# EMISSION FREE Power generation

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# **Natural Energy Partners Ltd.**



Maximizing the economic potential of distributed power



# **Typical 20 MW Power Generation Facility**



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11

11

3

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# **Advantage of Traditional Distributed Generation**





# **Natural Energy Model**





# **Natural Energy Process**



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10 - C2000 N6C Cummins twin turbo charged natural gas gen-sets

- Total output is 20 MW (28,000 hp)
- Cummins switch gear and parallel equipment manage the combined engine performance and output to the grid (Fortis Alberta Connection)









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Producing Liquid CO<sub>2</sub> - chiller and compression liquid CO2 7.68 tonne/hr. 1.9 MPa @ 125c Chiller







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#### Process Flow Diagram: Amine Treatment



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#### Producing liquid CO2 7.68 tonne/hr.

# Liquid CO<sub>2</sub> - cleaning and liquefaction



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11

11

13

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# **Typical Facility Monthly Production**

Monthly output (80% electrical capacity utilization)

- Base Load Electrical power: 11,680 MW/month
- Liquid CO<sub>2</sub>: 4,640 tonne/month
- Thermal energy: 5,754 MW/month
- Saleable Potable water: 3,103 m<sup>3</sup>/month
- Offset Carbon Credits: 6,658 tonne/month



# **Growth Plan**

- 10 Facilities are moving forward through engineering and regulatory processes, 5 in Alberta
- In February 2013 Alberta Utility Commission approved the construction & interconnection of the first facility in Ralston, AB
- 2<sup>nd</sup> through 5<sup>th</sup> facilities are moving forward through approval process in Alberta
- BC and Saskatchewan have a much slower time line, currently Natural Energy has a facility in each province slowing working through the application & regulatory process
- Yukon and the Northwest Territories have also requested power generation facilities



# **Electricity**

- NEPL facilities in Alberta connect to the un-regulated power grid. Power can be sold to any customer in the Western North America system
- Non-Alberta facilities will be constructed with 20 year provincial power purchase agreements
- Current wholesale spot market prices over the last 12 months average \$67/MWh. Spot market prices over the last 60 months average \$60/MWh
- Current 5 year forward hedge price is \$60/MWh
- Prices are based on running 7 days a week, 24 hours per day (7/24)
- In conversations with customers, retail prices on average, are a 15% premium to the wholesale price



# **Thermal Energy**

Each MW of electricity produced by a reciprocal engine genset generates recoverable thermal energy from 3 places;

- Exhaust gas from the engine block
- Engine block cooling water
- Engine block cooling oil

Thermal energy produced will be used as follows:

60% is going to be used internally:

- CO<sub>2</sub> recovery 45 %
- Heat the gas leading into the Turbo Expander 15%

The remaining 40% will be used to heat water for sale to the surrounding oil/gas well servicing industry



## Water

- Every molecule of natural gas combusted creates two molecules of water.
- Petroleum producers use tremendous amounts of water daily. Drawing water from the local aquifers is no longer permitted without extensive regulatory work. They now use local county water systems resulting in rising prices for potable water.
- Water in all Alberta county's is becoming more expensive to clean, treat, store and transport. In SE Alberta water currently sells for \$2.75/m<sup>3</sup> and then must be trucked to the field for use.
- NEPL can sell water directly to the petroleum producers for at, minimum, the County price, most likely more due to saving on trucking costs. Producers also require heated water which they can pick up at our facilities, currently they fire diesel boilers attached to the truck during transport to heat the water. Heated water can sell for over \$30/m<sup>3</sup>



# **Carbon Offset Credit Calculation**

- A NEPL power facility produces well below the greenhouse gas emissions as per the requirements of section 7 under the *Specified Gas Emitters Regulation in Alberta*.
- Natural Energy is registered with Alberta Emission Offset Registry (AEOR) as operated by Climate Change Central (C3). 1 offset credit is equal to 1 tonne of CO<sub>2</sub>e.
- Greenhouse gases (GHG) are based in tonne of carbon dioxide equivalent (CO<sub>2</sub>e)
- Calculations are done using the ISO 14064-2 platform (the federal RET program) to calculate tonne of CO<sub>2</sub>e reductions.
- Natural Energy 20 MW facilities reduce the CO<sub>2</sub>e from the federal baseline as follows;
  - Facility efficiency: 6,558 tonne/month
  - Reduction of NO2: 100 tonne/month
  - Use of thermal energy: Credit is dependent on the end user (2,520 tonne/month)
  - Use of liquid CO<sub>2</sub>: Credit is dependent on the end user (4,639 tonne/month)
  - Each offset credit in Alberta trades for \$15.00 government set price



# Liquid CO<sub>2</sub>

- 6.5% of the engine exhaust stream after the ERT is CO<sub>2</sub>
- 17 MWh of electricity production produces 150 tonne of CO<sub>2</sub> a day
- Capturing, cleaning and cooling CO<sub>2</sub> requires 60% of the power plants thermal output and 5% of the electricity produced



# **Proposed Sites**

	Site	Feasibility Study	Connection Approval	Utility Commission Approval	Natural Gas supply and power off take agreements	Construction Ready or Target Date
1	Ralston AB	Yes	Yes	Yes	Yes	Ready to build
2	Bellshill Lk, AB	Yes	Yes	Progressing		Q4 2013
3	Murray Lk, AB	Yes	Yes	Progressing		Q1 2014
4	Peace Butte, AB	Yes	Progressing			Q2 2014
5	Waterton, AB	Yes	Progressing		-	Q3 2014
6	Marshall, SK	Yes	Yes	Progressing		Q4 2014
7	FSJ, BC	Yes	Progressing			Q1 2015
8	Yukon 1	Yes				Q2 2015
9	BC 2	Progressing				Q4 2015
10	NWT 1	Progressing				Q1 2016

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10

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# **Proposed Alberta Facility Locations & Current CO2 Off-take Sites.**



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22

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