

## CBM Development Optimization

### Problem

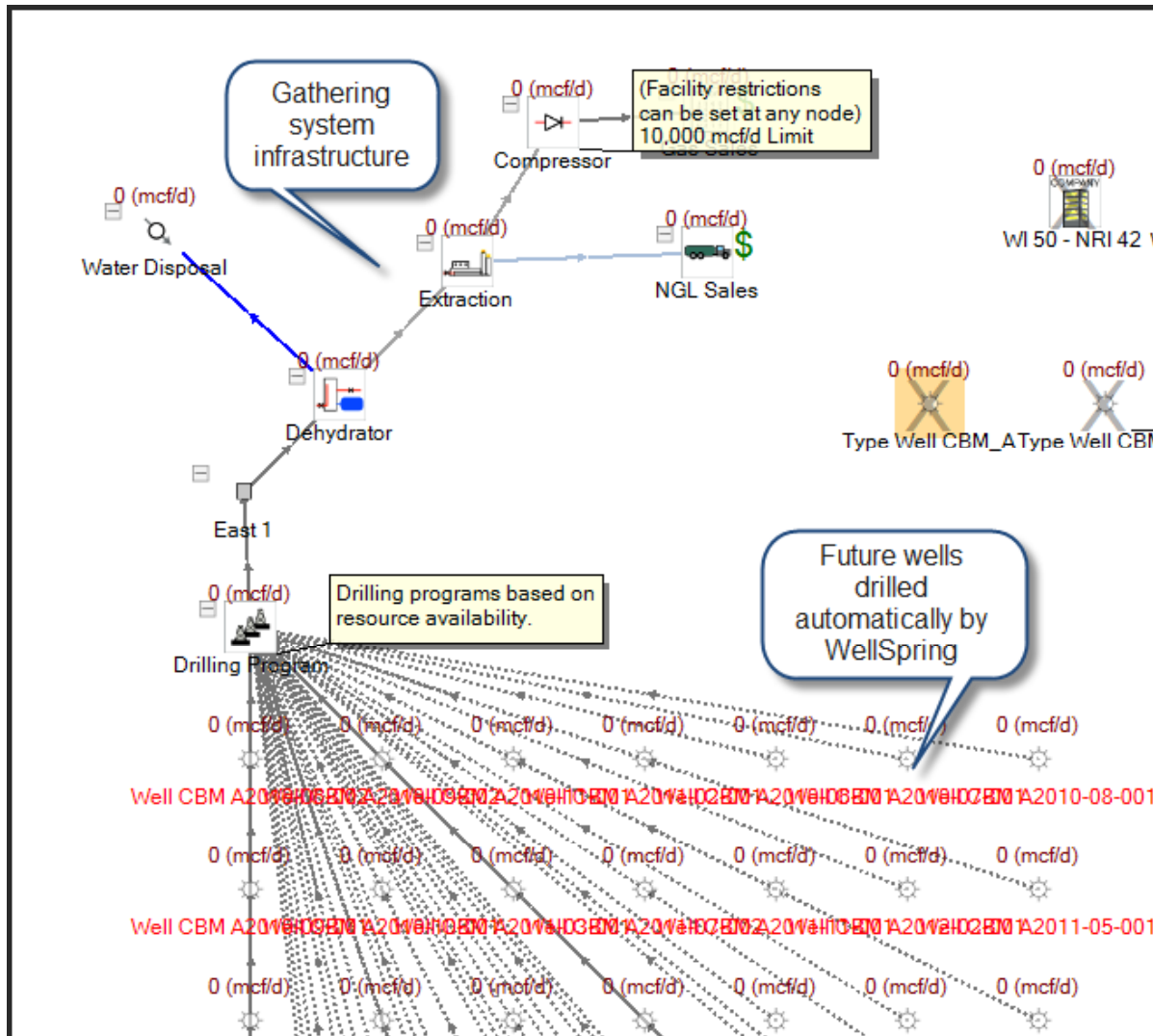
- Development planning for Coal Bed Methane (CBM) development

### Challenges

- Constrained production on gas production.
- Wells must be shifted in time in order to fit within these constraints.

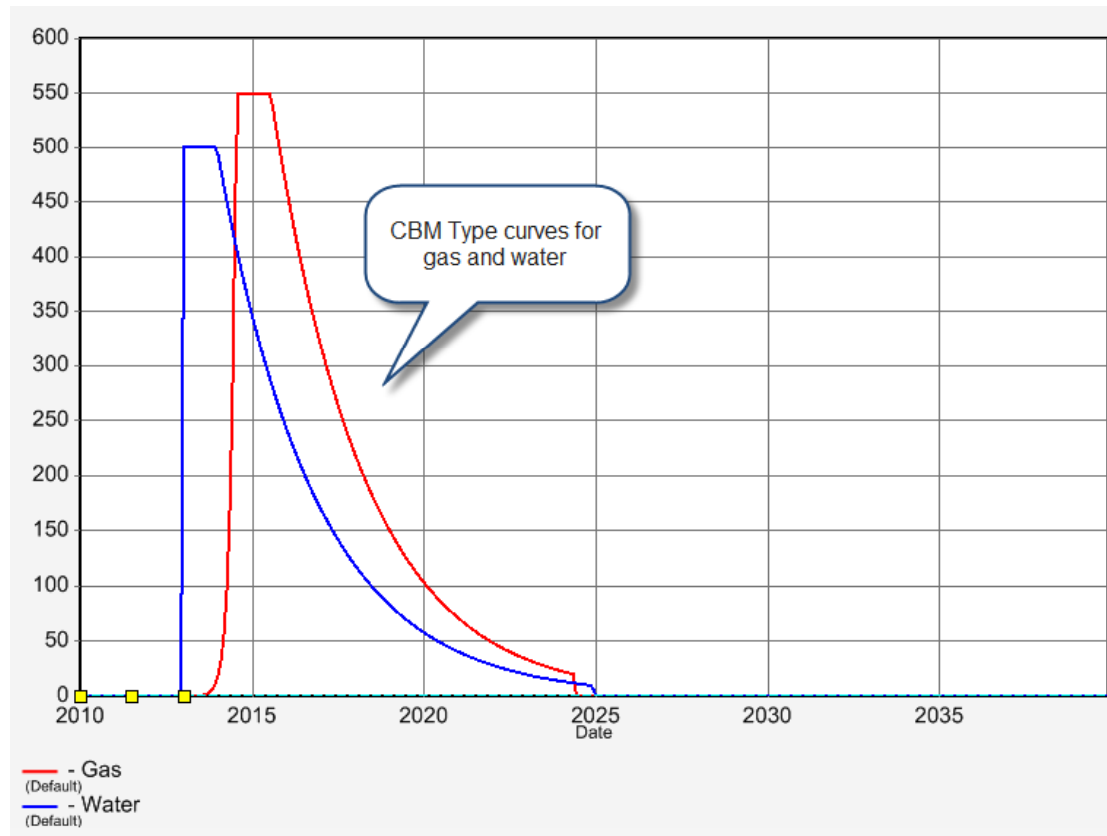
# Flow Diagram – CBM Development Planning

- A flow schematic is easily created in WellSpring to represent the field wells and facilities



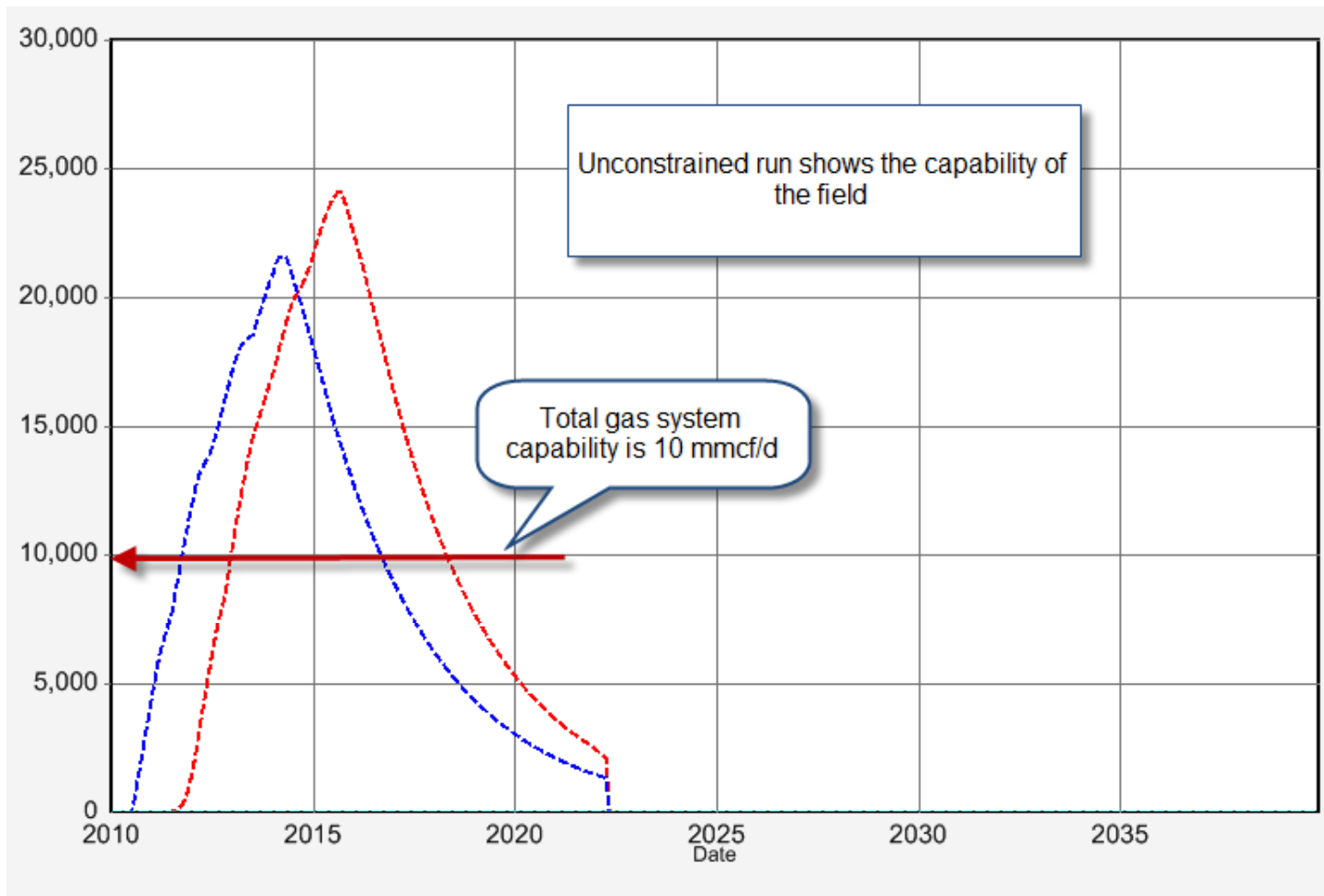
## Type Curve

- The hundreds of proposed wells are based on typical production and represented by a “Type Curve”.

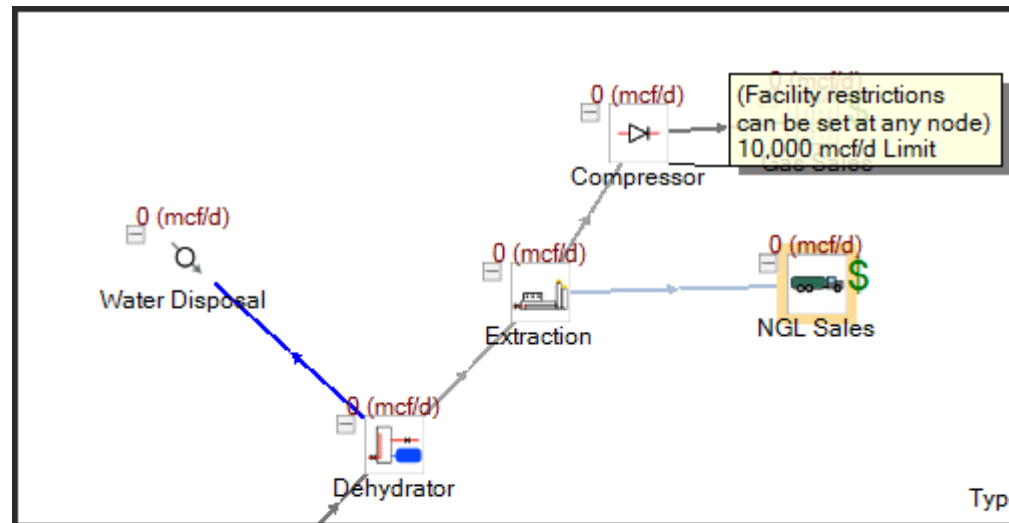


# Unconstrained Run

Actual production potential is higher than the facilities can handle, so not all wells can be brought on at the same time.



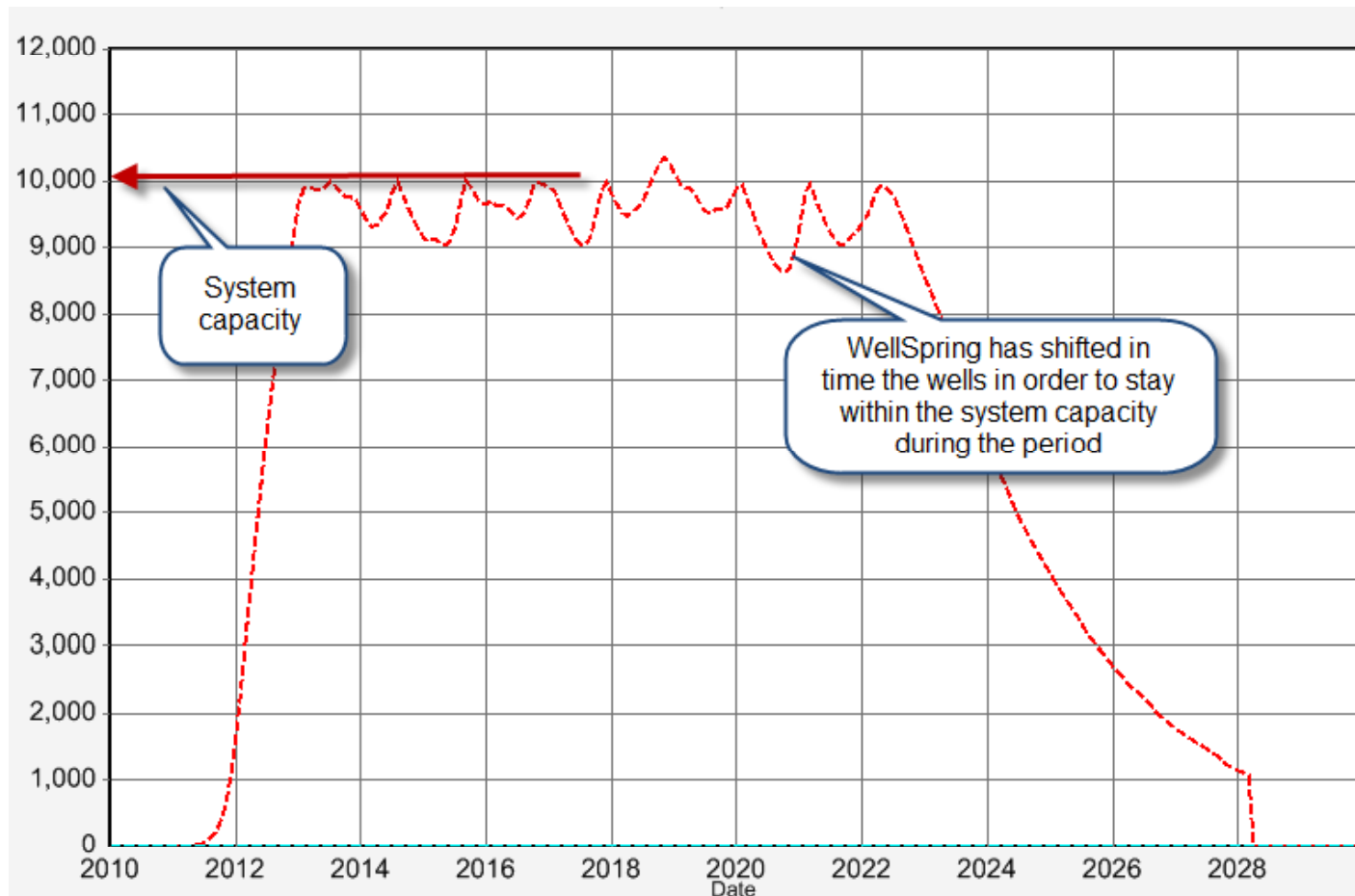
# Individual constraints can be added at each of the facility nodes



Production Limit	<input type="button" value="Add Constraint"/>		Gas	
	Date	Max Rate	Max Rate	Max Rate
	Jan 2010	0.0	10,000.0	0.0

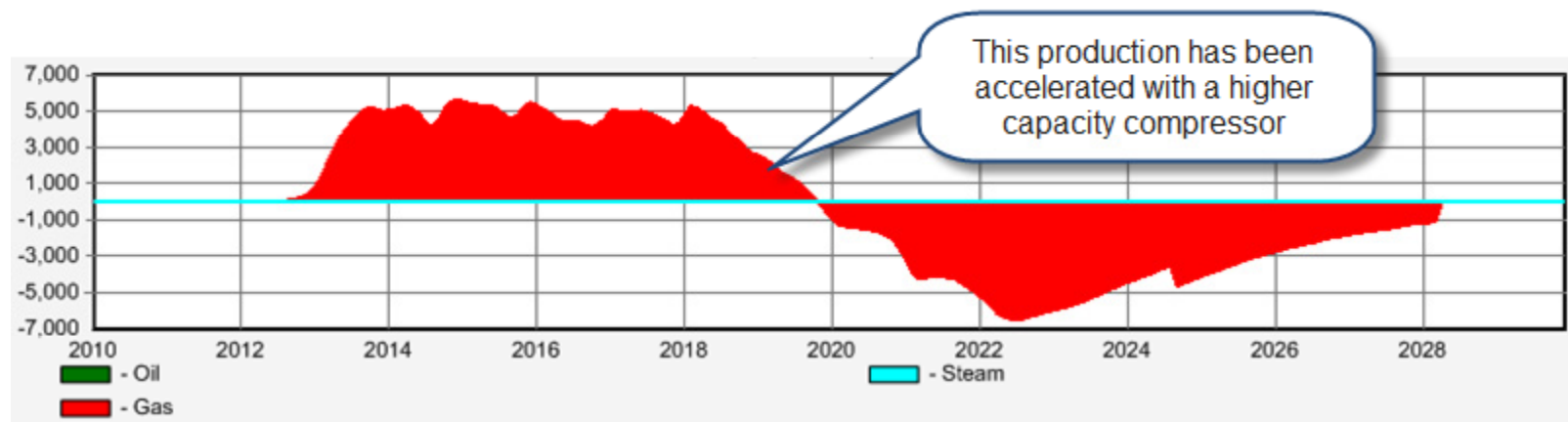
WellSpring then re-calculates the model, shifting individual wells in time in order to meet the constraints

# After the optimization, the field is producing within the facility constraints



## This model can then be used to compare different facilities sizes

- We can create a second scenario with compression capable of 15 mmcf/d
- The plot below shows the 10 mmcf/d case subtracted from the 15 mmcf/d case



## Economics

- With the respective capital and operating costs entered for these scenarios, an incremental comparison of the economics can be calculated to evaluate the alternatives.
- In this example, the production is accelerated, but it doesn't justify the increased capital for the larger facilities.

**Summary Report :** CBM Example - Don

	Gross	W.I.	Net		Gross		
					0 % D.F.	10% D.F.	15% D.F.
<b>Reserves</b>				<b>Net Present Value</b>	m\$	m\$	m\$
Oil	0.00	0.00	0.00 mbbl	B.T. Cash Flow	(9,506.20)	(3,210.21)	(3,467.83)
Gas	(32.61)	(16.30)	(13.70) mmcf	A.T. Cash Flow	(10,414.03)	(5,899.89)	(5,938.68)
NGL	0.00	0.00	0.00 mbbl	Total Capital	12,100.00	13,745.79	13,497.02
				BT DPI (\$/\$)	(0.79)	(0.23)	(0.26)

Incremental Reserves

Incremental NPV