Shale Gas Exploration
McArthur Basin Onshore Australia

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Director & Chief Executive Officer

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Aims

- Demonstrate why cultural heritage & natural environment must take precedence over petroleum

- Challenge technology providers to deliver necessary & timely breakthrough

- Imperial’s stand to preserve culture & environment and exploit resource
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McArthur Basin Shale Gas Play

- Imperial Oil & Gas
- Competitive landscape in Australia
- Shale Gas Play
- Aboriginal Land & Environment
- V + V + S
- Footprint
- Call to Action for petroleum technologists
Imperial Oil & Gas

Empire Energy Group Limited
Australian Securities Exchange (ASX: EEG)

96% → 100%
Imperial Resources LLC

~92%*

100% → 100%
Empire Energy USA LLC

Empire Drilling & Field Services LLC
Empire E&P LLC

47,952 km²
Aboriginal Land

11,220 km²
Native Title
Australia

- Shale Gas is still in infancy
  Little exploration & no-commercial production

- 396 Tcf TRR Shale Gas

- Greater than estimated CSG reserves that will...
  underpin 3 recent LNG projects
deliver capacity of 25 million tonnes a year

<table>
<thead>
<tr>
<th>Continent</th>
<th>Risked Gas In-Place (Tcf)</th>
<th>Risked Technically Recoverable (Tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>3,856</td>
<td>1,069</td>
</tr>
<tr>
<td>South America</td>
<td>4,569</td>
<td>1,225</td>
</tr>
<tr>
<td>Europe</td>
<td>2,587</td>
<td>624</td>
</tr>
<tr>
<td>Africa</td>
<td>3,962</td>
<td>1,042</td>
</tr>
<tr>
<td>Asia</td>
<td>5,661</td>
<td>1,404</td>
</tr>
<tr>
<td>Australia</td>
<td>1,381</td>
<td>396</td>
</tr>
<tr>
<td>Total</td>
<td>22,016</td>
<td>5,760</td>
</tr>
</tbody>
</table>
Late 2009: 20% under application

March 2010:
- Imperial applications 25th March 2010
- 59,000 km²
- 5% of onshore NT
70% under application

Entirely populated by modest sized independents
### Shale Deals

**Big moving on the small**

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Amount</th>
<th>%</th>
<th>Company</th>
<th>Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 2010</td>
<td>Mitsubishi</td>
<td>A$ 152.4 million</td>
<td>50%</td>
<td>Buru Energy</td>
<td>Canning Basin</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>CNOOC</td>
<td>A$50 million</td>
<td>50%</td>
<td>Exoma Energy</td>
<td>Galilee Basin</td>
</tr>
<tr>
<td>Apr 2011</td>
<td>Hess</td>
<td>U$60 million (+10 mm shares)</td>
<td>62.5%</td>
<td>Falcon Oil &amp; Gas</td>
<td>Beetaloo Basin</td>
</tr>
<tr>
<td>Jul 2011</td>
<td>CoP</td>
<td>A$ 109.5 million (+back costs)</td>
<td>75%</td>
<td>New Standard Energy</td>
<td>Canning Basin</td>
</tr>
<tr>
<td></td>
<td>BG</td>
<td>A$ 130 million  (+back costs)</td>
<td>60%</td>
<td>Drillsearch Energy</td>
<td>Cooper Basin</td>
</tr>
</tbody>
</table>

Beach flowed 2 mm scfd shale gas booking contingent 2Tcf in Cooper Basin

**Oz deals currently modest compared with USA & Canada**

<table>
<thead>
<tr>
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<th>Amount</th>
<th>%</th>
<th>Company</th>
<th>Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2011</td>
<td>BHP</td>
<td>U$12.1 billion Petrohawke Energy</td>
<td></td>
<td>(Texas &amp; Louisiana Eagle Ford, Haynesville &amp; Permian shale plays)</td>
<td></td>
</tr>
</tbody>
</table>
McArthur Basin

- Palaeo-Proterozoic
- 1.64 Billion years old
- Traditionally mining area
- No petroleum exploration

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The most spectacular indication of live hydrocarbons encountered to date in the McArthur Group was in the Koonenbitt-Ancoo mineral exploration corehole GR 9, drilled in the Clyde area. A summary log of this drill hole is shown as Figure 5, and the location is shown in Figure 2. Upon unintentional washing at the end of drilling (in December 1979), the corehole experienced a gas blow-out which yielded a 5-6m (15-20 ft) long flame. Condensate flow accompanying the gas, was indicated by the bright orange-yellow colour of the flame, and by an accompanying sooty tail. The hole flowed gas for an indeterminate period during the immediately following "wet" season. By the end of the "wet" the hole was filled with water and the gas flow had degenerated to a series of gas bubbles percolating through hydrostatic head. A sample of the gas taken at this stage yielded the following analysis:-

- Methane 74.25%
- Ethane 10.25%
- Propane 3.25%
- Iso-Butane 0.175%
- N-Butane 0.60%
- n-Pentane 0.10%
- Hexane 0.165%
- Heptane 0.08%
- Nitrogen 10.75%
- Carbon Dioxide 0.20%

The hole was plugged with cement in April 1980.
GR-9 Well

~ 6 mm scfd
~ 1 bcf in 6 months

“... mineral exploration hole drilled at the Glyde River prospect by Amoco in 1979 flowed gas and condensates at 140psi for 6 months .......”

Armour Energy ASX announcement 11th October 2010
Uncertainties

**Shale Quality**
- Distribution of gas-shale
- Regional quality trends

**Shale Effectiveness**
- Position of OGW/GGW
- Timing
- Sweet spots

Marcellus Analogue for volume

Access to Aboriginal Land......
Aboriginal Land

Imperial Acreage

47,952 km² Aboriginal Land 80%
11,220 km² Native Title 20%

Gawirrin Gumana AO
DOB ~ 1918

Galiwinku
Gan Gan
Gapuwiyak
Gurrumurru
Borroloola

2009
Perception

On the one hand....

“...the push to drill for natural gas is turning vast swaths of beautiful American country into dangerous sludge dumps...”

“... dirty business...”

.... yet on the other

“...2 out of the 3 wells that Gas-Land featured were contaminated biogenic gas unrelated to oil and gas activity”

“...natural gas falsely accused (of) 35 mile fish kill. U.S. Environmental Protection Agency tied the fish kills to coal mine run-off”

.... SO....
Incremental Change

Now

Future

Opportunity

Incremental Efficiency

Technology Creep

More of the same... is not acceptable

Future Base Case

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Game Change

Now

Future

VALUES, ETHICS & COMMITMENT

Technology Breakthrough

Technology Creep

More of the same

Ambition

Thomas Kuhn (1962) Paradigm Shift
"... scientific advancement is not evolutionary, rather is a series of peaceful interludes punctuated by intellectually violent revolutions"
Imperial’s Vision

Safely develop the shale gas resources while preserving cultural heritage, customs & natural environment

... which means ....
... being true to our words

Technology breakthrough

Values

Resources

... then ...
So, the reality is ..... 

- access to resource is constrained by environment & culture
- protect these or forget the resources

**Strategy**

Drive the *timely development* & implementation of drilling & production *technology* to

- remove risk to environment & culture
- maximise recovery
- optimise shale gas economics
Minimising Footprint

Fewer pads means:
- less roads, pipelines
- reduced visual impact
- lower LTI’s?

Deviated or Horizontal Well

2 Drill Rigs on 1 location can drill many horizontal wells

500 to 5,000 feet

Shale gas layer

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Natural Rehabilitation

6 months - regrowth
10 years - complete regrowth
Shale Gas Drilling Limit

Current
- Deepest (MD) 7,620m a-c
- Deepest (TVD) 4,481m a-b
- Lateral Length 3,048m b-c
- Highest Initial Production
  - 10,000 BOPD
  - 60 MMCF/Day
- Up to 22 fracs per well

Trends
- Cleaner
- Deeper
- Hotter
- Longer
- More Laterals
- More fracs per well
- Cheaper

In 2-5 years?

Values provided by Packers Plus April 2011
Push the limit

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Reservoir at 1,600m TVD

Sherwood sandstone reservoir

1,585 m TVD subsea

Drill site

Sherwood existing TD location

Sherwood planned TD location

Radius of development of offshore reserves by extended reach drilling

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1999

World record for 11km long reach horizontal well

National Park & Wildlife Reserve
Strategy

Drive the **timely development** & implementation of **drilling & production technology** to
- remove environment risk
- maximise recovery
- optimise shale gas economics

**Technology Challenge**
- **Cheap**
- **Safe**
- **10km+ fracced horizontal wells**
- **with multi-lateral, multi-level & multi frac**
- **that have no lasting impact on environment**
Acknowledgment the past but no precedent for future

Responsibility to protect heritage & natural environment
- no compromise!

“...I’ll tell you what I want, what I really, really want...”

Technology breakthrough in 2-5 years
- Safe, cheap & clean
- 10km+ fracced horizontal wells as standard
- multi-lateral/level/frac
Broader Vision

The first predominantly Aboriginal-led petroleum exploitation company with focus on the East Arnhem Region

..... a ‘NOC’ like PetroMin in PNG
McArthur Basin Shale Gas Play
Northern Territory Onshore Australia

Opportunity
In 2010 Imperial Oil & Gas secured 100% interest in 59,000km² of prospective shale gas exploration acreage in the Proterozoic McArthur Basin (Exploration Permit Applications EP (A) 180 – 188). The McArthur is a petroleum frontier basin of low exploration maturity and no prior shale gas activity. It is an inverted Proterozoic basin with thick carbon-rich black shale petroleum source rocks also mined for Pb-Zn. There are direct indications of oil & gas in the basin and existing gas pipelines. Analogue shale gas basins suggest Imperial's acreage contains the order of 24 Tcf of potential recoverable resources. For the permits to be granted and exploration work to start agreements must be negotiated with Traditional Land Owners. This process has commenced.

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Key Uncertainties & Risk
Consistent with a frontier basin the regional extent, quality, and thermal maturity of the Barney Creek & Velkerri Formation shales have yet to be adequately constrained due chiefly to past focus on mineral exploration from the former. Potential gas prone sweet spots are yet to be delineated and hence Imperial's strategy of acquiring a very large initial acreage position.

Land access and permit grant in six of the seven permit applications requires approval of the Traditional Owners given they are in Aboriginal Freehold Land. This is a risk given the licenses may not be granted for some time or at all. If negotiations are successful then some permits could be granted and work commence as early as 3M 2012. If not then the majority of the permits enter a 3 year vote period after which negotiations may re-commence.

Exploration Work Programmes
Once each permit is granted, the work programmes in all 7 permit areas are essentially the same. Years 1 & 2 of the 5 Year Initial Exploration Term will be concerned with demonstrating the quality of any potential gas shales by geological fieldwork, sampling, and by acquiring pilot core samples. This work will form the basis for a Petroleum System Analysis to constrain whether, and in what locations, these shales may be capable of gas (or oil) production. The option to exit can be examined at the end of any permit year.

Year 3 will focus on 2D seismic acquisition to define the basin shape and depth as well as subsurface targets for vertical test drilling. In Year 4, if proven to contain shale gas then Year 5 will include the drilling and evaluation of a deviated or horizontal well involving fracking and gas production testing.

Barney Creek Formation
Lithofacies Carboneaceous black silty dolomitic shale
Depth Outcrop to 4,000m
Gross 502 - 1,000m
Net 13% (in GR-9) to 27%
TOD 0.4 - 10.4%
SH/T 5 - 70 l/g/ton
Maturity Immature to GGW

For more information on Imperial Oil & Gas Pty Ltd and its Parent Empire Energy Group Limited (ASX: EEG) visit http://empireenergygroup.net/