Concept Presentation


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Clean Energy Alternatives

Vast Trapped Natural Gas Reserves

Hydraulic fracturing technology has created an unprecedented supply of oil and natural gas to meet the country’s energy needs. Many legacy natural gas fields are uneconomic in the current price environment.

Water Driven Gas Reservoirs & Water Management

Many uneconomic gas fields also produce vast amounts of brackish water. Access to cheap electricity on location creates an opportunity for desalination in many drought-stricken areas.

Clean Energy Conversion

Natural gas producers can realize an additional $2.00-$3.00 per Mmbtu by selling their gas as electricity and also realize substantial operating cost savings by using field-generated electricity at the field level.
• Domestic natural gas is now plentiful and affordable enough to serve America’s power generation needs beyond the next 50 years.

• Integrating natural gas production directly with power generation creates a new and profitable business model

• The new model addresses multiple issues with today’s power generation industry while remaining affordable to the consumer, profitable to the company, and benefitting the community and environment as a whole.

• Acquiring gas fields that are currently uneconomic or abandoned locks in the largest expense component and largest variable in the power generation industry – the fuel.
Current Business Model - Example

Current System

- Natural Gas Production is often piped hundreds of miles away before it is utilized
- Once burned for electricity, power is often transmitted hundreds of miles from where it is generated to where it is consumed
- Expenses are incurred at every sales/transfer point, ultimately ending up being paid by final consumer
- Largest losses in power generation are in long-distance transmission
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Market Overview

- Power Generation Market exceeded $375 Billion in 2013 in the United States alone.*
- Regulatory influence and environmental factors are driving the market towards cleaner power generation methods.
- Aging infrastructure and security concerns are driving the market towards distributed generation solutions.
- Market share gains from Wind and Solar are impressive but simply cannot meet the needs of this evolving market.
- Large centralized power generators are resistant to these driving forces and will continue to lose market share.

### Sales, Revenue, and Average Retail Price for January through December

<table>
<thead>
<tr>
<th>Sector</th>
<th>Retail Sales (million kWh)</th>
<th>Percentage Change</th>
<th>Total U.S. Electric Power Industry</th>
<th>Retail Revenue (million dollars)</th>
<th>Percentage Change</th>
<th>Average Retail Price (cents/kWh)</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1,394,919</td>
<td>1.5%</td>
<td>Year 2013</td>
<td>169,113</td>
<td>3.6%</td>
<td>12.12</td>
<td>2.0%</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,344,207</td>
<td>1.3%</td>
<td>Year 2012</td>
<td>138,224</td>
<td>3.2%</td>
<td>10.28</td>
<td>1.9%</td>
</tr>
<tr>
<td>Industrial</td>
<td>978,352</td>
<td>-0.7%</td>
<td>Year 2013</td>
<td>66,909</td>
<td>1.7%</td>
<td>6.84</td>
<td>2.5%</td>
</tr>
<tr>
<td>Transportation</td>
<td>7,625</td>
<td>4.2%</td>
<td>Year 2012</td>
<td>747</td>
<td>7.7%</td>
<td>10.55</td>
<td>3.3%</td>
</tr>
<tr>
<td>All Sectors</td>
<td>3,725,103</td>
<td>0.8%</td>
<td>Year 2013</td>
<td>375,050</td>
<td>3.1%</td>
<td>10.07</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Bring Oil & Gas Expertise Directly to the Power Grid

- Combine Natural Gas production with Power Generation at the field
- Acquire Natural Gas fields that are currently uneconomic and have associated gas gathering and electrical infrastructure in good power markets
- Financed through Power Purchase Agreements (PPAs), install Power Generation facilities at the central gathering points of the produced gas
- Reduce field-level OPEX by generating electricity for the field (single largest production expense)
- Sell excess electricity into the grid through the PPA
The majority of CBM fields require $3.50/mmbtu gas to breakeven, whereas prices have fallen steeply below $2.00/mmbtu.

Many large gas fields have been shut-in, abandoned, or have gone through bankruptcies in the last few years.

More shut-ins, abandonments, and bankruptcies are coming due to the current abundance of less expensive gas from shale plays.

CBM fields require substantial electrical infrastructure in order to produce gas.

Most CBM fields also have their own centralized gas gathering systems.

CBM fields are located in diverse markets around the country.
Case Study: Black Warrior Basin CBM Field currently in bankruptcy

- 34mmcfpd of methane production
- Nearby electrical substation currently services electrical needs of the field
- Gas gathering system owned by current operator, also in bankruptcy
- Field not likely to resume business in a sub $3.50 natural gas market
- Acquisition of the field and infrastructure would ensure a supply of over a TCF of natural gas over a 30 year life of the field
- Acquisition cost would be minimal. Possibly for debt assumption or even just liability assumption
Case Study: Black Warrior Basin CBM Field currently in bankruptcy

- 34mmcfpd using conventional power generation methods will produce a 166MW power plant
- Selling 166MW of power at just $.05/kWh generates $72m of annual gross revenue
- This effectively converts an uneconomic natural gas resource into a field that sells gas in the form of electricity for $5.86/mmbtu
### Case Study: Black Warrior Basin CBM Field

#### Illustrative CBM Field Conversion Economics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition of CBM Assets</td>
<td>$5m</td>
</tr>
<tr>
<td>Acquisition and Installation of Power Generation</td>
<td>$100m</td>
</tr>
<tr>
<td>Conversion Efficiency of Plant BTU to kWh</td>
<td>40%</td>
</tr>
<tr>
<td>Cost of CBM OPEX</td>
<td>$.75/mcf</td>
</tr>
<tr>
<td>Cost of Power Gen OPEX</td>
<td>$.015/kWh</td>
</tr>
<tr>
<td>Natural Gas Royalty</td>
<td>25%/mcf</td>
</tr>
<tr>
<td>Sales Price per kWh</td>
<td>$.05/kWh</td>
</tr>
<tr>
<td>Gross Revenues</td>
<td>$72m</td>
</tr>
<tr>
<td>OPEX</td>
<td>$31.1m</td>
</tr>
<tr>
<td>Mineral Royalty Payments</td>
<td>$22.9m</td>
</tr>
<tr>
<td>Net Revenue</td>
<td>$21.7m</td>
</tr>
</tbody>
</table>
Traditional and Clean
Natural gas turbines are a clean-burning power generation technology that creates nearly half the amount of CO2 per BTU as coal.

Pounds of CO2 emitted per million British thermal units (Btu) of energy for various fuels:

- Coal (anthracite) 228.6
- Coal (bituminous) 205.7
- Coal (lignite) 215.4
- Coal (subbituminous) 214.3
- Diesel fuel and heating oil 161.3
- Gasoline 157.2
- Propane 139.0
- Natural gas 117.0

* Source: EIA
Traditional and Clean

- Natural gas turbines convert the heat generated by combustion into electricity at about 40% efficiency

- When the waste heat from combustion is captured and used to generate steam and generate more electricity, conversion efficiency can reach 56%. This is called Combined Heat & Power (CHP)

- Efficiency drives revenues and maximizing output per BTU is environmentally responsible

- Using the metrics from the Black Warrior Basin Case Study in previous slides, increasing efficiency from 40% to 56% nearly doubles net revenues from $22m/yr to $43m/yr

- Other opportunities for waste heat include HVAC, desalination of produced water, hydrogen generation, natural gas processing and many others
Emerging Technology – Microturbines

- New business model allows microturbine technology to finally reach a mature and economic stage of development

- Microturbines are more efficient than their larger counterparts

- Microturbines produce less CO2 and NOx than any other economic fossil fuel based electricity source

- Placing power generation in the field with natural gas infrastructure creates the opportunity for safe and economic sequestration of produced CO2 for a zero-carbon footprint power generation plant

- Because the volumes of CO2 produced are so low, other economic uses for the produced CO2 can be explored
Scalability of Microturbines

- Microturbines offer a wide range of electrical production capability
- Microturbines can be daisy-chained for flexible capacity as field conditions change
- Microturbines are capable of base load through peaking conditions
- Scalability offers the potential to revive thousands of abandoned uneconomic wells and fields
New Technology

• GENSETS technology takes the potential beyond the field level

• GENSETS technology takes the potential to the WELL level

• GENSETS would represent the ultimate in natural gas based DEG

• Vast majority of producing oil & gas wells require artificial lift (pumps)

• Vast majority of artificial lift powered by grid electricity

• Electricity is the largest operating expense to many legacy oil & gas wells

• Vast majority of oil wells also produce “associated” gas – often vented to atmosphere
Regulatory Assistance

• EPA has adopted a new policy aimed at curbing methane emissions in the oil & gas industry

• Operators will have less flexibility to flare or vent natural gas

• Many oil wells with “associated” gas do not have pipeline to sell gas into

• New regulations could force operators to adopt new technology to avoid shutting in oil production due to new regulations

• The GENSETS target power profile has tens of thousands of potential applications at the “well level”

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