

Shale Gas Development Pacing Expand Facilities

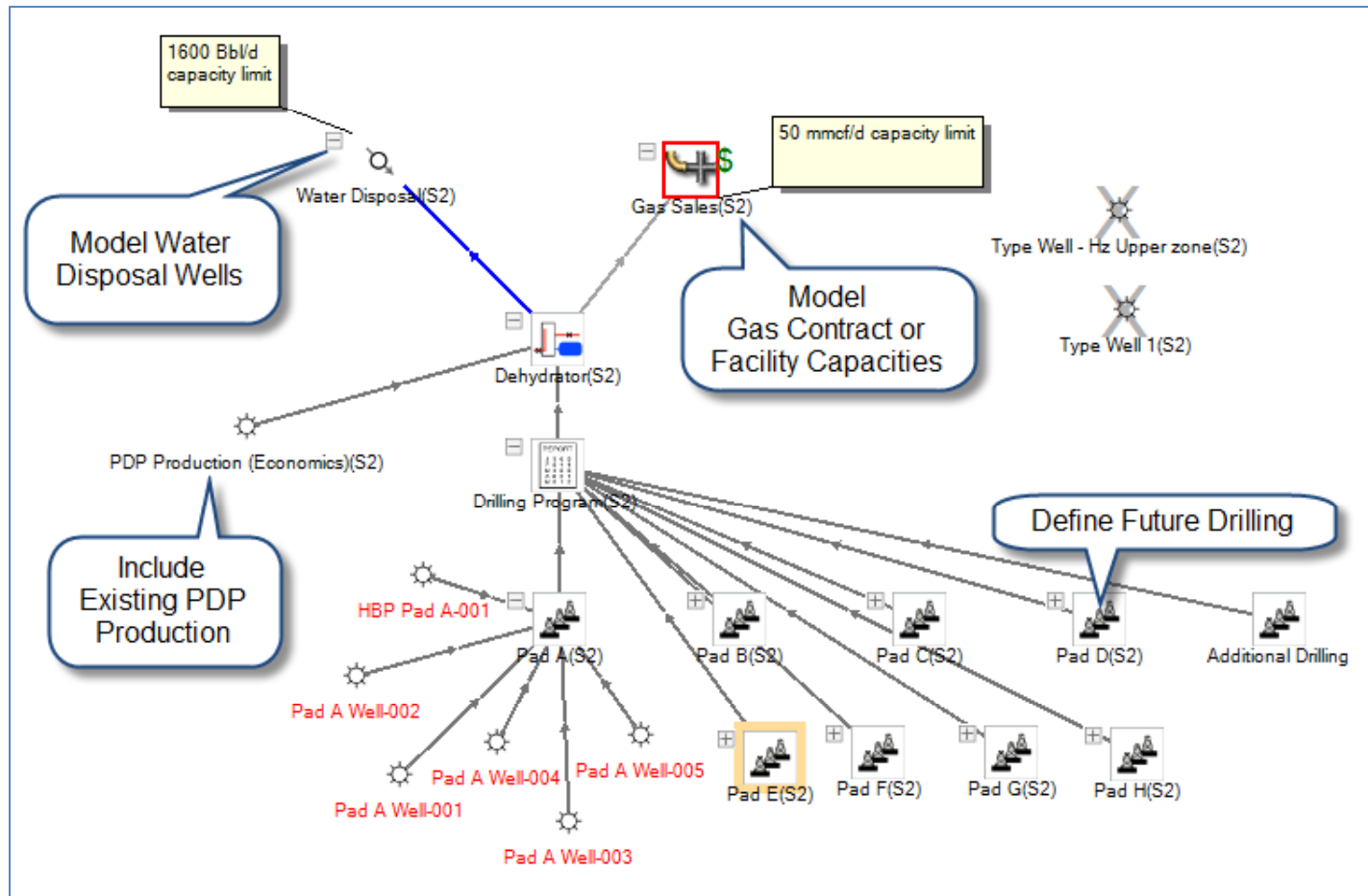
Problem

- Defining when to expand facilities to stay ahead of changing drilling schedules.

Challenges

- As “what-if” runs are made on drilling timing, when do facility expansions need to occur.
- How many or how large an expansion is needed for a given production plan.

Flow Diagram – Shale Gas Development Pacing



Expansions can be Triggered by Various Events

General Conditions(2)

Expand Facility Task: Additional Water Disposal

Condition Test: And Or

Add Condition

Condition Type	Condition Test	Delay After Condition
FinishStart	HBP Drilling Program	0 m fn
Production Threshold	Test Target: Water Disposal Operator: <= Than Product: Water Production Type: Production Potential Test: Volume Difference From Constraint Value (bbl): 100.00	And

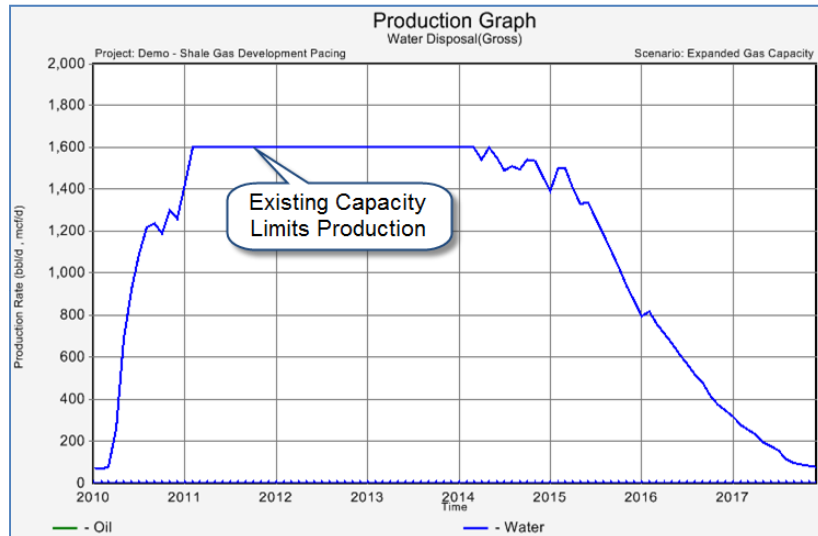
- Expansions can be trigger based on results/volumes at any asset
- Triggers can be based on:
 - Difference from Capacity
 - Flow Rates
 - Total volumes
 - Production Potential

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	2010	2011	2012	Start	Duration	Finish
HBP Drilling Program	[Gantt bar]			01/01/2010	147 Days	05/27/2010
Additional Water Disposal				01/01/2010	0 Days	12/31/9999
ExpansionEntry (1)		[Gantt bar]		02/01/2011	72 Days	04/13/2011
Site Prep		[Gantt bar]		02/01/2011	21 Days	02/21/2011
Drill Disposal Well		[Gantt bar]		03/17/2011	14 Days	03/30/2011
Hook Up		[Gantt bar]		03/31/2011	14 Days	04/13/2011
ExpansionEntry (2)		[Gantt bar]		08/01/2011	49 Days	09/18/2011
Drill to Fill - Gas Sales		[Gantt bar]		05/28/2010	1801 Days	05/02/2015

Expansions can have Multiple Steps, each with its own Costs, Timing, and Resource/Rig Requirements

Results – New program expands water disposal as needed as needed



- With Expand Facility disabled, volume is significantly deferred

- Expansions allow for full potential to be produced

