



PETRONAS

PETRONAS Unconventional Journey

March 2014



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PROGRESS CANADA ENERGY LTD



Progress Energy Canada Ltd. (PECL)

- ◆ Focused in two areas of the Western Canadian Sedimentary Basin

North Montney

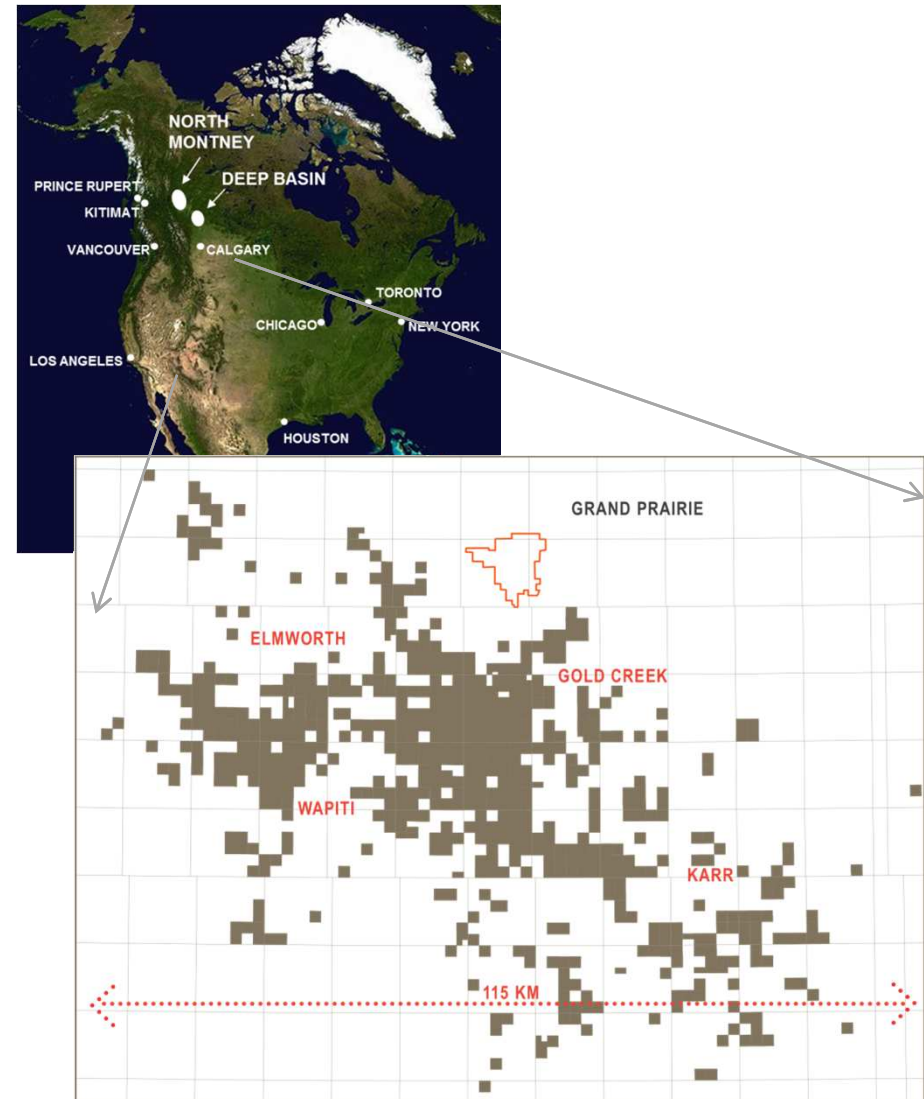
- ◆ Located in the province of British Columbia
- ◆ Progress is the largest Montney land holder
- ◆ Closest resource to the West Coast of Canada
- ◆ Include conventional and unconventional zones

Deep Basin

- ◆ Located in the province of Alberta
- ◆ Stacked zones with over 15 producing horizons
- ◆ Natural gas, NGL & oil drilling opportunities

DEEP BASIN

- ◆ Deep Basin forms part of WCSB, located in North West Alberta
- ◆ Progress has ~380,000 net acres of land (Elmworth, Gold Creek, Karr, Wapiti)
- ◆ Initially develop in 2004-2010 for tight gas—drilling results averaged 1.8 mmscf/d, with occasional wells at >5 mmscf/d
- ◆ PECL – first operator to drill horizontal wells for Dunvegan oil in 2011.
- Original vertical rates 10-20 bbls/day
- Initial 30 day light oil rates 210 – 290 bopd
- Wells stimulated using innovative oil fluid system to reduce formation damage.
- Frac oil recycling system developed to reduce capital costs.



Incremental 8,000 bbls/d and 40 mmbbls to be develop from small/ marginal field.

EVOLUTION OF THE NORTH MONTNEY

2005

- First multistage horizontals at Dawson

Q3 - 2008

- First North Montney vertical test

Q1 - 2009

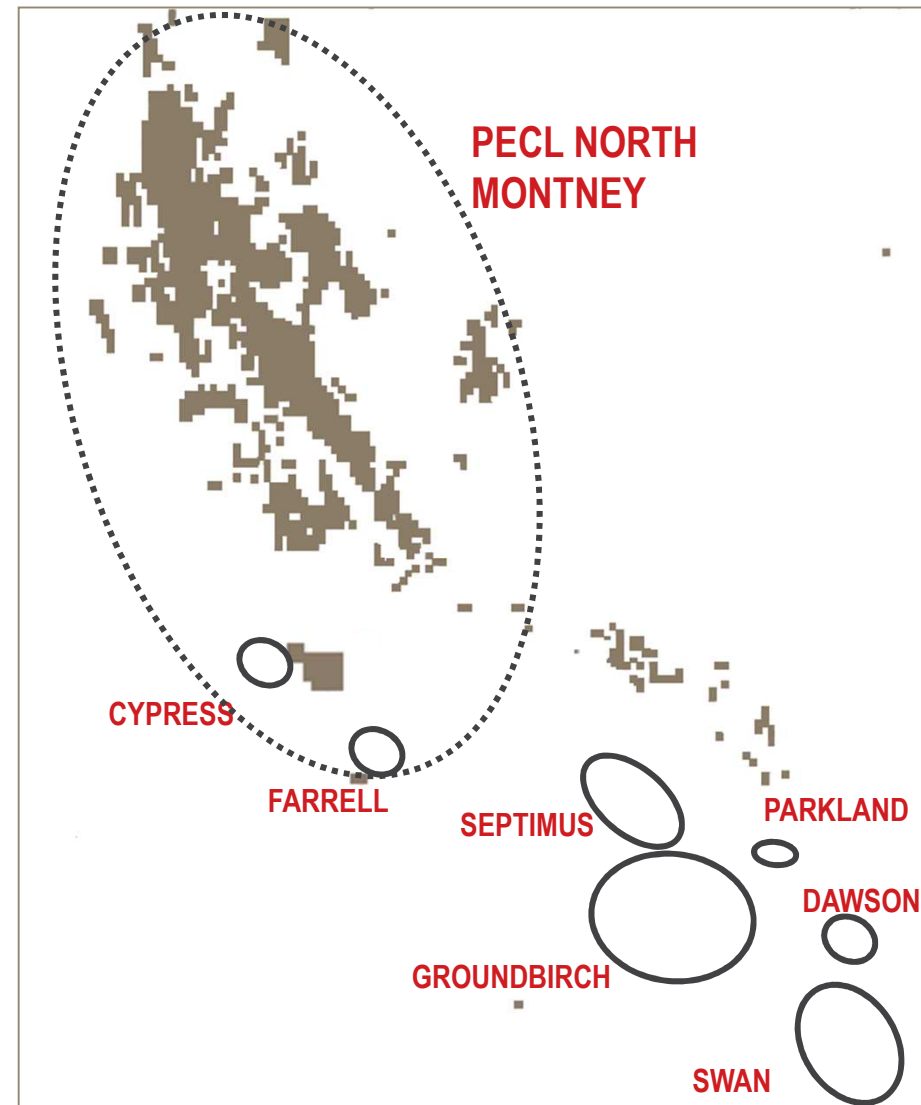
- First horizontal test

Q1 - 2010

- First developments at Town and Farrell

2012

- 250 producing horizontal wells
- 9 commercial developments
- 2 international joint ventures
- PETRONAS/Progress acquisition



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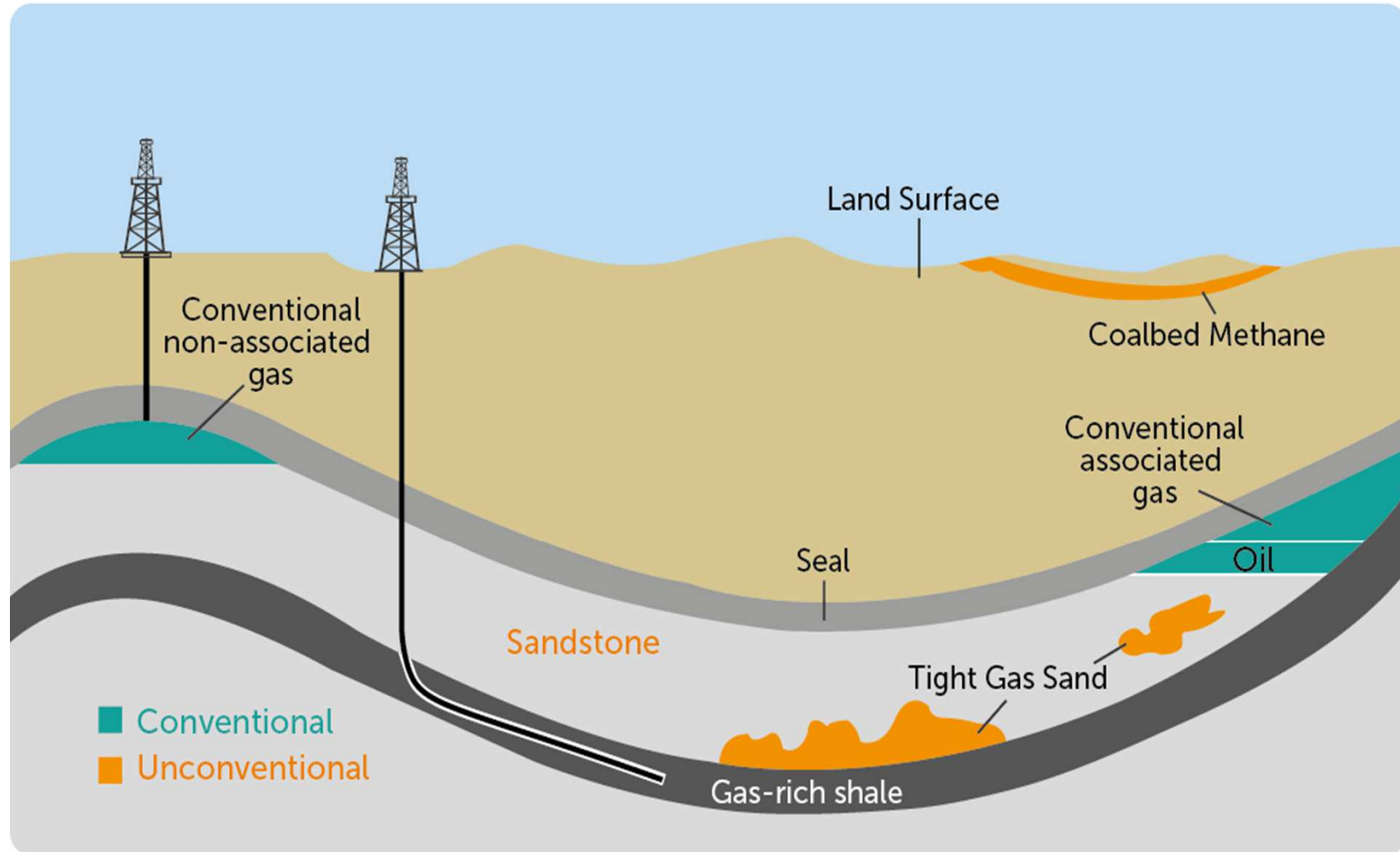
Challenges

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Fiscal Incentives

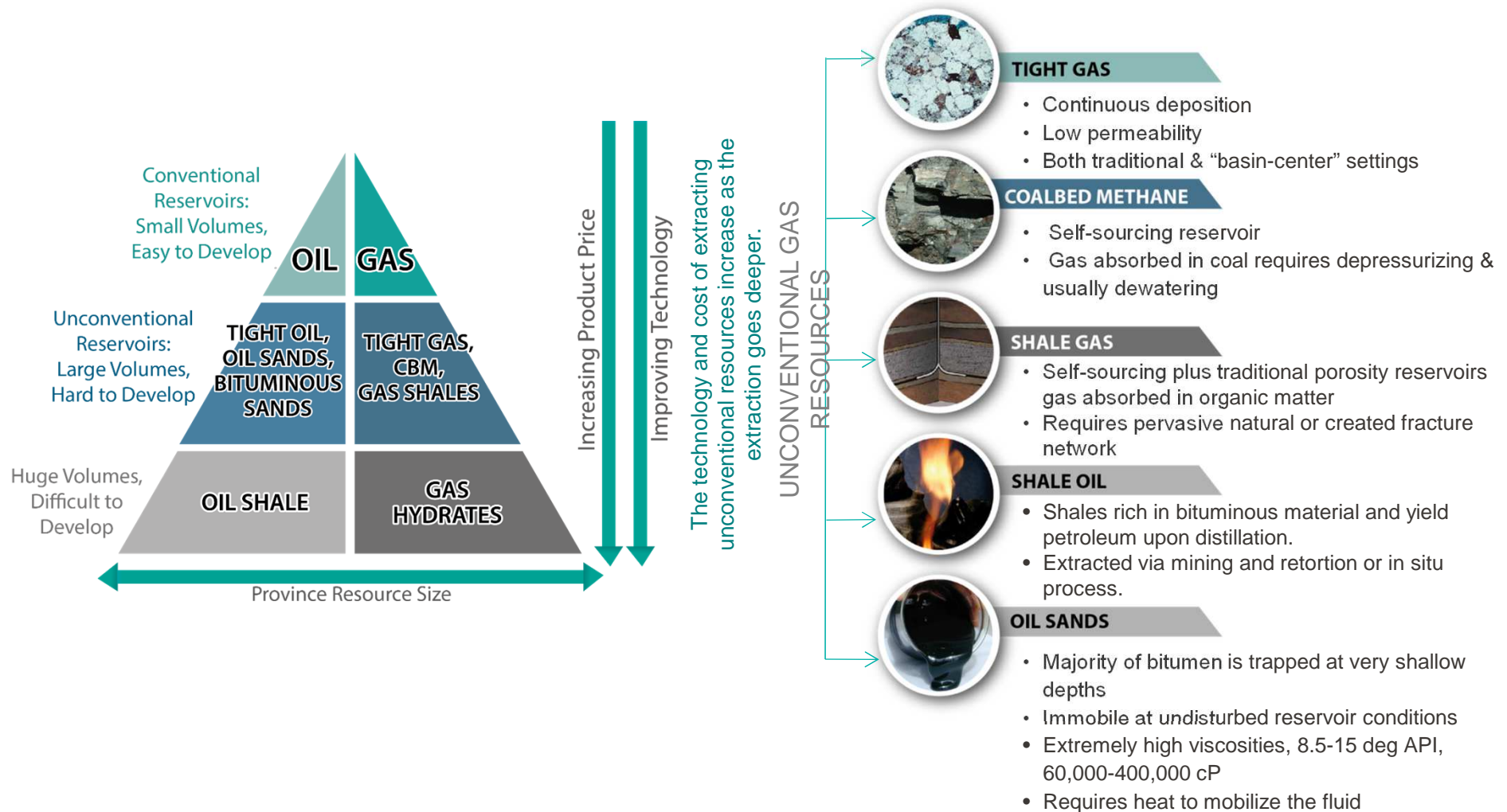
UNCONVENTIONAL HYDROCARBONS: WHERE IS IT?

Conventional vs Unconventional



UNCONVENTIONAL HYDROCARBONS : WHAT IS IT?

The key difference between “conventional” and “unconventional” hydrocarbons is the **manner, ease and cost associated with extracting the resource.**



Source: Adapted from WoodMac and Canadian Association of Petroleum Producers, not drawn to scale. Chart is for illustrative purposes only.

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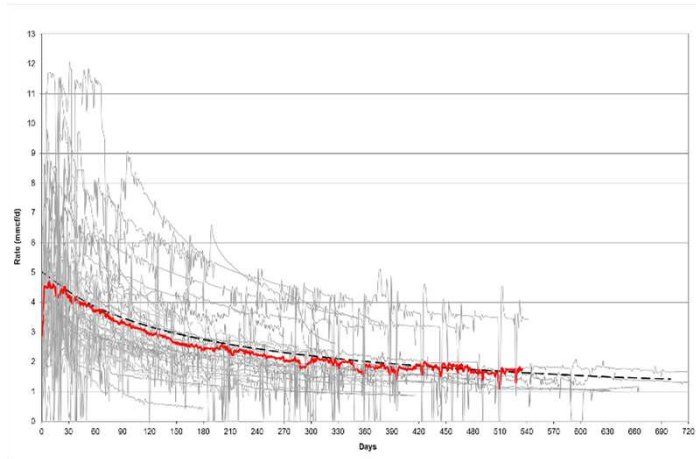
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Challenges & Technology Requirement

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Fiscal Incentives

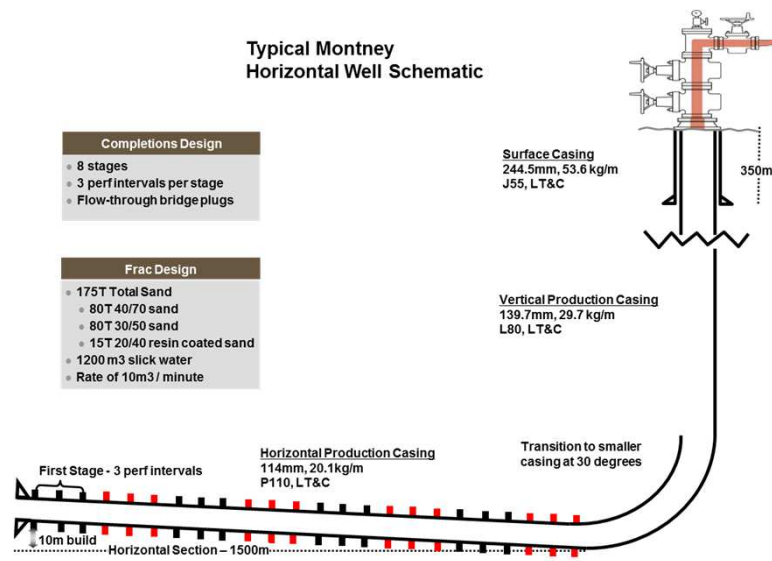
WELL CHALLENGES



Shale gas type curve

Typical Drilling Operation:

- Due to the reservoir decline behavior high number of wells are required to be drilled every year
- Each wells will be drilled horizontally and fractured with several stages according to the frac design.
- The typical drilling cost for shale gas wells range from \$ 4- 6 Million.



Horizontal Well Schematic

OPERATIONAL LOGISTIC CHALLENGES

Barnett operation



Canada operation



Typical Frac Operation:

- ◆ Handling logistics of water, sand trucking pose challenges as the operation are extensive.
- ◆ Monitoring of the fracturing operation can now being done real-time.
- ◆ Less populated area are preferred for operation.
- ◆ Road / highway access is also crucial.

WATER HANDLING CHALLENGES

Each Area to Have:

- ◆ 20,000 – 30,000 m³ double contained recycled water storage
- ◆ 50,000 – 200,000 m³ fresh water storage
- ◆ Produced water recycle system
- ◆ 8” pipeline connection to each pad

Typical Operation:

- ◆ Combination of fresh and produced water continuously pumped to C-rings at wellsite during fracturing
- ◆ Water heated during winter using specialized natural gas portable system
- ◆ Flowback water pumped back to central site for storage and re-use



NORTH MONTNEY TECHNOLOGY APPLICATIONS

- ◆ **Integrated subsurface - fracturing evaluation team**
 - microseismic to define sweet spot and fracturing efficiency.
 - collaboration between operator and frac service providers are crucial.
 - real-time monitoring to ensure quick decisions.
- ◆ **Modular design will reduce facilities cost and facilities installation timing.**
- ◆ Drilling pads and Pod concept **reduce footprint** for operation.
- ◆ **Recycling system for water** and fracture fluid to **reduce completion cost.**

FACILITIES – MODULAR DESIGN

- ◆ Use economies of scale
- ◆ Keep equipment size workable
- ◆ Standardize across areas
- ◆ Design with sand erosion in mind
- ◆ Sand filters and wet meters at wellsites

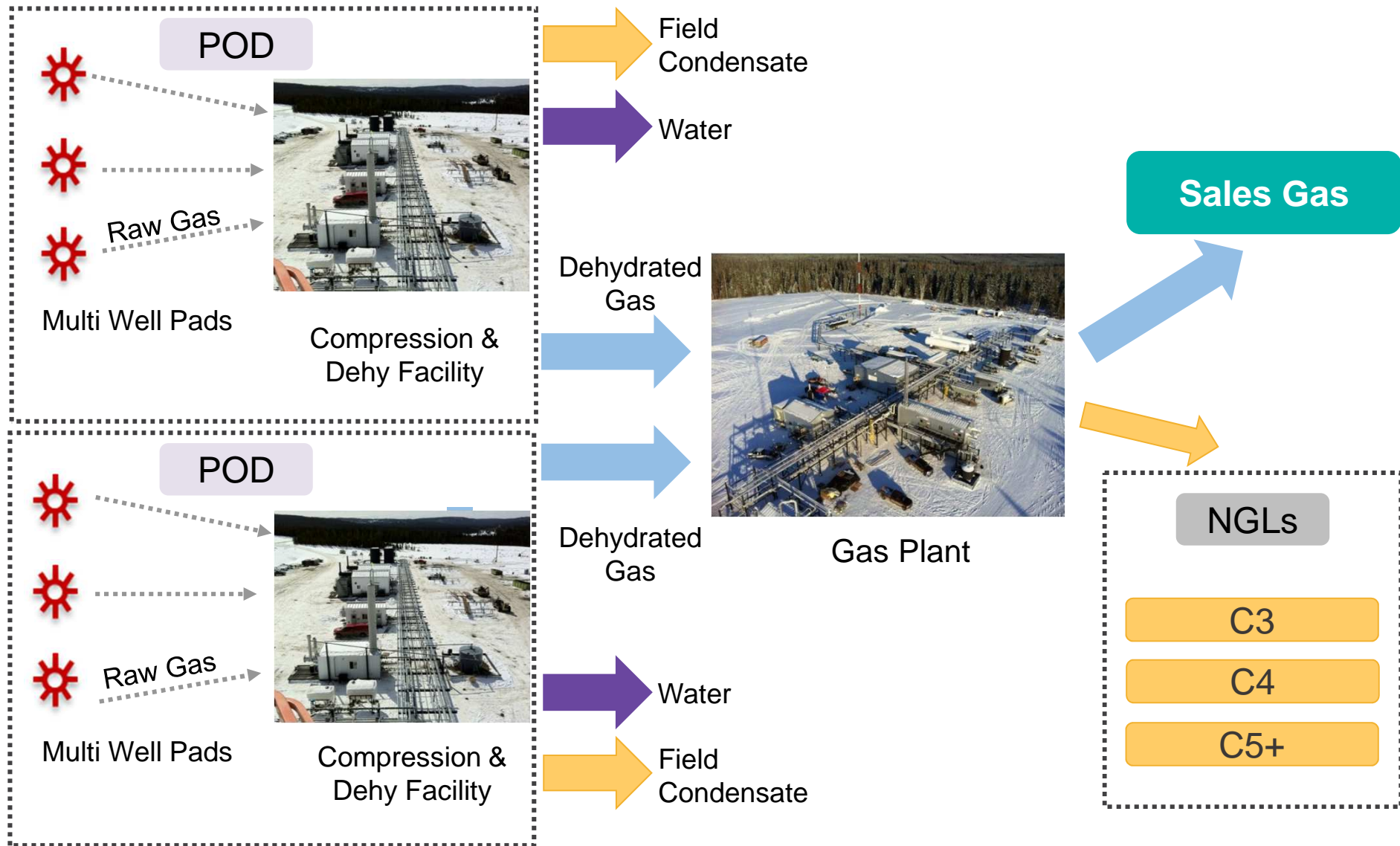


TYPICAL 50MMCF/D FACILITY

- ◆ Stage 1 – 25mmcf/d
 - 60"x 20' Inlet Separator, 36" Dehy
 - Two 1400HP Compressors
 - 8" Gathering and Sales Line
 - Auxiliary Equipment
- ◆ Stage 2 – Expand to 50mmcf/d
 - Two Additional 1400HP Compressors
 - Second Inlet Sep and Dehy



PROGRESS POD CONCEPT - PROCESS FLOW



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Best Parctise & Fiscal Incentives

NORTH MONTNEY ECONOMIC & FISCAL ADVANTAGES

- ◆ **BC deep drilling credit – 3% royalty for 1 to 3 years**
- ◆ **3rd party Pipeline accesss.**
- ◆ **Alaska highway provides all season access**
- ◆ **Few surface stakeholders**
- ◆ **Minimal above ground issues : i.e. Right of way & first nation**
- ◆ Liquids-rich stream – significant revenue lift (8 to 30 bbls/mmcf)
- ◆ High heat content (1100-1260 mmbtu/scf)
- ◆ No hydrogen sulphide, minimal CO₂
- ◆ Low Opex - \$0.28/mcf

PROJECT EXECUTION CAPABILITY

Proven track record over past ten years

- ◆ Over 700 wells drilled
- ◆ 15 pods brought on line

Top five driller in British Columbia for past five years

- ◆ Recognized low cost producer
- ◆ Top quartile finding and development costs
- ◆ Top quartile operating costs
- ◆ Operated 16 rigs in Q1/2013, expanding to 23 in Q3/2014

Long term relationships with key service providers

- ◆ Three fracturing spreads under long term contract with Calfrac

Canadian Association of Petroleum Producers (CAPP) – Platinum Stewardship Level

- ◆ Highest level of Environmental, Health and Safety performance

PROGRESS NORTH MONTNEY SUMMARY

- World class natural gas resource
- Industry leading onstream and operating costs
- Alignment with a credible and capable producer
- Rapidly evolving technology and cost reduction
- Strategic access to LNG markets



THANK YOU