

Annex 27:
Commission Paper on the Comparative Benefits of Timor LNG and
Darwin LNG & Condensed Comparative Analysis of Alternative
Development Concepts

COMMISSION PAPER
ON THE COMPARATIVE DEVELOPMENT BENEFITS OF TIMOR-LNG AND DARWIN-LNG

The present Paper is intended to set out an objective comparison of the benefits of the development options available for the Greater Sunrise field based on the information available to the Commission as of 22 February 2018.

The Commission recalls that, as part of the 30 August Agreement the governments of Timor-Leste and Australia agreed to criteria for the assessment of proposals for the development concept. In the Commission's view, the differences between the two governments and the Joint Venture in assessing the two concepts relate principally to:

- (a) whether both concepts will “support[] the development objectives and needs of each of Timor-Leste and Australia” and make “a significant contribution to the sustainable economic development of Timor-Leste”; and
- (b) whether both concepts are “commercially viable, including best commercial advantage”.

From the perspective of the sovereign decision of how to develop the resource, however, these criteria are inter-related. Development considerations bear on the benefits that the two governments—and, in particular, Timor-Leste—will derive from the resource. Development benefits, however, can only be realized if an approach to developing the resource is designed that is commercially viable.

The Commission does not wish to make a recommendation to the Parties regarding the development of Greater Sunrise, but considers that the Parties' decision-making would benefit from a neutral comparison of the two concepts in terms of the above metrics. A concise comparison of the two concepts is also set out in the chart included with this Paper as an Annex.

A. Development Benefits of the Timor-LNG and Darwin-LNG Concepts

1. Timor-LNG

The principal development benefits of a Timor LNG concept would follow from the construction and operation of an LNG plant and associated marine facilities at Beço on the south coast of Timor-Leste. As the Commission understands it, these benefits include the following:

- (a) the return on investment for capital committed to the construction of the LNG plant;
- (b) the economic multiplier effects of oil and gas activity in Timor-Leste;
- (c) the employment of Timorese nationals and the procurement of local materials and supplies during the construction of the plant;
- (d) the employment of Timorese nationals in the operation of the LNG plant, marine facilities, and onshore liquids process facilities with estimated annual operating expenditures of US\$280,000,000;
- (e) savings of at least US\$25,000,000 per year from the reduced cost of power generation as a result of converting Timor-Leste's power stations from diesel to gas;
- (f) the development in Timor-Leste of expertise in LNG operations to facilitate the future development of other gas fields;

- (g) the construction in Timor-Leste of infrastructure, such as the marine facilities and the LNG plant itself, that can facilitate the future development of other gas fields.

The Commission notes that Timor-Leste has repeatedly emphasized that it is more concerned with the development of human capital and long-term economic activity, rather than immediate revenue, and is cognizant of the value of such an approach.

The Commission also notes that, in the event a Timor LNG concept were realized, other elements of the project, such as offshore operations and supply, could well be managed and operated from Timor-Leste, provided that the Joint Venture has agreed to a specific approach to upstream operations. However, the Commission does not consider that such operations can be considered a development benefit of Timor-LNG until the Joint Venture has agreed to a specific approach to upstream operations.

Finally, the Commission notes that a number of consultant reports have endeavoured to quantify the broader economic benefits to Timor-Leste of Timor-LNG or the benefits to Australia of LNG operations in Darwin. The Commission recalls that earlier in these proceedings both governments agreed that such economic effects are difficult to quantify with precision. This continues to be the case.

2. Darwin-LNG with operations from Timor-Leste

The Commission recalls that the governments of Timor-Leste and Australia have already agreed that the revenue sharing arrangements under the Australia-Timor-Leste Maritime Boundaries Treaty will compensate for the broader economic benefits of processing the gas from Greater Sunrise in either Timor-Leste or Australia by allocating to Timor-Leste an additional 10 percent of the government revenue from the field, in addition to the 70 percent to which Timor-Leste would be entitled under either concept. The Commission estimates that this 10 percent will amount to between US\$3,134,000,000 and US\$3,539,000,000 in additional revenue to Timor-Leste over the life of the project that would be available for infrastructure and industrial development initiatives on the South Coast (and effectively matches the total capital investment that Timor-Leste has estimated for the entirety of the Tasi Mane Project, other than the LNG plant itself).

In addition, development benefits of a Darwin-LNG concept would follow from the conduct of offshore operations and supply for the Greater Sunrise fields from Timor-Leste and from the industrial development options available to Timor-Leste with the additional capital made available under this concept. As the Commission understands it, these benefits would be as follows.

First, given that the Darwin-LNG concept leverages existing infrastructure in Australia, the Joint Venture has committed to:

- (a) locating offshore, management, and support operations for the Greater Sunrise Project in Timor-Leste;
- (b) funding for a domestic gas pipeline to Timor-Leste which could be used for power generation, industrial development, and petrochemicals, for the benefit of the Timorese people.

In conjunction with the above, the Joint Venture has made a number of specific commitments with respect to equity participation by Timor-Leste in the project, employment, and supply sourcing, as well as other local content commitments and support for the development of the petroleum sector in Timor-Leste. The benefits to Timor-Leste would be as follows:

- (a) an offer of 3% free equity and up to 6% additional equity purchased on commercial terms for Timor Gap in the Greater Sunrise Joint Venture and an offer of 0.9% free equity and up to 1.8% additional equity purchased on commercial terms in the Darwin-LNG Joint Venture in order to provide Timor-Leste with a direct interest in all aspects of the project;

- (b) participation by Timor Gap, as a result of its equity share in the Great Sunrise Joint Venture, in the design, construction, management, and operations of the Greater Sunrise Project;
- (c) the employment of Timorese nationals in the offshore, management, and support operations for the Greater Sunrise project, which would be run from Timor-Leste with estimated annual operating expenditures of US\$282,000,000;
- (d) the establishment of a fabrication and manufacturing facility in Timor-Leste with estimated annual revenues of US\$6,000,000, as well as the employment in the facility of Timorese nationals;
- (e) a commitment to maximize Timorese sources of supply to the Greater Sunrise project;
- (f) a commitment to prioritize Timorese training and employment in all aspects of the Greater Sunrise project (including career development opportunities in the Darwin LNG facility);
- (g) a commitment of US\$2,500,000 per year during front end engineering design, US\$10,000,000 per year during the first five years after a final investment decision, and US\$5,000,000 per year for the 10 years thereafter, to be used for:
 - i. a business development centre focussed on enabling Timorese companies to meet the supply needs of the project;
 - ii. technical education in Timor-Leste, either through the establishment of a new institution or through the expansion and support of existing educational institutions in Timor-Leste;
- (h) a commitment of US\$200,000,000 in additional capital investment to enable the construction of a domestic gas pipeline to Timor-Leste, along with a commitment to supply gas to Timor-Leste for domestic power generation and other activities at the gas transfer price for up to 50M cu ft per day;
- (i) a stream of condensate of up to 10% of production at market value;
- (j) savings of at least US\$25,000,000 per year from the reduced cost of power generation as a result of converting Timor-Leste's power stations from diesel to gas;
- (k) a commitment of US\$50,000,000 in additional capital investment to the Suai supply base and marine facilities;
- (l) the development in Timor-Leste of expertise in offshore petroleum operations, management, logistics, and manufacturing to facilitate the future development of other oil and gas fields, including the potential development of a future Timor-LNG facility;
- (m) the construction in Timor-Leste of infrastructure, such as marine facilities and fabrication, that can facilitate the future development of other oil and gas fields, including the potential development of a future Timor-LNG facility;
- (n) the economic multiplier effects across the Timor-Leste economy of the foregoing activity in Timor-Leste;

The Joint Venture has further committed that investment in respect of the above commitments will be exempted from the uplift provisions of the production sharing contracts and that the commitment of US\$50,000,000 to the Suai supply base and marine facilities will be treated as non-cost recoverable. Pursuant to requirements of the Treaty, the Joint Venture's development plan will be required to establish "clear, measurable, binding and enforceable local content commitments" in respect of

employment and the development of the Timorese workforce, procurement and the development of Timorese suppliers, and Timorese commercial and industrial capacity. The Treaty also requires the development plan to include mechanisms to ensure that such commitments are implemented in practice.

In addition to the commitments made by the Joint Venture, the government of Australia has made a commitment of US\$100,000,000 toward the capital investment in relation to the domestic gas pipeline to Timor-Leste. Australia has also offered certain additional commitments to support the development of the Timorese petroleum sector and the use of the south coast of Timor-Leste as a petroleum hub for the Timor Sea and surrounding areas. These benefits include:

- (a) a commitment to facilitate access by Timor-Leste employees, vessels and aircraft, goods and services to the Greater Sunrise Area, the Darwin LNG Plant, and other oilfields in the Timor Sea in order to facilitate the development of Timor-Leste as a regional petroleum hub;
- (b) a commitment to implement a dedicated visa and labour scheme to provide Timor-Leste citizens access to employment in the onshore petroleum sector in the Northern Territory of Australia in order enable the Joint Venture to meet its commitments regarding Timorese training and employment and to build experience and capacity for the future development of a Timor LNG facility; and;
- (c) a commitment to provide US\$4,000,000 in funding for engineering and technical education in Timor-Leste with a particular focus on the development of the Timorese petroleum sector.

Finally, the development benefits of Darwin-LNG should be considered to include the infrastructure and industrial development initiatives that could be undertaken with the investment capital that Timor-Leste would need to commit to the construction of an LNG plant in a Timor-LNG scenario. As set out below, it is estimated that this would involve a direct subsidy of approximately US\$5,600,000,000 that would be available for other development investment if not used for Timor-LNG.

B. Certainty of Development Benefits under the Timor-LNG and Darwin-LNG Concepts

As noted at the outset, the Commission takes no view regarding which concept would offer greater development benefits to either Timor-Leste or Australia. The Commission does, however, consider that the benefits of developing Greater Sunrise will only be realized if the field is in fact developed. This consideration goes to the question of the commercial viability of the project.

In the Commission's engagement with the Joint Venture and the Parties, Timor-Leste has maintained that both Timor-LNG and Darwin-LNG are commercially viable. On the other hand, the Joint Venture have consistently held the view that only Darwin-LNG is commercially viable. Both Timor-Leste and the Joint Venture have provided the Commission with detailed economic models that produce diametrically opposite results. The Commission has not been able to accept either conclusion without independent confirmation and considers that a neutral assessment of both concepts is beneficial to the governments' decision-making.

As set out in detail in the Commission's Condensed Comparative Analysis of Alternative Development Concepts, the Commission considers the following assessment to be reasonable on the basis of neutral economic modelling:

- (a) Timor-Leste and the Joint Venture have analysed a Timor-LNG concept both as an integrated project (*i.e.*, with both upstream and downstream returns combined) and on a tolling basis (*i.e.*, with a fee paid to the downstream plant for LNG processing). A Darwin-LNG concept would only be on a tolling basis.

- (b) As an integrated project, the Commission anticipates that, under currently expected market conditions, Timor-LNG would generate a return in the order of 7.0% on a capital investment of US\$15,621,000,000. This would not be sufficient to meet the industry standard for investment by an international oil company.
- (c) As a tolling project, the upstream concept for Greater Sunrise (as envisaged either by Timor-Leste or the Joint Venture) has a fairly high cost of production and, under currently anticipated market conditions, is limited in the tolling fee that it could pay for LNG processing while remaining economically viable. At a tolling fee of US\$2.00 per MMBtu or lower, the return on the upstream project would fall within industry investment levels. However, should the tolling fee be higher than US\$2.50 per MMBtu, the return on the upstream project would fall below industry investment levels and the Commission does not anticipate that either concept would be investable for the members of the Joint Venture or other private sector actors.
- (d) The range of tolling fees currently under negotiation with Darwin-LNG are below US\$2.00 per MMBtu, and would thus fall within the range in which the upstream concept would be economically viable.
- (e) Due to the need to construct a new LNG plant at Beaco in Timor-Leste, a Timor-LNG plant would require a higher tolling fee to generate an adequate rate of return. After adjusting costs estimates, the Commission estimates that, with a toll of US\$2.00 per MMBtu, Timor-LNG would have a negative return of minus 4% on a capital investment of US\$7,142,000,000.
- (f) In order to match the target return of the Timor-Leste Petroleum Fund of 4%, it is estimated that Timor-LNG would need to charge a tolling fee of at least US\$3.50. In order to achieve a return of 7% to permit debt financing or the equity participation of an experienced operator, the Commission anticipates that the Timor-LNG would need to charge a tolling fee of at least US\$4.50. Both scenarios exceed the level that the upstream concept could reasonably be expected to bear.

Based on this assessment, the Commission considers that the challenge for Timor-LNG would be to achieve an acceptable rate of return on the downstream project without exceeding the tolling fee that the upstream concept could actually bear. The Commission considers that this could be done, but only with a direct subsidy of Timor-LNG by the government of Timor-Leste or another funder. The Commission estimates that a direct subsidy of the project's capital expenditure on the order of US\$5,600,000,000 would be required in order to render the remainder of the downstream project financeable through equity or debt.

In the Commission's view, these elements should be borne in mind in the consideration by Timor-Leste and Australia of the development benefits of the two concepts.

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ANNEX: COMPARATIVE ESTIMATES FOR T-LNG AND D-LNG

	TIMOR-LNG CASE	DARWIN-LNG CASE (WITH OPERATIONS FROM TIMOR-LESTE)
Investment Required		
Investment by Timor-Leste	Timor-Leste required to finance or arrange capital financing of US\$7,142,000,000	US\$0
Estimated return on investment	Negative 4% return on 100% TL equity (Direct subsidy of US\$5.6 billion necessary to secure debt finance or operator equity)	2.7% equity in Darwin LNG (0.9% free) 9% equity in Sunrise JV (3% free)
Development Benefits		
Location of LNG Plant	Beaço, Timor-Leste	Darwin, Australia
Pipeline	LNG pipeline to Beaço, Timor-Leste	Domestic gas pipeline to Timor-Leste; LNG pipeline to Darwin
Additional revenue to Timor-Leste pursuant to Treaty	US\$0	10% of government take (approx. US\$3.134 to US\$3.539 billion) available for development investment
Downstream operations	In Timor-Leste (estimated US\$280,000,000 in OPEX per year)	In Australia
Offshore operations and logistics support		Operated from Timor-Leste (estimated US\$282,000,000 in OPEX per year)
Fabrication		Fabrication facility in Timor-Leste (approximately US\$6,000,000 per year)
Sourcing of supplies		Commitment to prioritize Timorese supply, plus up to US\$10,000,000 per year to support business development in Timor-Leste
Employment and training		Commitment to prioritize Timorese employment, plus up to US\$10,000,000 per year for training and technical education in Timor-Leste
Support for Timor-Leste Petroleum Industry (JV)		US\$200,000,000 for domestic gas pipeline; US\$50,000,000 for Suai supply base
Gas and condensate stream		50M cu ft per day gas at gas transfer price; 10% of condensate at market value
Support for Timor-Leste Petroleum Industry (Australia)		US\$100,000,000 for domestic gas pipeline; and commitment to facilitate use of Timor-Leste facilities to supply Australian offshore fields, and facilitate Timorese employment in Darwin
Certainty of Implementation		
Assessment of commercial viability	Considered commercially viable by Timor-Leste only	Considered commercially viable by all parties
Estimated project return (IRR) Integrated Project	7.0%	N/A (Darwin facility would charge a tolling fee)
Segmented Project (Upstream) Estimated return (IRR)	11.82% at US\$4.00 tolling fee 13.18% at US\$3.00 tolling fee 14.44% at US\$2.00 tolling fee	14.52% at US\$3.00 tolling fee 16.08% at US\$2.00 tolling fee 17.27% at US\$1.20 tolling fee
Segmented Project (Upstream) Maximum viable tolling fee	Below US\$2.00 per MMbtu to achieve 15% IRR	US\$2.50 per MMbtu to achieve 15% IRR
Segmented Project (Downstream) Estimated return (IRR)	4.51% at US\$4.00 tolling fee 2.69% at US\$3.00 tolling fee negative 4% at US\$2.00 tolling fee	N/A (Darwin-LNG would handle downstream)
Segmented Project (Downstream) Minimum viable tolling fee	US\$3.57 toll to achieve 4% IRR (govt equity) US\$4.51 toll to achieve 7% IRR (debt finance)	N/A (Darwin-LNG would handle downstream)

CONDENSED COMPARATIVE ANALYSIS OF ALTERNATIVE DEVELOPMENT CONCEPTS

Pursuant to the Supplemental Action Plan agreed with the Parties in December 2017, the Commission has retained the assistance of an expert in oil and gas development planning to undertake a comparative analysis of the alternative development concepts proposed by Timor Gap and the Greater Sunrise Joint Venture based on neutral economic modelling. This document is intended to set out a condensed account of that comparative analysis.

A. Introduction

This analysis examines the subsurface (reservoir) assumptions, development plans, costs estimates and commercial potential of the respective alternative development concepts for the Greater Sunrise field prepared by Timor Gap and the Greater Sunrise Joint Venture (“SJV”). These alternatives are Timor Gap’s concept for the development of the field by way of a fixed platform and multiples pipelines to a new LNG plant in Timor-Leste (also known as Timor-LNG) and the SJV’s concept for the development of the field by way of a Floating Production Storage and Offloading (“FPSO”) unit with a pipeline to tie in to the Bayu Undan pipeline to the existing LNG plant at Wickham Point in Darwin, Australia.

The key technical drivers of the differences between the concepts are the resource volumes assumed and the relative technical risk of the upstream development concepts. The key commercial issue is the comparative economics of the two concepts, the requirement to invest in the construction of a new LNG plant in Timor Gap’s concept, and the tolling fee that such new plant would need to receive to be commercially viable.

B. Subsurface (Reservoir) Assessment and Production Forecasts

As part of their respective concepts, Timor Gap and the SJV have each independently undertaken technical evaluations of the gas initially in place in the Greater Sunrise reservoir and reached similar mid-case estimates. Both Timor Gap and the SJV have also identified field segmentation (discontinuities in the reservoir that reduce the area drained by each well) and the influx of water, which reduces the proportion of gas recovered, as key issues in the development of the field.

Both Timor Gap and the SJV have presented a range of potential recovery factors for gas from the Greater Sunrise field. The SJV’s economic model appears to be based on a 53% recovery factor (*i.e.*, an estimate that 53% of the gas initially in place could be recovered). Timor Gap appears to estimate a higher 75% recovery factor, based on continued low-level production for domestic gas after the end of LNG production. Without this tail production, Timor Gap’s recovery factor appears to be 61%. The variance in recovery factor between 53% and 61% is within expected estimated range, given the data available and prior to production from the field. Subsequent economic analysis is considered for both a 60% and 50% recovery factor. The tail domestic gas production anticipated by Timor Gap has no significant effect on the economics of the two concepts and is not considered further.

In the SJV concept, should a higher recovery factor of 60% be achieved, production could be extended by about 6 years as more gas would be recovered. In the Timor Gap concept, a lower recovery factor of 50% would reduce the production period by approximately 5 years.

C. Timor Gap Upstream Concept

The Timor Gap upstream concept envisages a fixed platform offshore with twin gas pipelines to shore in Timor-Leste with two additional pipelines to Timor-Leste for liquids and for the return of regenerated mono ethylene glycol (“MEG”). Condensate processing and MEG regeneration takes place on shore in Timor-Leste.

The concept is technically feasible. However, the requirement for onshore condensate processing and the use of multiple pipelines across the Timor Trough increases the comparative risk of pipeline damage due to localised failure of the Timor slope and hence potentially decreases the reliability and operability of the project. The concept also carries increased risk of hydrate blockage in both the gas and liquids pipelines.¹ Timor Gap's proposed pipelines are at the limit of current industry water depth capability.

For capital expenditure, the Timor Gap well design concept, configuration, and cost estimates appear to be inconsistent with the high initial well flow rate assumed in the production profile. The Timor Gap estimate for the twin 18" gas pipelines is very close to its original estimate for a single 24" pipeline and does not appear to address the increased installation costs of multiple pipelines. The costs of a full integrated project front end engineering design ("FEED") also appear to be omitted from Timor Gap's estimate.²

For operating expenditure, Timor Gap's costs estimates for the platform appear to be reasonable, but omit the operating expenditure of the onshore liquids processing facility (which would be separate from the LNG plant and would have limited operational synergies), as well as the operations, inspection and maintenance costs of the multiple pipelines.³ Given the risks of the concept, it would be reasonable to make an economic provision for one pipeline repair in the 25 year life of the project, however this has not been added to the Timor Gap operating expenditure estimates.

D. Sunrise Joint Venture Upstream Concept

The SJV upstream concept is for all gas and liquids processing to take place offshore on an FPSO. Gas would be delivered to Darwin by a single pipeline joining the existing Bayu Undan pipeline. The SJV upstream concept is industry standard. The FPSO is large, but within industry technology for water depth, swivel, processing, topsides load, and vessel size.

For capital expenditure, the SJV's estimates for subsea costs appear to be higher than recent analogue projects. In particular, the SJV's installation costs appear to be based on vessel spread rates prevailing several years ago at the market peak. Similarly, the SJV costs estimates for drilling appear to be based on rig rates prevailing several years ago at the market peak.⁴

The SJV's estimate for operating expenditure appears reasonable, as does the project schedule.

E. Timor Gap Downstream Concept

The Timor Gap concept is for the construction of a greenfield 5 MMTpa LNG plant at Beaco on the south coast of Timor-Leste that would receive gas from the offshore project. Condensate would also be processed onshore with MEG regeneration and return to offshore.

¹ These risks could be mitigated by locating condensate processing and MEG regeneration on a second offshore platform or FPSO. As this would not meaningfully alter the economic results, however, this possibility has not been evaluated further.

² For modelling purposes, the following adjustments were made to Timor-Gap's assumptions: (a) drilling cost estimates adjusted to current market rates for drilling rigs and well services; (b) subsea cost estimates adjusted to current market rates for installation vessels; (c) gas pipeline costs re-estimated for twin lines; (d) condensate/MEG costs re-estimated for twin lines; and (e) capital provision added for integrated project FEED. Specific adjustments are set out in an annex to this paper.

³ For modelling purposes, the following adjustments were made to Timor-Gap's assumptions: (a) operating expenditure added for liquids processing facility; and (b) operating expenditure added for pipeline operations, expenditure, and maintenance. Specific adjustments are set out in an annex to this paper.

⁴ For modelling purposes, the following adjustments were made to the SJV's assumptions: (a) drilling cost estimates adjusted to current market rates for drilling rigs and well services; and (b) subsea cost estimates adjusted to current market rates for installation vessels. Specific adjustments are set out in an annex to this paper.

For capital expenditure, Timor Gap's estimates for the LNG liquefaction plant and marine facilities appear reasonable. However, Timor Gap's estimate does not appear to include the cost of direct infrastructure associated with the LNG plant, such as roads, offices, and warehousing, and excludes LNG technology licence fees. Timor Gap's concept also appears to exclude the costs for the LNG Plant FEED.⁵

Timor Gap's estimate of LNG plant operating costs (in its economic model) appears to be based on a notional figure of US\$100 million per year, rather than the US\$204 million per year estimated by Timor Gap in its Greater Sunrise Timor LNG Project Development Concept Report, which also appears to be below prevailing industry levels.⁶

While Timor Gap's overall construction schedule appears reasonable, it is based on timetable with pre-FEED work commencing in 2016, which has now slipped by some 2 years, resulting in an earliest start-up date one year later than that used by Timor Gap in its economic model. Timor Gap's concept also appears to envisage 100% production from day one, rather than the industry standard expectation for a new facility of 50% production efficiency during the first year.⁷ The Timor Gap economic model does not make any provision for operational downtime in subsequent years, which is likely to be in the order of 5% based on industry experience

F. SJV Downstream Concept

The SJV concept is for gas to be processed at the existing LNG plant at Wickham Point in Darwin, Australia. Although the existing pipeline and LNG plant are some 20 years old, industry experience indicates that they should remain serviceable and reliable for the life of the project with appropriate inspection and maintenance. It is understood that full responsibility for maintenance and repair of the existing infrastructure would be covered by the tolling fee charged by the downstream owner, limiting the risk to the upstream joint venture

As the Wickham Point facility is owned by a different corporate entity and would charge a tolling fee to process gas from Greater Sunrise, the economics of the SJV downstream concept have not been independently analysed.

G. Economic Model Assumptions

Both Timor Gap and the SJV have assumed the application of the existing fiscal terms under which 20.1% of the asset is governed by JPDA production sharing contract terms (divided 90:10 between Timor-Leste and Australia) and 79.9% is governed by Australian terms. Although this fiscal regime will be replaced under the new treaty, the treaty provides that new fiscal arrangements will provide "conditions equivalent" and the existing regimes is used for modelling purposes.

The economic models prepared by Timor Gap and the SJV, as would be expected, make several non-comparable assumptions. In the SJV model, provision is made for a notional marketing entity that is understood to reflect the specifics of the application of the Australian petroleum resources rent tax. An alternative approximation of petroleum resources rent tax is used in the Timor Gap model. For comparability, the marketing arrangement of the SJV model has been simplified, with all revenues

⁵ For modelling purposes, the following adjustments were made to Timor-Gap's assumptions: (a) costs added for roads, offices, warehousing, and licence fees; (b) costs added for LNG plant FEED. Specific adjustments are set out in an annex to this paper.

⁶ For modelling purposes, the annual operating expenditure of the LNG plant was increased to US\$250 million.

⁷ For modelling purposes, the following adjustments were made to Timor-Gap's assumptions: (a) a one-year delay in startup; and (b) 50% production for year one.

accruing to the upstream JV.⁸ For comparability, adjustments are likewise made to the Timor Gap model as follows:

- The Timor Gap model applies the tolling fee to the feedstock (*i.e.*, the gas going into the plant), rather than the LNG sales volumes (the gas coming out of the plant). The industry norm is to apply the tolling fee to LNG sales volume, and the Timor Gap model is adjusted accordingly.
- The Timor Gap model is premised upon no downtime (*i.e.*, 365 days per year operations). The industry norm is to allow for 20 days downtime, and the Timor Gap model is adjusted accordingly.

Additionally, the JV and Timor Gap models differ as to whether LNG price inflation on the tolling fee would start in 2018 or upon production. While either approach is reasonable, the same approach must be used to enable an accurate comparison and the Timor Gap model is adjusted such that escalation of the tolling fee starts upon production, in line with SJV model.

H. Comparative Economic Analysis: Upstream Concepts

For analysis purposes, the required gas price (*i.e.*, the price at entry to the LNG plant required to achieve a 15% IRR for the upstream joint venture) was calculated for each of the Timor Gap and SJV upstream concepts after adjusting costs and assumptions. The results for the SJV upstream concept are as follows:

SJV Upstream Concept	
Case	Required Gas Price for Upstream 15% IRR US\$/MMBtu
SJV Base Case	US\$5.49
Adjusted Assumptions (exclude notional marketing entity)	US\$6.11
Production Normalized to 60% recovery	US\$6.01
Costs Normalized	US\$5.19
Final Normalized Case	US\$5.19

The results for the Timor Gap upstream concept are as follows:

Timor Gap Upstream Concept	
Case	Required Gas Price for Upstream 15% IRR US\$/MMBtu
Timor Gap Base Case	US\$2.89
Apply toll to LNG sales gas Include downtime Escalate toll from production start	US\$3.04
Delay start up by 1 year 50% uptime in first year	US\$4.52
Production normalized to 60% recovery	US\$4.57
Normalize capital expenditure	US\$6.18
Normalize operational expenditure	US\$6.21
Normalized Case at 60% recovery	US\$6.21
Normalized Case at 50% recovery	US\$6.52

⁸ This adjustment slightly decreases the returns of the SJV upstream concept and increase the government tax revenue, but renders the two models more comparable.

The approximate IRR that each upstream concept could be expected to generate at different potential tolling fees (assuming a 60% recovery factor and after normalizing costs and inputs) are as follows:

Tolling Fee US\$/MMBtu	SJV Upstream Concept IRR %	Timor Gap Upstream Concept IRR %
\$1.2	17.27%	15.40%
\$2	16.08%	14.44%
\$2.5	15.32%	13.82%
\$3	14.52%	13.18%
\$3.5	13.70%	12.51%
\$4	12.83%	11.82%
\$4.5	11.92%	11.10%

I. Comparative Economic Analysis: Timor Gap Downstream Concept

For analysis purposes, the Timor Gap downstream concept was evaluated with respect to the tolling fee required for the Timor Gap downstream project to earn between 0% and 10% IRR, calculated as follows:

Timor Gap Downstream Concept				
Cases	Required Toll for 0% IRR US\$/MMBtu	Required Toll for 4% IRR US\$/MMBtu	Required Toll for 7% IRR US\$/MMBtu	Required Toll for 10% IRR US\$/MMBtu
Timor Gap Base Case	\$1.26	\$1.82	\$2.49	\$3.35
Apply toll to LNG sales gas Include downtime Escalate toll from production	\$1.72	\$2.49	\$3.41	\$4.59
Delay start up by 1 year 50% production efficiency in first year	\$1.75	\$2.67	\$3.79	\$5.30
Production normalized to 60% recovery	\$1.95	\$2.94	\$4.06	\$5.54
Normalize capital expenditure	\$1.91	\$2.79	\$3.75	\$4.99
Normalize operational expenditure	\$2.73	\$3.57	\$4.51	\$5.74
Normalized Case at 60% recovery	\$2.73	\$3.57	\$4.51	\$5.74
Normalized Case at 50% recovery	\$3.11	\$4.00	\$4.95	\$6.17

The approximate IRR that the Timor Gap downstream concept could be expected to generate at different potential tolling fees (assuming a 60% recovery factor and after normalizing costs and inputs) are as follows:

Timor Gap Downstream Concept	
Tolling Fee US\$/MMBtu	IRR %
\$2	negative 4.62%
\$3	2.69%
\$4	6.23%

J. Comparative Economic Analysis: Upstream Concepts

A further analysis was undertaken of total government take (in accumulated cash flow) for Australia and Timor-Leste under both the SJV and Timor Gap Concepts at a range of possible tolling fees.

In the case of the SJV concept, this analysis was undertaken at the US\$2.00 toll used as a base in both the SJV and Timor Gap models and at a hypothetical lower toll of US\$1.20 in the event that significant savings are achieved in negotiations with Darwin LNG JV. This analysis excludes the income to the operator of the Wickham Point plant or the corporate income taxation paid by the downstream operator to Australia:

SJV Concept			
Tolling Fee US\$/MMBtu	Total Gov. Upstream Take US\$MM	Timor-Leste Upstream Take US\$MM	Australia Upstream Take US\$MM
\$1.20	\$35,392	\$28,314	\$7,078
\$2.00	\$31,337	\$25,070	\$6,267

In the case of the Timor Gap concept, this analysis was undertaken at a range of tolling fees. This analysis includes the income to the operator of Timor-LNG and the corporate income taxation paid to Timor-Leste:

Timor Gap Concept						
Tolling Fee US\$/MMBtu	Total Upstream Gov. Take US\$MM	Australia Upstream Take US\$MM	Timor-Leste Upstream Take US\$MM	Timor-LNG Owner Take US\$MM	Timor- Leste Income Tax US\$MM	Timor-Leste + Timor-LNG Take US\$MM
\$2.00	\$28,775	\$8,632	\$20,142	neg. \$4,895	0	\$15,247
\$3.00	\$24,555	\$7,366	\$17,188	\$1,661	\$333	\$19,182
\$3.50	\$22,432	\$6,729	\$15,702	\$4,772	\$666	\$21,140
\$4.00	\$20,299	\$6,090	\$14,209	\$7,881	\$1,001	\$23,091
\$4.50	\$18,155	\$5,446	\$12,708	\$10,986	\$1,340	\$25,035

K. Economic Analysis: Financing and Subsidy

A final analysis was undertaken of the potential for Timor Gap's development concept to address the feasibility of equity participation from an experienced international operator and to secure debt financing, and to estimate the level of government subsidy that would be necessary to render the remainder of the project financeable.

Without knowing the specific financing or operator arrangements contemplated by Timor Gap, it is likely that an international operator or institutional lender would require an IRR in the order of 10%. Even if the government of Timor-Leste were willing to provide equity financing for the remainder of the project at an IRR of 0% or debt financing could be achieved at 7%, the project would still need to generate an overall IRR in the order of 4% to 5% to be sustainable (depending on the respective shares of the project). To achieve an overall IRR of 4%, (similar to the return understood to be achieved by the Timor-Leste Petroleum Fund) the LNG plant would require a tolling fee of approximately US\$3.50 per MMBtu.

In order to achieve a US\$2.00 tolling fee while preserving a 7% IRR on the overall project, it would be necessary for the government of Timor-Leste to directly subsidise the capital expenditure of the LNG facility. A subsidy on the order of US\$5.6 billion (or about 80% of capital expenditure)—with no

expectation of receiving revenue from the operation of the facility— would be required in order to render the remainder of the downstream project financeable.

L. Conclusion

The foregoing analysis supports the following conclusions on the basis of neutral economic modelling:

- (a) Timor-Leste and the SJV have analysed the Timor Gap concept both as an integrated project (i.e., with both upstream and downstream returns combined) and on a tolling basis (i.e., with a fee paid to the downstream plant for LNG processing). The SJV concept would only be on a tolling basis.
- (b) As an integrated project, the Commission anticipates that, under currently expected market conditions, Timor Gap's concept would generate a return in the order of 7.0% on a capital investment of US\$15,621,000,000. This would not be sufficient to meet the industry standard for investment by an international oil company.
- (c) As a tolling project, the upstream concept for Greater Sunrise (as envisaged either by Timor-Leste or the SJV) has a fairly high cost of production and, under currently anticipated market conditions, is limited in the tolling fee that it could pay for LNG processing while remaining economically viable. At a tolling fee of US\$2.00 per MMBtu or lower, the return on the upstream project would fall within industry investment levels. However, should the tolling fee be higher than US\$2.50 per MMBtu, the return on the upstream project would fall below industry investment levels and the Commission does not anticipate that either concept would be investable for the members of the Joint Venture or other private sector actors.
- (d) The range of tolling fees currently under negotiation with Darwin-LNG are below US\$2.00 per MMBtu, and would thus fall within the range in which the upstream concept would be economically viable.
- (e) Due to the need to construct a new LNG plant at Beaco in Timor-Leste, a Timor Gap downstream concept would require a higher tolling fee to generate an adequate rate of return. After adjusting costs estimates, the Commission estimates that, with a toll of US\$2.00 per MMBtu, Timor Gap's downstream concept would have a negative return of minus 4% on a capital investment of US\$7,142,000,000.
- (f) In order to match the target return of the Timor-Leste Petroleum Fund of 4%, it is estimated that the LNG plant in Timor-Leste would need to charge a tolling fee of at least US\$3.50. In order to achieve a return of 7% to permit debt financing or the equity participation of an experienced operator, the Commission anticipates that Timor-LNG would need to charge a tolling fee of at least US\$4.50. Both scenarios exceed the level that the upstream concept could reasonably be expected to bear.

Based on this assessment, the challenge for Timor Gap's concept would be to achieve an acceptable rate of return on the downstream project without exceeding the tolling fee that the upstream concept could actually bear. The Commission considers that this could be done, but only with a direct subsidy of the downstream project by the government of Timor-Leste or another funder. A direct subsidy of the project's capital expenditure on the order of US\$5,600,000,000 would be required in order to render the remainder of the downstream project financeable through the equity participation of an experience operator or by debt.

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**ANNEX:
ADJUSTMENTS TO ECONOMIC ASSUMPTIONS**

ADJUSTMENTS TO JOINT VENTURE ECONOMIC ASSUMPTIONS FOR UPSTREAM CONCEPT	
COMMENT	ADJUSTMENT
Cost estimates for wells and drilling do not appear to reflect reduction of rates in current market conditions	Reduce capital expenditure for wells to US\$1,040 million
Cost estimates for subsea installations do not appear to reflect reduction of rates in current market conditions	Reduce capital expenditure for subsea to US\$2,080 million
ADJUSTMENTS TO TIMOR GAP ECONOMIC ASSUMPTIONS FOR UPSTREAM CONCEPT	
COMMENT	ADJUSTMENT
Cost estimates for wells appear overly optimistic	Increase capital expenditure for wells to US\$1,040 million
Cost estimates for subsea installations appear overly optimistic	Increase capital expenditure for subsea to US\$2,080 million
Cost estimates for gas pipelines for two 18" pipelines (derived from estimate for one 24" pipeline) appear overly optimistic	Increase capital expenditure for gas pipelines to US\$1,500 million
Cost estimates for two 18" MEG pipelines based on estimate for gas pipeline	Increase capital expenditure for MEG pipelines to US\$1,400 million
No provision made for costs of Upstream Front-End Engineering and Design (FEED)	Add capital expenditure of US\$300 million
Upstream operating expenditure does not include operating expenditure for onshore MEG plant and liquid processing or pipeline repair contingency	Increase upstream operating expenditure to US\$193 million per year
ADJUSTMENTS TO TIMOR GAP ECONOMIC ASSUMPTIONS FOR TIMOR-LNG CONCEPT	
COMMENT	ADJUSTMENT
Tolling fee is applied to raw gas feedstock rather than LNG sales volumes	Apply tolling fee to LNG sales volumes per industry standard
Inflation of tolling fee starts from 2017	Begin inflation of tolling fee from start of production, for comparability
Model assumes operation 365 days per year	Add assumption of 20 days per year downtime, per industry standard
LNG costs estimates do not include for infrastructure associated with the LNG plant, LNG technology licence fees, or LNG Front-End Engineering and Design (FEED) costs	Increase LNG Plant capital expenditure to US\$7,142 million
LNG plant operating expenditure appears overly optimistic	Increase LNG Plant OPEX to US\$250 million per year
Economic model is based on a schedule which has already slipped by one to two years	Add one-year delay to project schedule
Model assumes operation at 100% capacity from day 1 of operations	Assume operation at 50% capacity for first year, per industry standard