

# Use Cases of @RISK in Multiple Industries



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*Host*  
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# Presenter

Jose Orellana is a Solutions Engineer for Lumivero.

Jose has aided clients as a consultant for the past 10 years.

He has an engineering background and many years of modeling experience.



Jose Orellana  
Solutions Engineer  
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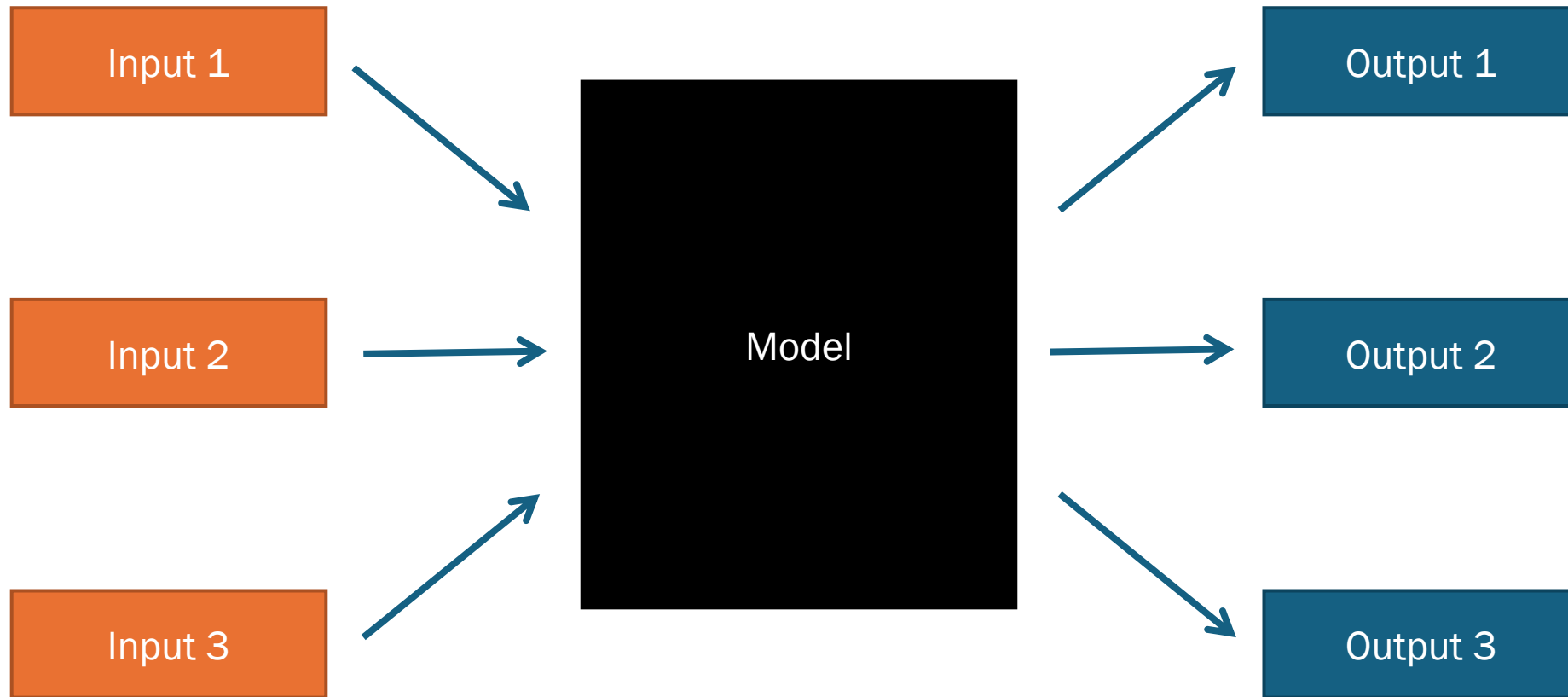
# Agenda

- Lumivero
- Monte Carlo simulation overview
- @RISK overview
- Examples
  - Project costing and risk register
  - Projectile motion
  - Porosity and water saturation – fitting outputs
  - Six sigma – electrical circuit analysis
  - Process pipeline – Goal Seek
  - Hydroelectric power generation
- Reference material

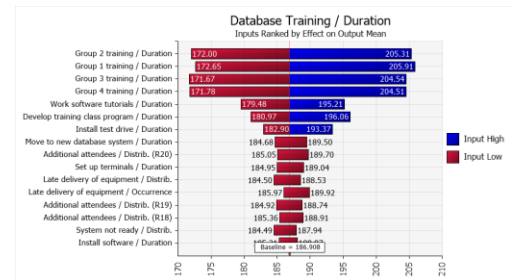
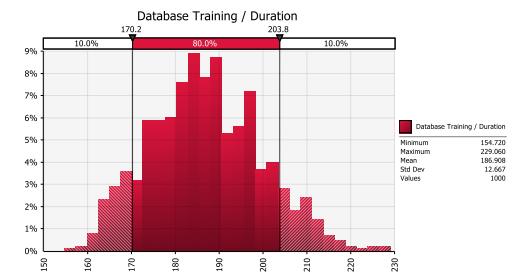
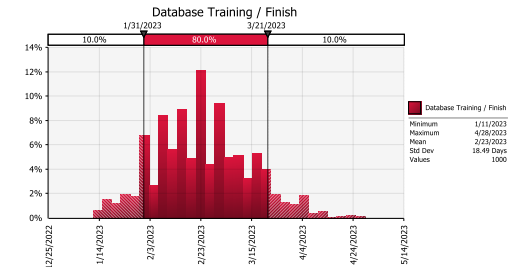
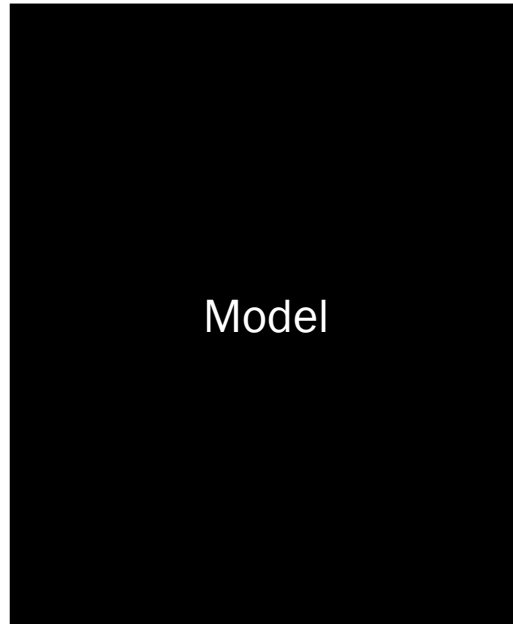
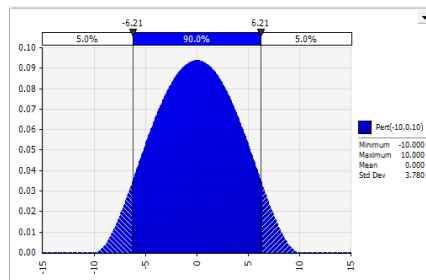
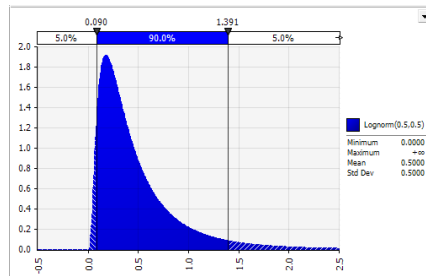
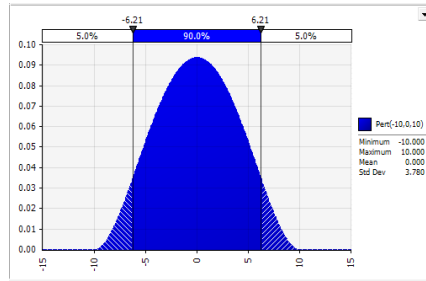
# Monte Carlo Simulation

a way to use random samples of parameters to evaluate the behavior of a complex system.

# Typical Excel Model



# Using @RISK with existing Excel model



# @RISK Features

- Monte Carlo simulation add-in for Excel
- Extensive modeling capabilities
- Broad library of probability distributions
- Data fitting tools (distributions and time series)
- Correlation modeling
- Sensitivity analysis
- Customizable and exportable graphs and reports
- Probabilistic Goal Seek, stress testing and optimization tools

# Examples

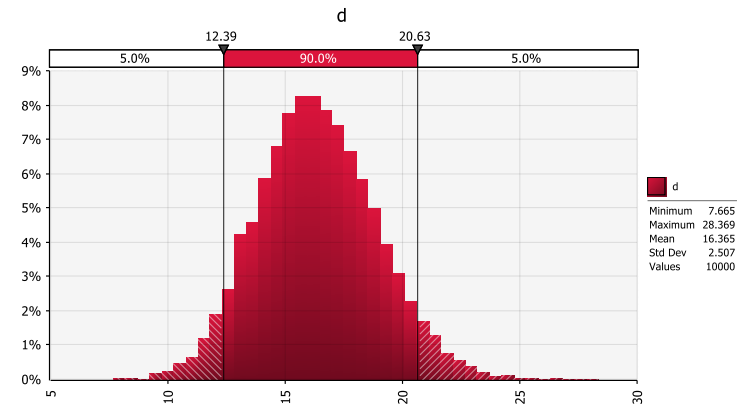
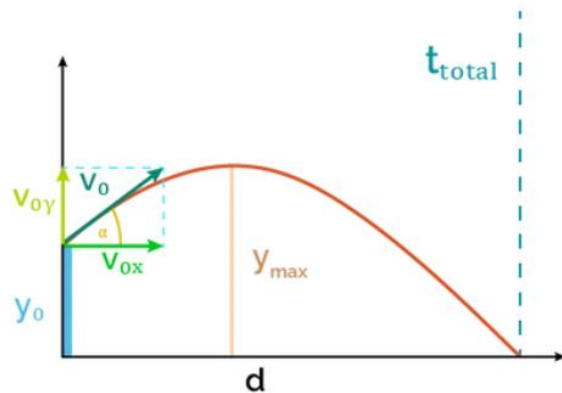


# Project Costing (CAPEX) and Risk Register effect

- Measure CAPEX variability caused by uncertainty in assumptions
- Measure CAPEX variability due to risk events
- Understand major risk drivers of the CAPEX distribution
- Determine proper contingency allocation for the project

# Projectile Motion

- @RISK can be used to find answers to equations where a closed form solution is complex.
- Calculate thousands of possible outcomes. We can use the results to estimate a distribution that reflects the output of the equation.
- What is the range of traveled distance ( $d$ )?

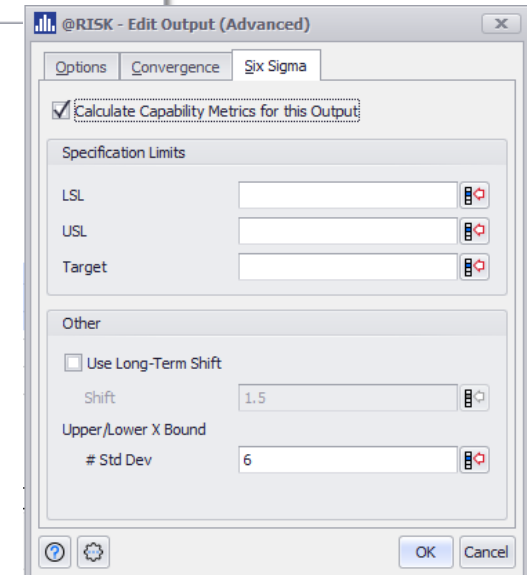
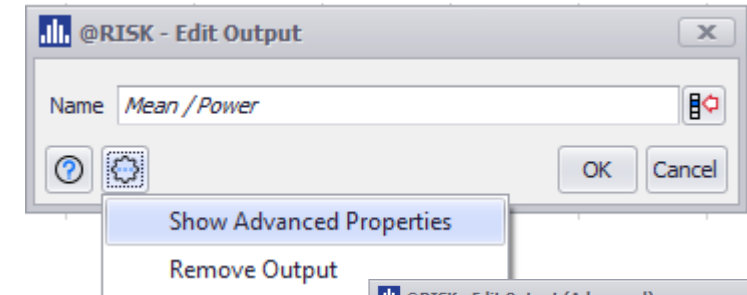
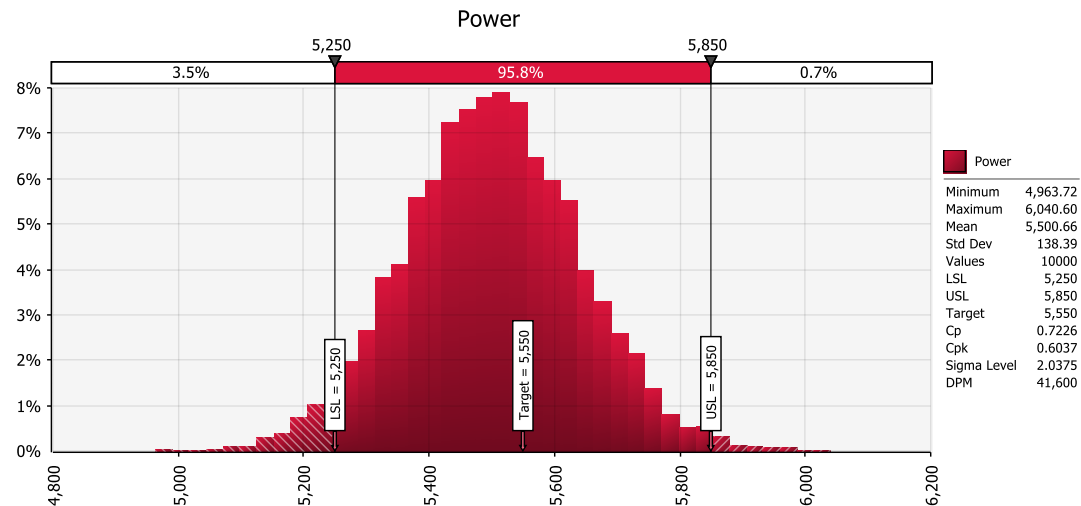


# Correlation between Porosity and Water Saturation

- Two important concepts in oil/gas exploration. We can estimate the distribution of values from measurable uncertainty using Archie's equation.
- These estimated distributions can then be used in volumetric analysis. Volumetric analysis would use the term:  $\phi * (1 - S_w)$
- However, beware of correlations between these terms and include them in further use of these distributions.

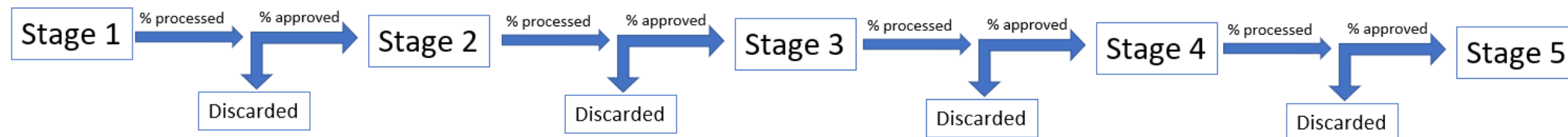
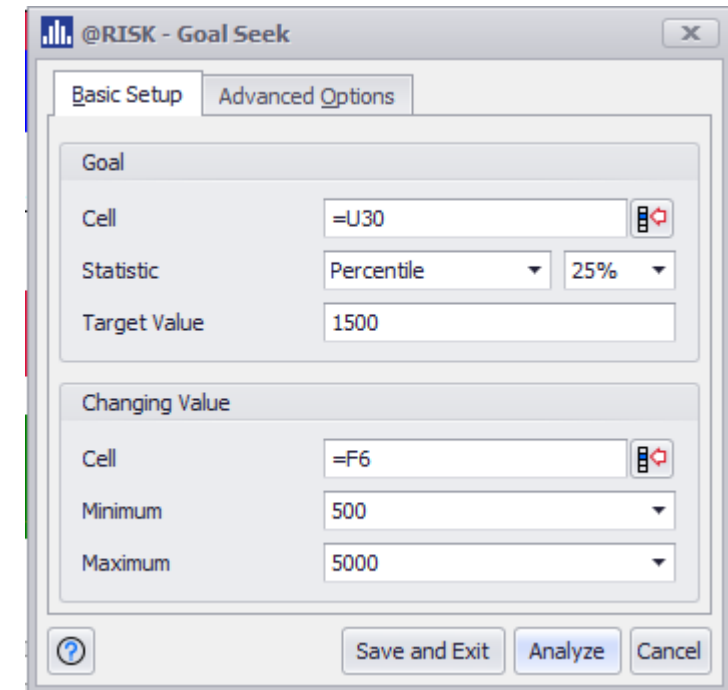
# Six Sigma – Electrical circuit analysis

- We can use @RISK to determine Six Sigma statistics such as Process Capability, Defects per Million, Percentage Non-conforming.
- Using the RiskOutput > Show Advanced Properties, we can define the specification limits.



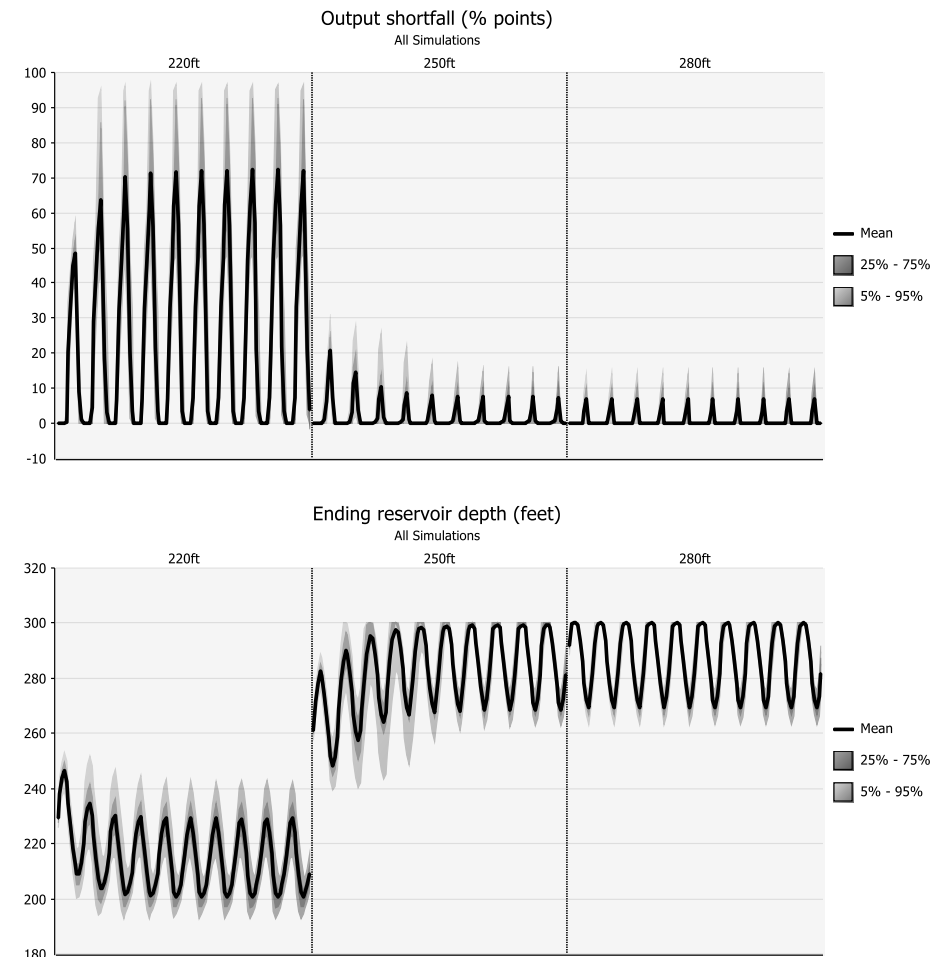
# Process pipeline modeling – Goal Seek

- This model tracks units through a 5-stage process.
- Model calculates distribution of units at each stage.
- We need to generate distribution for each time period.
- @RISK is used to calculate the likelihood of achieving a target.
- Additionally, @RISK's Goal Seek functionality can help determine the initial conditions needed to achieve the target with a given probability.



# Hydroelectric Power Generation

- Simulation of power generation for a 120-month horizon.
- 3 sources of uncertainty: monthly demand for power, rainfall and evaporation.
- Uses RiskSimTable functionality to simulate multiple starting conditions.
- Parameters to @RISK distributions can come from other @RISK distributions, notice how the most likely value for demand and rainfall is the previous month's actual value.



# Review

- Monte Carlo simulation and @RISK
- @RISK Features
- Examples:
  - Project costing and risk register
  - Projectile motion
  - Porosity and water saturation – fitting outputs
  - Six sigma – electrical circuit analysis
  - Process pipeline – Goal Seek
  - Hydroelectric power generation

# Questions?





# Free Learning Resources



**@RISK**



**DecisionTools  
Suite**

[Help Resources](#)

[Knowledge Base](#)

[Lumivero Community](#)

[Other @RISK Resources](#)

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## Funding Opportunities

- [Early Career Researcher Grant - 2024](#)

# The Data Landscape



The most complete collection of research, data and decision-making tools available anywhere

