

# Advantages of open hole multi-stage systems in the Montney formation

Bob Dickenson – Pittsburgh, PA

# The Montney

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## Overview

- What is it?
- Where is it?
- Why is it so valuable?
- How have operators benefited from OHMS systems?

# Montney

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# The Montney

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## Where is it and What is it?

- Stratigraphical unit of the Lower Triassic age in the Western Canadian Sedimentary Basin in British Columbia and Alberta
- Named after the hamlet of Montney
- First described in Texaco's Buick Creek No. 7 well by J.H. Armitage in 1962
  - Well was drilled 41 km (25 mi.) north of Fort St. John, immediately east of the Alaska Highway

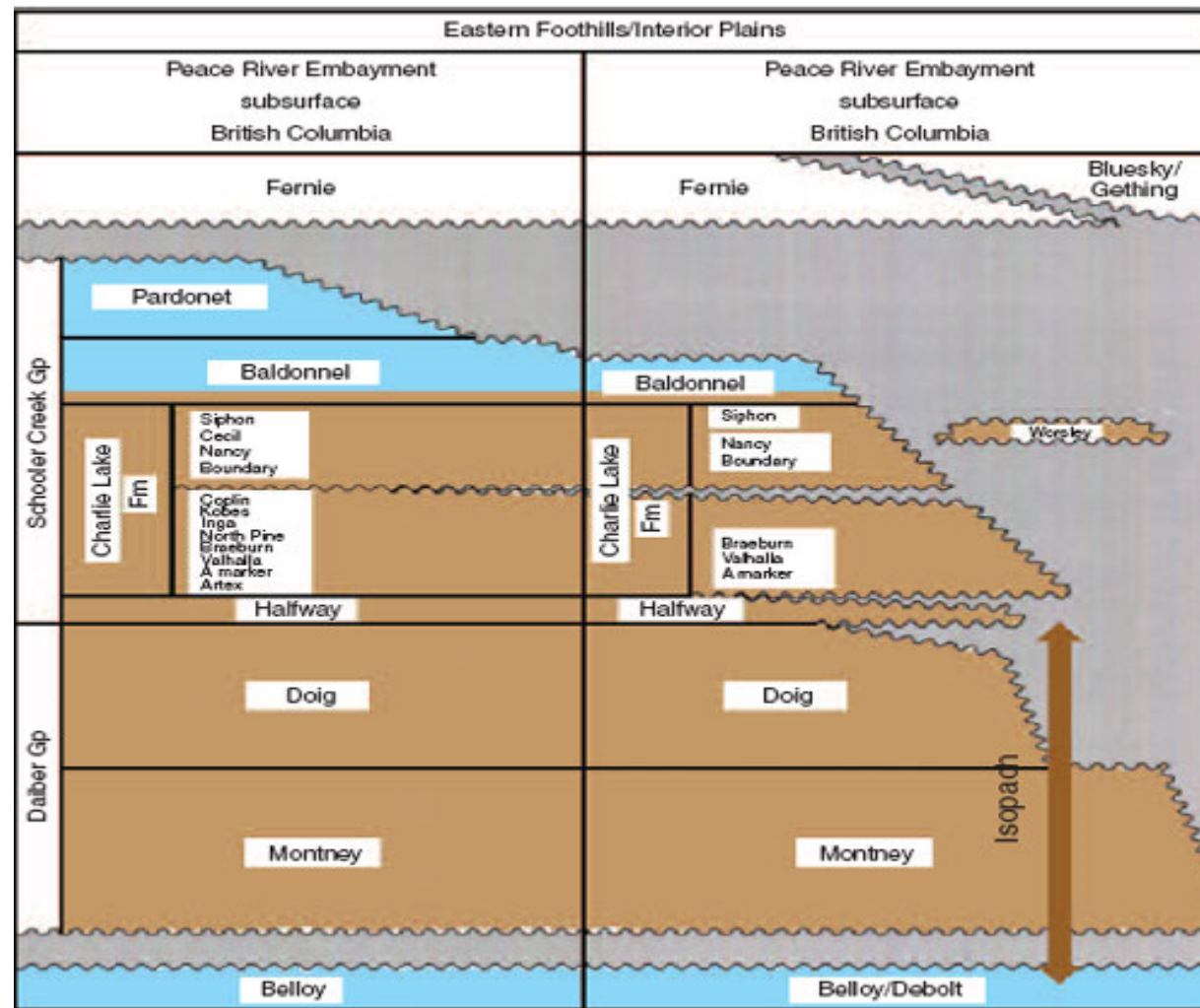
# The Montney

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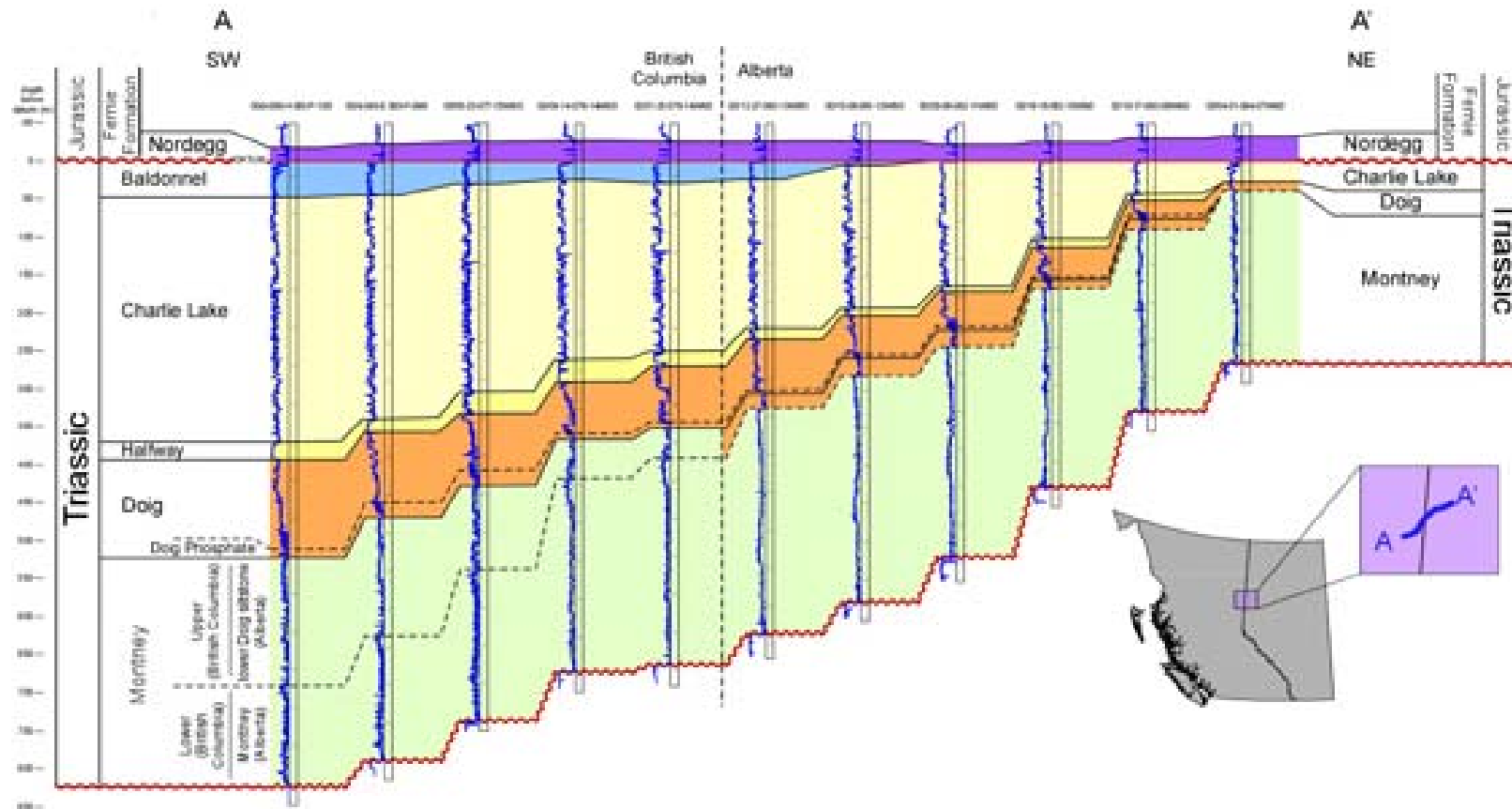
## Lithology

- Composed of siltstone and dark grey shale
  - Dolomitic siltstone in the base
  - Fine grained sandstone towards the top
  - Facies is shaley in the north and west of the extent (Fort St. John)
  - Silty in the center (Dawson Creek and Pouce Coupe areas)
  - Becomes coarser (sandy) in western Alberta (Valleyview area)

# The Montney



# The Montney



# The Montney – Formation Comparison

	Montney	Utica	Marcellus
Depth (ft)	5,500 – 13,000	1,600 – 10,800	4,000 – 8,500
Thickness (ft)	Up to 900	300 – 900	150 – 900
Porosity (%)	1.0 – 6.0	2.2 – 3.7	3 – 10
TOC	1 – 7	0.3 – 2.25	3 – 12
Maturity (R <sub>0</sub> )	0.8 – 2.5	1.1 – 4	1.2 – 3
Silica (%)	20 – 60	5 – 25	20 – 40
Calcite/Dolomite (%)	Up to 20	30 – 70	5 – 40
Clay (%)	<30	8 – 40	10 – 30
Free Gas (%)	64 – 80	35 – 50	0 – 70
CO <sub>2</sub> (%)	1	<1	–
GIP/sec (Bcf)	8 – 160	25 – 210	60 – 150
Play area GIP (Tcf)	80 – 700	>120	500



# What makes the Montney so attractive?

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- Large land positions
- Sweet gas
- Very fracable rock; brittle
- High amounts of natural gas liquids through much of the trend
- Flat declines relative to other shale plays (VERY important for valuations)
- There is the Upper, Middle, and Lower Montney, plus other formations like the Doig and Doig Phosphate

# Painted Pony – Montney



PAINTED PONY PETROLEUM LTD.

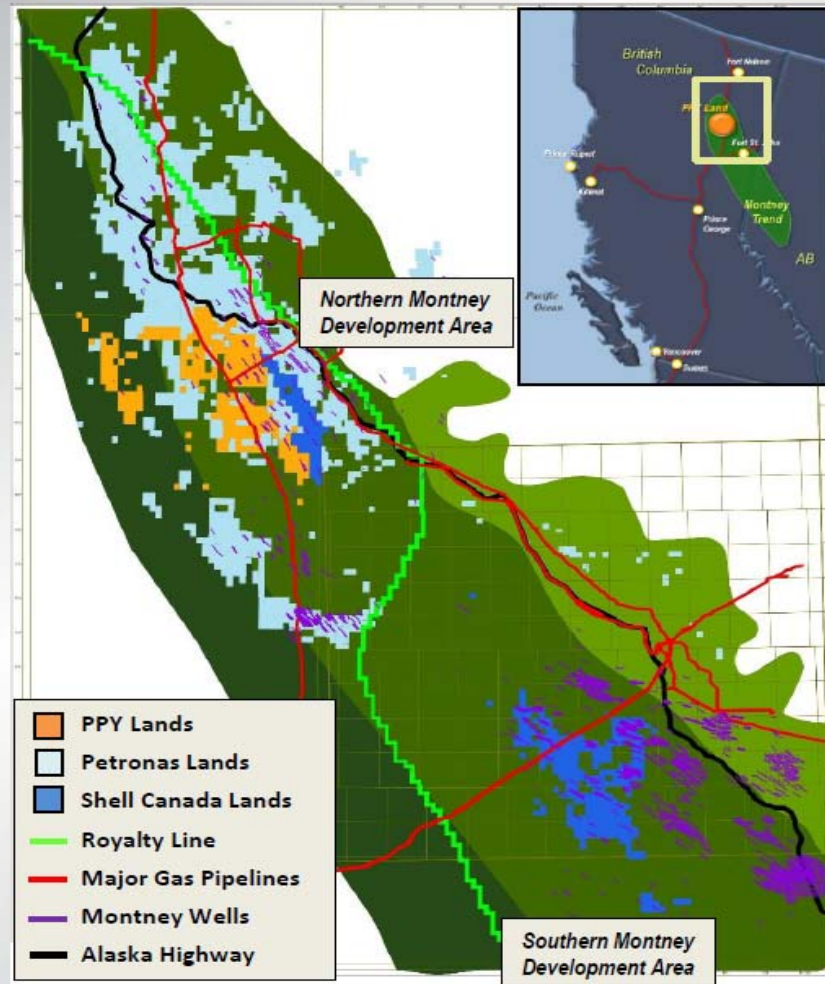
## *Corporate Presentation*

SEPTEMBER 8, 2014

**TSX : PPY**  
**paintedpony.ca**

# Painted Pony's Montney Position

## Premium Assets Located in the Optimum Area



### Key Attributes

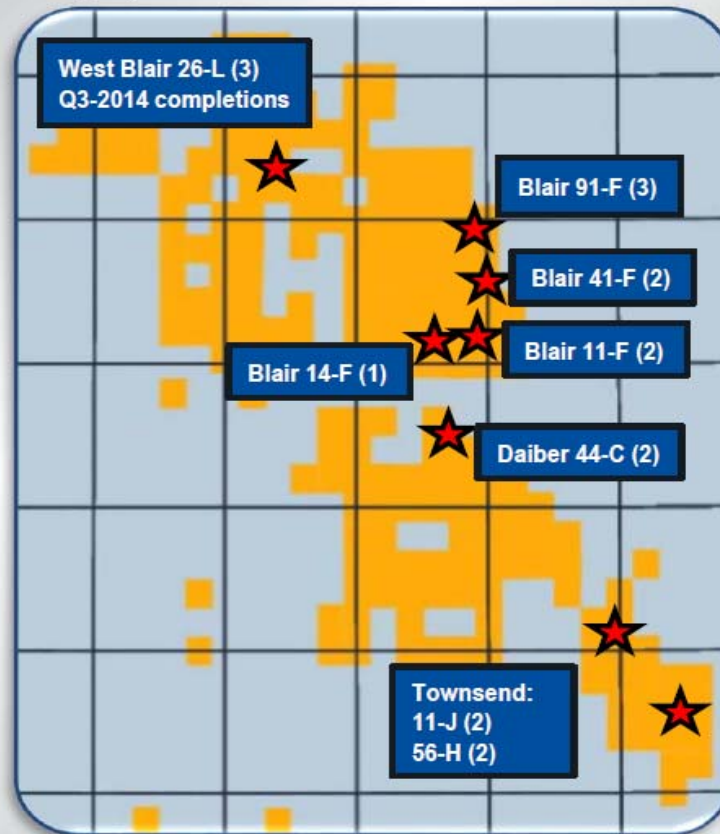
- Large contiguous land base with year-round access  
*203 Net sections (129,800 net acres)*  
*2nd Largest position in northern Montney west of royalty line*
- High working interest  
*Average 74%, with operatorship on all key properties*
- Attractive provincial royalty structure  
*\$2.2 million average royalty credit per well*
- Significantly over-pressured reservoir  
*> 225 Bcf/section of gas-in-place<sup>(1)</sup>*
- 2,400 Drilling locations for a 3-layer development  
*63 wells drilled to date (46 operated by PPY)*  
*~300 locations in 5-year model*
- High gas liquids (C3+) content  
*Up to 60 bbls/MMcf forecast yield at Townsend*  
*1080 Btu/scf residual heat content*
- Proven low cost operator

(1) See "Disclaimer" section.

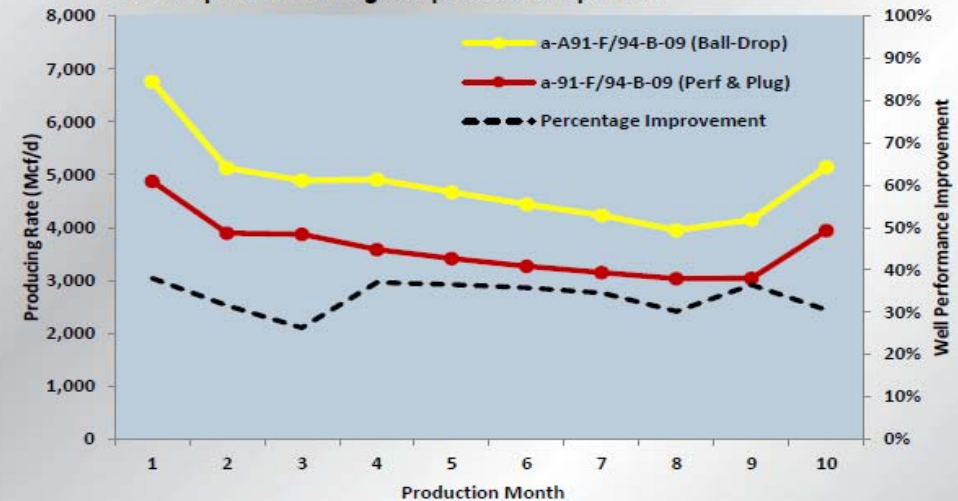


# Improved Performance Through Technology Open-Hole Ball-Drop Completions

## ★ PPY-operated Ball-Drop Completions



Ball-Drop vs. Perf & Plug Completions Comparison



### a-A91-F/94-B-16 Ball-Drop Completion

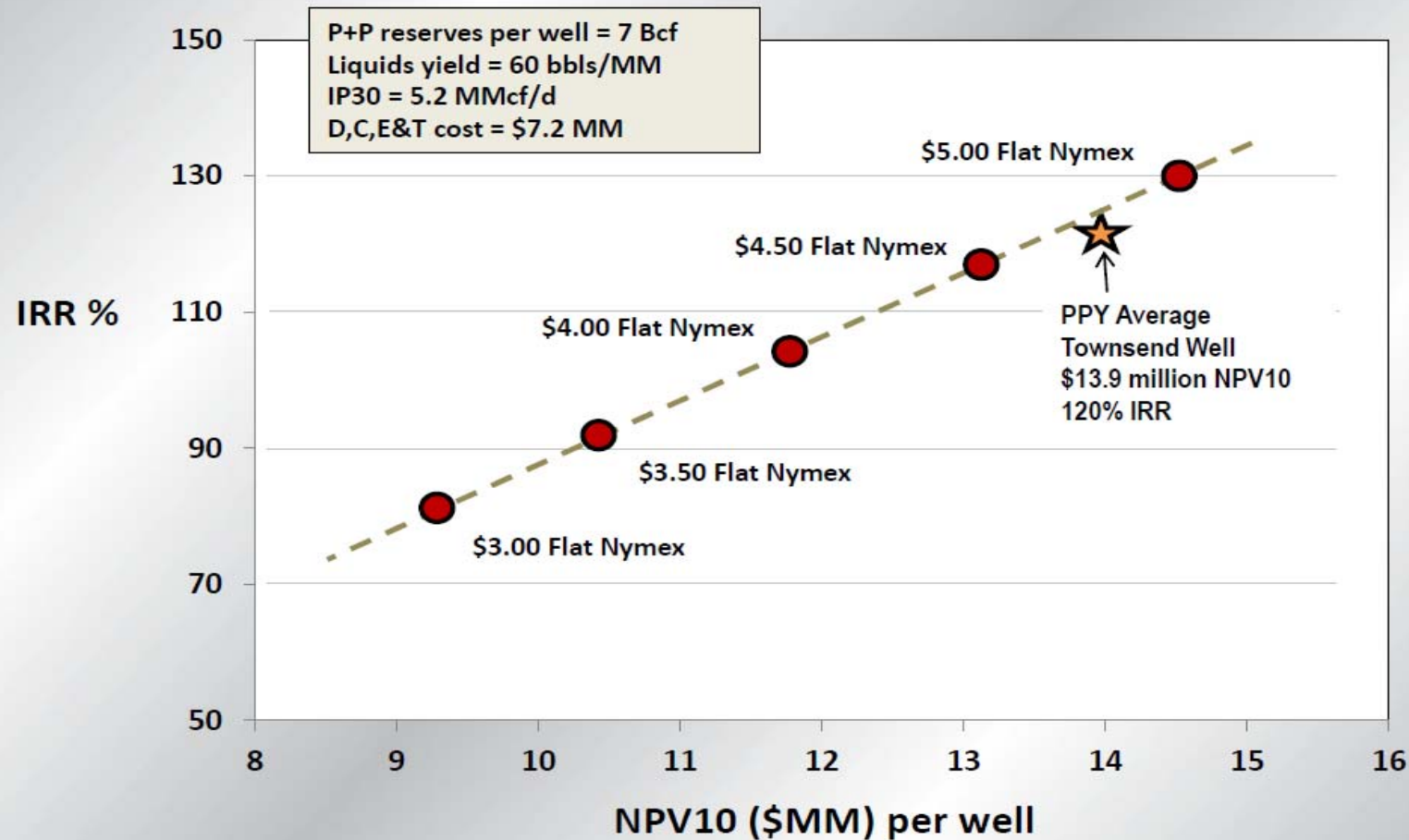
- Peak test rate: **8.7 MMcf/d** (1,870 boe/d)
- Cumulative production: **1,401 MMcf** over 300 days

### a-91-F/94-B-16 Perf-and-Plug Completion

- Peak test rate: **6.7 MMcf/d** (1,450 boe/d)
- Cumulative production: **1,036 MMcf** over 300 days

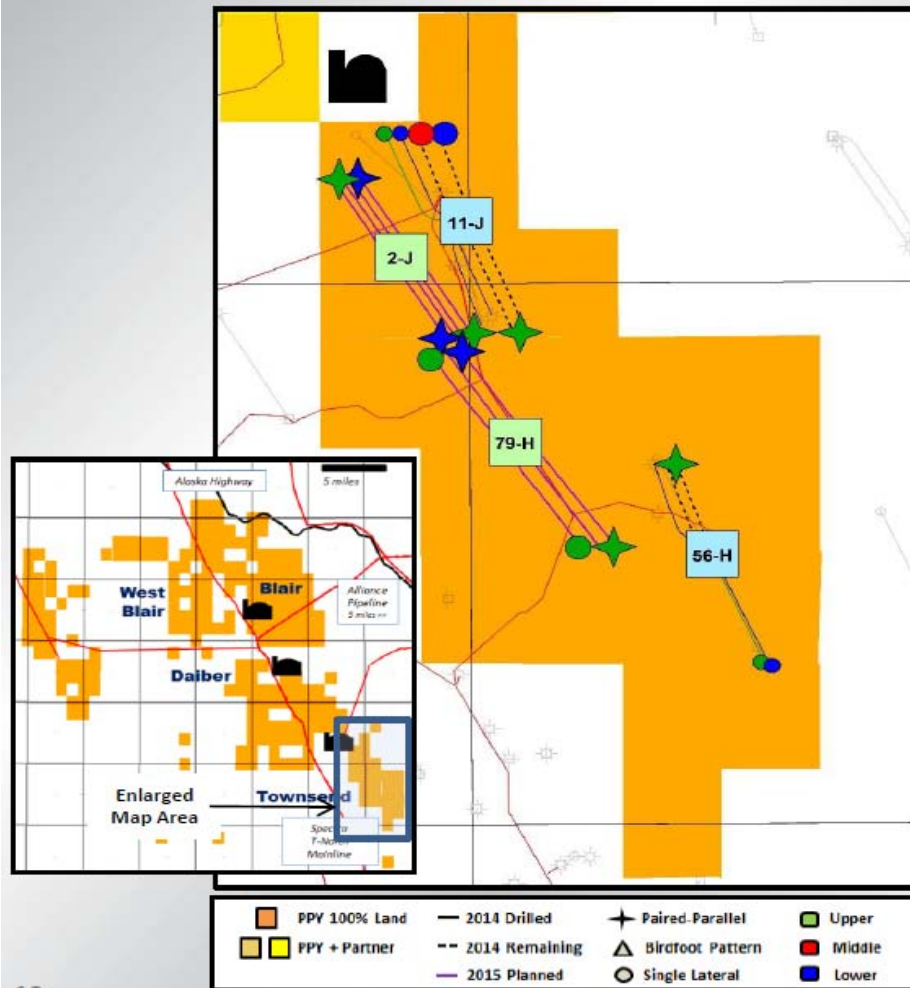
# Montney Development Economics

## Townsend Flat Price Sensitivities



# Townsend Development Plan

## 2014 & 2015 Program



### Development Program Economics

- \$7.2 million Drill, complete, and equip
- 5.2 MMcf/d I.P.30 production rate
- 7.0 Bcf P+P reserves per well
- 60 bbls/MMcf Liquids recovery (C3+)
- \$13.9 million NPV 10% per well
- 120% Internal rate of return<sup>(IRR)</sup>
- 0.9 years Payout period

### Activity Highlights

- Expect to drill 6 100% W.I. wells (4 Parallel-Pair) in H2-2014
- AltaGas to commence refrigeration plant construction

### Program Price Deck

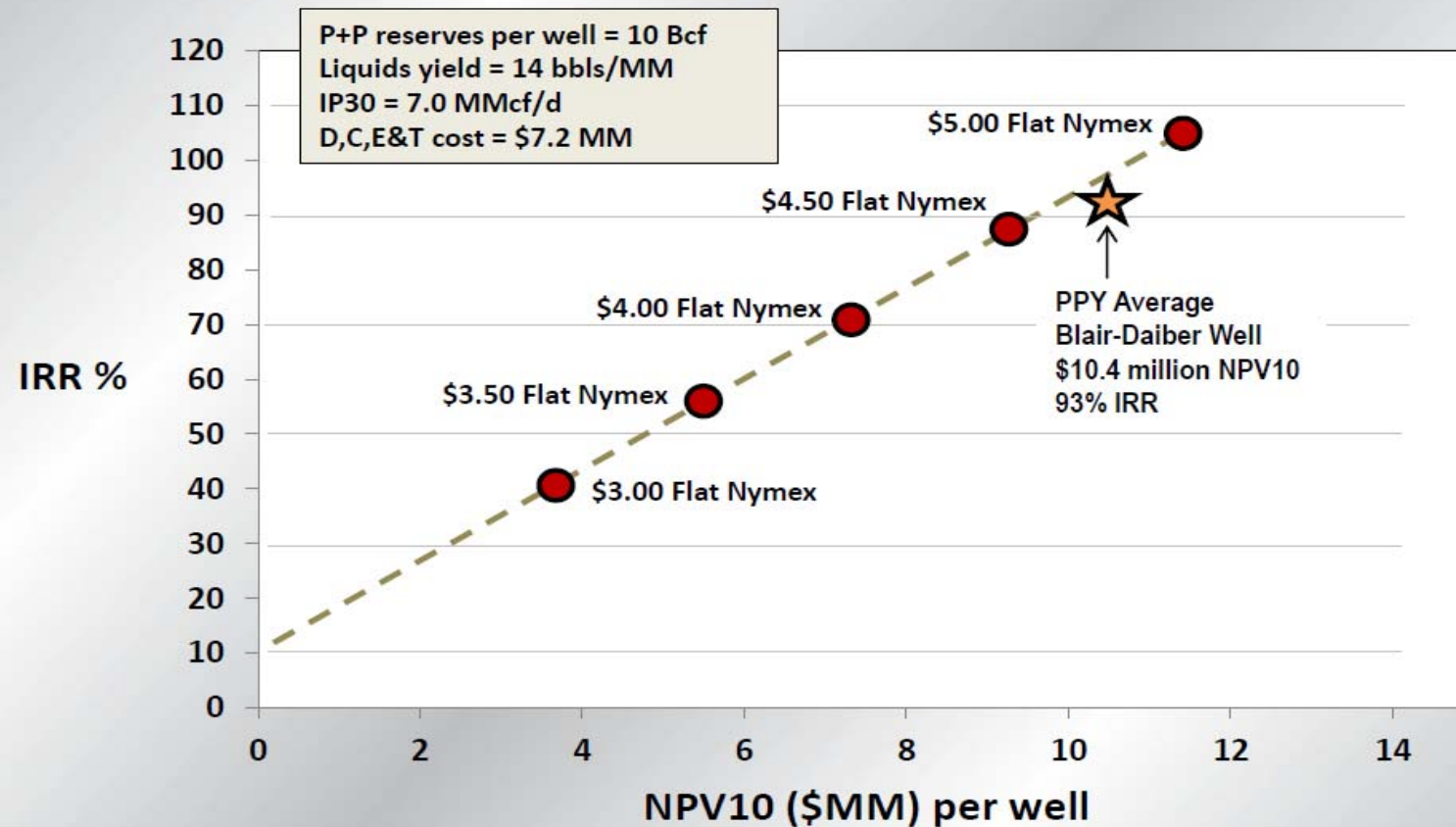
\$Nymex/MMBtu

2014	2015	2016	2017	2018
\$4.27	\$4.50	\$4.75	\$4.90	\$4.90

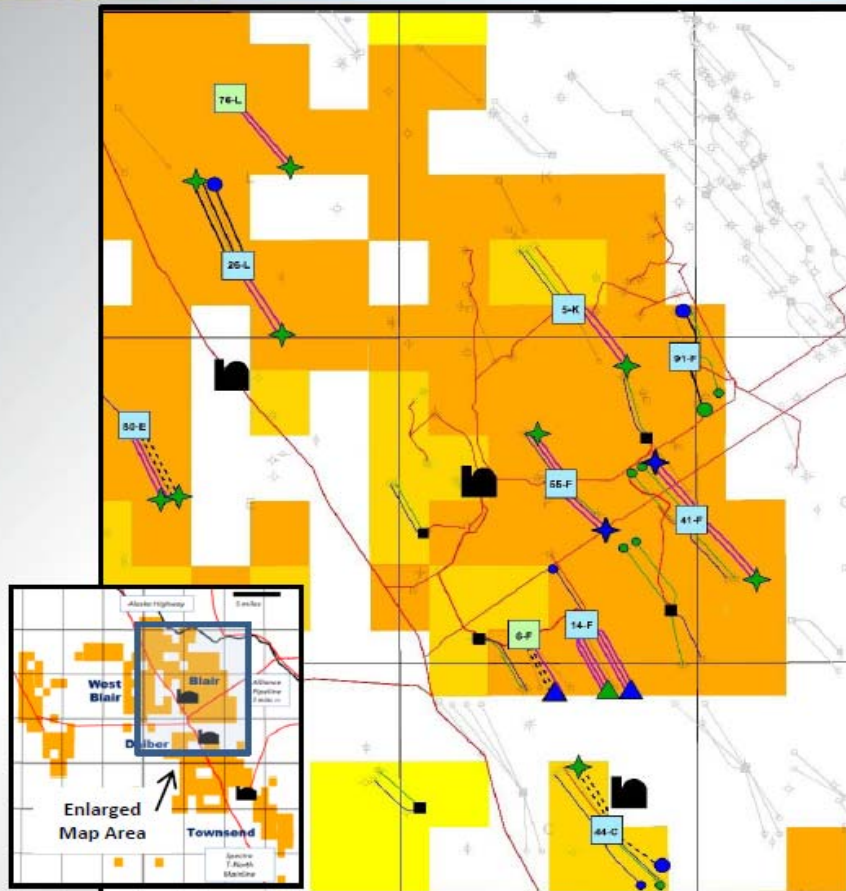


# Montney Development Economics

## Blair-Daiber Flat Price Sensitivities



# Blair-Daiber Development Plan 2014 & 2015 Program



## Development Program Economics

- \$7.2 million Drill, complete, and equip
- 7.0 MMcf/d I.P.30 production rate
- 10 Bcf P+P reserves per well
- 14 bbls/MMcf Liquids recovery (C3+)
- \$10.4 million NPV 10% per well
- 93% Internal rate of return<sup>(IRR)</sup>
- 1.1 years Payout period

## Activity Highlights

- Expect to drill 7.5 net wells (6 Parallel-Pair) in H2-2014
- Expand Daiber lean gas processing facility
- Construct West Blair lean gas processing facility
- Construct Blair-Daiber pipeline interconnect
- Construct water supply hub

## Program Price Deck

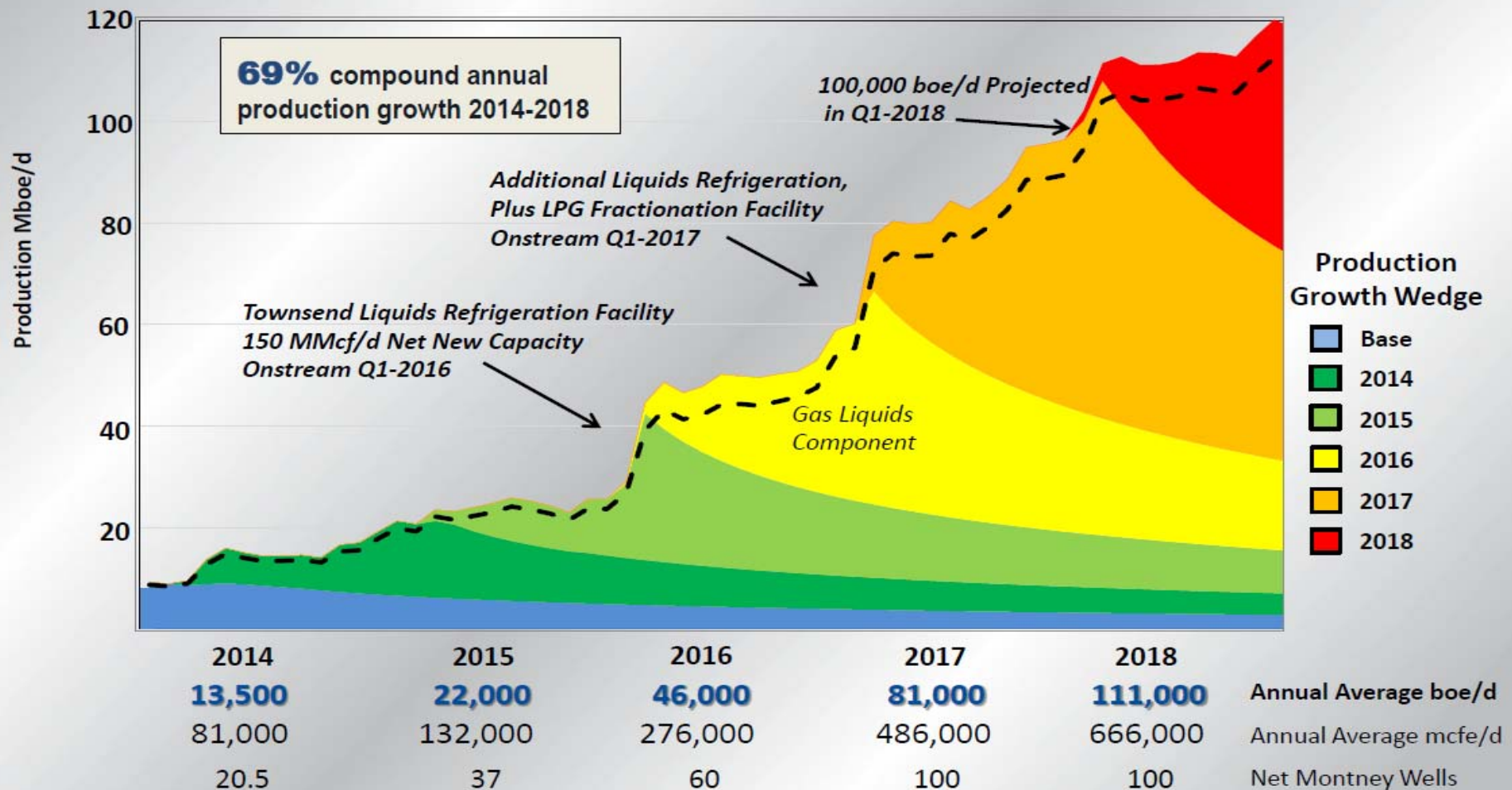
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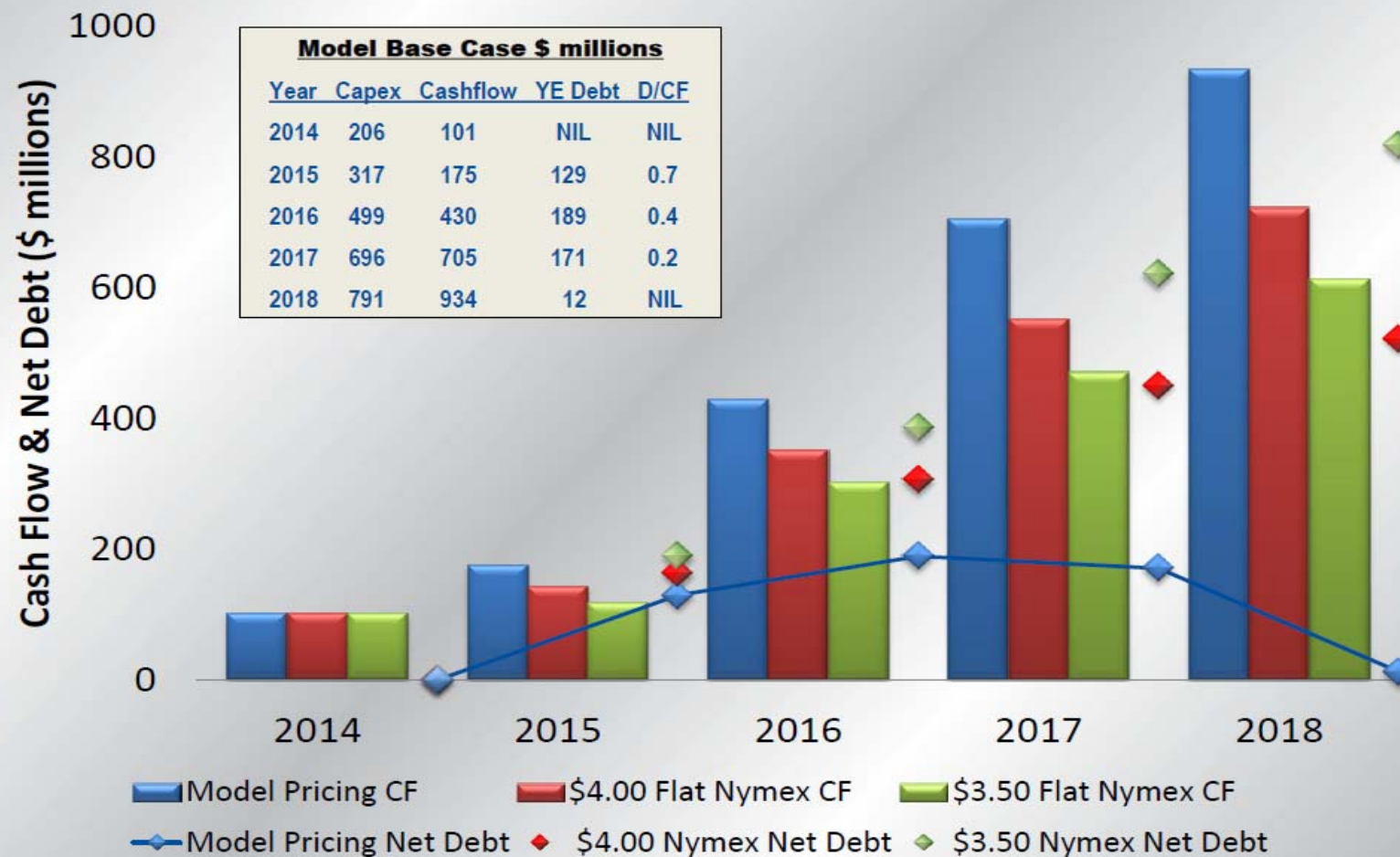
# 5-Year Montney Development Model

## Processing Infrastructure Build-out Drives Growth

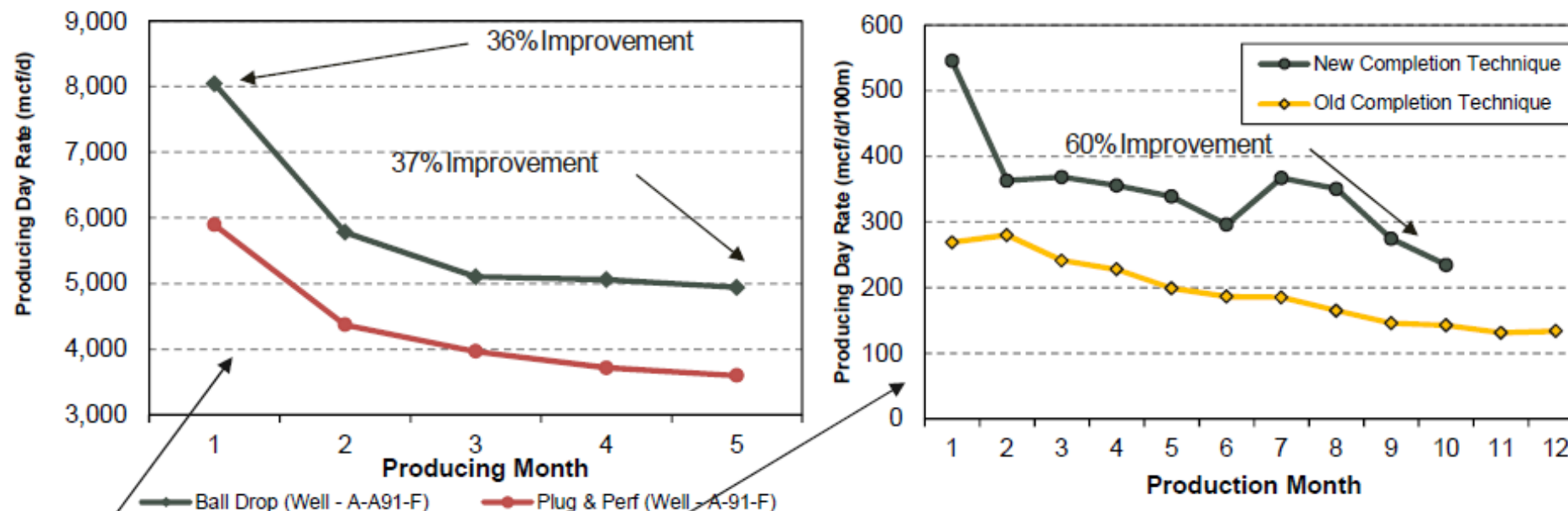


# 5-Year Montney Development Model

## Cash Flow Growth



## Exhibit 1. Completion Method Comparison



On a side by side well basis, the ball drop technique outperforms the plug & perf method.

This trend continues across the entire field

We estimate that some wells might have EURs around 7-8 Bcfe. This compares to 2013 PDP bookings of 5.6 Bcf/well and probable bookings of 4.4 Bcf/well

Metric	Completion Style		% Diff
	Plug & Perf	Ball Drop	
30d IP Rate (mmcf/d)	5.8	7.2	25%
EUR (Bcfe)	6.7	8.4	25%
Well Cost (\$mm)	\$7.0	\$6.5	-7%
F&D (\$/BOE)	\$6.25	\$4.64	-26%
First Year Avg Prod'n Eff. (\$/BOE/D)	\$11,346	\$8,428	-26%
NPV10 (\$mm, Btax)	\$3.2	\$5.8	84%
IRR (%)	31%	58%	
Payback (months)	27	16	-41%
Breakeven (\$/mcf)	\$2.35	\$1.60	-32%

Economics done before taxes, \$3.50/mcf flat AECO



# Painted Pony – Montney

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**Painted Pony Petroleum\* (PPY : TSX : \$10.40), Net Change: 0.88, % Change: 9.24%, Volume: 1,495,214**

*KEY TAKEAWAY FROM PAINTED PONY'S RELEASE...THE BALL DROP METHOD DRIVING STEP CHANGE IN WELL RESULTS.* Painted Pony released an operational update announcing current production in the field of >15,000 boe/d on the back of commissioning its 25 mmcf/d gas processing facility at Townsend. Canaccord Genuity Energy Analyst Anthony Petrucci notes this much higher than anticipated bump was driven by better than expected well results from Blair and Townsend, as the switch to the ball drop completion method continues to enhance well performance and increase recoveries. IP rates from a handful of PPY's Montney wells completed with the ball drop method (versus the plug and perf) suggested improved deliverability in the early stages of production. Now, however, with the first ball drop wells on production for ~6 months, we see the step change in IP rates (+35% improvement) are leading to similar type outperformance after several months on production. Type curves on the wells that have utilized the ball drop method of completion, are suggesting recoveries of ~8 bcf/well, a significant increase from the already impressive 6 bcf/well the company's NE BC Montney wells have exhibited previously. PPY's share price has shown strong performance recently; however, with continued operational success Petrucci anticipates there is still significant room to run.

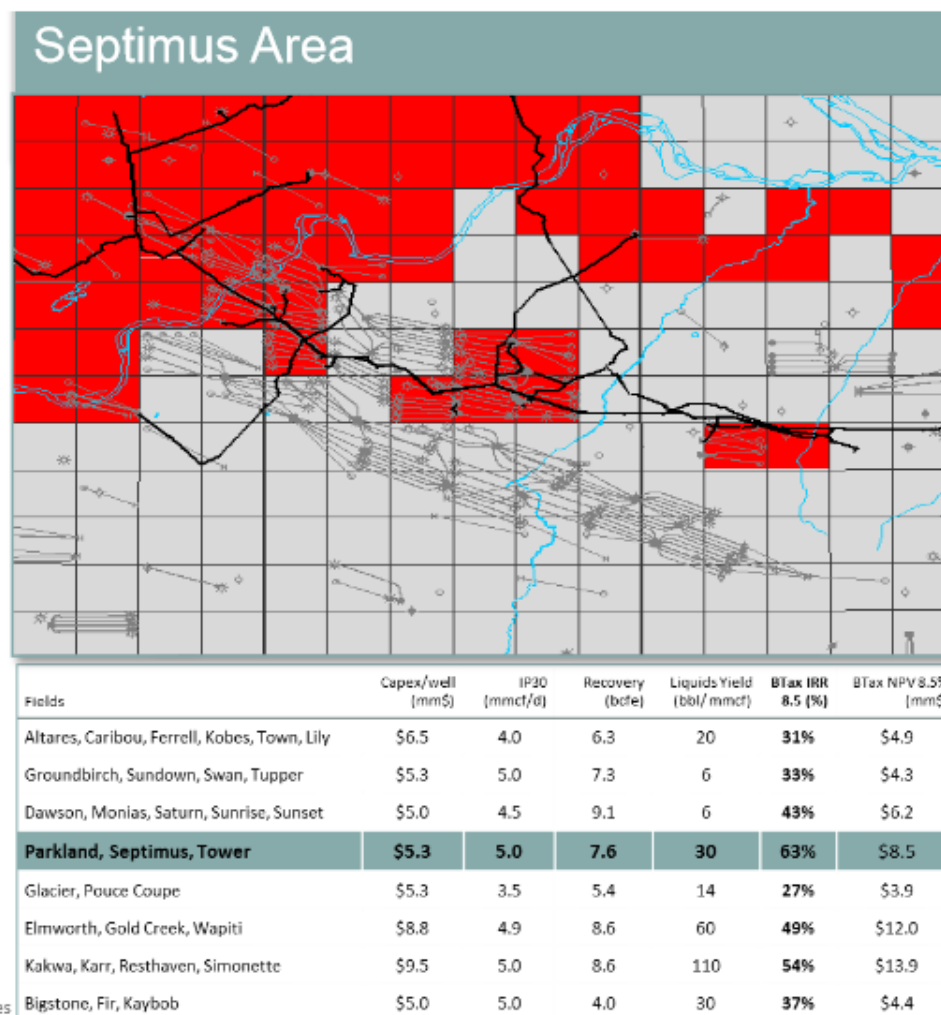
\* Canaccord Genuity and its affiliated companies may have a Corporate Finance or other relationship with the company and may trade in any of the Designated Investments mentioned herein either for their own account or the accounts of their customers, in good faith and in the normal course of market making. The authors have not received, and will not receive, compensation that is directly based upon or linked to one or more specific Corporate Finance activities, or to coverage contained in the Morning Coffee.

# Crew Energy – Montney

## SEPTIMUS

### Initial Montney Development Area

- Active drilling and development program
- Adoption of new technology
- Existing 60 mmcf/d gas plant currently at capacity from area production
- Long-range plan features 180 mmcf/d capacity in the area
- Superior returns



Source: Company Reports and RBC Capital Markets Estimates

# Crew Energy – Montney



## SEPTIMUS: EXCEPTIONAL ECONOMICS & IMPROVING EURs

Positive results in Septimus to date support expansion into other areas of the Montney: West Septimus, Tower & Groundbirch

Well Economics<sup>1</sup>

Capex (\$4.2-5.5mm)	<b>4.7MM</b>
1 Month IP	<b>955 boe/d</b>
NPV10 per well	<b>\$9.7MM</b>
PIR	<b>2.2</b>
ROR before tax	<b>190%</b>
F&D	<b>\$5.55/boe</b>

Well depth 3,500m MD

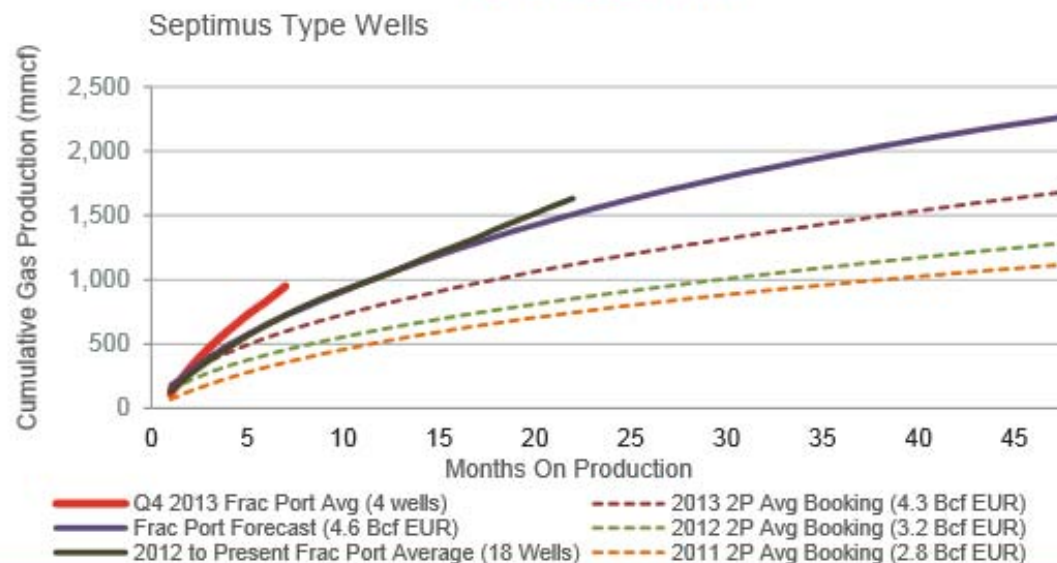
<sup>1</sup>Reflects updates to the B.C. Royalty Regime announced March 14, 2014

<sup>2</sup>On 238 sections in Upper Montney NGL rich window - Sproule July 1, 2014 Forecast

**4.3 bcf**  
EUR per well

**>500 boe/d**  
IP365

**2,850 drilling locations<sup>2</sup>**  
@ 12 wells/ section



# Crew Energy – Montney

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- Montney type curve wells in the Septimus area recently exhibiting a net present value of \$8.5 million per well, the successful development of only 1.5 net sections of the acquired lands (based on 12.8 development wells) would pay out this entire acquisition.
- EURs have steadily improved since 2011 (2.8 Bcf/well) to 2012 (3.2 Bcf/well) to 2013 (4.3 Bcf/well) and are expected to continue to improve over time as Crew Energy continues to better understand the Montney reservoir and how to apply new technologies related to drilling and completion practices.





## Improving Industry Completion Costs

We break down the improvements in Montney capital efficiencies, highlighting the regional 'Heritage' region of BC.

- **Changes in Completion Techniques:** For industry players, average completion costs/stage have fallen 52% since H1/12 (from \$433,000/stage to \$206,000/stage). With cost improvements, we've also seen the number of stages increase (from 9.3 to 16.2 stages/well). We'll also note that the amount of proppant per well has also fallen 25% (from 133 tonnes/stage to 100 tonnes/stage).
- **How have IP rates changed?** IP90 rates into H1/13 have moved up ~25% from 2011, from 3.6 mmcf/d to 4.6 mmcf/d. We believe we are likely to see higher IP rates for Q4/13 and Q1/14 as data becomes available.
- **The top 10 wells** in our study (of 363 wells) have shown average IP90 rates of 12.3 mmcf/d with an average of 22 stages (62 tonnes/stage). All 10 of these wells also used an 'Open Hole' design (vs. Cased), Multiple or 'Ball & Seat' technology. For further interest, 'Open Hole' well IP rates have outperformed Cased wells by 27%.





**Improving Montney Completion Techniques:** For industry players, average completion costs/stage have fallen 52% since H1/12 (from \$433,000/stage to \$206,000/stage). With cost improvements, we've also seen the number of stages increase (from 9.3 to 16.2 stages/well). As a result, IP90 rates into H1/13 have moved up ~25% from 2011, from 3.6 mmcf/d to 4.6 mmcf/d however we believe rates could be much higher for Q4/13 and Q1/14 as data becomes available (based on test rates from press releases). Overall, as operators look to add further stages (at a much cheaper cost), historical capital efficiencies that have been used to forecast future production could be quite conservative. Crew's completion styles are highlighted within, as well as potentially new techniques to watch for.



**Open vs. Cased:** Appears to be operator specific again. ARC has used open-hole completion for only 2% of its wells, 21% open-hole for Shell, CNRL at 18% (however Q4/13 has seen this average increase to 45% of wells that are now open hole) and 13% for Encana (however they too have increased open-hole completions to 27% for wells drilled in 2013). Crew, Tourmaline and Crocotta use open hole on 100% of wells.

Michael Dembicki, P. Eng.  
403 292 1204  
[michael.dembicki@tdsecurities.com](mailto:michael.dembicki@tdsecurities.com)

## Painted Pony Petroleum Ltd. (PPY-T) C\$10.40



TD Securities Inc.

Energy Producers - Junior &  
Intermediate

Recommendation:	BUY <i>Unchanged</i>
Risk:	HIGH
12-Month Target Price:	C\$16.00↑
<i>Prior:</i>	C\$12.00
12-Month Dividend (Est.):	C\$0.00
12-Month Total Return:	53.8%



## CREW ENERGY

CR | TSX

**\$8.21**

Rating: Outperform

One Year Target: \$12.00 (*up  
from \$10.00*)

Total Return: 46%

March 19, 2014

# The Montney – Review

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- One of the most important plays in Canada
- The application of OHMS has been very effective
- Painted Pony success is open hole exclusively
- Crew Energy success
- Where do we go next?