Rovuma Basin Economic Model

Centro de Integridade Pública &

Resources for Development Consulting

28 October 2015
Resources for Development Consulting

• Extractive economics for all citizens
• Assess government revenue prospects:
  – Analysis of public domain information
  – Creation of public economic models
  – Publication of revenue prospects reports
• Belize, Chad, Cambodia, Kenya, Tanzania
• The team: Don Hubert, Gordon Kirkwood, Daniel Dumas and Lindsey Allwright
Realistic Revenue Projections

• Rovuma LNG revenues
  – Great potential but high uncertainty
• Existing projections suggest billions of dollars to Mozambique in early 2020s
• But revenue estimates often overstated
  – Nigeria, Angola expecting $100/barrel of oil

Mozambique needs “achievable” projections
Integrated Economic Analysis

• Revenue projections are based on scenarios
• Scenarios include basic assumptions about:
  – Production timelines and volumes
  – LNG sales price
  – Project costs
  – Fiscal terms
• Changes cannot be understood in isolation
  – Analyze through a “cash flow” model
Confidential Economic Models

• Three existing cash flow models
  – Gas Master Plan 2012/13
  – International Monetary Fund 2012 & 2014
  – Standard Bank for Anadarko 2014

• Reports available but models are confidential
  – All three are based on outdated assumptions
  – Production timelines / LNG prices
Where are the Updated Projections?

• Mozambican’s should understand the implications of changing circumstances

• Solution is a public model allowing users to revise based on changing inputs

• CIP launching economic model for Rovuma LNG
Benefits of Transparency in Modeling

• A public model can be verified
  – Open to peer review to ensure reliable results

• A public model is adaptable
  – Able to accommodate new input data

• A public model creates common ground
  – Able to understand differences in results
CIP Rovuma Revenue Model

• Industry standard cash flow model

• Easily changeable from the dashboard:
  1. Dates for first gas and expansion
  2. Sale price assumptions
  3. Include ENH participation

• Changeable inside the model:
  1. Project profiles and costs
  2. Project financing assumptions
A User-Friendly Dashboard

Model inputs and Assumptions

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Area 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Phase</td>
<td>First Prod.</td>
</tr>
<tr>
<td>ENI FLNG</td>
<td>2021</td>
</tr>
<tr>
<td>Anadarko Onshore (2 Trains)</td>
<td>2021</td>
</tr>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Price</th>
<th>Final Sale Price in Asia</th>
<th>$/mmbtu</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Terminal Price in Mozambique</td>
<td>8.55</td>
<td>$/mmbtu</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Costs</th>
<th>Anadarko</th>
<th>ENI</th>
</tr>
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<tbody>
<tr>
<td>Exploration</td>
<td>2800</td>
<td>1500</td>
</tr>
<tr>
<td>Development Capex</td>
<td>51000</td>
<td>28000</td>
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<td>Operating Costs</td>
<td>38000</td>
<td>21000</td>
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<table>
<thead>
<tr>
<th>Fiscal Terms</th>
<th>Anadarko</th>
<th>ENI</th>
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<tbody>
<tr>
<td>Royalty</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Cost Recovery Limit</td>
<td>65%</td>
<td>75%</td>
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<table>
<thead>
<tr>
<th>R-Factor</th>
<th>Govt Share</th>
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<td>0</td>
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<td>25%</td>
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<tr>
<td>2</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>3</td>
<td>50%</td>
<td>40%</td>
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<tr>
<td>4</td>
<td>60%</td>
<td>55%</td>
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<tr>
<td>ENH Participation</td>
<td>15%</td>
<td>18%</td>
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<tr>
<td>Corporate Income Tax</td>
<td>32%</td>
<td></td>
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</table>

Return to Base Case
Presentation Outline

• Gordon Kirkwood on inputs and model
  1. Production timelines and volumes
  2. Development and operating costs
  3. LNG prices
  4. The cash flow model

• Don Hubert on fiscal terms and results
  1. Fiscal terms from 2006 EPCCs
  2. Overall government revenues
  3. Timelines to government revenues
Technical Inputs

Dr. Gordon Kirkwood
Resources for Development
Phases of Gasfield Life

- Final Investment Decision
- Exploration well
- Discovery well
- Appraisal well
- Commercial discovery
- Commercial production
- Plateau
- Decline
- Economic limit
- EXPLORE
- DEVELOP
- PRODUCE
- ABANDON
- Final Investment Decision
Final Investment Decisions

FID Drivers:
• Government Terms and Development Plan Approvals
• Binding LNG Sales Agreement – Volume & Price
• Project Financing
• Clear Company Strategy for Changing Petroleum Industry

Assumed Final Investment Decision (FID) Timings:
• Eni Coral FLNG : 2016
• Anadarko Golfinho : 2016
• Eni Mamba : 2021
• Anadarko Prosperidade: 2021

More Chance of Delay than Acceleration
Duration of Project

- Minimum 5 years FID to First Gas Onshore LNG
- Minimum 4 ½ years FID for Floating LNG (Unproven)
- Upstream Development Takes Less Time Than LNG Project
Gas Resources Is Not The Issue

<table>
<thead>
<tr>
<th>Area 1</th>
<th>Condensate (million bbl)</th>
<th>Gas (bcf)</th>
<th>Area 4</th>
<th>Condensate (million bbl)</th>
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<td>5 746</td>
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<td>Lagosta</td>
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<td>Mamba North East</td>
<td>32</td>
<td>9 000</td>
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<tr>
<td>Orca</td>
<td>11</td>
<td>3 235</td>
<td>Mamba South</td>
<td>14</td>
<td>3 908</td>
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<tr>
<td>Tubarão</td>
<td>4</td>
<td>1 000</td>
<td>Mamba North East 2</td>
<td>32</td>
<td>9 008</td>
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<td>Barquentine (Commercial)</td>
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<td>10 119</td>
<td>Mamba North East South</td>
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<td>beCamarao (Commercial)</td>
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<td>Windjammer (Commercial)</td>
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<td>3 745</td>
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<td><strong>Total</strong></td>
<td><strong>220</strong></td>
<td><strong>62 519</strong></td>
<td></td>
<td><strong>229</strong></td>
<td><strong>57 718</strong></td>
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Source: Wood Mackenzie, estimates as at 1 Jan 2014

- Massive gas resources in Mozambique
- A 5 mtpa LNG train requires around 6 TCF
Upstream Development

• Deepwater gas development is challenging
• Standard Bank costs used for upstream
• Cost +/- Uncertainty
  – Drilling rig market depression at $50 oil
  – But reservoir uncertainty
LNG Plant Capital Expenditure

- Upward cost pressure on LNG plants
- Plant cost of $1300/mtpa used (vs. SB $1000/mtpa)

[Source of Data: Oxford Institute of Energy Studies February 2014]
LNG Economy of Scale

- Additional Trains Attract Economy of Scale
- 23% Reduction of Cost Implied
Project Financing

• Assume project financing for LNG plants only
• No restrictions on debt equity ratio
• Assume 70% debt 30% equity
## CIP Model Cost Summary

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<tr>
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<th>Area 4</th>
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<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td><strong>Phase 2</strong></td>
<td><strong>Phase 1</strong></td>
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<tr>
<td>2 x 6mtpa</td>
<td>2 x 6mtpa</td>
<td>1 x 2.5mtpa</td>
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<td>$2.8b</td>
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<td>Development</td>
<td>$27.7b</td>
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<tr>
<td>Operating</td>
<td>$823m/yr</td>
<td>$683m/yr</td>
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Understanding LNG Price

Netback Price Methodology ($/mmbtu)

If LNG Tolling

Feed Gas Price $9.30

Less:
LNG Process Fee $3

Mozambique EPPC Contract LNG Terminal Price $12.30

Less:
Transportation and Regas Cost $1.70

Japan LNG Import Price $14 (For Example)
LNG Price

- High prices used in past revenue projections **no longer exist**
- (IMF $14 Japan; Gas Master Plan $13-17; 16-7/mmbtu Japan Standard Bank $12 Export = $13.70 Japan)
CIP Model LNG Price

Netback Price Methodology ($/mmbtu)

Mozambique EPPC Contract LNG Terminal Price $8.55

Less:
Transportation and Regas Cost $1.70

Japan LNG Import Price $10.25
Model Overview
### October 2015 CIP Model Inputs

#### Model Inputs and Assumptions

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Input Based Conclusions

• Limits to public accessibility of data, but we have *plausible* data to draw conclusions

• Model meets Industry expectations for cash flow analysis; we have confidence in results

• Different numbers for different purposes
  – Company CEOs need to drive action
  – Governments need realistic achievable (and independent) forecasts for strategic planning.
Fiscal Inputs and Results

Dr. Don Hubert

Resources for Development
Summary of Technical Inputs

1. First gas not until 2021
   There is a minimum but no maximum

2. Expansion FIDs only after first production

3. Sale price of LNG in Asia at $10.25

4. Greenfield costs could exceed estimates
LNG Inside EPCC Terms

**Integrated with Upstream**
- **Upstream**
  - Gas production
- **LNG**
  - Liquefaction
- EPCC fiscal regime
- LNG costs recoverable under EPCC fiscal regime
- LNG Buyer

**Tolling LNG plant**
- **Upstream**
  - Gas production
- EPCC fiscal regime
- Tolling fee
- LNG Liquefaction
  - IRPC
- LNG sales
  - Cost plus return from tolling fee
- LNG Buyer
## Fiscal Terms – 2006 EPCCs

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<td>75%</td>
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<td>Profit Gas Split</td>
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<tr>
<td>R-factor</td>
<td>(Government Share)</td>
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<td>1.0</td>
<td>10%</td>
<td>15%</td>
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<tr>
<td>2.0</td>
<td>20%</td>
<td>25%</td>
</tr>
<tr>
<td>3.0</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>4.0</td>
<td>50%</td>
<td>45%</td>
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<tr>
<td>&gt;4.0</td>
<td>60%</td>
<td>55%</td>
</tr>
<tr>
<td>Corporate Tax</td>
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<tr>
<td>First 8 yrs</td>
<td>24%</td>
<td>24%</td>
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<tr>
<td>After 8 yrs</td>
<td>32%</td>
<td>32%</td>
</tr>
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Secondary Fiscal Instruments Not Included
State Participation - ENH

• Back-in rights 15% (Area 1) and 10% (Area 4) carried for exploration, pay from start of development

• ENH participation modeled with project financing to show additional funding requirements

• ENH likely to borrow and repay with interest
  – And then reinvest in second phase?

• Is ENH revenue actually government revenue?
Results

• Results for Area 1, Area 4 and both combined are available from the model

• The following results are for two-train and four-train Area 1 only

• Chosen because of data in the public domain

• ENI LNG generates additional revenue
### Government Revenue and Take

<table>
<thead>
<tr>
<th></th>
<th>2 Train Standard Bank</th>
<th>2 Train CIP</th>
<th>4 Train Standard Bank</th>
<th>4 Train CIP</th>
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<td>Royalties</td>
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<td>68.5</td>
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<td>Income Tax</td>
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<td><strong>21.2</strong></td>
<td><strong>119.7</strong></td>
<td><strong>50.3</strong></td>
</tr>
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</table>

- Lifecycle revenue are highly dependent on price
- Even at $10.25 revenues are tens of billions
- Government 48%, ENH 7%, IOC 45%
Government Revenue Comes Late

Sources of Government Revenue

USD millions

Royalty
Government Profit Oil
Corporate Income Tax

Years
2015 2020 2025 2030 2035 2040 2045 2050
Preliminary Conclusions

• Big Uncertainties
  – First gas and pace of growth
  – LNG sale price

• Risks to Revenue
  – Cost recovery eligibility and control
  – No thin capitalization restrictions

• Outstanding Modeling Questions
  – ENH investment funding and prospective revenues
  – Integrated v non-integrated project
  – Domestic Gas Obligations
Transparency for Good Governance: A Public Model for Rovuma LNG

• Model can be peer reviewed

• Input assumptions can be changed

• Common basis for public debate

Ensure revenue projections are “achievable”