
DTU

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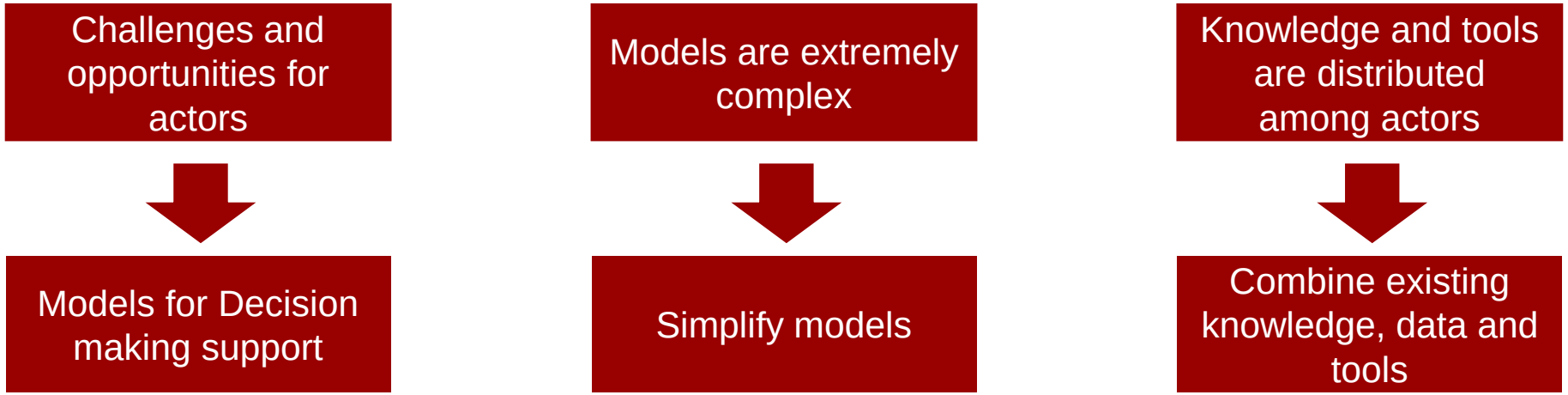
Machine Learning based surrogate models for large-scale sector-coupled energy systems

Background and Motivation

- Sector coupling is expected to help increase the integration of variable renewable energy sources and the energy systems overall efficiency
- Sector coupling increases exchange capacities, storage capacities, electricity demand, hydrogen technologies and demand flexibility



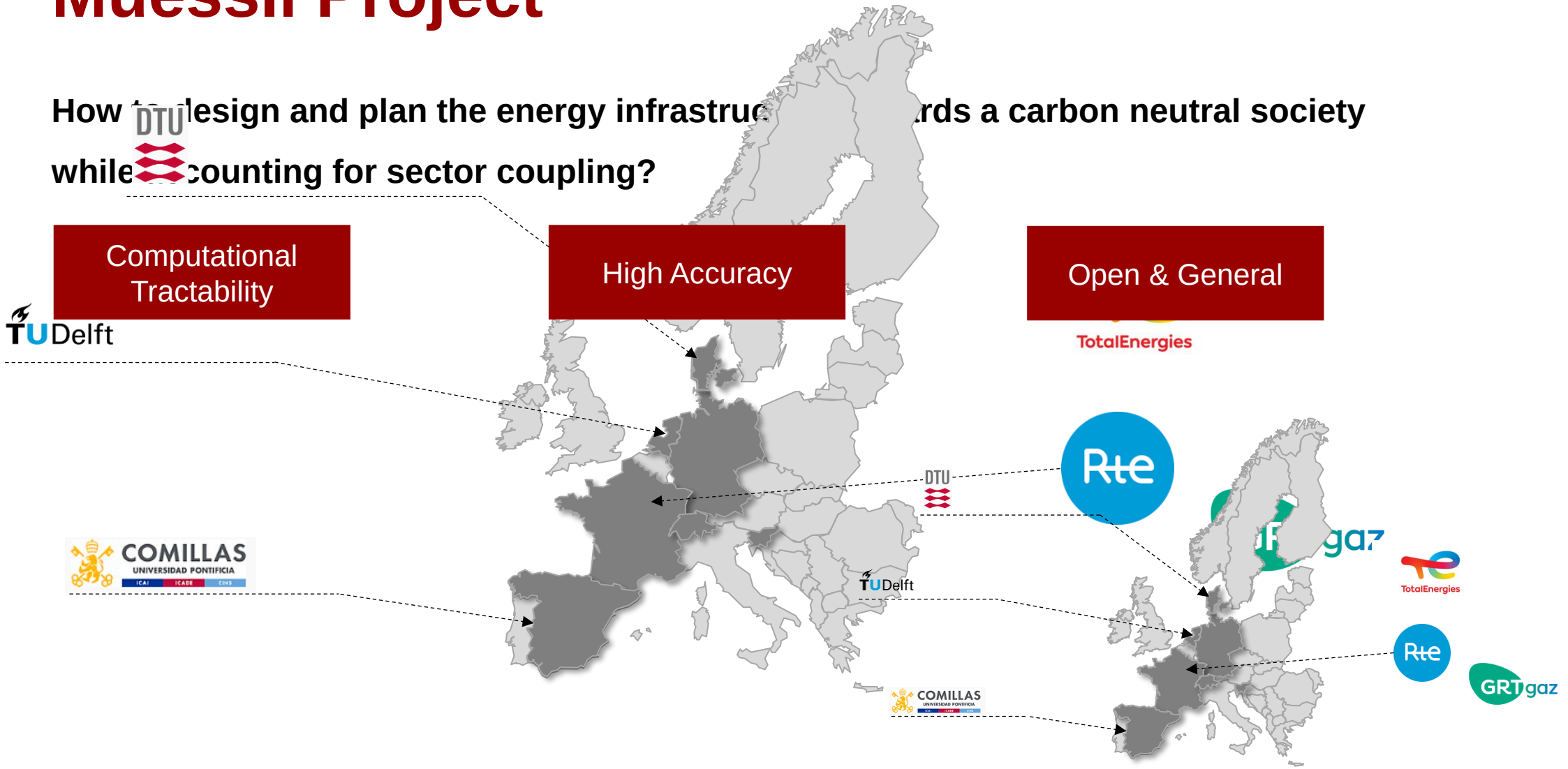
Muessli Project

How to design and plan the energy infrastructure towards a carbon neutral society while accounting for sector coupling?

Computational Tractability

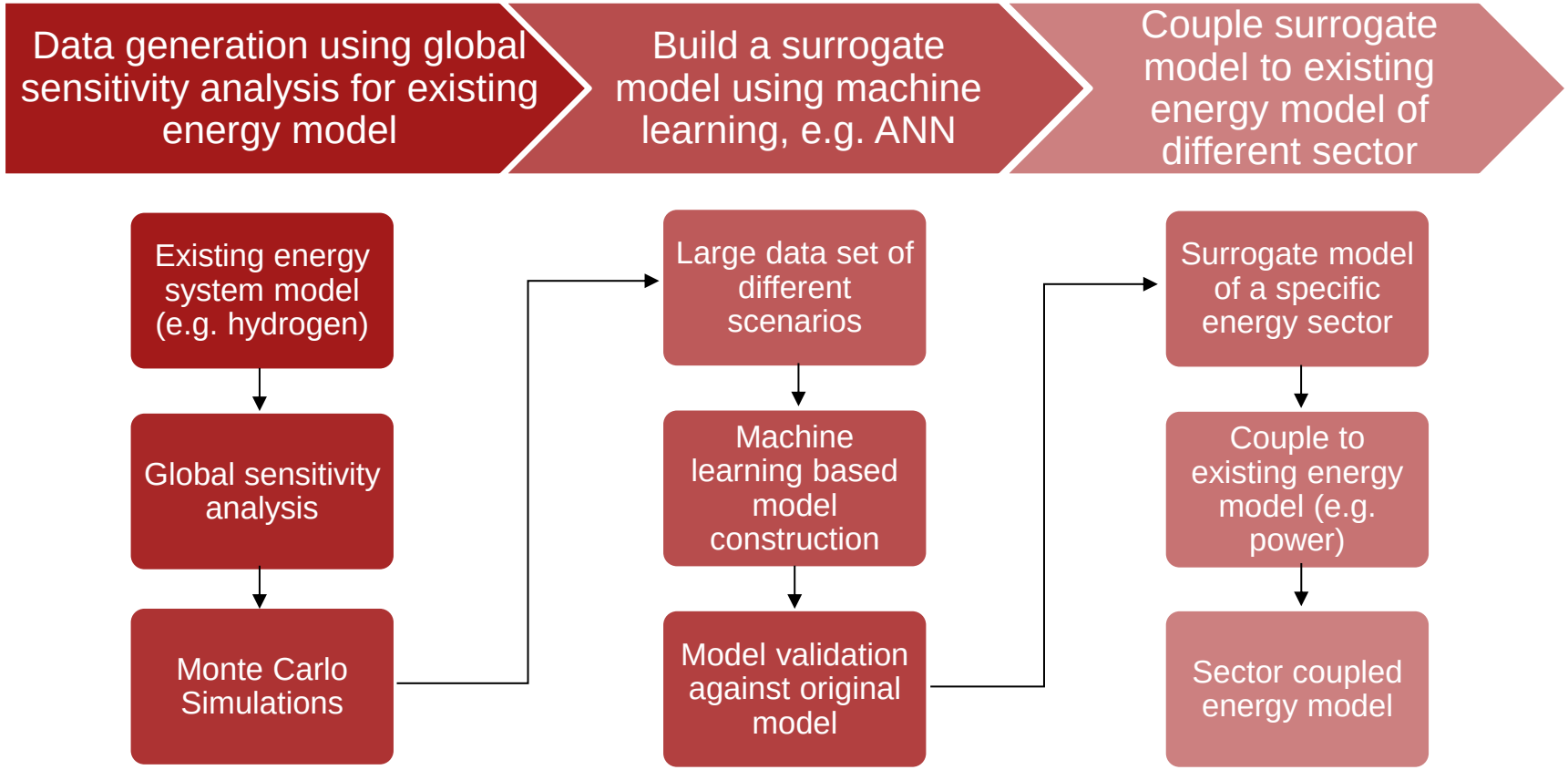
High Accuracy

Open & General



Machine Learning based surrogate models

Build surrogate models from existing energy models to capture functionality while reducing computation times



Outlook/Ideas

- **Bayesian Learning:**
  - Get uncertainty estimates for surrogate model outputs to perform hybrid linking
- **Constraint Learning:**
  - Include energy model constraints in learning process (e.g. Lagrangian Dual methods)
  - Speed up training process
  - Ensure outputs fulfill constraints
- **Graph Neural Networks:**
  - Capture network structure of energy systems