Welcome!

Webinar #5. TIME and Annual model

July 12, 2017

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Presenter: Evgeny Zakharenkov

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Agenda

- Introduction
- Snapshot
- Annual model
- What is TIME, when to use TIME
- TIME, power plant sample
- Q & A session

Introduction

Heat balance & equipment design

Cost & labour estimation

Cashflow & investment analysis

Thermoflow software

Introduction

Thermoflow Features for Cashflow & Investment Analysis

- Snapshot (GT PRO/MASTER, STEAM PRO/MASTER, THERMOFLEX)
- Annual model (GT PRO/MASTER, STEAM PRO/MASTER)
- TIME - **T**ime **I**ntegrated **M**odeling **E**conomics (GT MASTER)

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Snapshot

Snapshot - multiplying plant performance at the average ambient conditions by the number of operating hours per year

Plant performance at average conditions **X** Operating hours per year (full load equivalent) → NPV, ROI…

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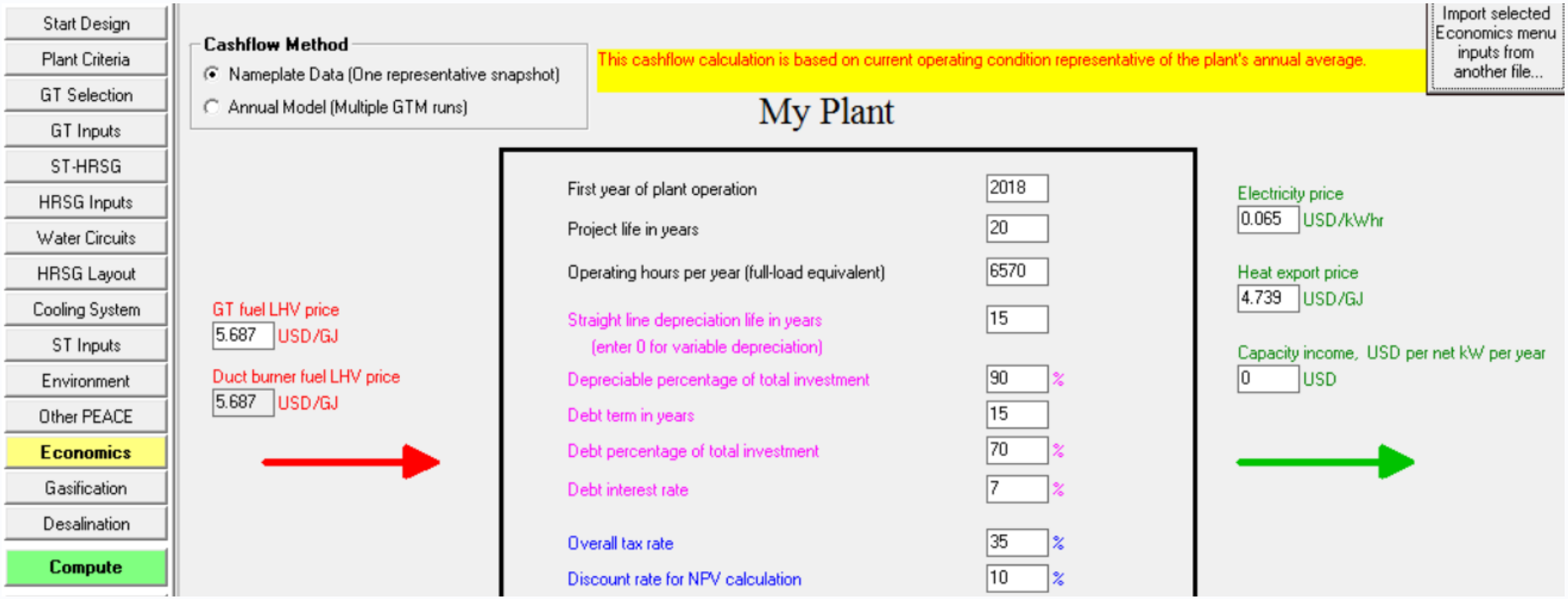
Snapshot

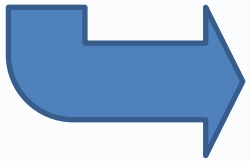


- quick analysis
- plant operated mainly at base load
- low range of ambient conditions

Snapshot

But, it does not work when:

- The plant is started and stopped every day or several times per week
- Duct firing is used to generate more power when the power price is high
- The plant supplies steam to variable demand customer
- …



Annual model or TIME

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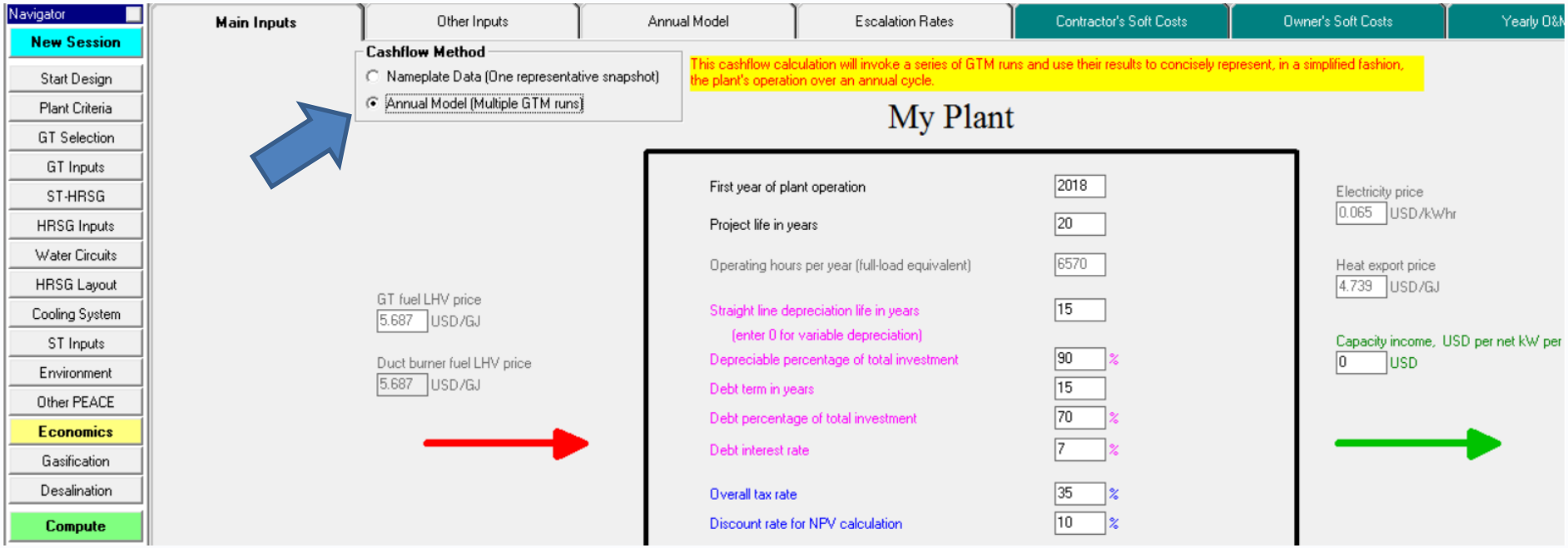
Annual model

Annual model is simple, quick and easy method for users who have no time to perform an exhaustive analysis, but who still wish to have a more accurate model, than may be possible with a single point average input (snapshot)



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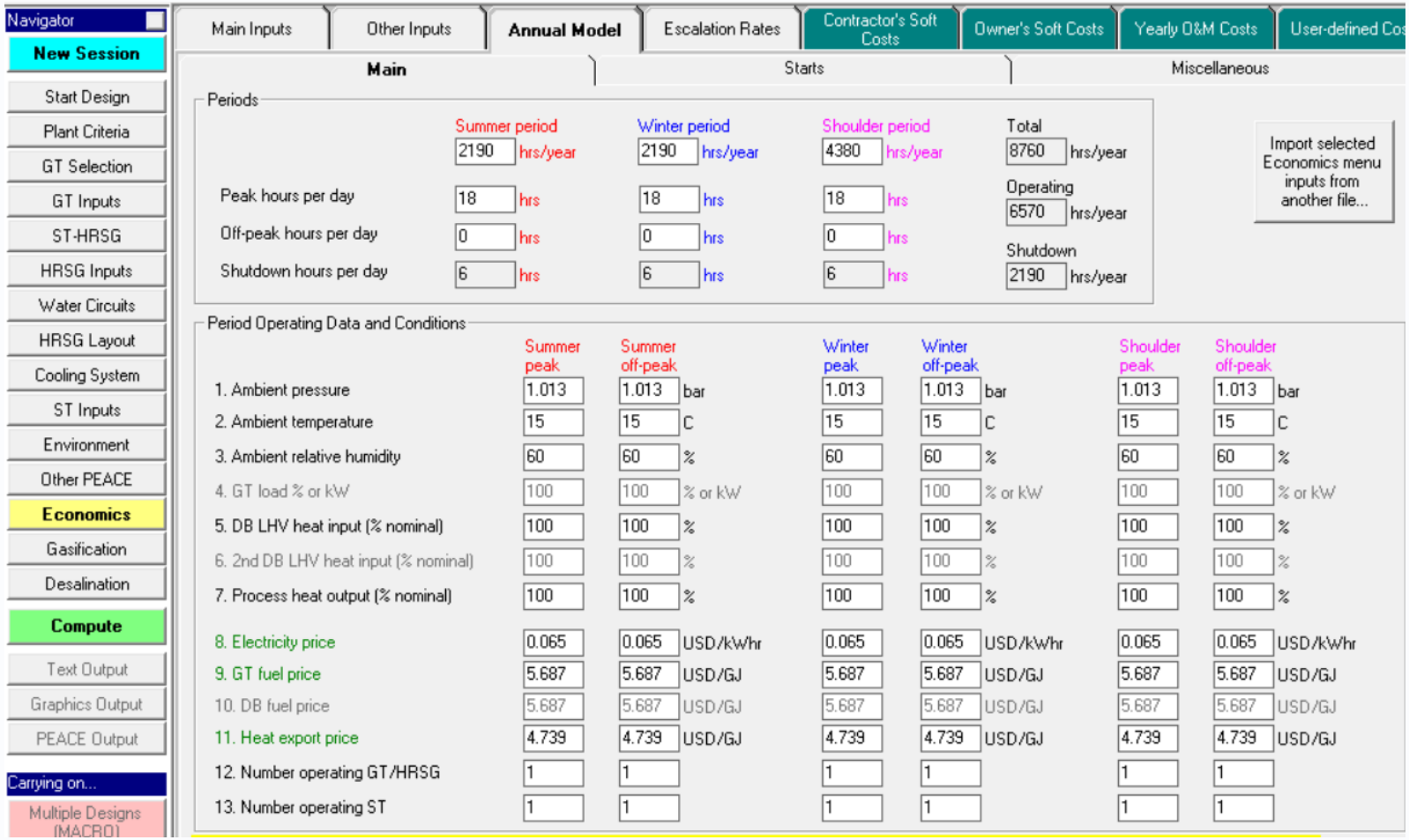
Annual model



TIME

- Tool for GT MASTER (added in version TF24), **T**ime **I**ntegrated **M**odeling **E**conomics (**TIME**)

- It is used when you want to compute plant economics and performance by combining results from a single model at different operating conditions, each applied for a specified period of time.

- TIME helps to compute project's NPV when running with ambient conditions and loads that vary naturally throughout the year.

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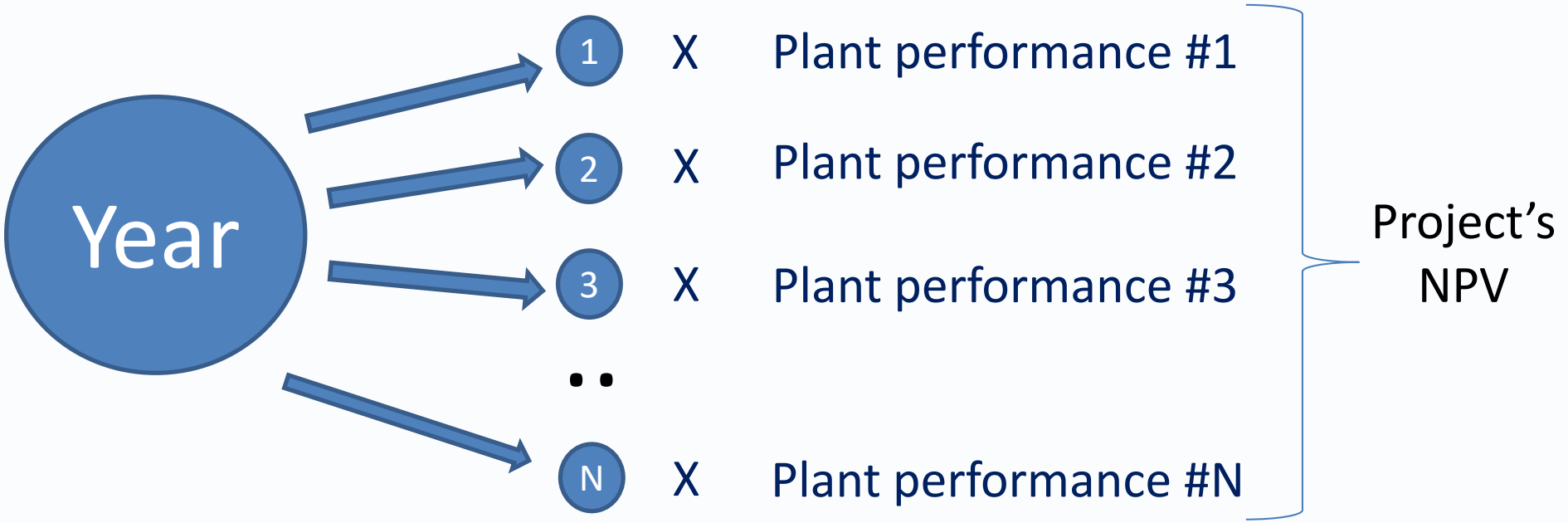
TIME

How does it work?



Time bins, representing some number of hours, certain operating and financial conditions

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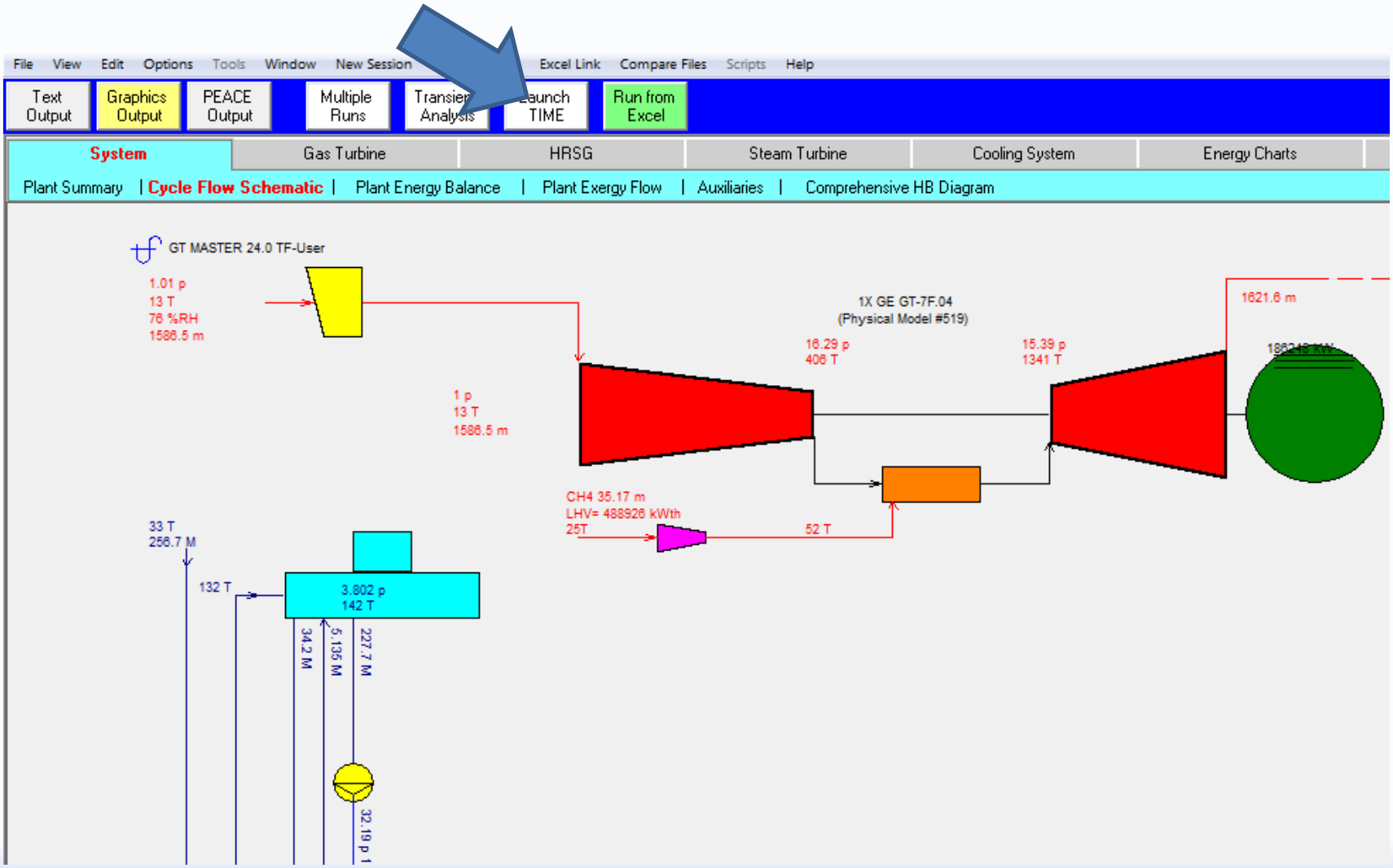
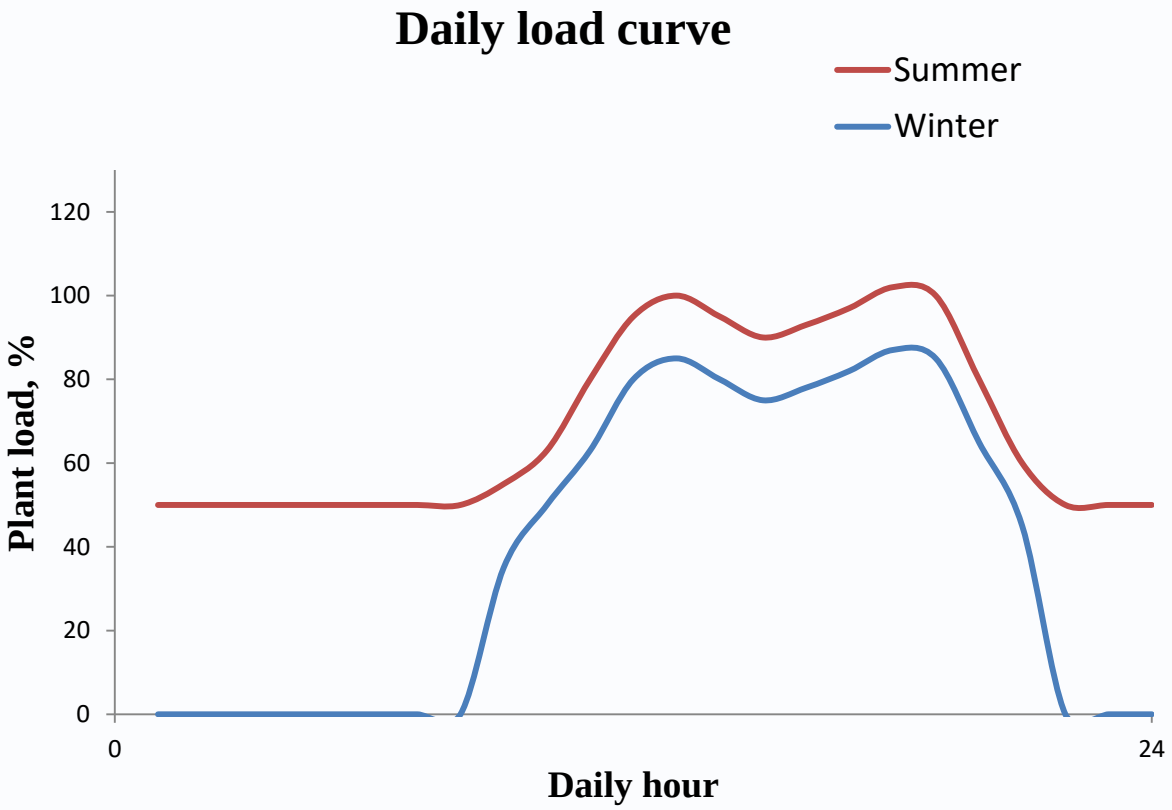
How to launch



This plant is located in Montana, Miles City, TMY (Typical Meteorological Year) ID 742300. It is CCGT based on gas turbine GE GT-7F.04. The power station is operated on the following scenario:



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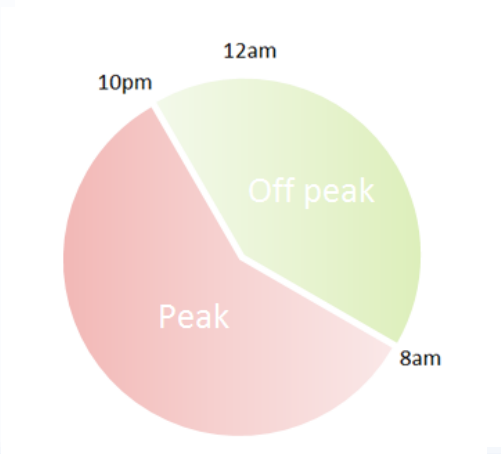
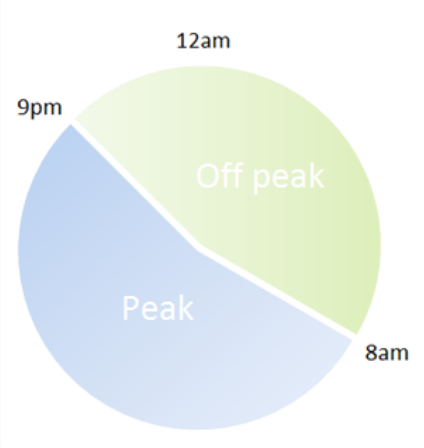
Electricity price, USD/kWh		
Summer	Peak	0.927
	Off Peak	0.043
Winter	Peak	0.061
	Off Peak	0.039

Summer (May-Oct)



Winter (Nov-Apr)



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TIME sample (GT PRO design)

Make the following Inputs:

New Session: Above 200 MW, GT, HRSG and condensing reheat ST

Plant Criteria: 0.921, 8.88 C (year average TMY), RH 56.3 % (year average TMY), 60 Hz, Water cooling with mechanical cooling tower

Plant Criteria-Regional costs: Montana

GT Selection: GE GT-7F.04 (ID 612)

ST-HRSG: Steam superheat/reheat – 579/579 C

Environment: NOx produced 9 ppm, include SCR – 80% effectiveness

Economics: Fuel price - 4.15 USD/GJ, Overall tax rate – 39.39% (Federal – 35%, 6,75% - Montana), Variable O&M costs - 0.0032 USD/kWh.

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Q & A session

Please send your questions to the **presenter** in the webinar chat!

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Thank you!