry	06 Aug 2052
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Paleogene/Oligocene/Rupelian/Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
2,861 mmbbl Oil	Gravity (°API)	18 - 24
704 bcf Sales Gas	Sulphur (%)	0.8
<b>Remaining Reserves at 01/01/2018</b>	Total Acid No. (mg KOH/g)	1.5
322 mmbbl Oil		
75 bcf Sales Gas		

### Summary

The giant Marlim oil field is a high priority asset for Petrobras. It was the largest field in terms of reserves until the pre-salt discoveries in the Santos basin were made. The Marlim discovery (along with the Albacora discovery made in the year prior) shifted Petrobras' exploration strategy to focusing on sandstone targets, where it later achieved excellent results with the Roncador and Marlim Sul discoveries.

At the time of its discovery, Marlim's water depth of 650 to 1,050 metres rendered the field beyond the reach of production technology. Given the technological challenges, the size of the field, and the need to generate early cash flow, Marlim has been developed on a phased basis. Multiple facilities were installed across the field over three phases: an initial pilot phase followed by two main development phases. Phase 1, from 1994-1997, was focused on the north and east flanks of the field and Phase 2, from 1998-2002, targeted the south and west. Production peaked in 2002 at almost 600,000 b/d of oil and has been in decline ever since.

To try to maintain production, Petrobras has been implementing a range of strategies and technologies including infill drilling, the implementation of a 4D seismic programme, and the use of novel technologies such as subsea processing.

### Key Issues

#### Near-field exploration success - the Varredura Project

Petrobras has been carrying out a near-field exploration campaign, known as the Varredura Project, in the Campos basin since 2009. This campaign has been targeting deep prospects identified within existing production concessions, both in pre-salt and the post-salt carbonates. These discoveries deliver a high rate of return for Petrobras as they can be developed via existing production infrastructure.

At Marlim, Petrobras made the Brava discovery in pre-salt reservoirs in 2010, with potential reserves of 380 million barrels of oil. An EWT took place in 2012-2013, peaking at 3,200b/d. A decision on commerciality has not yet been made.

#### Extended contract until 2052

The ANP has approved an additional 27 years of operation for the Marlim and Voador licences. The contract extension is conditional upon additional investments to boost the recovery factor.

As part of the revitalization plan, Petrobras will decommission all existing platforms and replace them with two new units. The new FPSOs will have the capacity to process 100,000 bopd each. An additional commitment requires Petrobras to drill ten new wells.

As Petrobras has not disclosed a plan for this new development phase, we do not currently model this additional investment and production upside.



## Marlim Leste Area

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date	Jan 1987
Licence: Marlim Leste, Area: 496 km <sup>2</sup>	Issue Date	06 Aug 1998
Water Depth: 933 - 2444m	Pilot Test Started	Apr 2000
	Pilot Test Finished	Jun 2002
	P-53 Start-up	30 Nov 2008
	FPSO Cidade de Niteroi Start-up	26 Feb 2009
	Peak Gas Production (58 mmcfd)	2011
	Peak Oil Production (157,430 b/d)	2011
	Final Expiry	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Marlim Leste: Paleogene\Oligocene\Rupelian\Carapebus		
Jabuti: Cretaceous\Lower Cretaceous\Albian\Macaé\Quissama		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
599 mmbbl Oil	Gravity (°API)	23.1
155 bcf Sales Gas	Calorific Value (btu/scf)	1.0
<b>Remaining Reserves at 01/01/2018</b>	Reservoir Depth (m)	2,876
217 mmbbl Oil		
26 bcf Sales Gas		

### Summary

Marlim Leste is a medium-sized, deepwater oil and gas field located to the east of the giant Marlim field. It was discovered in 1987, but remained undeveloped for 22 years as Petrobras concentrated on the larger deepwater fields in its portfolio.

The field is being exploited using a floating production and offloading vessel (FPO) and a floating production storage and offloading vessel (FPSO). The first FPO vessel (the P-53) was brought onstream in November 2008 and is exploiting heavy oil from the shallower Carapebus formation sandstone reservoirs. The second module (the Cidade de Niterói FPSO) came onstream in February 2009.

Oil is transported to Brazilian refineries via a pipeline/tanker system that was developed to serve three fields in the Campos Basin: Marlim Leste, Marlim Sul and Roncador. The project is known as PDET (Oil Transportation and Processing Master Plan) and came onstream in late-2007. The crude is piped from Marlim Leste to the PRA-1 platform, some 48 kilometres to the northwest. A floating storage and offloading (FSO) vessel is located near the PRA-1. Gas is exported to market via a dedicated line tied back to the P-26 facility on the Marlim field.

### Key Issues

#### New development plan

In December 2014, the ANP approved a new development plan for Marlim Leste. The plan calls for a new drilling campaign and an investment program through 2017 to develop the remainder of the field.



## Marlim Sul

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date	Oct 1987
Licence: Marlim Sul, Area: 960 km <sup>2</sup>	Pilot Phase - Production Started	Apr 1994
Water Depth: 1159 - 1874m	Issue Date	06 Aug 1998
	Module 1 - Production Started	Dec 2001
	Module 2 - Production Started	Jan 2009
	Production Started: Mucua	Aug 2010
	Production Started: Jurará	Sep 2010
	Module 3 - Production Started	Jul 2011
	Final Expiry: Marlim Sul	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Marlim Sul: Paleogene\Oligocene\Rupelian\Carapebus		
Mucua: Cretaceous\Lower Cretaceous\Albian\Macaé		
Jurará: Cretaceous\Lower Cretaceous\Albian\Macaé		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
1,518 mmbbl Oil	Gravity (*API)	13 - 27
1,051 bcf Sales Gas		
<b>Remaining Reserves at 01/01/2018</b>		
317 mmbbl Oil		
227 bcf Sales Gas		

### Summary

Located in the Campos basin, Marlim Sul is one of Brazil's largest producing assets. The development has presented technical challenges, and initial development of the field was less of a priority than Marlim. Marlim Sul is far larger in areal extent than Marlim, but recoverable reserves are roughly comparable, as Marlim Sul has a much thinner and more heterogeneous reservoir than its neighbour.

The Marlim Sul area is also host to other fields, including two deep carbonate accumulations beneath it, Jurará and Muçuã. These fields were discovered in 2007 and 2008 respectively. In early 2013, the operator announced the discovery of the Mandarin field, an Eocene-age sandstone body brought onstream in late-2013.

Petrobras is developing Marlim Sul in phases, as this assists in gathering reservoir data and building experience, in addition to testing new deepwater technology. The field is being exploited through two phases, each comprising two separate modules.

Phase 1 aimed at exploiting reserves that lie in waters less than 1,500 metres deep in the north (Module 1) and west-central (Module 2) areas. Phase 2 is exploiting deeper water in the east-central area (Module 3) and Module 4 is still under study, but would target the extreme east and south portions of the field.

### Key Issues

#### Upside from near-field exploration

In August 2017, the operator discovered the pre-salt Poraquê Alto accumulation. The 6-BRSA-1349-RJS well found 45 metres of net pay. We estimate volumes of 150mmbbl, although further testing and drilling is still required. Prior exploration near the Marlim Sul field has also yielded positive results. The deep carbonate accumulations, Muçuã and Jurará, may hold up to 350 million barrels. They have been producing since 2010 and some wells have peaked above 25,000 b/d of oil. These discoveries were followed by the deeper sandstones of the Mandarin accumulation. Petrobras has produced from this reservoir since 2013 and has achieved well production rates above 10,000 b/d.

#### Further exploration and development investment

Similarly, to other mature giant fields in the Campos basin, the ANP is pushing the operator to intensify investment in order to increase the recoverable volumes before the licence expiry date in 2025. Further investments include production and injection wells targeting sub-exploited reservoirs, the upgrade of facilities to increase injection capacities, and exploration and development of the Module 4 area. Module 4 encompasses extra viscous heavy oil in ultra-deep waters to the south-eastern portion of the field.





### FPSO Marlim Sul

The FPSO Marlim Sul was decommissioned in early-2015 after an agreement to extend the lease of the vessel was not reached. At the end of 2014, the FPSO was producing 27,000 b/d through five wells. The wells will be eventually re-connected to adjacent facilities. However, as no clear plans were announced, we do not model production from these wells.



## Maromba

### Key Facts

Probable Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date	13 Jun 2003
Licence: Maromba, Area: 410 km <sup>2</sup>	Declaration of Commerciality	26 Dec 2006
Water Depth: 164m	Expected Startup	Jan 2025
	Peak Oil Production (49,880 b/d)	2028
	Final Expiry	26 Dec 2033
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	70.00
	Chevron	30.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Upper Cretaceous\Maastrichtian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
131 mmbbl Oil	Gravity (°API)	14 - 16
<b>Remaining Reserves at 01/01/2018</b>		
131 mmbbl Oil		

### Summary

Maromba is a fringe asset in Petrobras' portfolio. It is a relatively small and technically challenging oil field in the Campos basin. We expect commercial production from Maromba to commence in 2025.

Development plans are still at the conceptual stage. The proposed production system for the development of Maromba foresees the use of an FPSO that will serve both for the EWT and the commercial production system. Four options were evaluated including a fixed wellhead platform along with an FPSO. The technical and economic feasibility study concluded that the use of a fixed platform would not be necessary, thereby reducing project costs. We expect that an FPSO with a capacity of 60,000 b/d will be leased.

### Key Issues

#### Divestment process

On 06 July 2017, Petrobras announced its intention to divest the Maromba field. Chevron has also announced that its stake is for sale, making 100% of the asset for sale. Potential buyers are required to have operating experience in offshore fields. If part of a consortium, only the leading buyer needs to qualify.

#### ANP may force relinquishment

The ANP has threatened to revoke concessions of fields where activities have been halted for more than one year. The list includes 26 fields located in six basins, including Maromba.

The ANP has notified the operators, granting a period of one year for work to resume. If companies do not resume activities, their licenses will be revoked.



## Peregrino

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Peregrino	Jun 2004
Licence: Peregrino, Area: 583 km <sup>2</sup>	Issue Date	06 Sep 2006
Water Depth: 100m	Declaration of Commerciality	20 Mar 2007
	Production Started: Peregrino	Apr 2011
	Final Expiry	05 Sep 2033
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Statoil	Statoil	60.00
	SINOCHEM	40.00
<b>Primary Reservoir(s):</b>		
Paleogene\Eocene\Ypresian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
579 mmbbl Oil	Gravity (°API)	14.5
<b>Remaining Reserves at 01/01/2018</b>	Viscosity (cP)	122.5
421 mmbbl Oil		

### Summary

Peregrino is Statoil's largest offshore operation outside of Norway and is a key part of the company's global growth strategy. The field produces heavy oil and is in the shallow waters of the Campos basin.

The first phase is being developed using two fixed wellhead platforms, with production flowing to a 100,000 b/d FPSO. In order to maximise recovery of the heavy crude, long-reach horizontal wells equipped with downhole electric submersible pumps (ESPs) are being used. Production started in April 2011. There are currently 22 producers and six water injectors in operation. Phase 1 has seen the joint development of the Peregrino main area with a portion of its southwest extension discovered in 2007.

Phase 2 will see the development of Pitangola (named Peregrino Sul before declared commercial) and the portion of the southwest extension not exploited in Phase 1. The Phase 2 development will use an additional wellhead platform, and production will be tied back to the existing FPSO. First oil is expected in 2020. The Pitangola field was unitised with Peregrino, being jointly developed and paying Special Participation Taxes.

### Key Issues

#### Reserves upside potential

Promising exploration potential remains in the area. Oil has been discovered in Albian carbonates that lie beneath the Pitangola field. A northern extension, as well as the Juxiá and Isolado prospects, lying to the west and east of the Peregrino main area, respectively, will need to be further appraised.

A polymer injection pilot was launched in early 2017. It will last 12 to 18 months, via one water injector being monitored by two nearby producers. If successful, the technique can be implemented in full-scale further increasing the volumes of recoverable oil. Until the success of the pilot is determined, we do not model additional costs or upside from polymer injection.

#### Cost reduction efforts

Statoil has focused heavily on cost reduction efforts to make Peregrino economic under low oil prices. For Phase 2, original plans required US\$3.5 billion of development capex. The simplification of the project and a more efficient procurement strategy cut the costs to US\$2.8 billion. The substitution of a special jacket design by a standard design, modification of an existing drilling rig instead of a new build, a shorter tie-back from fixed platform C to the existing infrastructure and relocation of wells to reduce average lateral lengths are some of the measures taken to reduce the project cost.

For Phase I, contract renegotiations led to an opex reduction of 20%. Statoil will operate and maintain the FPSO, instead of outsourcing the operation. Fixed platforms A and B's rigs will be operated by a single drilling crew, reducing labour and logistics costs. A new contract for chemicals and materials, and for maintenance of the fixed platforms also contributed to the results achieved.



## Roncador

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date	Oct 1996
Licence: Roncador, Area: 430 km <sup>2</sup>	Issue Date	06 Aug 1998
Water Depth: 1700m	Production Started (Module 1 pilot)	Jan 1999
	Module 1 Start-up	May 2000
	P-36 sinking	Mar 2001
	Module 2 Start-up	Dec 2007
	Module 3 Start-up	Jan 2014
	Module 4 Start-up	May 2014
	Peak Oil Production (353,750 b/d)	2009
	Peak Gas Production (180 mmcf/d)	2020
	Final Expiry	05 Aug 2025
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Upper Cretaceous\Maastrichtian\Carapebus		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
2,620 mmbbl Oil	Gravity (°API)	17 - 31
1,228 bcf Sales Gas	Sulphur (%)	0.6
<b>Remaining Reserves at 01/01/2018</b>	Total Acid No. (mg KOH/g)	1.5
1,386 mmbbl Oil	CO <sub>2</sub> (%)	2 - 4.5
605 bcf Sales Gas		

### Summary

Roncador is one of the largest and most important fields in Petrobras' portfolio. Located in the deep waters of the Campos basin, it is one of the country's biggest producers and generates significant cash flow for the company. It was discovered in 1996 and full-scale production began in 1999. Given its size and the different nature of the reservoir on each particular area of the field, Roncador is being developed in four phases. Each phase requires a separate production unit. However, progress has been hindered by problems and delays.

- Module 1/1A: exploits the lighter oil in the north and east of the field. After a pilot test, permanent facilities were brought online in January 1999. However, the P-36 FPS sank due to a gas explosion in March 2001. It was replaced by an FPS and an FPSO. The 90,000 b/d FPSO Brasil and 180,000 b/d P-52 FPS were brought onstream in 2002 and 2007 respectively. In early-2014, the FPSO Brasil was decommissioned.
- Module 2: exploits the heavier oil in the southwest of the field. Following a pilot test, the 180,000 b/d P-54 FPSO was brought onstream in 2007.
- Module 3: exploits the southeast part of the field. The 180,000 b/d P-55 FPS came onstream in January 2014. A pipe-laying accident in March 2014 temporarily slowed the ramp-up of this module, but eight wells were in production by late-2014.
- Module 4: the last planned module exploits the southern-central part of the field. The 180,000 b/d P-62 FPSO came onstream in May 2014.

The oil produced is transported via both pipeline and shuttle tanker. Gas sales are transported via the Campos basin pipeline infrastructure.

### Key Issues

#### Statoil acquires 25% interest in the Roncador field

On 18 December 2017, Statoil announced it had acquired 25% participation in the Roncador field in Brazil from Petrobras. As part of the deal, the Major has guaranteed access to onshore gas processing capacity at the Cabiúnas terminal for its operated project BM-C-33. Statoil will pay US\$2.35 billion at deal closing and will carry Petrobras investments worth US\$550 million aiming to increase the recovery factor.

Petrobras and Statoil announced remaining recoverable volumes of 1 bnboe, but the two companies expect to increase the recovery factor by 5%, producing an additional 500 mmboe, through technical cooperation on IOR and infill drilling. Using the asset phase functionality from our Global Economic Model (GEM) tool, we value the initial 1 bnboe at US\$8.0 billion, with the incremental recovery of 500 mmboe adding US\$1.6 billion to the NPV.



### Production decline management

The cash flow generated by Roncador (and Petrobras' wider Campos basin assets) provides a significant component of the investment required to develop the company's pre-salt assets, particularly in the near-term, with ramp-up of two new production facilities underway during the next few years.

However, production has disappointed and Petrobras is now under pressure from the ANP to reverse the production decline of recent years. In February 2015, Petrobras announced that initial production at Modules 3 and 4 had disappointed due to worse than expected reservoir characteristics.



## Tartaruga Verde

### Key Facts

Onstream		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Campos	Discovery Date: Tartaruga Verde	13 Jun 2009
Licence: Tartaruga Verde, Area: 93 km <sup>2</sup>	EWT Start-up	Jun 2011
Water Depth: 976m	Issue Date	Dec 2012
	Final Expiry	Dec 2039
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b> Cretaceous\Lower Cretaceous\Albian\Macaé\Quissama		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
316 mmbbl Oil	Gravity (°API)	28
<b>Remaining Reserves at 01/01/2018</b> 299 mmbbl Oil		

### Summary

Located in the Campos basin 125 kilometres off the coast of Macaé, Tartaruga Verde was discovered by Petrobras in 2009. The company plans to develop the field using a 150,000 b/d FPSO. Limited production via a series of extended well tests began in 2011. Petrobras is targeting full commercial production starting in late-2017, although we assume a more conservative start date of 2018.

### Key Issues

#### Unification and new field development plan

The Brazilian National Petroleum Agency (ANP) has ruled that Tartaruga Verde and Tartaruga Mestiça are one field, and must be unitised into a single ring fence. Petrobras is currently working on a new development plan. In December 2014, Petrobras awarded a 20-year FPSO lease contract to a Modec-Schahin consortium to supply a 150,000 b/d FPSO for the field, with delivery scheduled for late-2017.

#### Carbonate concerns

The field is reservoirised in Albian-aged carbonates, where a string of discoveries has been recorded in recent years. However, the initial production at some fields, including Polvo and Tubarão Azul, have been below expectations. These projects were fast-tracked to first oil, but the reservoirs have turned out to be more complex than originally thought. Petrobras conducted an 8-month EWT of the Tartaruga Verde discovery well starting in June 2011. A 10-month EWT of the Tartaruga Mestiça well started in March 2012. A 9-month well test commenced in July 2014 at Tartaruga Verde and a 13-month EWT at Tartaruga Verde started in November 2015. Test results have been positive, leading Petrobras to continue with development plans aimed at a late-2017 production start-up date. We model a slightly more conservative, early-2018, start date.



## Búzios

### Key Facts

Under Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	30 Sep 2010
Licence: Búzios, Area: 852 km <sup>2</sup>	EWT Startup	Mar 2015
Water Depth: 2100m	Full-Field Expected Startup	2018
	Peak Oil Production (950,890 b/d)	2034
	Peak Gas Production (603 mmcf/d)	2034
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
6,987 mmbbl Oil	Gravity (°API)	28
4,341 bcf Sales Gas		
<b>Remaining Reserves at 01/01/2018</b>		
6,981 mmbbl Oil		
4,341 bcf Sales Gas		

### Summary

Búzios is a giant pre-salt oil and gas field located in the Santos basin. The field, formerly known as Franco, was discovered by the ANP and renamed Búzios upon its declaration of commerciality. It is located 41 kilometres to the northeast of the lara field complex in water depths of almost 2,200 metres. Early estimates indicated that the discovery held around 4.5 billion barrels of oil equivalent.

In September 2010, 3 bnboe were transferred to Petrobras as part of the Transfer of Rights (TOR) agreement. Later estimates indicated additional reserves between 6.5 to 10 bnboe. These volumes are known as the Transfer of Rights surplus volumes.

Petrobras will develop the reserves through ten FPSOs. First oil is scheduled for 2018, prior to which a series of EWTs are planned. The first EWT took place in 2015. The second and third began in 2016. There is the possibility of additional tests later.

Sales gas will be transported via pipelines linking the pre-salt Cluster Area to processing plants at Cabiúnas and Comperj onshore gas processing units in the Rio de Janeiro State.

### Key Issues

#### Valuation based on the Transfer of Rights (TOR) agreement

Under the terms of the TOR contract, the reserves volumes and value of each TOR block is re-assessed at declaration of commerciality. The first step of the review process comprised the hiring of two independent reserves certification companies by the ANP and Petrobras, re-assessing volumes and values. The ANP hired Gaffney, Cline and Associates, while Petrobras hired DeGolyer and MacNaughton. The studies were concluded in Q2 2017.

Depending on the new valuation, adjustments might need to be made. If the revised valuation is higher than the original valuation, Petrobras will either pay the difference to the government or request a reduction in the volume of reserves to be produced. If the revised valuation is lower, then the government will pay the difference to Petrobras. In the case of Búzios, Petrobras acquired 3,058 mmbboe for US\$9.04/boe. The operator confirmed this reserve estimate during DOC. The time of release of the final terms is still uncertain.

#### Surplus volumes of the Transfer of Rights (TOR) agreement

Exploration at all the TOR areas has been very successful, confirming the contracted volumes and discovering additional volumes at four of the six TOR areas. The additional volumes are called the Transfer of Rights surplus volumes.

Búzios holds additional volumes between 6.5 and 10 bnboe. In June 2014, the Ministry of Mines and Energy (MME) decided to award the exploitation of the four surplus volumes areas directly to Petrobras under production sharing contracts. Since then, the National Audit Office (Tribunal de Contas da União) has imposed a court injunction forbidding Petrobras and the MME from signing the contracts. The contract will be reviewed and signed only after the original TOR terms review is finished.



## Iara Entorno

### Key Facts

Under Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	19 May
Licence: Iara Entorno, Area: 565 km <sup>2</sup>		2013
Water Depth: 2230 - 2266m	Issue Date	29 Dec
		2014
	Expected Startup	2018
	Peak Gas Production (222 mmcf/d)	2029
	Peak Oil Production (384,800 b/d)	2029
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
2,213 mmbbl Oil	Gravity (°API)	25 - 28
1,037 bcf Sales Gas	CO <sub>2</sub> (%)	25
<b>Remaining Reserves at 01/01/2018</b>		
2,210 mmbbl Oil		
1,037 bcf Sales Gas		

### Summary

Iara Entorno is a pre-salt oil and gas discovery located in the Santos basin of Brazil and is an extension of the three accumulations discovered at the Iara area. Iara Entorno reserves were included as part of the Transfer of Rights (TOR) agreement between the Brazilian government and Petrobras, signed in September 2010.

In December 2014, Petrobras declared commerciality for the Iara and Iara Entorno blocks, delimiting three separate accumulations. Two of the three accumulations are centred in the Iara block, and each extends beyond the block boundary into the Iara Entorno area. The three fields, from West to East, are Berbigão, with Berbigão North and South located in the Iara Entorno area, Sururu, with Sururu North and South in the Iara Entorno Area, and Atapu, with West Atapu located in the Iara block and the main Atapu formation located in Iara Entorno.

First oil is scheduled for 2019. We expect that the five accumulations will need to be unitised with their Iara components before development can proceed.

### Key Issues

#### Valuation based on the Transfer of Rights (TOR) agreement

Under the terms of the TOR contract, the reserves volumes and value of each TOR block is re-assessed at declaration of commerciality. In December 2014, the last TOR area, Iara Entorno, was declared commercial and the review process began. The first step of the review process comprised the hire of two independent reserves certification companies by the ANP and Petrobras, re-assessing volumes and values.

Depending on the new valuation, adjustments may need to be made. If the revised valuation is higher than the original valuation, Petrobras will either pay the difference to the government or request a reduction in the volume of reserves to be produced. If the revised valuation is lower, then the government will pay the difference to Petrobras. In the case of Iara Entorno, Petrobras acquired 600 mmboe for US\$5.82/boe. The operator confirmed this reserve estimate during DOC. The time of release of the final terms is still uncertain.

#### Surplus volumes of the Transfer of Rights (TOR) agreement

Exploration at all the TOR areas has been very successful, confirming the contracted volumes and discovering additional volumes at four of the six TOR areas. The additional volumes are called the Transfer of Rights surplus volumes.

Iara Entorno holds additional volumes between 2.5 to 4.0 bnboe. In June 2014, the Ministry of Mines and Energy (MME) decided to award the exploitation of the four surplus volumes areas directly to Petrobras under production sharing contracts. Since then, the National Audit Office (Tribunal de Contas da União) has imposed a court injunction forbidding Petrobras and the MME from signing the contracts. The contract will be reviewed and signed only after the original TOR terms review is finished.





### Complex unitisation

In its declaration of commerciality, Petrobras identified three separate accumulations, with each reservoir lying across both lara and lara Entorno blocks. It resulted in the creation of eight separate development ring-fences. These fields will need to be unitised before exploitation can begin. The lara Entorno area presents further complications, as the TOR surplus volumes will need to be unitised with the concession and original TOR volumes. An unitisation agreement will be required before production begins.



## Itapu

### Key Facts

Probable Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	2013
Licence: Itapu, Area: 162 km <sup>2</sup>	Declaration of commerciality	Sep 2014
Water Depth: 2009m	Expected Startup	2022
	Peak Oil Production (128,700 b/d)	2024
	Peak Gas Production (59 mmcfd)	2024
<b>Operator</b>	<b>Participants</b>	%
Petrobras	Petrobras	100.00
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
663 mmbbl Oil	Gravity (°API)	29
264 bcf Sales Gas		
<b>Remaining Reserves at 01/01/2018</b>		
656 mmbbl Oil		
264 bcf Sales Gas		

### Summary

Itapu (formerly Florim) is a pre-salt oil and gas discovery located in the Santos basin of Brazil. The field's reserves were included as part of the Transfer of Rights (TOR) agreement between the Brazilian government and Petrobras, signed in September 2010. Additional reserves were discovered in the area and are known as the surplus volumes, which will be produced under a production sharing contract.

We assume a 150,000 b/d FPSO will be leased for the development. As an alternative, one of the eight replicant FPSOs being commissioned by Petrobras could be reallocated to the Itapu field.

### Key Issues

#### Valuation based on the Transfer of Rights (TOR) agreement

Under the terms of the Transfer of Rights (TOR) contract, the reserves volumes and the value of each TOR block is re-assessed at declaration of commerciality (DOC). The first step of the review process comprised the hire of two independent reserves certification companies by the ANP and Petrobras, re-assessing volumes and values.

Depending on the new valuation, adjustments may need to be made. If the revised valuation is higher than the original valuation, Petrobras will either pay the difference to the government or request a reduction in the volume of reserves to be produced. If the revised valuation is lower, then the government will pay the difference to Petrobras. In the case of Itapu, Petrobras acquired 467 mmbbl for US\$9.01/boe.

Initial expectations is that the Brazilian government will have to reimburse Petrobras. Payment would come in the form of more oil reserves under the Transfer of Rights reserves.

#### Surplus volumes of the Transfer of Rights (TOR) agreement

Exploration at all TOR areas was very successful, confirming the contracted volumes and discovering additional volumes at four of the six TOR areas. The additional volumes are known as the Transfer of Rights surplus volumes.

Itapu holds additional volumes of between 300 and 500 mmbbl. In June 2014, the Ministry of Mines and Energy (MME) decided to award the exploitation of the four surplus volumes areas to Petrobras under production sharing contracts. Since then, the National Audit Office (Tribunal de Contas da União) has imposed a court injunction forbidding Petrobras and the MME from signing the contracts. The contract will be reviewed and signed only after the original TOR terms review is finished.



## Sepia

### Key Facts

Under Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	13 Apr 2012
Licence: Sepia, Area: 174 km <sup>2</sup>	EWT Start-up	Feb 2016
Water Depth: 2131m	Expected Startup	2021
	Peak Gas Production (88 mmcf/d)	2023
	Peak Oil Production (127,480 b/d)	2023
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	100.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
743 mmbbl Oil	Gravity (°API)	26
470 bcf Sales Gas	CO <sub>2</sub> (%)	20
<b>Remaining Reserves at 01/01/2018</b>		
740 mmbbl Oil		
470 bcf Sales Gas		

### Summary

Sépia (formerly Northeast of Tupi) is a pre-salt oil and gas discovery located in the Santos basin of Brazil. The field's reserves were included as part of the Transfer of Rights (TOR) agreement between the Brazilian government and Petrobras, signed in September 2010.

First oil is scheduled for 2020, but we assume a more conservative 2021 start year. In August 2015, Petrobras issued a tender for a chartered FPSO with capacity to produce 180,000 b/d of oil and process 172 mmcf/d (5 Mcmd) of gas. The contract will be for thirteen years, with the possibility of an extension for another eight years.

### Key Issues

#### Sépia Leste

Appraisal work confirmed that the Sépia reservoir extends into the BM-S-24 block, where the Júpiter discovery lies. In November 2015, the Sépia extension was trimmed from the original block and declared commercial. The area was re-named Sépia Leste (see separate analysis).

#### Sépia FPSO

In August 2015, Petrobras issued a tender to lease an FPSO for Sépia with capacity to produce 180,000 b/d of oil and process 172 mmcf/d (5 Mcmd) of gas. The high local content requirements, project complexities and high cost to finance the construction of the FPSO resulted in the deadline for contractors to submit proposals being postponed several times. Initial bids had lease rates close to US\$1 million/day, representing 30% to 40% of overprice.

Petrobras called a second tender. This time, local content requirements were greatly reduced, with part of the construction process allowed to be done outside of Brazil. The winning bid is expected to be around US\$720,000/day. However, the signature of contracts and start of construction still depends on the approval of a local content waiver for the FPSO.

We expect the process will only be finalised in Q1 2018. Allowing 38 months from contract signature to first oil, resulting in a mid-2021 start date for the Sépia field.

#### Valuation based on the Transfer of Rights (TOR) agreement

Under the terms of the Transfer of Rights (TOR) contract, the reserves volumes and the value of each TOR block is re-assessed at declaration of commerciality (DOC). The first step of the review process comprised the hire of two independent reserves certification companies by the ANP and Petrobras, re-assessing volumes and values. The ANP hired Gaffney, Cline and Associates, while Petrobras hired DeGolyer and MacNaughton. The studies were concluded in Q2 2017.

Depending on the new valuation, adjustments may need to be made. If the revised valuation is higher than the original valuation, Petrobras will either pay the difference to the government or request a reduction in the volume of reserves to be produced. If the revised valuation is lower, then the government will pay the difference to Petrobras. In the case of Sépia, Petrobras acquired 428 mmbbl for US\$8.54/boe.



Initial expectations are that the Brazilian government will have to reimburse Petrobras. Payment would come in the form of more oil reserves under the Transfer of Rights reserves.

### Surplus volumes of the Transfer of Rights (TOR) agreement

Exploration at all TOR areas was very successful, confirming the contracted volumes and discovering additional volumes at four of the six TOR areas. The additional volumes are known as the Transfer of Rights surplus volumes.

Sépia holds additional volumes of between 500 and 700 mmbob. In June 2014, the Ministry of Mines and Energy (MME) decided to award the exploitation of the four surplus volumes areas to Petrobras under production sharing contracts. Since then, the National Audit Office (Tribunal de Contas da União) has imposed a court injunction forbidding Petrobras and the MME from signing the contracts. The contract can be reviewed and signed only after the original TOR terms review is finished.



## Libra

### Key Facts

Probable Development		Offshore
<b>Location</b>	<b>Timetable</b>	
Sector, Basin: Rio de Janeiro, Santos	Discovery Date	25 Feb 2011
Licence: Libra, Area: 1,548 km <sup>2</sup>	Issue Date	02 Dec 2013
Water Depth: 1964m	Expected Startup	Jul 2021
	Peak Oil Production (1,253,720 b/d)	Jan 2030
	Final Expiry	01 Dec 2048
<b>Operator</b>	<b>Participants</b>	<b>%</b>
Petrobras	Petrobras	40.00
	Shell	20.00
	Total	20.00
	CNOOC Ltd	10.00
	CNPC	10.00
<b>Primary Reservoir(s):</b>		
Cretaceous\Lower Cretaceous\Aptian		
<b>Recoverable Reserves (p+p)</b>	<b>Hydrocarbon Quality</b>	
6,227 mmbbl Oil	Gravity (°API)	27
<b>Remaining Reserves at 01/01/2018</b>		
6,225 mmbbl Oil		

### Summary

Libra is a major pre-salt oil and gas field located in the Santos basin and is one of Brazil's flagship assets. Libra was discovered by Brazil's upstream regulator, the Agência Nacional do Petróleo (ANP), in 2011. It is located in ultra-deep waters, around 45 kilometres to the northeast of the lara pre-salt field. The ANP has suggested that it holds reserves of 8 to 12 bnboe, and it is possible that the field is the largest in Brazil.

The field was the first pre-salt opportunity to be offered to industry under the country's new Production Sharing Contract (PSC) fiscal system. It was licensed in November 2013 by a consortium of five companies that submitted the only bid for the minimum allowable amount. There are major technical and commercial challenges associated with the pre-salt, and Petrobras and its partners are dedicating significant resources to solve them.

### Key Issues

#### Mero declaration of commerciality

In November 2017, Petrobras declared commerciality of the north-western portion of the discovery, calling it the Mero field. Appraisal work continues in the central and south-eastern sections. Mero will be developed by the first four FPSOs planned for the Libra area. The operating consortium estimates recoverable volumes of 3.3 billion barrels of oil in the area. Libra's first extended well test started in the Mero area in November 2017. In December 2017, the consortium awarded the construction contract for the first full-development FPSO to Moddec.

The central and southeast portion of the Libra area had their exploration period extended for another 27 months, to March 2020.

#### Local content

The Libra contract set a global local content target of 59%. This commitment was established at a time when the Sete Brasil project and a major revamp of local shipyards were expected to provide locally-built drilling rigs and FPSOs built from scratch in Brazil. Nowadays, both options are severely limited, and we see local content targets above 35% as very hard and expensive to achieve. Higher targets will be particularly challenging post-2020, when at least four FPSOs per year are planned to come onstream in the country. This will stretch even more the limited local supply capacity.

In 2016, the consortium applied for a partial waiver of its local content commitments on the construction of the first FPSO (Piloto de Libra). To substantiate its waiver request, the consortium provided the results of two FPSO construction tenders carried out with very different local content requirements. Tenders that satisfied the original local content target were 40% over the price of offers with very limited local content. In 2017, the ANP partially approved the waiver request, reducing the average FPSO local content level to 35%.



### Gas contaminants

The high carbon dioxide content in Libra gas, around 45%, adds more challenges to the development. Special alloy pipes are necessary to resist corrosion, adding to costs. Furthermore, traditional membrane separation technology may not be able to reduce the carbon dioxide content to the required levels for transportation. Alternatively, the re-injection of gas rich in carbon dioxide can assist with enhanced recovery. We therefore expect all gas not consumed in-field to be re-injected.

### The role of Pré-sal Petróleo SA (PPSA) and potential for political interference

Pré-sal Petróleo SA (PPSA) is an entity set up by the Brazilian government to represent the interests of the state in pre-salt developments governed by the new PSC system. The entity has veto power on all development decisions for Libra. This is potentially a source of project delay, although the government has mitigated some of these concerns by appointing only experienced technical teams to lead the PPSA to date.

### Unitisation

Work done to date has shown that the Libra reservoir stretches south in the direction of Búzios, beyond the block boundary. There is evidence that a small portion of the reservoir also extends beyond the north boundary of the block, which can only be effectively confirmed after drilling a well in the area. These areas will need to be unitised with Libra.



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April 3, 2018

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**Re: Attachment of Report to Offering Memorandum for RioPrevidência Securitization Transaction**

Ladies and Gentleman,

Reference is hereby made to the report entitled “Oil Royalties Securitization Bond Offering” dated March 28, 2018, attached as Annex I hereto (the “**Expert Report**”, which was originally prepared for the use of and under the instructions provided by BNP Paribas Securities Corp. (“**BNPP**”) and BB Securities Ltd. (“**BB Securities**” and, together with BNPP, the “**Initial Purchasers**”) for purposes of the offering of Series 2018-1 Notes (the “**Notes**”) by Rio Oil Finance Trust (the “**Issuer**”) pursuant to an agreement between Wood Mackenzie Ltd. (the “**Expert**”) and the Initial Purchasers, dated January 24, 2018 (the “**Agreement**”) and attached hereto as Annex II. Capitalized terms used but not otherwise defined herein shall have the respective meanings ascribed thereto in the Agreement.

1. I, Chris Grieve, hereby certify to the Issuer and the Initial Purchasers that I am a duly authorized representative of Wood Mackenzie Ltd.
2. The Expert has used reasonable skill and care as described in the Agreement in the preparation of the Expert Report.
3. The Expert Report may be relied upon by the Issuer and the Initial Purchasers with the following conditions:

- (a) The Expert Report was prepared for the Initial Purchasers on the basis of



- the Agreement, which includes the Expert's standard Consulting Agreement and Terms and Conditions;
- (b) The Expert Report was prepared on the terms and subject to the qualifications and assumptions set out in the Agreement;
  - (c) The Expert is not responsible for providing advice on legal, regulatory, tax, investment, or accounting matters.
  - (d) The Expert Report was prepared for the Initial Purchasers in connection with the offering of the Notes and was not prepared for, and should not be treated as suitable for, any other purpose.
4. The Expert acknowledges and consents to (1) the inclusion of the Expert Report in its entirety in any draft of a preliminary offering memorandum, preliminary offering memorandum or final offering memorandum related to the Notes (each, an "**Offering Document**"), (2) the inclusion in any such Offering Document of the summary and/or excerpts from the Expert Report included in Annex III hereto, which summary and/or excerpts, as applicable, represent a fair and accurate summary of the Expert Report, (3) being named in such Offering Document as an independent oil and gas industry consultant, and (4) the reliance on the Expert Report by each recipient that is an investor in the Notes being offered pursuant to the Offering Documents (for the avoidance of doubt, without having to execute a reliance letter); provided that the Expert Report will state that each recipient of the Offering Document will be deemed to acknowledge that as a condition to receiving the Expert Report attached to the Offering Document, it will be subject to the terms and conditions of the Agreement including the limitations of liability and standard of care therein (it being understood that items 1 through 3 above shall be for the benefit of the Initial Purchasers, as initial purchasers of the Notes and the Issuer).
5. The Expert confirms that, as of the date hereof, nothing has come to their attention that would cause them to believe that, as of the date hereof, any of the sections of the Expert Report contains any untrue statements of material fact or omits to state a material fact necessary in order to make the statements therein, in light of the circumstances under which they were made, not misleading. The Expert hereby confirms that the evaluation, conclusions and recommendations contained in the Expert Report are complete and correct in all material respects.

IN WITNESS WHEREOF, the undersigned has executed this letter on the date set forth above.

**WOOD MACKENZIE LTD.**

By:   
Name: Chris Grieve  
Title: EVP CONSULTING

## ANNEX I