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Gathering System Planning

Problem

- Gas plant construction and sizing for the second phase of shale gas drilling program

Challenges

- Second phase reserves and number of pads still variable
- Gas plant capacity planning is required for different sizing scenarios

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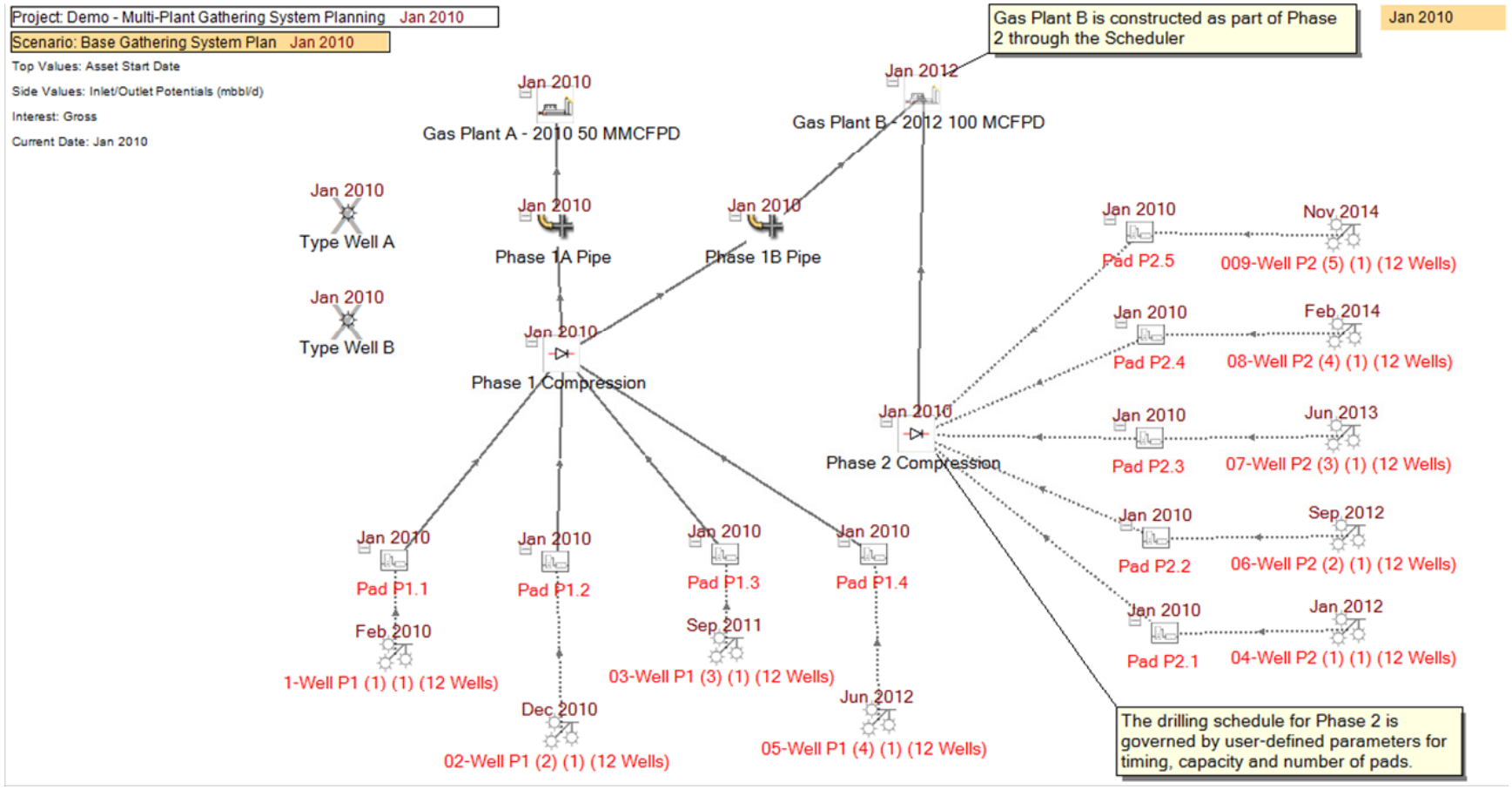
Flow Diagram – Gathering System Planning



The gathering system for the second phase of the development project is under consideration, including the size of the gas plant and the number of pads to drill

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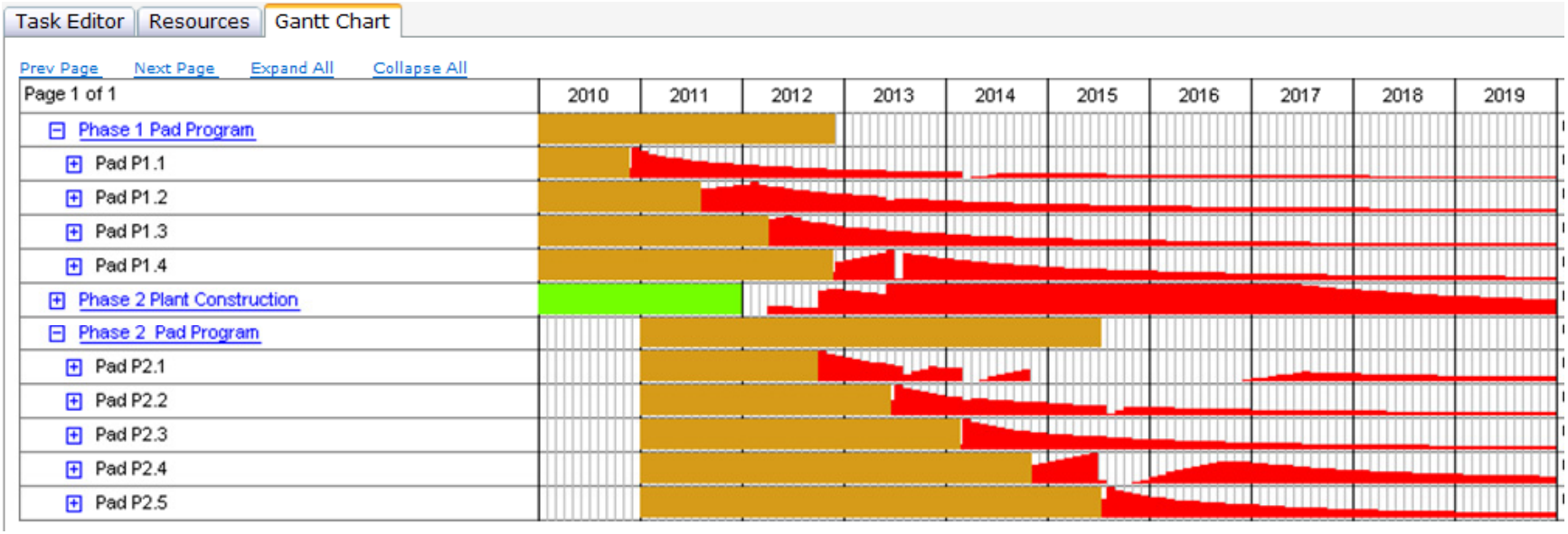
The development plan for the second phase of development includes construction of a second gas plant and a second pad drilling program



The generation of a new what-if scenario can be done in a few minutes:

1. **Copy the base scenario**
2. **Input the new key parameters to the development scenario**
3. **Calculate and Compare**

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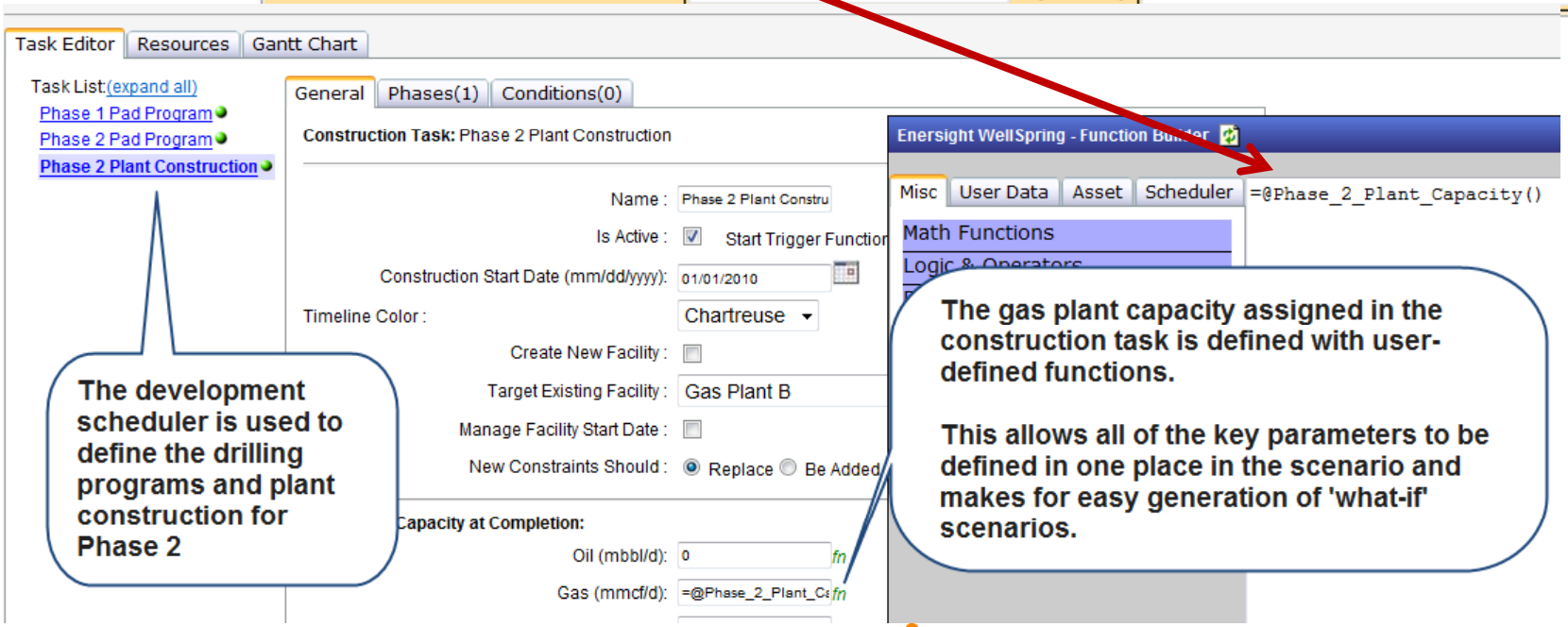
The Key Parameters for the Second Phase of Development is Managed Through User Data

Phase_2_Pads	5.00	*fn*	The number of 12 well pads
Phase_2_Drilling_Delay	12.00	*fn* (Months)	The delay from the start of project before drilling
Phase_2_Plant_Delay	0.00	*fn* (Months)	The delay from the start of the project before plant construction
Phase_2_Plant_Capacity	100.00	*fn* (mmcf/d)	Design capacity for the plant
Phase_2_Plant_Capital	500.00	*fn* (mm$)	Forecast capital costs for the plant construction
Phase_2_Plant_Construction_Duration	24.00	*fn* (Months)	Duration of plant construction



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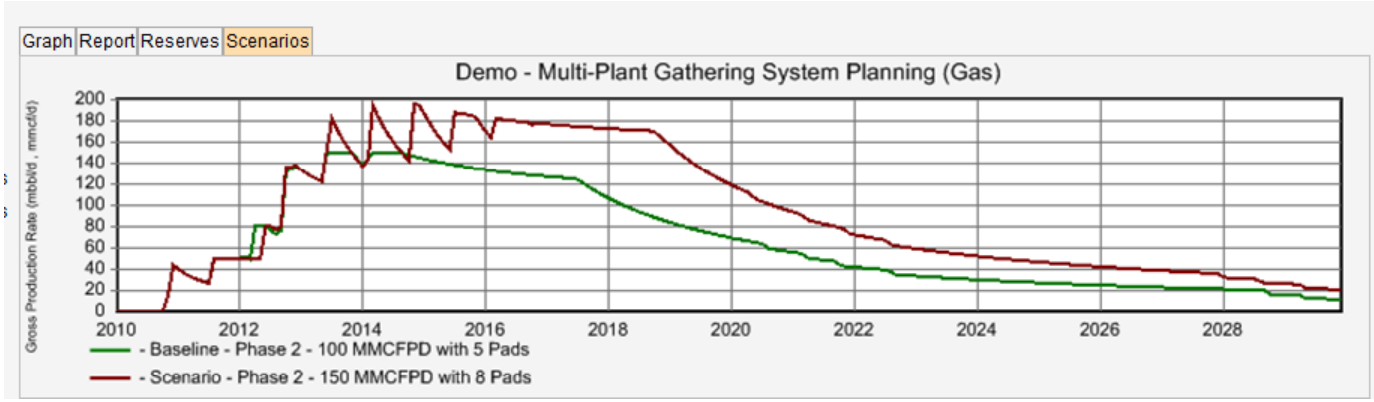
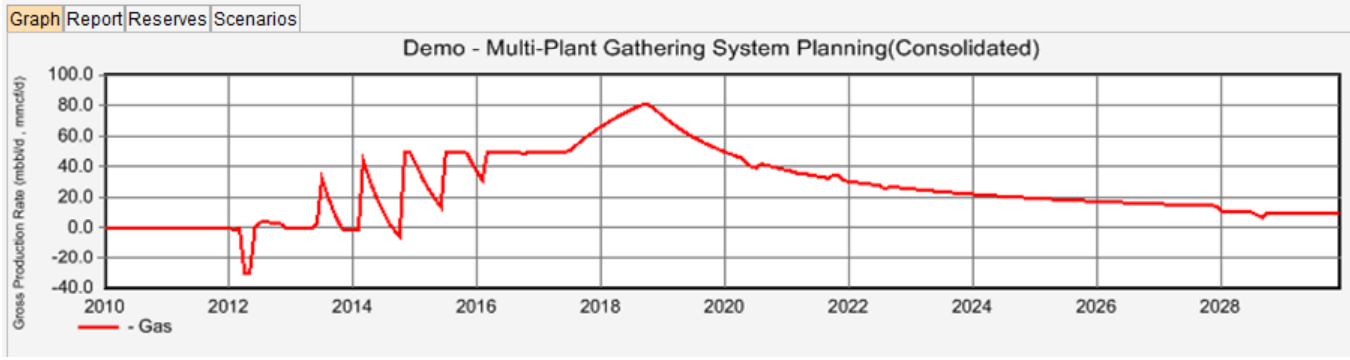
Comparing the different development scenarios can be conducted on an incremental basis

Scenario 1 (Baseline)
Phase 1 - 50 MMCFPD
Phase 2 – 100 MMCFPD

Scenario 2 ('What-If')
Phase 1 - 50 MMCFPD
Phase 2 – 150 MMCFPD



Incremental Results
Scenario 2 – Scenario 1



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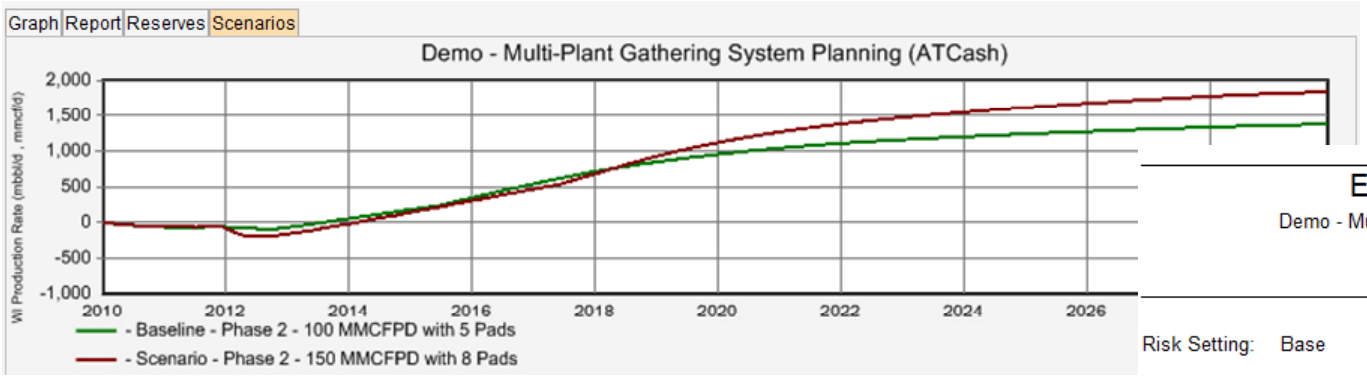
Including generating the key economic indicators to compare the options



Comparison of Cumulative AT Cash Flow

WellSpring quantifies the economics of your gathering system options in one integrated application

Incremental Economic Indicators

Economic Indicators

Demo - Multi-Plant Gathering System Planning

Risk Setting:	Base	WI Type:	Gross

Before Tax

BT NPV @ 0%	576.24 mm$	BT NPV @10%	157.26 mm$
Capital @ 0%	325.64 mm$	Capital @ 10%	206.12 mm$
DPI @ 0%	1.77 $/$	DPI @ 10%	0.76 $/$
ROR	26.14 %	ROR	26.14 %
Payout	12.00 mo	Payout	12.00 mo

After Tax

AT NPV @0%	467.26 mm$	AT NPV@10%	131.00 mm$
Capital @0%	209.15 mm$	Capital @10%	141.53 mm$
DPI @0%	2.23 $/$	DPI @ 10%	0.93 $/$
ROR	27.65 %	ROR	27.65 %
Payout	0.00 mo	Payout	0.00 mo

Reserves

	Gross		Net
Oil	0.00 mmbbl	Oil	0.00 mmbbl
Raw Gas	188.23 bcf	Raw Gas	141.17 bcf
Flow Gas	188.23 bcf	Flow Gas	141.17 bcf
Sales Gas	188.23 bcf	Sales Gas	141.17 bcf
NGL	0.00 mmbbl	NGL	0.00 mmbbl
Sulfur	0.00 Mton(us)	Sulfur	0.00 Mton(us)

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Learning Curves for Drilling Time & Cost

Problem

- In resource plays, significant learning can be achieved over the development of the field and can significantly impact drilling time and costs

Challenges

- A learning curve based on well count requires a drilling program to know how many wells have been previously drilled
- The schedule for the drilling program needs to dynamically reflect the learning

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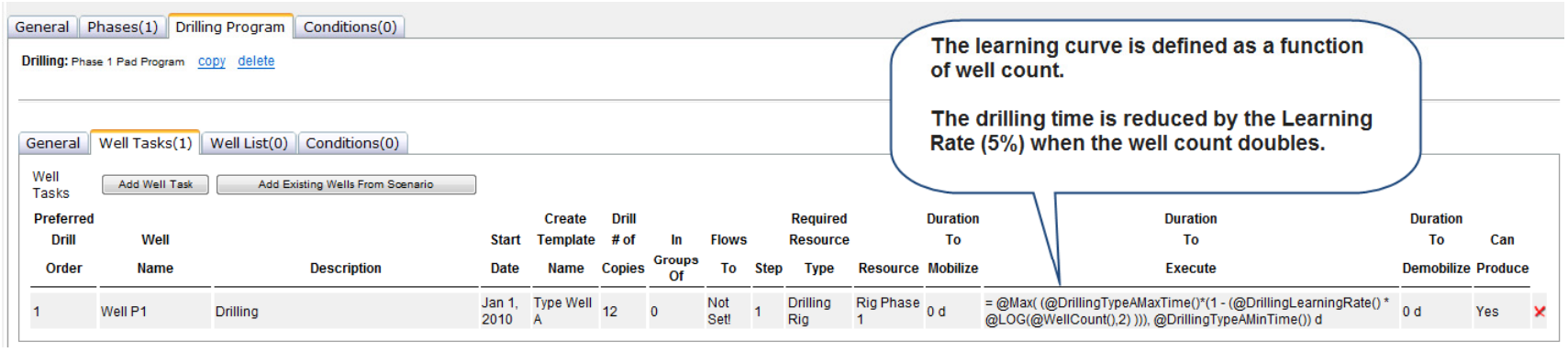
The Learning Curve can be input as a parameterized formula in the drilling program



DrillingLearningRate	5.00 fn (%)	Percentage reduction of drilling time for every doubling of well count
DrillingTypeAMaxTime	27.00 fn (Days)	Max time for drilling Type A wells
DrillingTypeAMinTime	15.00 fn (Days)	Minimum time for drilling Type A wells
DrillingTypeBMaxTime	31.00 fn (Days)	Max time for drilling Type B wells
DrillingTypeBMinTime	18.00 fn (Days)	Minimum time for drilling Type B wells

The algorithm for the learning curve is defined by the user.
User-defined variables can be used to centralize data entry and allow easy modification to the learning curve across several different drilling programs.

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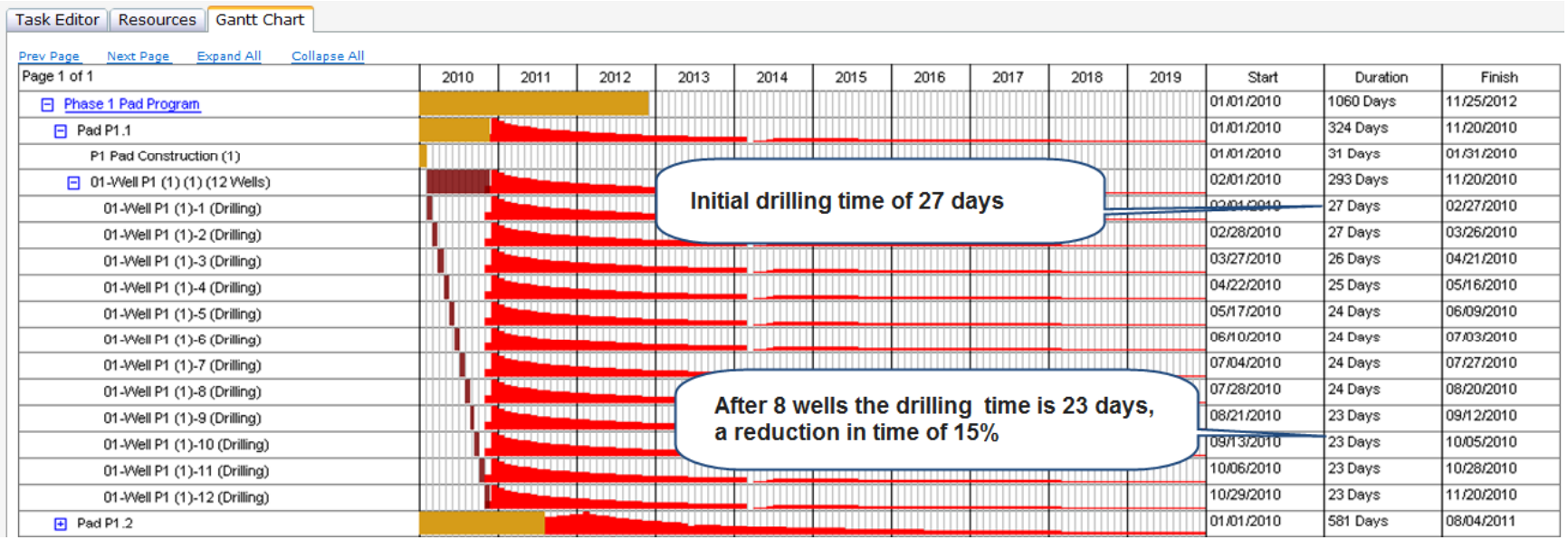
The impact of the learning curve can be observed in the drilling times for the wells over the life of the drilling program



In the same fashion a learning function can be applied to specific capital expenditures in the program, such as drilling capital.

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