Enersight White Paper: Integrated Upstream Development Planning for Coal Seam Gas to LNG
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Resource plays such as Coal Seam Gas (CSG) fields exhibit a number of unique features compared with other conventional or unconventional developments. Field development planning for CSG is faced with unique challenges such as large number of wells and huge basin areas in order to meet the deliverability requirements of multiple LNG trains. CSG to LNG is also a challenge because of the dewatering requirement which generate initial large water volumes, rapid production ramp-up for the LNG plant. This is further complicated by the relatively low production rates of the wells and by the variable nature of CSG reservoirs which are notoriously difficult to model. This white paper looks at modeling a CSG to LNG development in the Enersight solution.

This project, we’ll explore is a coal seam gas to LNG development in Queensland, Australia where a typical project supplies an LNG plant with 1.5 bcf per day from five thousand to seven thousand producing gas wells in the basin lasting more than 25 years. Enersight’s integrated development planning workflow incorporates the individual well forecasts, surface flow model, constrained surface network, drilling scheduling, and economics.

Enersight’s development planning model can be used to run multiple realisations of the project in order to establish the development schedule, size the gas and water facilities and pipelines as well as test value drivers for the project. The system is also capable of providing daily iterations of the production forecast together with the well phasing, facility timing, capacities...
and capacity utilization with a total resource base of over the wells. The resulting projects can be used to provide schedules and production for budgeting and further economics processing.

**Solution**

Enersight is a cloud hosted application that is accessed via a web browser. Client data is brought into Enersight with spreadsheet-type import tools.

A large CSG development has multiple gathering areas feeding to field compression and further processed at a central processing facility before being sent to a large export pipeline. A typical example of this nodal network structure is shown below.

![Figure 2 - Nodal Network Flow Diagram](image)

The model also supports constrained flow at each of the facilities along with the individual downtime events for wells and facilities (such as well workovers, shutdowns or plant turnarounds).
Production Forecast

A typical CSG production forecast will include an early dewatering phase characterized by a high water and low gas rate. During this period, the gas is coming from the coal matrix. As the water production decreases, this reduces the pressure in the matrix, and allows the gas to flow into the matrix, and then subsequently to the wellbore. CSG wells in Queensland can produce at a peak rate from several hundred thousand mcf/day to two million mcf/day depending on the depth and reservoir quality. The plot below shows an example of a CSG/CBM production forecast.

This production forecast is typically generated by a reservoir simulator such as Eclipse, which models the entire field – taking into account the reservoir heterogeneity. The type curves can be imported as production forecasts directly into Enersight. Once in Enersight, the individual wells can be scheduled according to the well construction steps and rig availability in the scheduler.
Drilling Schedule

In order to achieve the steep ramp up profile required for the LNG plant, it is necessary to drill hundreds of wells per year, get them de-watered and then on producing into the plant. In Enersight, the drilling schedule can be either done at a high level as a “number of wells per year” or with all of the rig availability, well construction steps and timing. The impact of changes to the drilling schedule can also be quantified.

Network Flow

One of the key results from the model is the ability to see the available as well as the excess capacity of every facility in the flow network. The vehicle to illustrate this in the model is the ullage graphs.
Full Field Development Plan

With the production forecast, flow network and facilities, system constraints and downtime, capital, and operating costs, Enersight provides a complete view of the entire field development plan. With the model in place sensitivities on any variable can be set to perform “what-if” analysis on the results. Scenario analysis can also be done on any specific investment decision such as a facility capacity decision.

Conclusion

With the breadth and detail of the Enersight planning model, full field development planning can be accomplished with incredible detail, yet preserving the ease of access of the big picture.

Enersight lets you track and model development through exploration, development and production phases of large complex oil and gas projects. Enersight’s unconventional gas workflow helps companies to model complex development plans quickly so you can spend time on testing ideas and strategies instead of developing and maintaining massive spreadsheets.