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Energy Simulation Solutions Ltd.

Building Design Optimisation

- A Few Key Concepts

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Today's Topics

1. Why do we need parametric analysis and optimisation
2. What is optimisation and its key components
3. Applications of optimisation

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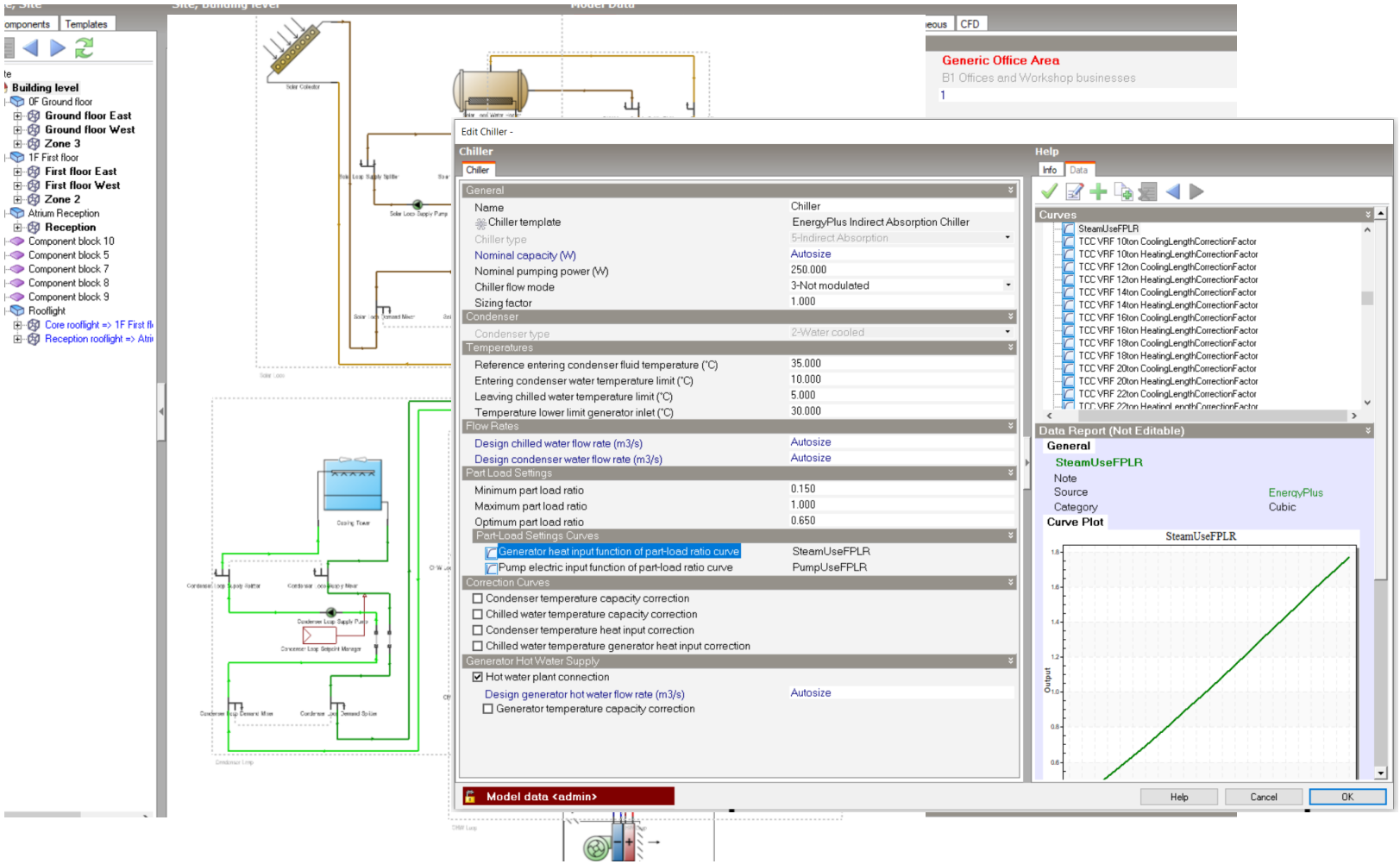
The challenges of energy modelling



Let’s first look at how to find the best building design

Please go to:

https://app.ensims.com

The key ingredients of optimisation

1. Optimisation variables – the search space
2. Optimisation criteria – **objectives** and **constraints**
3. An effective and **efficient** search strategy
4. Means to evaluate **many** solutions

In the context of building design & operation

Optimisation variables

- Dimensions, orientations, constructions, values, parameters, coefficients, …
- Operational schemes, schedules and setpoints, custom control strategies …
- Alternative designs, system configurations, equipment selection…
- And possibly a lot more

In the context of building design/operation

Optimisation criteria

- *Objectives* are for chasing the **best** options

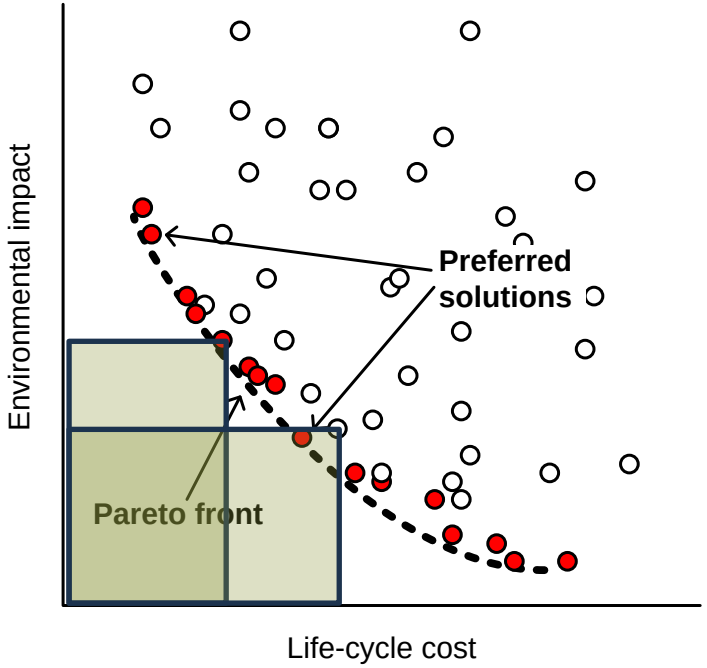
  Performance and cost metrics such as:

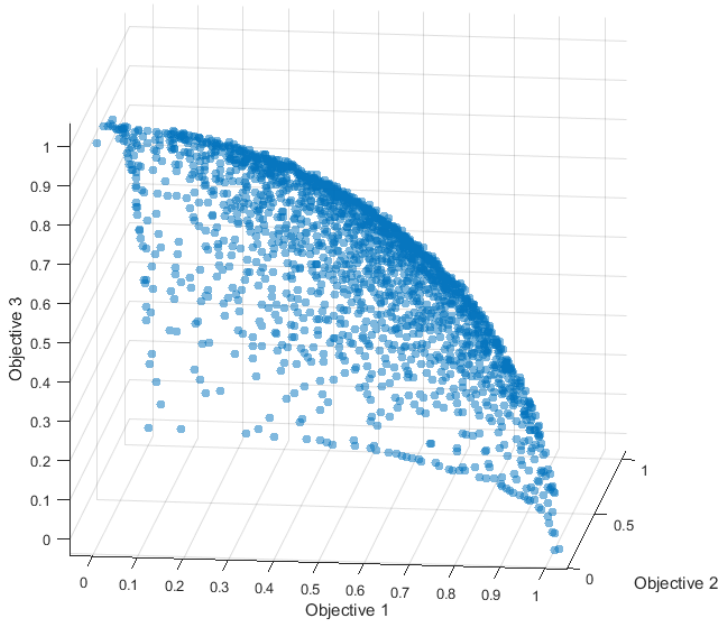
  - Energy
  - Carbon
  - Cost
  - Comfort
  - …

- *Constraints* are for seeking the **acceptable** options
  - Energy
  - Carbon
  - Cost
  - Comfort
  - …
  - Availability, preference, and physics

Multi-objective optimisation

- Should I choose a single or multi-objective approach?
- How to handle ‘many’ (more than 2) objectives?





Genetic and Evolutionary Algorithms

Belyaev's Farm Fox Experiment