



## HOW TO CREATE, SET UP AND WORK WITH ASSETS IN “HC\_CALC”. COMMON USER PERSPECTIVE

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## WHAT IS HC\_CALC?

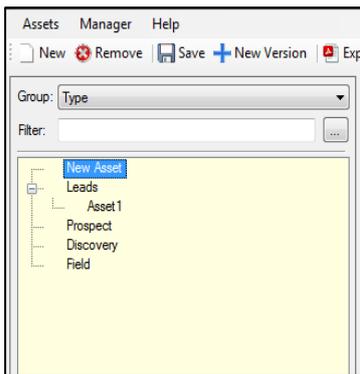
HC\_Calc is a system to computerize the management of reserve estimates using probabilistic methods and complements the evaluation of the best fields exploring alternatives that contain significant oil and gas reserves. It was designed with a fully probabilistic approach in order to show not only what could happen, as well as the probability of each outcome. Allowing the generation of different result scenarios which will be used as a parameter for analysis to decision making.

### FIRST STEPS.

Now let's go through a few steps to show how to start a simple project with HC\_Calc.

#### Adding a new asset.

1. Click the New button to add a new asset to the list, or select an existing asset and click the New Version button to add a clone of the selected asset (img.1).
2. When the new asset shows in the left panel, the information section will be enabled to enter the basic metadata of the asset (img.2).
3. Save the active. Once the asset is saved, this will be classified on the asset's tree.



Img.1: Assets Tree.

Report	Information	Settings	Rock Volume	HC Yield	HC Volumes	Chance	Production Curve
Name:	Asset 2	Play:	Play				
Type:	Leads	Formation:	Formation				
Basin:	Basin	Reservoir:	Reservoir				
Block:	Block	Terrain:	Off-Shore				
Region:	Region	Water Depth:	0,00				
Company:	Company	Elevation:	0,00				
Consortium:	Consortium	Latitude:	0,0000				
Operator:	Operator	Longitude:	0,0000				
Partner:	Partner	Last Modification:	01 September 2015 15:07:55				
Description:		User:	Administrator				

Img.2: Information Section.

#### Setting configurations:

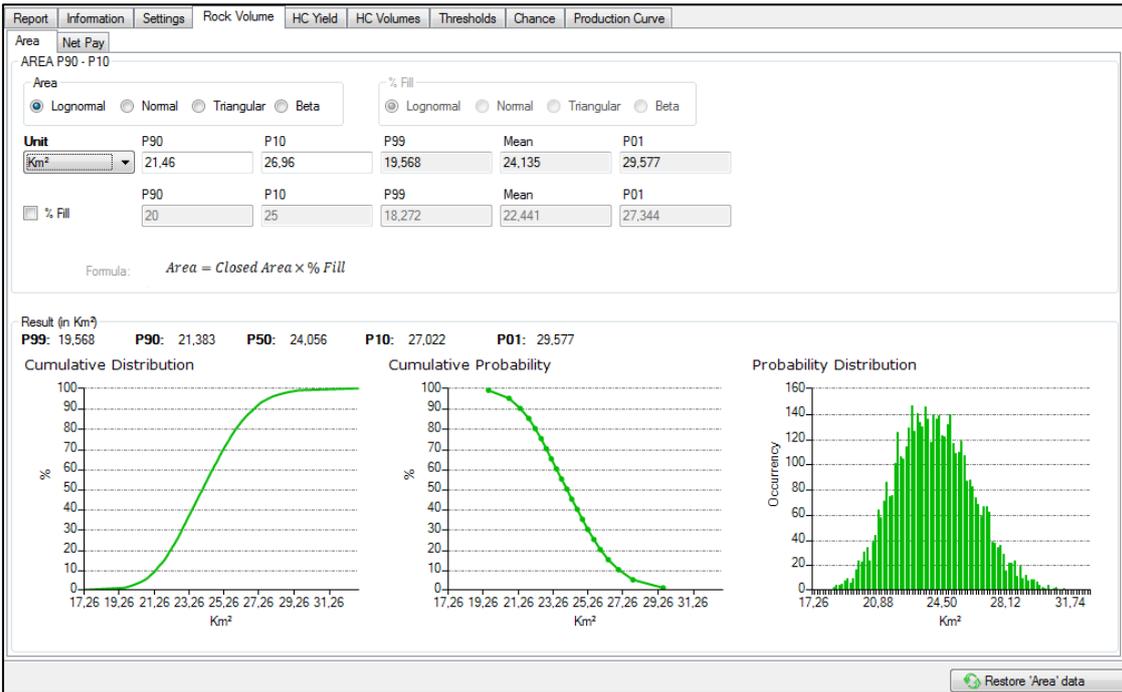
1. Select the HC Yield Properties. It is very important to select the products that the asset will have, Primary and Secondary Products. This will cause changes in the system layout and changes of data requirements for the simulation process (img.3).
2. Select the Rock Volume type. It could be "Area x Net Pay" or "GRV".
3. If necessary, it is possible to change the iteration number for the simulation and the conversion ratio for equivalent oil calculation.

Report	Information	Settings	Rock Volume	HC Yield	HC Volumes	Thresholds	Chance	Production Curve
Simulation Settings								
# Iterations: <input type="text" value="5000"/>								
Conversion Ratio <input type="text" value="6"/> * Used for Calculation of Oil Equivalent								
Rock Volume Type:								
<input checked="" type="radio"/> Area x Net Pay <input type="radio"/> GRV								
HC Yield Properties								
Primary Products				Secondary Products				
<input checked="" type="checkbox"/> Oil				<input type="checkbox"/> Solution Gas <input type="checkbox"/> Condensate (Solution Gas)				
<input checked="" type="checkbox"/> Gas				<input checked="" type="checkbox"/> Condensate (Gas)				

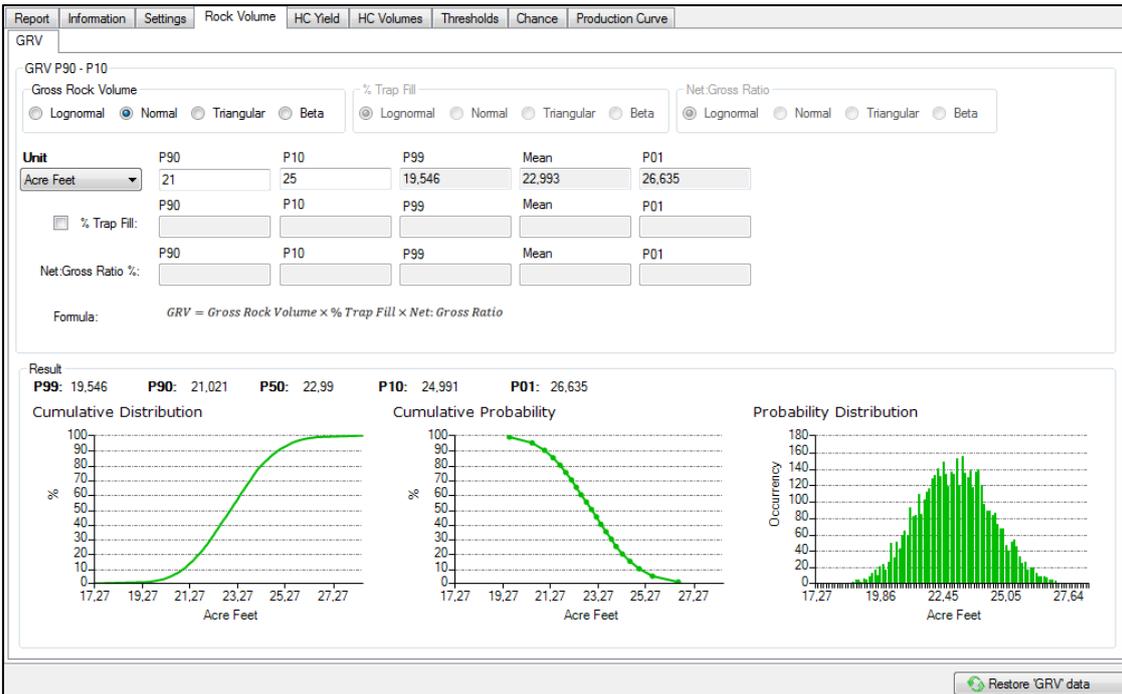
Img.3: Settings Section.

### Setting up The Rock Volume:

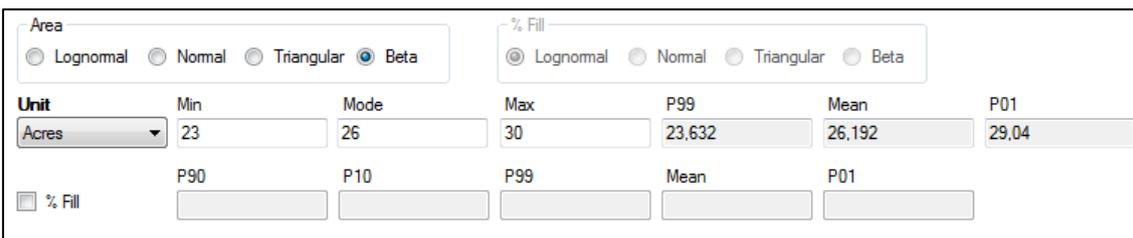
1. Make sure your settings configurations are right. The layout of the Rock Volume changes on dependence of the Rock Volume Type selected in de settings section (img.3). If the option "Area x Net Pay" was marked in the settings then will be shown two tabs in de Rock Volume Section: Area and Net Pay (img.4). In case the "GRV" option was marked in the settings (img.5) then will be shown just one tab: "GRV".
2. Select the data distribution: Lognormal, Normal, Triangular or Beta Distribution.
3. Select the unit of measure in which the data is: Acre Feet, Thousands of Acre Feet, Acre, Km<sup>2</sup>, Meters, etc.
4. Insert the values required by the system. These values may change according to the data distribution selected before. For example: if the data distribution selected was Beta or Triangular Distribution then will be necessary introduce three parameters (minimum value, maximum value and mode value) (img.6), else if the data distribution selected was Normal or Lognormal distributions then will be necessary just two parameters (P90 value and P10 value).
5. Once the system has the basic information to calculate the probability distribution curve, the cumulative distribution curve and the cumulative probability curve the graphics will be shown on the bottom of the window.



Img.4: Rock Volume Section [Area x Net Pay].



Img.5: Rock Volume Section [GRV].



Img.6: Rock Volume Section [Beta Distribution selected].



## Setting up The HC Yield:

1. Make sure your settings configurations are right. The layout of the Yield section changes on dependence of the HC Yield Properties selected in de Settings section (img.3). The default configuration will be asset whit only oil as primary product. So if this setting remains like that; in the HC Yield section will be presented just two tabs: Properties and Oil. Each selected option in HC Yield Properties (settings section) will add a tab for the HC Yield Section's layout (img.7).
2. Set the required values in the Properties Sub-Section. In this subsections will be setting up parameters that relate all variables (primary or secondary products) that were selected on the Settings Sections (img.8).
3. Insert the values required by the system in each sub-sections [Properties, Oil, Gas, Solution Gas, Condensate Solution Gas or Condensate Gas]. These values may change according to the selection of data distribution.
4. Once the system has the basic information to calculate the curves, the graphics will be showed.



Img.7: HC Yield Section [with all the subsections activated].



Report	Information	Settings	Rock Volume	HC Yield	HC Volumes	Thresholds	Chance	Production Curve																																																									
<div style="border: 1px solid black; padding: 5px;"> <div style="border-bottom: 1px solid black; display: flex; justify-content: space-between; padding-bottom: 5px;"> <span>Properties</span> <span>Oil</span> <span>Gas</span> <span>Solution Gas</span> <span>Condensate Solution Gas</span> <span>Condensate Gas</span> </div> <div style="padding: 5px;"> <p><b>Oil and Gas</b></p> <p>Proportion</p> <p><input checked="" type="radio"/> Lognormal   <input type="radio"/> Normal   <input type="radio"/> Triangular   <input type="radio"/> Beta</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">P90</td> <td style="width: 15%;">P10</td> <td style="width: 15%;">P99</td> <td style="width: 15%;">Mean</td> <td style="width: 15%;">P01</td> </tr> <tr> <td>Oil Proportion (%):</td> <td>3</td> <td>6</td> <td>2,277</td> <td>4,393</td> <td>7,991</td> </tr> </table> <p><small>* The Oil Proportion will be considered in the simulation</small></p> <hr/> <p><b>Common Attributes</b></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Porosity</p> <p><input type="radio"/> Lognormal   <input checked="" type="radio"/> Normal   <input type="radio"/> Triangular   <input type="radio"/> Beta</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">P90</td> <td style="width: 15%;">P10</td> <td style="width: 15%;">P99</td> <td style="width: 15%;">Mean</td> <td style="width: 15%;">P01</td> </tr> <tr> <td>Porosity (%):</td> <td>25</td> <td>30</td> <td>23,111</td> <td>27,549</td> <td>32,226</td> </tr> </table> </div> <div style="width: 45%;"> <p>HC Saturation</p> <p><input type="radio"/> Lognormal   <input checked="" type="radio"/> Normal   <input type="radio"/> Triangular   <input type="radio"/> Beta</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">P90</td> <td style="width: 15%;">P10</td> <td style="width: 15%;">P99</td> <td style="width: 15%;">Mean</td> <td style="width: 15%;">P01</td> <td style="width: 15%;"></td> </tr> <tr> <td>HC Saturation (%):</td> <td>23</td> <td>56</td> <td>16,732</td> <td>40,303</td> <td>69,962</td> <td>Porosity Correlation</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.00</td> </tr> </table> </div> </div> <p>Unit: <span style="border: 1px solid black; padding: 2px;">Bbls per Acre Foot (oil) and MCF per Acre Foot (gas)</span></p> <hr/> <p><b>Shrinkage and Surface Loss</b></p> <p>Surface Loss</p> <p><input type="radio"/> Lognormal   <input checked="" type="radio"/> Normal   <input type="radio"/> Triangular   <input type="radio"/> Beta</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">P90</td> <td style="width: 15%;">P10</td> <td style="width: 15%;">P99</td> <td style="width: 15%;">Mean</td> <td style="width: 15%;">P01</td> </tr> <tr> <td>Surface Loss (%):</td> <td>0</td> <td>0</td> <td></td> <td></td> <td></td> </tr> </table> <p><small>* The Surface Loss will be considered in the simulation</small></p> <div style="text-align: right; margin-top: 10px;"> <span style="border: 1px solid black; padding: 2px; font-size: small;">Restore 'Properties' data</span> </div> </div> </div>										P90	P10	P99	Mean	P01	Oil Proportion (%):	3	6	2,277	4,393	7,991		P90	P10	P99	Mean	P01	Porosity (%):	25	30	23,111	27,549	32,226		P90	P10	P99	Mean	P01		HC Saturation (%):	23	56	16,732	40,303	69,962	Porosity Correlation							0.00		P90	P10	P99	Mean	P01	Surface Loss (%):	0	0			
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	P90	P10	P99	Mean	P01																																																												
Surface Loss (%):	0	0																																																															

Img.8: HC Yield Section [Properties sub-section].

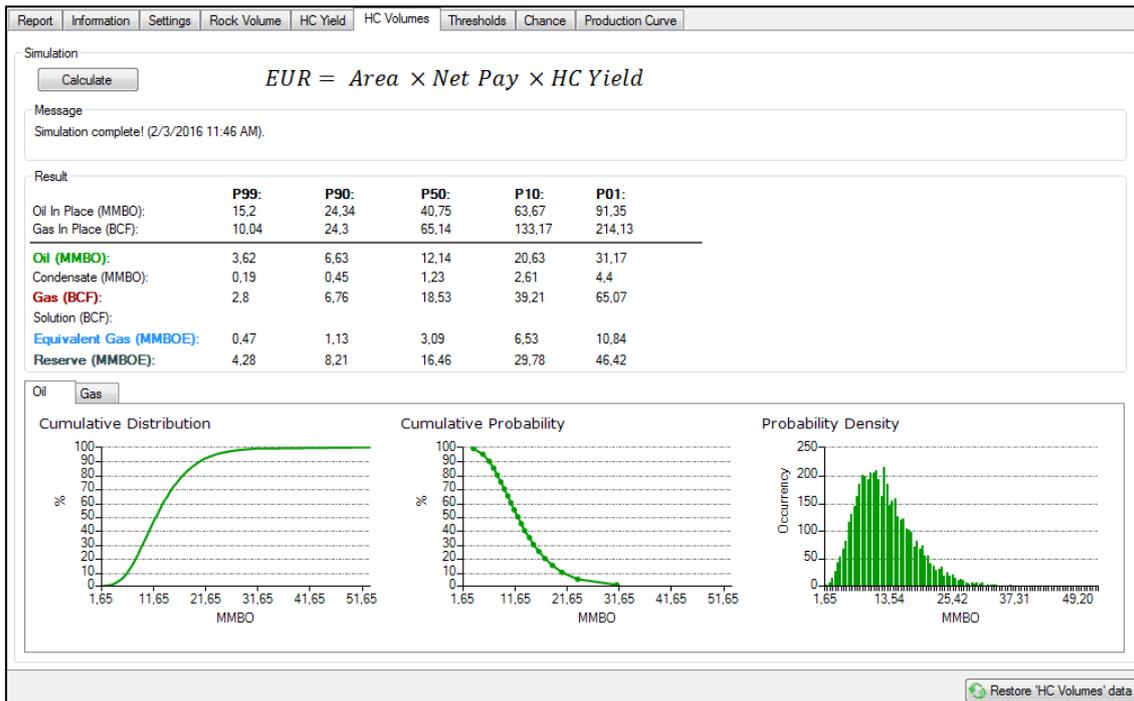
### Generate a Simulation:

With all basic information filed now is time to execute the Monte Carlo's simulation. Just get into the Simulation Section and click the Calculate button (img.8).

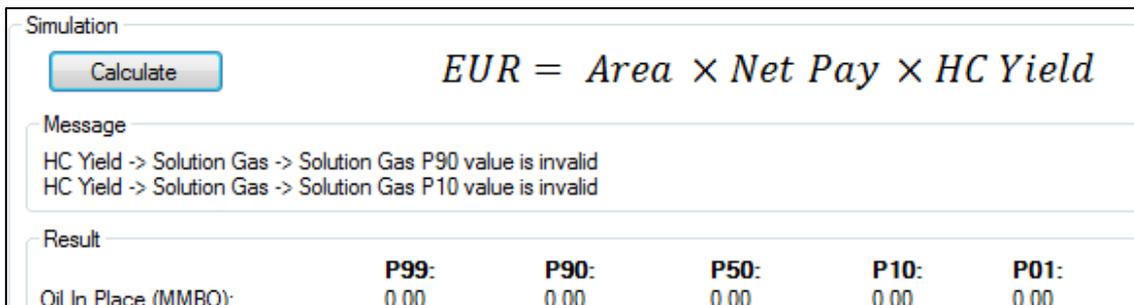
### What's could happen?

Once the Calculate button was clicked can happen two scenarios:

1. If all the basics information were provided properly to the software then the simulation will be executed without problem (img.9).
2. If any information is missing or invalid, will be displayed a message(s) where the missing or invalid data is exposed (img.10). To solve this issue just rectifies the invalid or missing value.



Img.9: Simulation Section [After simulation].



Img.10: Simulation Section [Invalid values message].

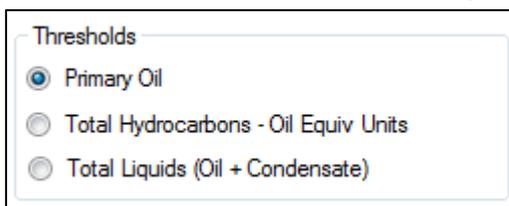
## SUPPORT TOOLS:

For a better analysis after simulation HC\_Calc provides a set of useful tools that provide an additional view for evaluating the potential of assets.

### Thresholds Section:

After simulation is important to know the minimum field size that would generate a PV > 0 so that's what the Thresholds section is all about.

1. Select which threshold will be analyzed (img.11)



Thresholds

Primary Oil

Total Hydrocarbons - Oil Equiv Units

Total Liquids (Oil + Condensate)

Img.11: Thresholds Section [Selecting threshold type].



2. Select which curves will be displayed and set the value for the economic and commercial threshold (img.12).

Prospect Thresholds

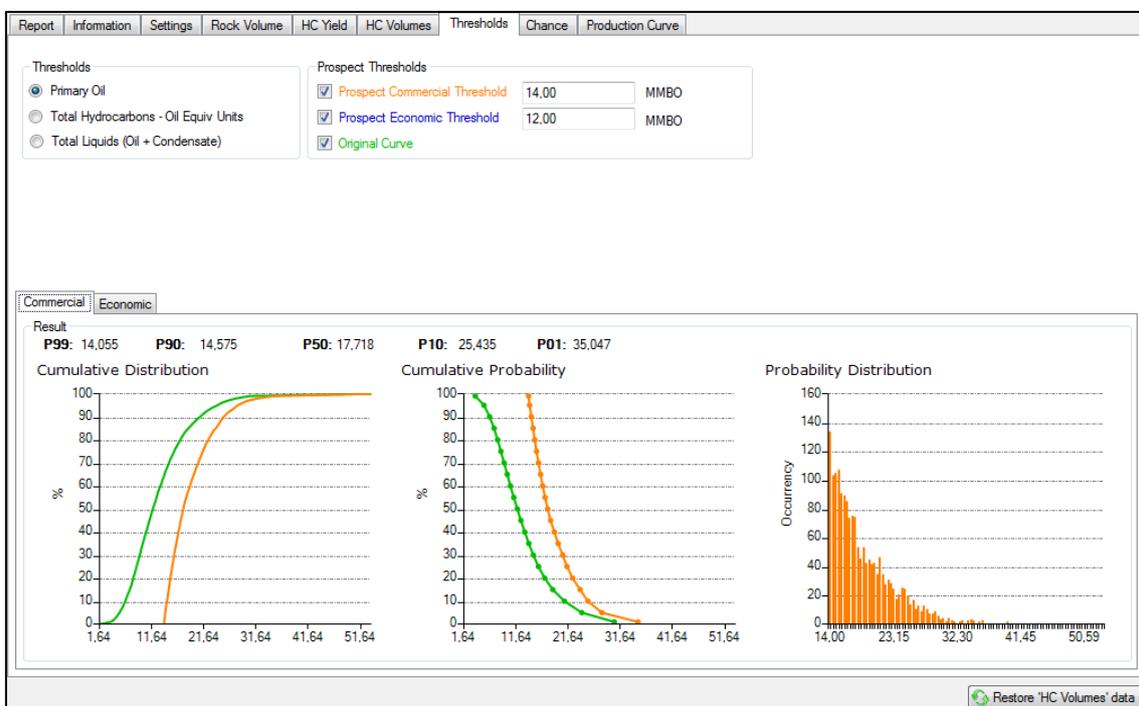
Prospect Commercial Threshold 30 MMBO

Prospect Economic Threshold 60 MMBO

Original Curve

Img.12: Thresholds Section [Selecting threshold prospects and setting values].

3. Once the system has the basic information to calculate the curves the graphics will be exposed (img.13).

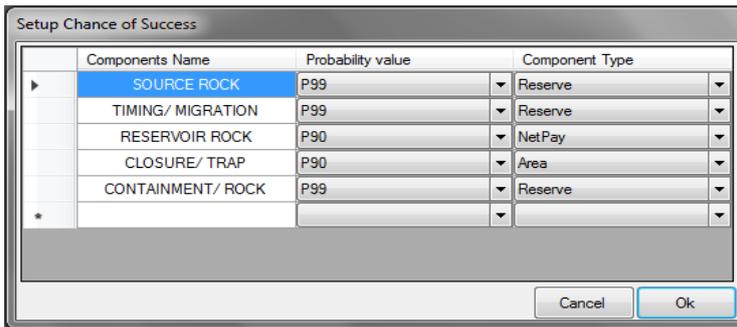


Img.13: Thresholds Section.

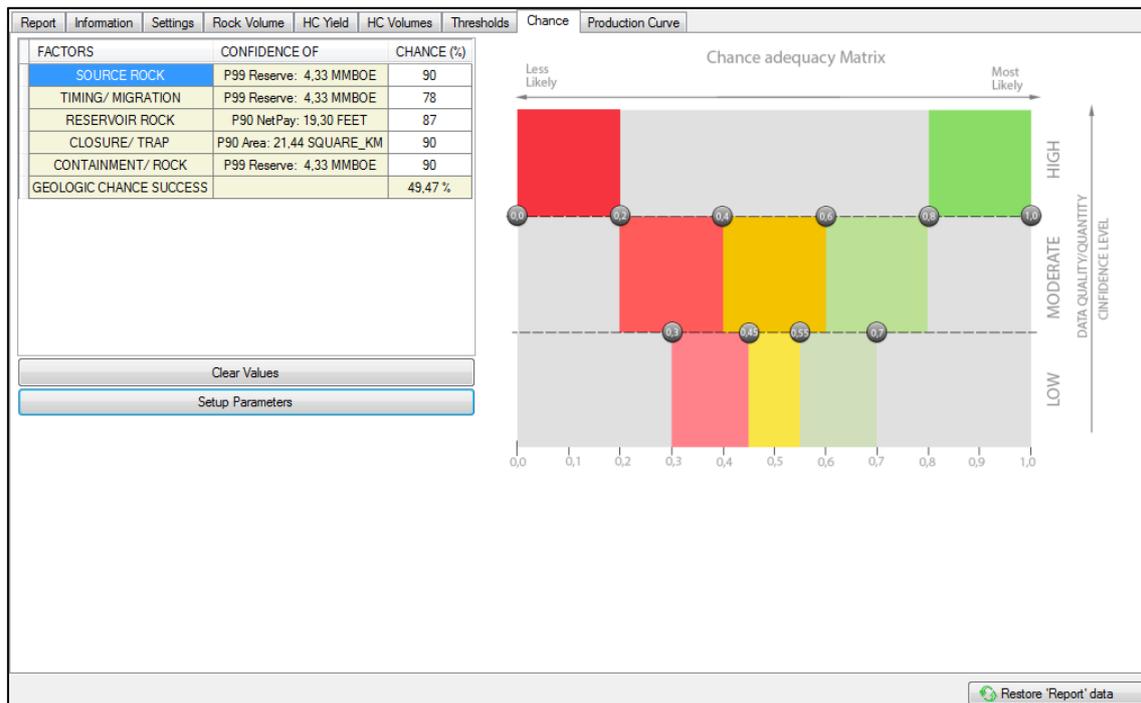
### Chance of Success Section:

On this section is possible evaluate asset chances of success associated to the quantity and quality of the information that is used on the prospecting process. Work with this section is very easy. Just need configure the factors of interest and set a percent value for each one of them. Setup the factors with a Name, Probability Value and a Component Type (img.14).

1. Set a value for each factor. To help on the decision of this value is recommended to use the Chance Adequacy Matrix (img.15).
2. Analyze the final value of the Geologic Chance of Success to see if it is worth investing in the asset.



Img.14: Chance of Success Section [setup factor of interest].

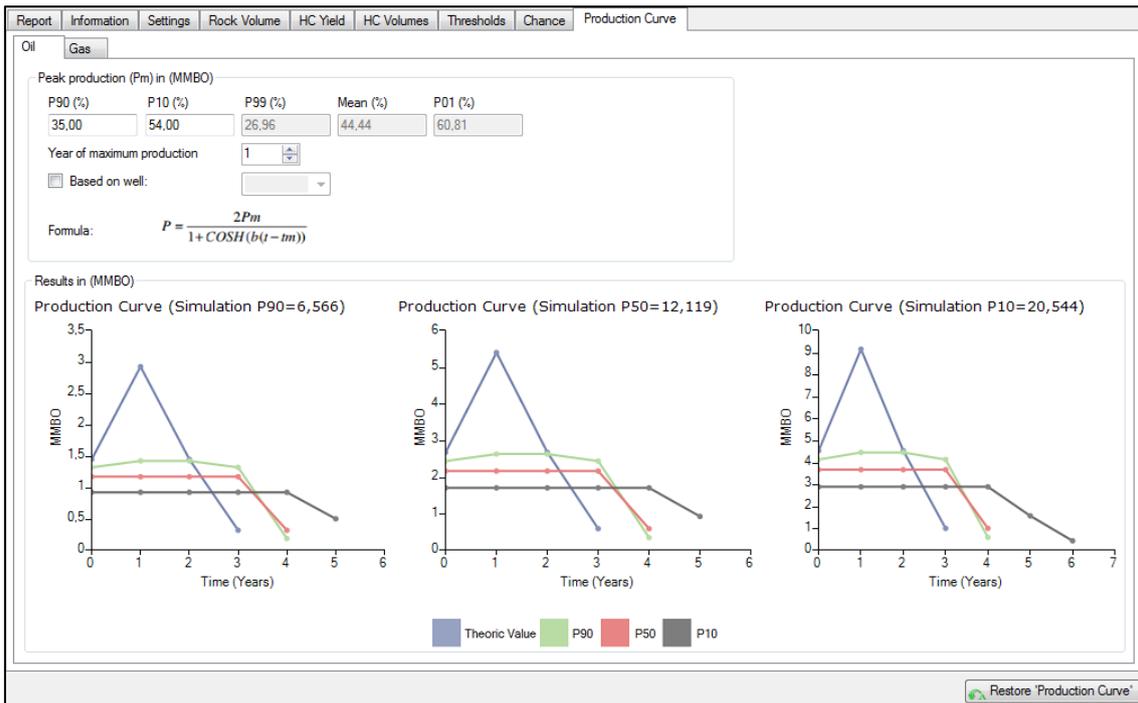


Img.15: Chance of Success Section.

### Production Curve Section:

The "Production Curve" section provides an estimate of the production behavior over time.

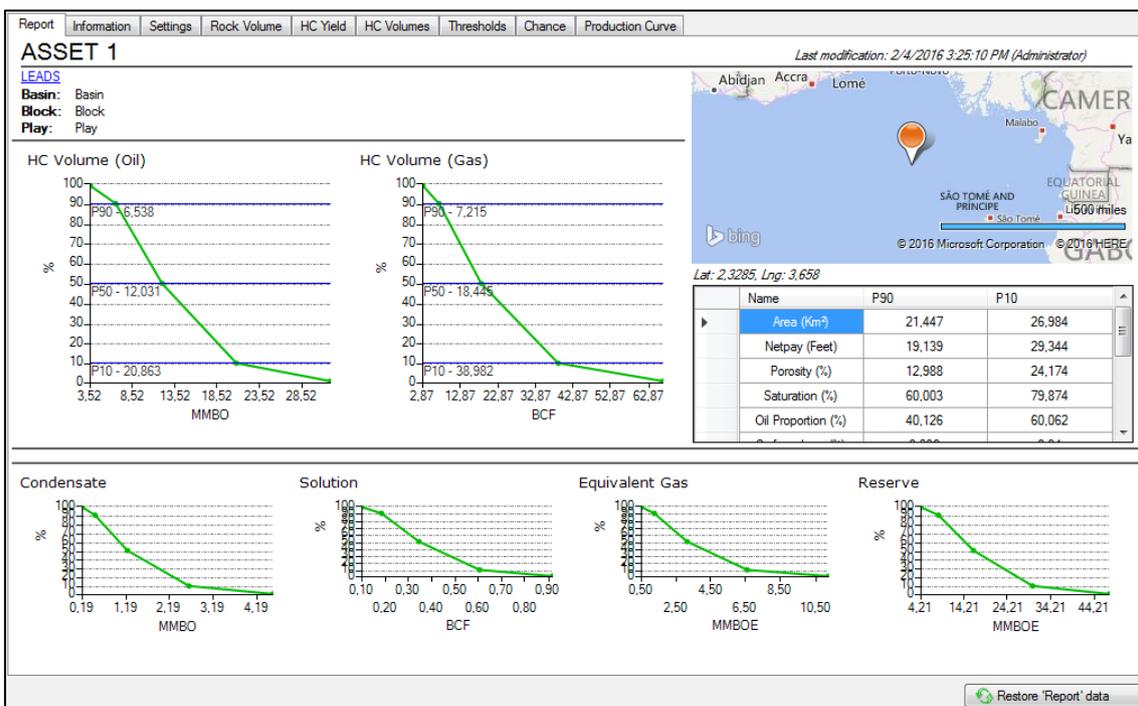
1. Set P90 and P10 value of the percentage of the reserves that represent the peak of production.
2. Introduce the number of years to reach the Peak of production.
3. Once the system has the basic information to calculate the curves the graphics will be exposed or updated in case of modifications (img.16).



Img.16: Production Curve Section.

### Saving the asset and generating a Report:

Don't exist a right moment to save the active asset. It is possible to save an asset that doesn't have all the information needed to run the simulation process. But if the simulation was done and the asset was saved then a group of key information will be showed in the Report Section (img.17).



Img.17: Report Section.