PlanningPro®

PlanningPro® is an extension of the technologies encompassed in NITEC's ***LYNX***® software. ***PlanningPro*** is designed to aid the user in developing optimal drilling locations and schedules. ***PlanningPro*** utilizes all available computing resources and provides flexibility to the user in defining and scheduling the drilling program.

PlanningPro utilizes proprietary methods to evaluate the user specified, prospective new well locations, rank these new wells based on cumulative production potential, and determine the optimal combination of new wells. The technology developed in ***PlanningPro*** allows a minimal number of simulation cases to be utilized to determine the optimal case. The process is completely automated once the user specifies the required parameters.

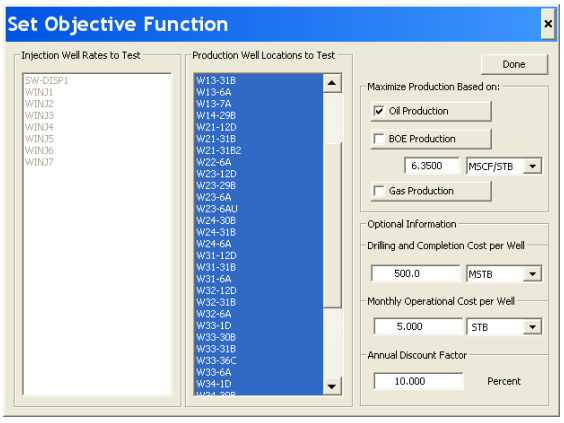
PlanningPro can currently interface with the Eclipse, Sensor, and VIP simulators.

The PlanningPro Process

To begin the evaluation process, the proposed new wells are imported. ***PlanningPro*** requires only the prospective new well names. The simulation data deck is contained in a template file which must include the identical wells and the typical well information (I, J, K, PI, etc.). Additionally, the deck should also include standard well parameters such as field, gathering center constraints, gathering center identification, and well types. While there is no limit to the number of prospective new wells loaded initially, the user can later specify the maximum number of wells to evaluate.

Next, the drilling schedule parameters must be entered. These include the drilling start date, duration for drilling each well, completion days per well, and number of drilling rigs available. Simulation well types must be identified as liquid producers, gas producers, or water injectors. This should be consistent with the simulation data deck. The user must then define the rate constraint for each of the wells. ***PlanningPro*** will write the well rates to the simulation data deck.

Having defined the basic well and simulation parameters for the prospective new wells, the user identifies the list of new wells to be evaluated. By default, all of the original list of proposed wells is selected. However, the number of wells can be limited if desired. The user can define the objective function, which will be maximized, to be based on cumulative oil production, cumulative gas production, BOE or a 'pseudo' economic evaluation of NPV.



Benefits of PlanningPro

- Speeds New Well Selection
- Reduces Simulation Run Time
- Requires Limited User Intervention
- Provides Pseudo NPV Optimization
- Interfaces with Many Simulators

NITEC LLC
475 17th Street, Suite 1400
Denver, CO USA 80202

1.303.292.9595
solutions@nitecllc.com
www.nitecllc.com

NITEC

PlanningPro's automated process ranks all of the prospective new wells to be evaluated based on a proprietary objective function. The ranking is then used to simulate the model performance adding additional new wells ranked from the highest to lowest output. The user can select all or some of the previously identified wells to be evaluated.

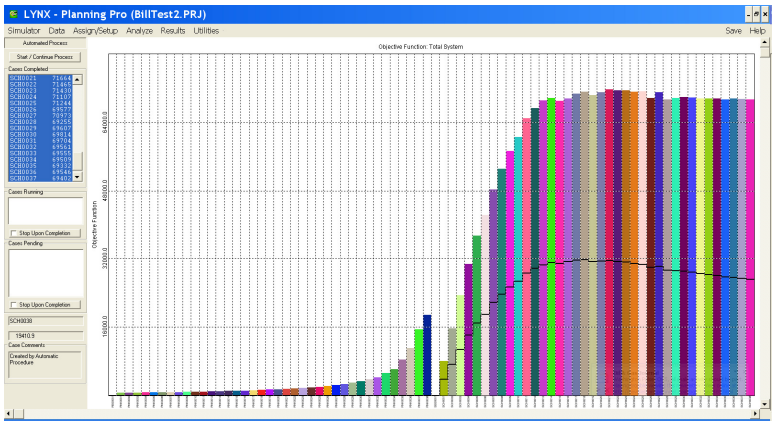
The ranking of the wells is carried out by simulating their model response for a portion of the overall simulation prediction period. If the full prediction period is 20 years, only 3-5 years needs to be simulated in the ranking runs. Once the ranking order has been established, the full prediction runs are made.

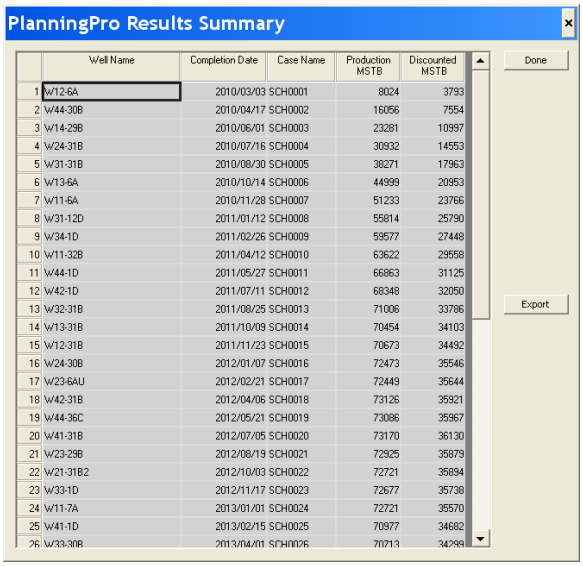
As an example:

Number of wells to evaluate	50
Duration of full prediction	25 yrs
Duration of ranking runs	5 yrs
Number of short ranking runs	50
Number of full prediction runs	51 (includes a "no new wells" base case)

Prior to launching the automated process the user must define the CPUs to be used. Multiple CPUs and simulator licenses will accelerate the process.

As the process progresses, a bar chart is generated to display the objective function value for each simulation case - ranking through scheduling. ***PlanningPro*** reports the pending, completed, and running cases. If economic parameters were indentified for the objective function, the "pseudo" economic analysis discounted NPV value is represented by a black line on each bar in the chart.



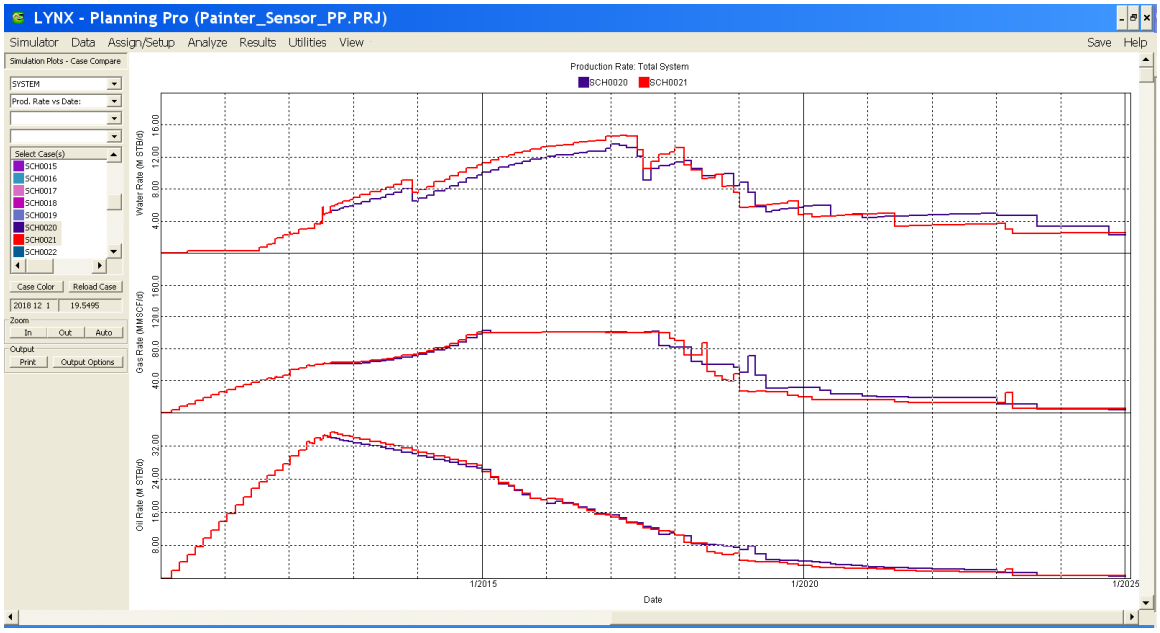


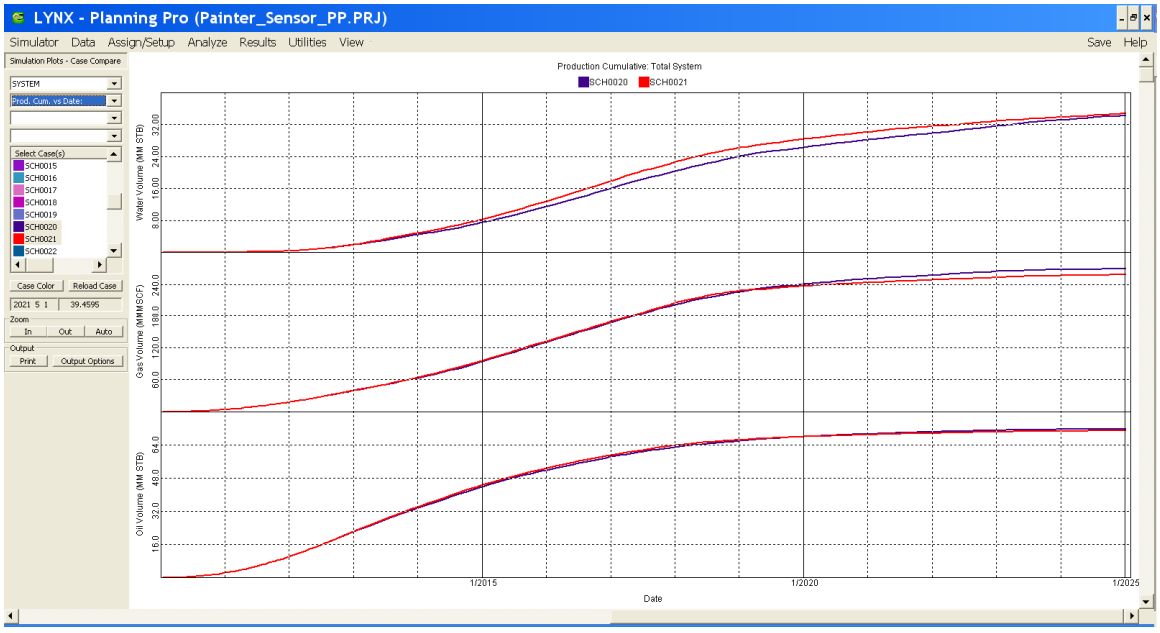
	Well Name	Completion Date	Case Name	Production MSTB	Discounted MSTB
1	W12-6A	2010/03/03	SCH0001	8024	3793
2	W44-30B	2010/04/17	SCH0002	16056	7554
3	W14-29B	2010/06/01	SCH0003	23281	10997
4	W24-31B	2010/07/16	SCH0004	30932	14553
5	W31-31B	2010/08/30	SCH0005	38271	17963
6	W13-6A	2010/10/14	SCH0006	44999	20953
7	W11-6A	2010/11/28	SCH0007	51233	23766
8	W31-12D	2011/01/12	SCH0008	55814	25790
9	W34-1D	2011/02/26	SCH0009	59577	27448
10	W11-32B	2011/04/12	SCH0010	63622	29558
11	W44-1D	2011/05/27	SCH0011	66863	31125
12	W42-1D	2011/07/11	SCH0012	68348	32050
13	W32-31B	2011/08/25	SCH0013	71006	33786
14	W13-31B	2011/10/09	SCH0014	70454	34103
15	W12-31B	2011/11/23	SCH0015	70673	34492
16	W24-30B	2012/01/07	SCH0016	72473	35546
17	W23-6AU	2012/02/21	SCH0017	72449	35644
18	W42-31B	2012/04/06	SCH0018	73126	35921
19	W44-36C	2012/05/21	SCH0019	73086	35967
20	W41-31B	2012/07/05	SCH0020	73170	36130
21	W23-29B	2012/08/19	SCH0021	72925	35879
22	W21-31B2	2012/10/03	SCH0022	72721	35894
23	W33-1D	2012/11/17	SCH0023	72677	35738
24	W11-7A	2013/01/01	SCH0024	72721	35570
25	W41-1D	2013/02/15	SCH0025	70977	34682
26	W33-30B	2013/04/01	SCH0026	70713	34299

The resulting drilling schedule can be displayed along with the production for each well. Case SCH001 includes only the highest rank well; W12-6A in the example. The highest oil production from the new wells occurs in Case SCH020 - 73,170 MSTB. Wells W12-6A through W41-31B are included in that case.

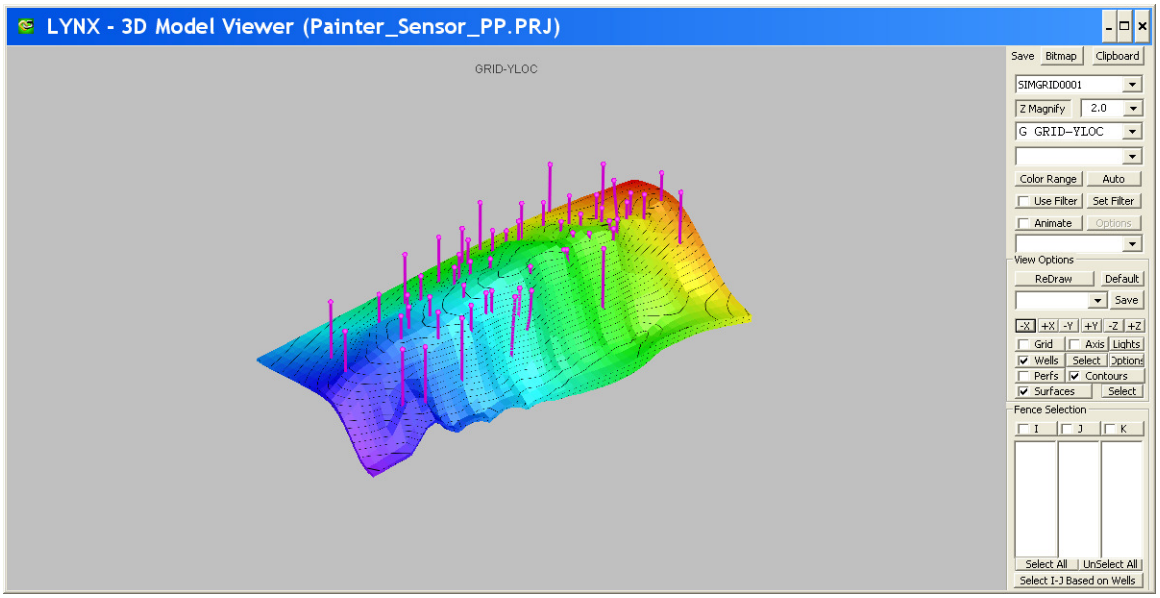
Note: This example is a reservoir model where new wells are drilled beginning at initial conditions. If prior wells were present, ***PlanningPro*** would restart from the end of the history matched period. All active historical wells would be included in the prediction cases along with the new wells.

PlanningPro allows the user to display production rate and cumulative plots for any of the simulated cases and compare one case to another. Results can also be exported to a comma delimited file for use in other applications. The production rate and cumulative performance for Case SCH020 and SCH021 are compared below. Case SCH020 is the optimal case based on cumulative oil production. SCH021 provides a level of accelerated oil production for a period of time, but the cumulative oil production is slightly less than SCH020. This is the case for all wells drilled after the 20th ranked well.

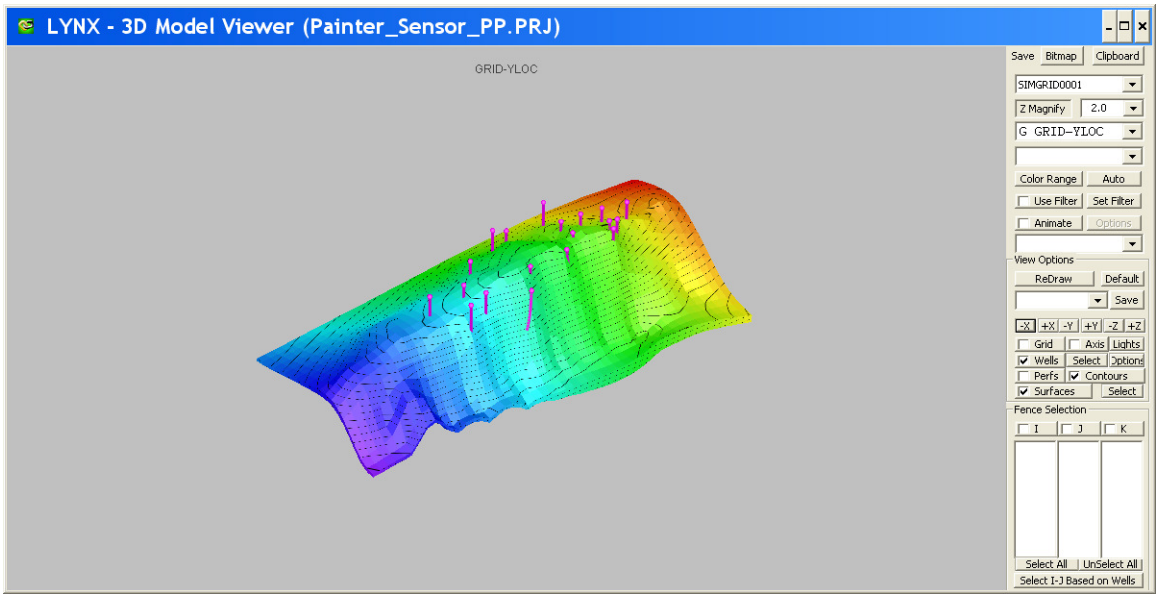




Array results (P, So, Sw, Sg) can be loaded and displayed for any case. The display below shows all 46 new wells considered in the evaluation.



The display below shows the 20 new wells in the optimal case. To achieve maximum oil production from the field, only 20 of the 46 original wells were required .



Currently, ***PlanningPro*** only optimizes the prospective new production wells. Similar optimization of injection wells will be added in the future.