Strategy for greater sustainability

Special Analyst Presentation

21st April 2016
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<th>STRATEGIC INITIATIVES</th>
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<td>BANPU O&amp;G STRATEGY</td>
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<td>CHAFFEE CORNERS</td>
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- Banpu is conducting a strategic review to maximize long term shareholder and stakeholder value in a sustainable way.

- Budgeting and business planning due for completion by Q3 2016.

- Banpu will continue to strengthen its conventional energy business while integrating into new business areas which harness innovative and greener energy technologies.

- New investment plans are being developed for Banpu’s upstream, midstream and downstream businesses with the objective of building on existing skillsets and assets while maximizing vertical and horizontal integration synergies.

- First steps in the new strategy have been taken: downstream into solar PV and upstream into unconventional gas.
KEY CRITERIA FOR NEW STRATEGY

Harness new and greener energy technology trends

Maximize synergies with existing assets and skills

Achieve quick returns with minimal capital outlay

Position Banpu in geo-industry segments with long term growth potential
NEW ENERGY RESOURCES
- Build on underground extractive expertise: e.g. hydraulic fracturing
- Gas: lower carbon emissions
- Gas to be mainstream beneficiary of energy growth
- Near term profitability possible
- Low upstream O&G asset prices

SUPPLY CHAIN MANAGT.
- Low capex, quick returns
- Immediate asset and skillset synergies: diesel procurement
- Marketing of coal-to-chemicals and bio-mass?
- Leverage Banpu’s regional footprint

SMART ENERGY
- Trends: policy support, market acceptance, technical advances, cost reductions
- Strong long term growth and risk diversification
- Synergies with Banpu’s solar PV business
BANPU 2020: GREENER, SMARTER

**Renewable energy:** >20% of Banpu’s power portfolio

**Gas:** new business, starting upstream, North America

**Smart energy:** integrated solutions: decentralized renewables, storage, IT

**High efficiency, low emissions:** focus for all new conventional power investment

**Financial engineering:** RO, power IPO, fund and venture structures

**Logistics:** leverage and synergize Banpu’s regional footprint – supply chain management
1 STRATEGIC INITIATIVES
2 US UNCONVENTIONAL GAS
3 BANPU O&G STRATEGY
4 CHAFFEE CORNERS
GAS: STRONG SUSTAINABILITY PROFILE

- **Coal**
  - Remains most cost competitive option
  - Abundant supply in several politically stable countries
  - But slow progress on projects to further reduce emissions

- **Gas**
  - Unconventional gas brings economic advantage
  - Cost competitive in certain markets, e.g. U.S.
  - Improved security of supply from development of unconventional and LNG

- **Renewable**
  - Greenest option but falls behind on economics and reliability
  - Significant cost improvements over the years
  - Energy storage – potential key to supply reliability issue
SHARES OF PRIMARY ENERGY

ANNUAL DEMAND GROWTH BY FUEL
Unit: Mtoe per annum

Source: BP Energy Outlook 2016 Edition
*Includes biofuels
CONVENTIONAL VS. UNCONVENTIONAL

KEY VALUE DRIVERS

- Ability to successfully identify, acquire and prove up significant oil and gas reserves
- Ability to maintain/extend production plateau once producing
- High exploration risk, high reward for identifying larger resource pools
- Drill a few core vertical and/or horizontal development wells

KEY VALUE DRIVERS

- Ability to acquire acreage in main sweet spots or fairways of plays
- Ability to leverage operational capabilities and scale to drive down cost and enhance production
- Relatively lower risk around identifying resource but higher risk on development phase
- Drill hundreds of horizontal fracturing wells to achieve portfolio mean performance

Fracturing fluid\(^{(1)}\) is pumped into a well
Pressure causes rock to crack, proppants\(^{(2)}\) hold cracks open to allow trapped natural gas to escape

\(1\) A mixture of water, sand and chemicals
\(2\) Sand or ceramic beads
Shale gas to become primary source that drives future gas production growth globally (c.40% of incremental gas supply from 2015-2030)

- Supply growth rate much higher than that of conventional
- Great entry point with lower development risks and competition

U.S. TO DRIVE SHALE GAS PRODUCTION

New shale supply expected to come from U.S.

GLOBAL SHALE GAS PRODUCTION BY REGION
Unit: bcf/d

- Large proven resource with long history of oil & gas development
- Leading operators with advance technologies
- Established transportation infrastructure
- Large highly qualified talent pool
- Access to extensive information
- Accessible, liquid & mature asset market

Source: BP Energy Outlook 2035
THE US GAS SECTOR

• Gas is consumed domestically but significant LNG export potential

• Major production from conventional source is located in the south

• Pipelines used to transport gas from the south up northeast but new production from shale source esp. Marcellus has gradually reversed the flow

• Future production is expected from unconventional esp. from Marcellus (+38 bcf/d growth between 2010-20)

NORTH AMERICA NATURAL GAS DEMAND, IMPORT AND EXPORT
Unit: Bcf/d

Source: IHS, EIA
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4 CHAFFEE CORNERS
BANPU UPSTREAM GAS STRATEGY – NORTH AMERICA

- Balanced fuel choice: supply security, economics, environmental impact
- Unconventional gas: lower costs
- Lower carbon emissions

- >2 years to research and prepare a capable team and strategy
- Strategic partnership established with local experts in the U.S.
- First step: non-operating portfolio (learning curve)

- Majority of new global gas supply to come from unconventional
- Marcellus accounts for one-fifth of U.S.'s total gas production and three-quarters of all new gas output in U.S. over the next two decades

- Long-term value creation in profitable growth market
- Risk diversification into a high potential energy resource
- Opportune timing
Banpu management first North America trip

Banpu Board approved investment strategy in North America

>100 investment opportunities reviewed

Banpu first investment in North America - And first ever foothold by a Thai company in the US unconventional oil and gas industry

Strategy Formulation

Investment Screening / Investment / Asset Management

US$/MMBtu

From Dec.13: Rig Decrease >80%

From Dec.13: Price Drops >50%

Today: Price is of 15-year low

Today: Oil&Gas Rig Count is 70-years low

Source: Baker Hughes, EIA
When we first took positions in mines in China a decade ago we had limited underground experience.

Step-by-step approach from small investment to majority position results in an overall value creating experience.

Although, investment in unconventional gas is different but cash flow profiles and some risks are similar to underground mining.
### INVESTMENT STRUCTURE AND GOVERNANCE

**INVESTMENT COMMITTEE**
- Evaluate and approve investments
- Anon Srlisaengtaksin
- Somruedee Chaimongkol
- Somyot Ruchirawat
- Akaraphong Dayananda

**ACQUISITION TEAM**
- Originate, analyse, evaluate and propose opportunities to the committee
- Chris Kalnin, Managing director/co-founder
- Joe Davis, VP Geoscience/Partner
- Ethan Ngo, VP Engineering/Partner
- Matthew Johnson, Land Expert/Finance
- Pisit Masiri, Manager
- Fuangyos Silairatana, BD Analyst
- Ronnayut Busaba, Petroleum Engineer
- Chaiwat Charoenpong, Geologist

**BKV Oil & Gas Capital Partners, L.P.**
- U.S.-based fund
- 10-year fund life
- $112M

- Sole sponsorship
- Final investment decision made by the investment committee
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CHAFFEE CORNERS: BANPU’S FIRST O&G ACQUISITION

$112m investment for 29.4% stake in Chaffee Corners, Pennsylvania, USA

Strategic location: Northeast of Marcellus, c.200 miles from NYC

Dry gas unconventional: 156 Bcf* proved (P1) reserves; 173 future wells; 10 Tcf OGIP**, average net production target 2016 c.21mmcfd*

Established midstream infrastructure and sold in “firm” contract into the domestic market

Positive cash flows: self-funding, last twelve months Ebitda of c.$11m*, stable cash flow outlook, avg. well breakeven gas price at $0.78/Mcf***

Timing acquisition: attractive valuation $0.7/Mcf (1P)

Operating partner: Repsol/Talisman Energy – a world-class operator
CHAFFEE CORNERS OPERATED BY A WORLD CLASS OPERATOR

**NON-OPERATING PARTNER**
- $112m for 29.4% through a fund structure established and managed by Kalnin Ventures

**OPERATING PARTNER**
- Global integrated national oil and gas (partly owned by Spanish government)
- $47bn revenue, 27,000 employees
- Principal business in upstream (2.2bn boe proved reserves), downstream and Gas Natural Fenosa
- Acquired an unconventional operator, U.S.-based Talisman in May 2015 at a purchase price c.$13bn
- Talisman USA produces c.400+ Mcf/day from Marcellus and has a reputation as a world-class operator in the Marcellus.

**PASSIVE INVESTOR (LIMITED RIGHTS)**
- Family-owned company with large position across the NE Marcellus

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**BKV Oil & Gas Capital Partners, L.P.**

**REPSOL**

**TALISMAN ENERGY**

**ABARTA ENERGY**

**CHAFFEE CORNERS JEA**

DRY GAS

UNCONVENTIONAL

29.4% 65.4% 5.2%
FAVOURABLE LOCATION: MARCELLUS SUPERCORE

- A pure-play investment in a de-risked dry gas resource base with very high recovery rates – in the core of the Northeast Pennsylvania Marcellus Gas Play

- Asset is located in the “Super Core” region of North East Pennsylvania

- Marcellus is the lowest cost play in the U.S., and the NE Super Core is the lowest costs area of the Marcellus

- Producers in the Marcellus field benefit from prolific well, substantial infrastructure investment and proximity to the high-demand markets along the East Coast of the United States.
STRONG RESOURCES POSITION; DERISKED

• ~11,000 net acres to Banpu’s position
• Proved reserves (1P) of 156 Bcf* net to Banpu
• A 29.4 % working interest in Joint Exploration Area (JEA)
• JEA owns midstream pipeline gathering system and compressor station
• Firm gas offtake contract for 10 years at fixed fees
• 62 producing wells
  14 wells waiting on completion
• 173 de-risked well locations

*Verified by third party Feb 2016: Rose & associates
CHAFFEE CORNERS: PHOTOS

Wellhead

Compressor station

Metering station

Tie-in to Tennessee Gas Pipeline
### CHAFFEE CORNERS KEY METRICS

#### ACQUISITION PRICE

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>EV/1P Reserve</td>
<td>~$0.71/Mcf</td>
</tr>
<tr>
<td>EV/ Daily production</td>
<td>~$5,300/Mcf/day</td>
</tr>
<tr>
<td>EV/Net undeveloped acre</td>
<td>~$4,300/net acre</td>
</tr>
<tr>
<td>EV/Last twelve months EBITDA</td>
<td>~10x</td>
</tr>
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</table>

#### OPERATING METRICS

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. NYMEX gas price 2015</td>
<td>$2.63/Mmbtu</td>
</tr>
<tr>
<td>Avg. differential to Henry Hub</td>
<td>$0.53/Mcf</td>
</tr>
<tr>
<td>Last twelve months EBITDA</td>
<td>~$11 million</td>
</tr>
<tr>
<td>Avg. daily production (2016e)</td>
<td>21 Mcf/day</td>
</tr>
<tr>
<td>Operating net back**** (2016e)</td>
<td>c. $1.25/Mcf</td>
</tr>
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</table>

#### SINGLE WELL ECONOMICS (SOUTH)

<table>
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<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Average cost per well (DC&amp;T*)</td>
<td>$6.2 million</td>
</tr>
<tr>
<td>Average EUR** per well (South)</td>
<td>~10 Bcf</td>
</tr>
<tr>
<td>Avg. well operation breakeven gas price</td>
<td>$0.78/Mcf</td>
</tr>
<tr>
<td>Full cycle single well IRR at 04/20/16 NYMEX*** strip</td>
<td>17.4%</td>
</tr>
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* Drilling, completion & tie-in costs; ** Estimated ultimate recovery; *** The New York Mercantile Exchange (NYMEX) strip is the average of the daily settlement prices of the next 12 months' futures contracts on natural gas; **** Estimated based on historical prices for Jan-Mar 2016 and Nymex Henry Hub strip as of April 20, 2016;
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Source: IHS Transaction Analysis database, as of March 10, 2016
* Based on share price as of 12 April 2016, 1P reserves as of 12/31/2014, shown in Mcf equivalent (@ 1 BOE = 6 MCF)
## LAND POSITION
- 11,116 net mineral acres, largely contiguous
- 86% Held By Production (HBP) of currently producing wells
- Opportunity for surrounding bolt-on acquisitions through area of mutual interest and beyond

## OPERATOR
- Large & highly respected
- Safe and environmentally conscious track record
- Team-oriented partner
- Technically-focused operation

## MIDSTREAM
- Asset includes midstream (pipeline) equipment within area
- Midstream equipment is a source of revenue from surrounding operators
- Scalable in event of significant increased future production

## OFF-TAKER
- Talisman USA handles all marketing on behalf of JEA
- Gas is sold via a “firm” contract with Tennessee Gas Pipeline which expires in 2025

## ECONOMICS
- Marcellus offers the most economic natural gas basin in the US
- Supercore offers the most productive wells in the basin
- Firm contract secures premium on natural gas sales
Banpu site visit

K.Chanin Vongkusolkit, K.Anon Sirisaengtaksin and team visiting the operating site in Pennsylvania, USA on 14th January 2016
Appendices
**Barrel (Bbl)**  
This is the standard measurement for quantities of oil. One barrel of oil is equal to 42 gallons.

**Mcf**  
Gas is measured in number of cubic feet. Thousands of cubic feet, or Mcf, is the standard measurement for quantities of gas. Production can be measured in Mmcfd, meaning million cubic feet of natural gas produced per day.

**Reservoir**  
A reservoir is defined by four features. These four features are the accumulation of hydrocarbons via a present source rock, organic material that is "cooked" into hydrocarbons, porosity and permeability, and an impervious cap rock.

**Porosity**  
Porosity is defined as the pore space within the rocks.

**Permeability**  
Permeability entails the connections between pore spaces within the rock.

**Drilling**  
This process entails using a drilling rig to drill the vertical or horizontal wellbore for the future extraction of hydrocarbons.

**Completing**  
The activities that take place after the initial drilling of a well, and are used for bringing a well on to production. This involves cementing, perforating, fracking, and more. Together, in the Chaffee Corner area, drilling and completion costs average ~$6.0MM.
Hydraulic Fracturing
The process of pumping water, sand and chemicals into a drill wellbore in order to fracture impermeable rock. This fracturing then allows hydrocarbons, previously considered inaccessible, to flow towards the wellbore for production.

Vertical Well
A well drilled directly above the producing target, straight down.

Horizontal Well
A well drilled vertically to a given depth, then gradually curved until the wellbore is horizontal, so as to intersect a producing formation across thousands of horizontal feet.

Operator
The operator is the company whose name is on the well and manages the day-to-day operations. The operator is one and only one of the joint working interest owners.

Non-operator
Non-operators pay their proportionate share to the operator. This involves all of the rest of the joint working interest owners, other than the operator.

Joint Working Interest
Two or more parties each own an undivided fraction of the working interest in a single lease.

Lease Operating Expenses (LOE)
Lease Operating Expenses are measured as a function of costs per thousand cubic feet (mcf) of gas produced.
**Oil and Gas Lease**
Prior to drilling activities, an Oil and Gas Lease must be retrieved from the mineral owner. Mineral owners are paid an upfront Lease Bonus, in addition to a royalty percentage from any productive well.

**Held By Production (HBP)**
Acreage is HBP when there is a producing well on the underlying Oil and Gas Lease. In this event, the Oil and Gas Lease will not expire, as long as the well continues to produce hydrocarbons.

**Economic Reserves**
The quantity of reserves that are technically and economically recoverable under existing conditions and operating methods are deemed to be Economic Reserves.

**Proved Developed Reserves (PDP)**
Proved Developed Reserves are expected to be extracted through existing wells and equipment, and are actively being produced.

**Proved Undeveloped Reserves (PUD)**
Proved Undeveloped Reserves are expected to be extracted through new wells on undrilled acreage, however, this undrilled acreage must be "proved" to a reasonable extent.

**Estimated Ultimate Recovery**
The estimated cumulative amount of oil or gas forecasted for a single well. Typically, this production will occur over 40 to 50 years.

**Single Well Economics**
Single Well Economics measure the economics of a single oil or gas well. These economics account for relevant acquisition costs, drilling and completion costs, and production over the 40 to 50 year life of the well.
OIL & GAS: THE BASICS

**OIL**

- High carbon and hydrogen content
- Liquid at room temperature

**NATURAL GAS**

- A naturally occurring hydrocarbon gas mixture consisting primarily of methane

**PROPERTIES**

- Primarily refined and used in transport fuels (e.g. gasoline)

**UNIT**

- Barrel
  
  “Barrel Oil Equivalent (BOE): 1 barrel of oil = 600 cubic feet of gas”

- Cubic feet

**PRIMARY USES**

- Traded on a global basis
- Used for heating and electric power generation

**TRADE**

- Traded on a domestic basis
- Difficult and expensive to transport (e.g. Liquefied Natural Gas (LNG))

**PRICES**

- North America price benchmark
- West Texas Intermediate (WTI)

- North America price benchmark
- Henry Hub (HH)

*Prices trade separately on their own fundamentals and are only slightly linked*
CONVENTIONAL VS. UNCONVENTIONAL

Hydraulic fracturing involves high pressure injection of fracking fluids, mainly water into deep-rock formations to enable gas, trapped in low-permeably shale to flow more freely for extraction.

Source: Sanchez Energy Corporation
<table>
<thead>
<tr>
<th>Conventional oil and gas upstream business</th>
<th>Unconventional oil and gas upstream business</th>
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<tbody>
<tr>
<td><strong>Key value driver:</strong></td>
<td><strong>Key value driver:</strong></td>
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<td>• Ability to successfully identify, acquire and prove up significant oil and gas reserves</td>
<td>• Ability to acquire acreage in main sweet spots or fairways of plays</td>
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<tr>
<td><strong>Risk return profile:</strong></td>
<td><strong>Risk return profile:</strong></td>
</tr>
<tr>
<td>• High reward for identifying larger resource pools as there exist significant risk/uncertainty around successfully targeting the resource base</td>
<td>• Lower relative risk around identifying resource base as there abundance of information on where potential tight oil/gas resources exists</td>
</tr>
<tr>
<td>– Exploration well success rates of about 30+% considered good</td>
<td>– Development well success rates average somewhere between 90-95%</td>
</tr>
<tr>
<td>• Drill a fewer core vertical and/or horizontal development wells to provide the plateau of production</td>
<td>• Drill hundreds of horizontal fracturing wells to achieve a portfolio effect and drive production targets toward the targeted mean production</td>
</tr>
<tr>
<td>• Most of the opportunity value creation has occurred once resource base has been successfully targeted</td>
<td>• Even after resource base is successfully targeted, major value creation is driven by the operators ability to drill high productivity wells at increasingly lower costs</td>
</tr>
<tr>
<td>– Remaining value creation focused on optimizing development and maintaining production</td>
<td>– Well design and drilling technologies employed are highly localized and vary significantly between operators</td>
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US gas demand growth from power and LNG

- 2.5% CAGR demand growth expected over next 30 years
- Growth driven by demand in power sector and LNG

Marcellus leads the additional supply

- Majority of demand met by domestic shale production
- c.75% of new supply coming from Marcellus
MARCELLUS: A PLACE-TO-BE FOR US UNCONVENTIONAL GAS

**Resource potential**
- One of the most prolific basins (c.140 trn ft³)

**Known producing basin low risks**
- Large and potential largest producer (14 bcf/d to be 40 bcf/d by 2040*)
- Source of c. 75% of new supply (CAGR 13% 2010-40)

**Strong economics**
- Close to demand
- Low cost

**Strong deal flows**
- Numbers and types of operator in Marcellus area and current dynamic generate attractive deals

* Trillion cubic feet
EXPERIENCED BANPU O&G TEAM

Chris Kalnin
Managing director/co-founder
- Former strategy advisor at PTTEP shaping international growth strategy
- Former strategy consultant at McKinsey with focus on energy sector

Joe Davis
VP Geoscience/Partner
- >30 year global O&G experience
- Member of AAPG* Dallas Chapter
- Geologist PhD from UT Austin

Ethan Ngo
VP Engineering/Partner
- >8 year experience in unconventional plays
- Worked at ExxonMobil, Newfield Exploration, Liberty Resources and Fidelity E&P

Matthew Johnson
Land Expert/Finance
- Expertise in U.S. land and land management
- Worked at Linc Energy and Sam Gary Jr. and Associates

Anon Sirisaengtaksin
Executive advisor
- Decades of Oil & Gas experience
- Former CEO of PTTEP and PTTGC
- >30 years with PTT group, with roles in operations and business development across natural gas value chain

Pisit Masiri
Manager – Business Planning & Analysis
- Almost a decade of experience in business planning & analysis and engineering

Fuangyos Silairatana
Business Development Analyst
- 5 years experience in BD and oil & gas - PTTGC, Bangkok Industrial Gas and CUEL

Ronnayut Busaba
Petroleum Engineer
- 5 years experience
- M.E. and B.S. in Petroleum Engineering

Chaiwat Charoenpong
Geologist
- 4 years as Earthscience Technologist at Chevron
- M.Sc. in Petroleum Geoscience and B.Sc. in Geology

*Advancing the world of Petroleum Geosciences
OPERATING PROCESSES

- **WELL HEAD**
  - RESERVOIR
  - Boiler heats up wellhead gas before compressing it into pipeline
  - Used temporary and be removed once pressure is down to c.1000-1200 psi

- **T-PACK/BOILER**
  - 12 identical engines: c.15,400 HP
  - 3 stages
  - Out Pressure: 1,100 lbs
  - Inlet: 250 lbs, or 125 lbs
  - 140 MMcfd capacity

- **COMPRESSOR**
  - **SIVERS METER**
  - 450 mmcf/d capacity

- **TRANSMISSION PIPELINE**
  - Tie-into Tennessee Gas Pipeline is c.100' from meter station
  - Firm LT gas contract
  - Prevailing interstate gas pipeline

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*All infrastructure already built and under a firm long-term gas contract*