

*Modelling, **Simulation** & Optimization*
of
Solar Thermal Power Plant

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Types of Models

⇒ Simple input/output models:

- Models are based on the fundamental conservation equations along with phenomenological laws and simple representative equipment characteristics
- Simulation: Solution of algebraic equations
- System feasibility and comparison of different options

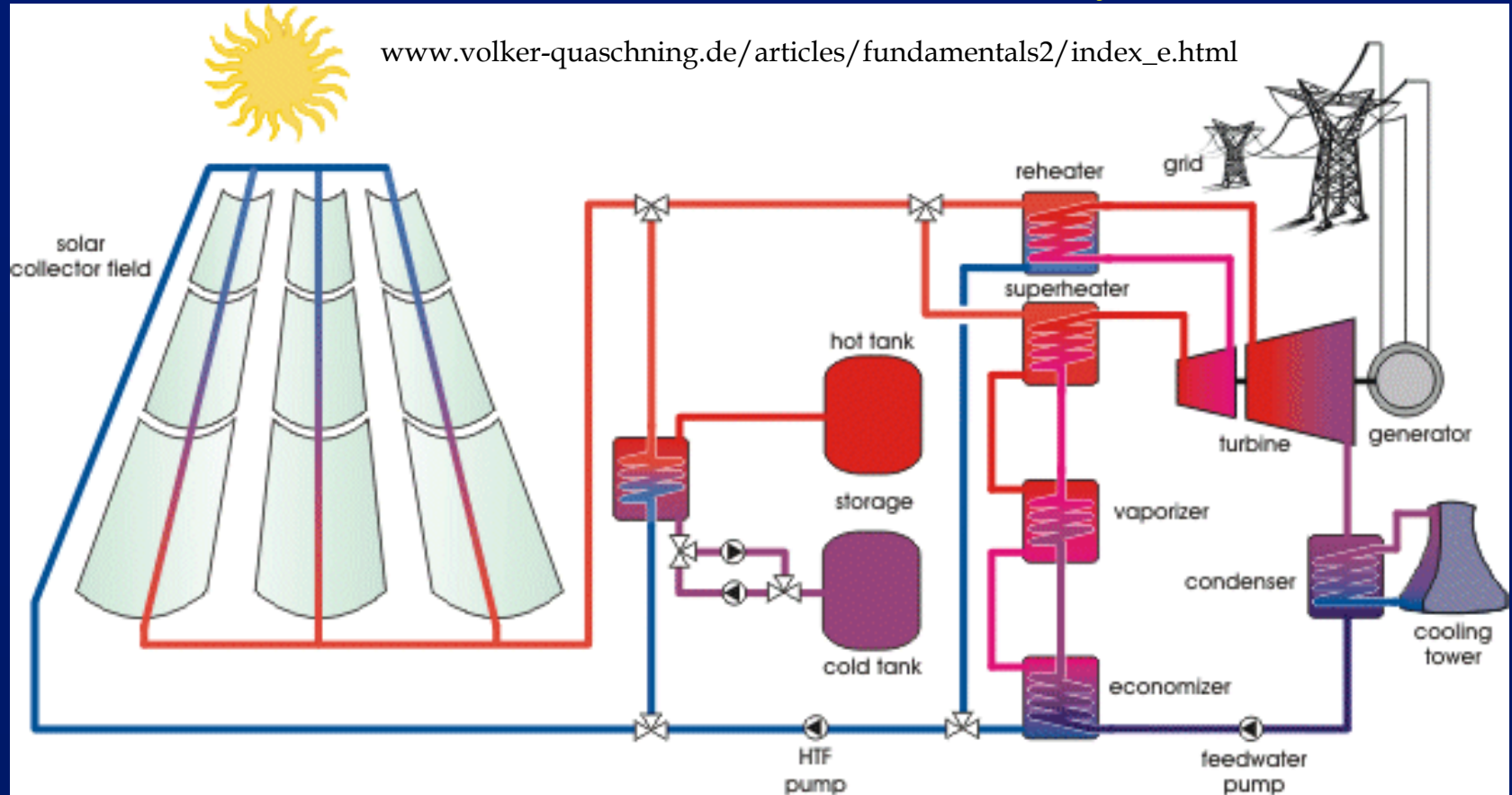
⇒ Detailed models:

- Incorporates detailed equipment characteristics
- Simulation: Solution of differential-algebraic equations
- System Integration and optimization

⇒ Dynamic models:

- Time variations of components
- Optimal control and operations

Solar Thermal Power Plant: Sub-systems



Solar collectors

Heat transmission

Power generation

Solar Collectors: Issues

- ⇒ Types of collector
- ⇒ Different models
- ⇒ Tracking system
- ⇒ Working fluid
- ⇒ Thermal stress
- ⇒ Wind and other load
- ⇒ Variation and uncertainty of solar radiation

Heat Transmission & Power Generation: Issues

- ⇒ Types of heat exchangers
- ⇒ Storage
- ⇒ Thermal stress
- ⇒ Stability, suitability, environmental impact of working fluids
- ⇒ Integration of conventional thermal system (may be at the start-up and shut-down)
- ⇒ Synchronization and optimal despatch
- ⇒ Turbine-alternator system

Overall System & Capability

- ⇒ Component selection and design
- ⇒ System integration
- ⇒ Optimal operation, maintenance, scheduling and control
- ⇒ Operator training
- ⇒ Numerical experiments
- ⇒ Scale-up study

- ⇒ **Capability exists with IIT-Bombay**
 - Especially for inputs at the developmental, basic, and detailed design stages.