**Geothermal Asset Planning & Technical-Economic Valuation XL tool**

**Examples of model input / output** (v.14/07/2017, for info: email christian.bos@tno.nl)

Below are examples of input into and output from the GEOCAP Geothermal asset evaluation tool, coded in XL. Most I/O variables contain comments in the cells marked with a small red triangle in the top-right corner (e.g. ) to help the user filling in the data or interpreting the output. In the ‘*Intro*’ worksheet, a detailed description is given of the inner workings of the model. This worksheet also contains background and practical information on the tool, including a disclaimer.

**Input (scalar variables)**

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**Input (time-series variables)**

Time-series can be currently specified for a maximum evaluation period of 30 years, starting at the user-specified first year of evaluation. Later, this period will be extended to 50 years.

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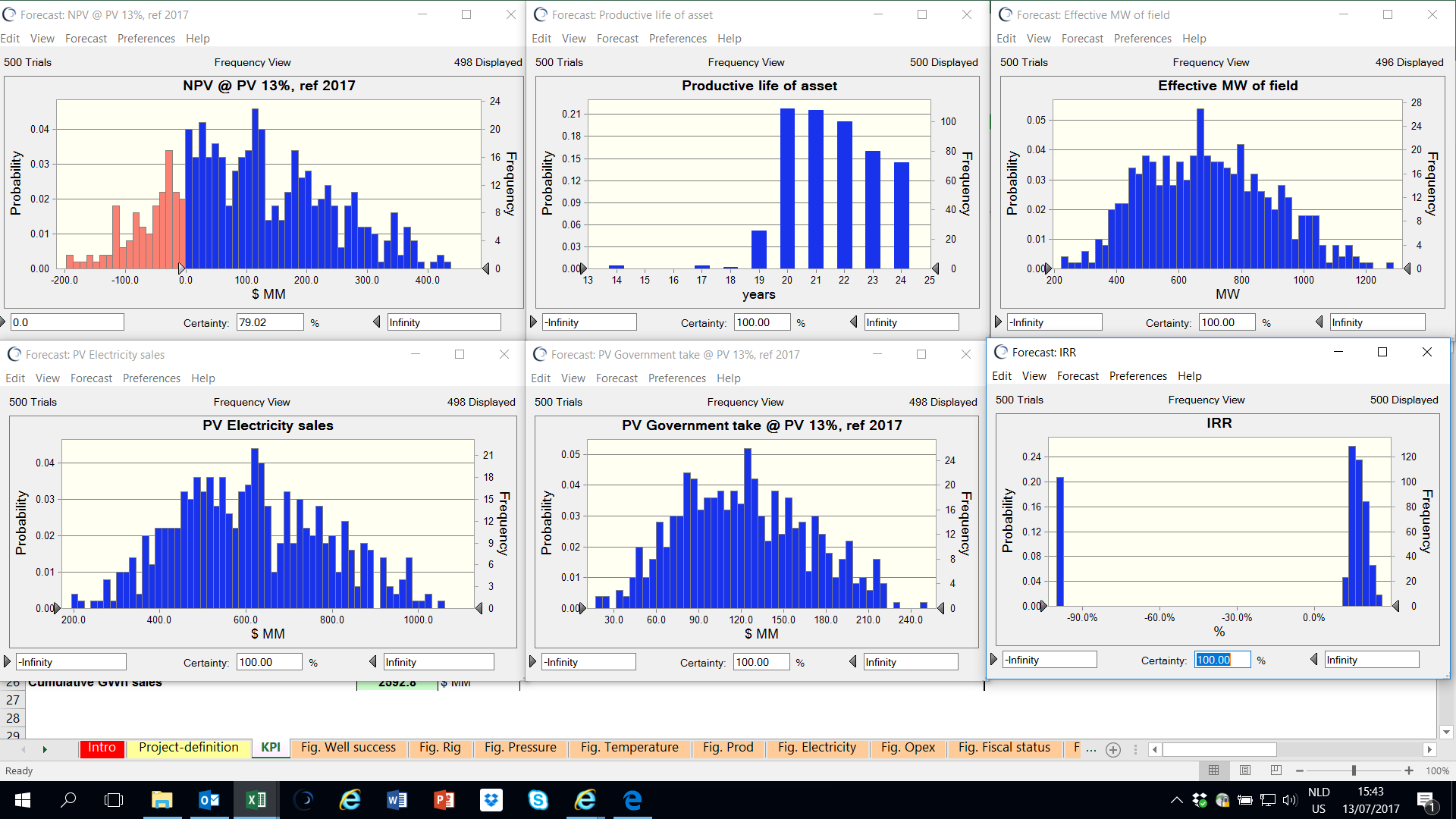
**Output KPIs**

Key Performance Indicators (KPIs) pertain to the full evaluation period / life cycle of the asset under study and are typically used as decision metrics for (investment) decision support. The current version of the tool provides the following KPIs:



**Histograms of output KPIs**

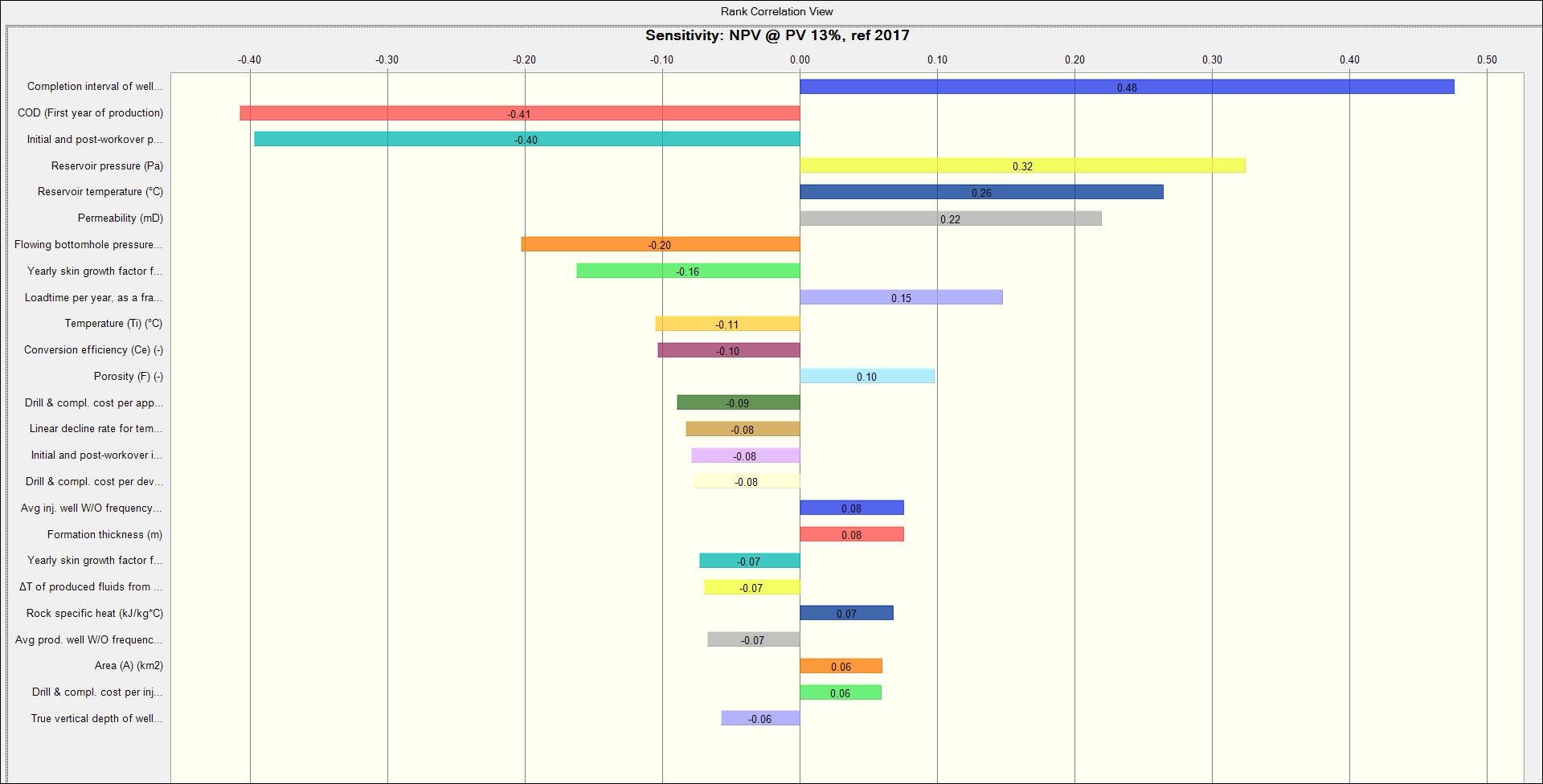
When using a Monte Carlo XL plug-in such as Crystal Ball (™Oracle) or @Risk (™Palisade), all above KPIs can be computed as output histograms. The histograms of the KPIs featuring as blue cells in the above figure are displayed below.



The statistics of all KPI populations can be extracted (i.e. Mean, Median, Standard Deviation, Variance, Skewness, Kurtosis, Range, Coeff. of Variation) and also the percentiles (p10-p50-p90 etc.)

**Multivariate sensitivity analysis**

Using the Crystal Ball sensitivity analysis option, the sensitivity of any probabilistic output-KPI to all stochastically defined input variables can be displayed, for example as *Rank correlation* chart, or as *Contribution to variance* chart:



**Output graphs (technical)**

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**Output graphs (economic time-series)**

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**Probabilistic time-series**

All time-domain output can also be displayed as probabilistic time-series, for example the mean-p90-p50-p10 production forecasts, or ditto cashflows.

**Crystal Ball reporting**

Using the Crystal Ball reporting functionality, various output reports can be made, including all input *Assumptions* (i.e. stochastic distributions of the uncertain input variables, including stochastic correlations), *Decision variables* (controllable variables and assumptions), *Forecasts* (i.e. KPI output histograms, or probabilistic time-series), *Data* etc.

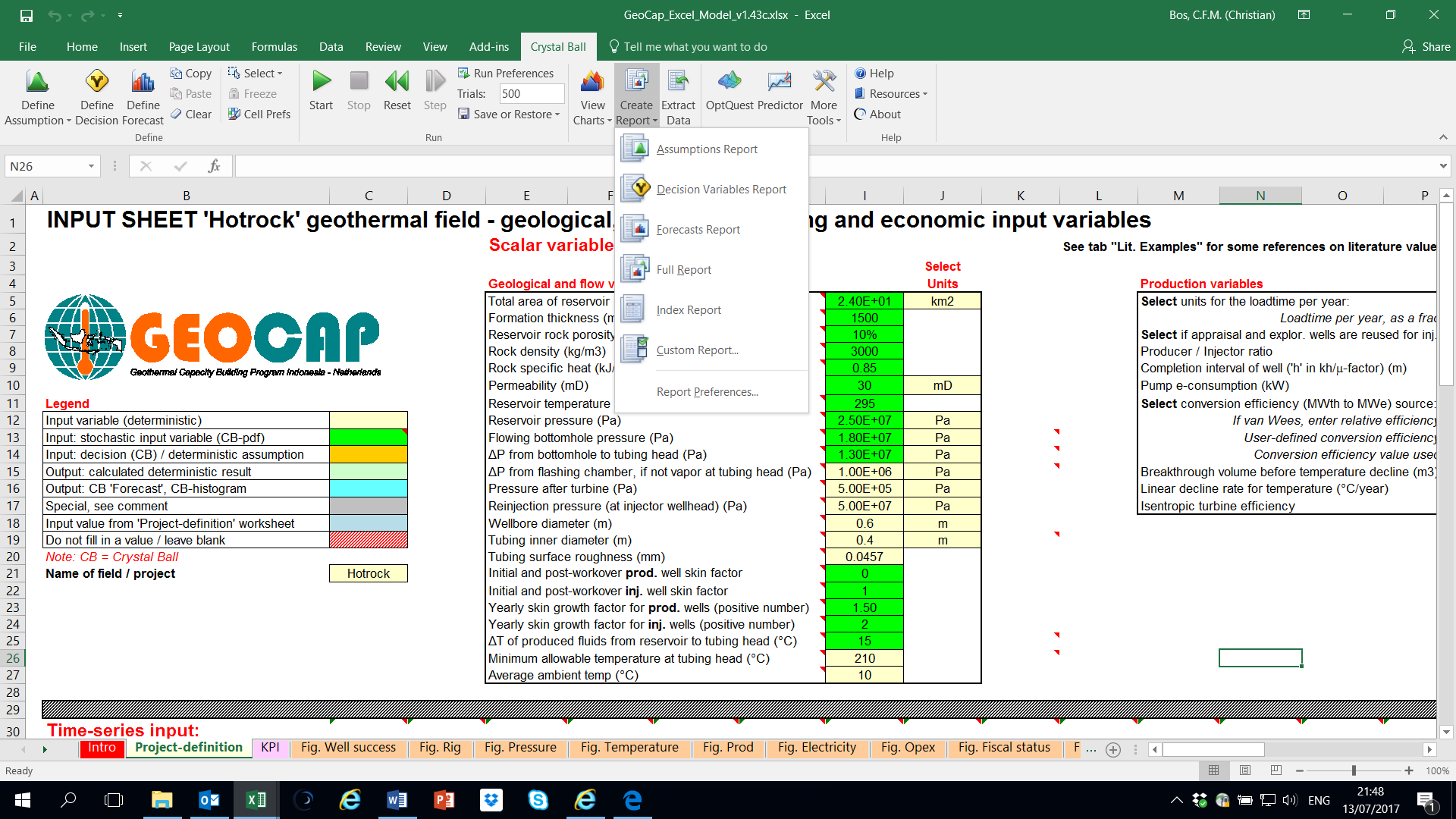


Figure - Crystal Ball reporting functionality