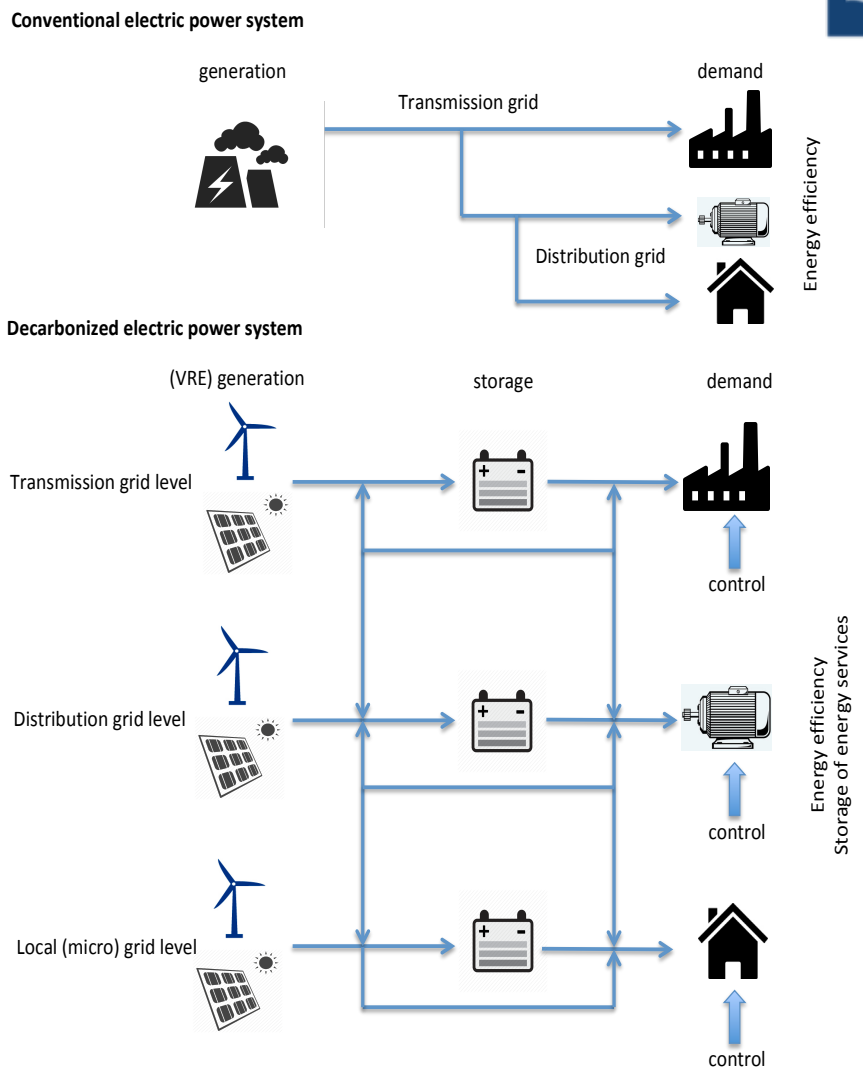


Netherlands Enterprise Agency

Energy efficiency and renewable energy in a decarbonized electric power system - asking the right questions

Eceee Summer Study 2019

Panel 2: What's next in energy policy?

5 June 2019

Hans-Paul Siderius

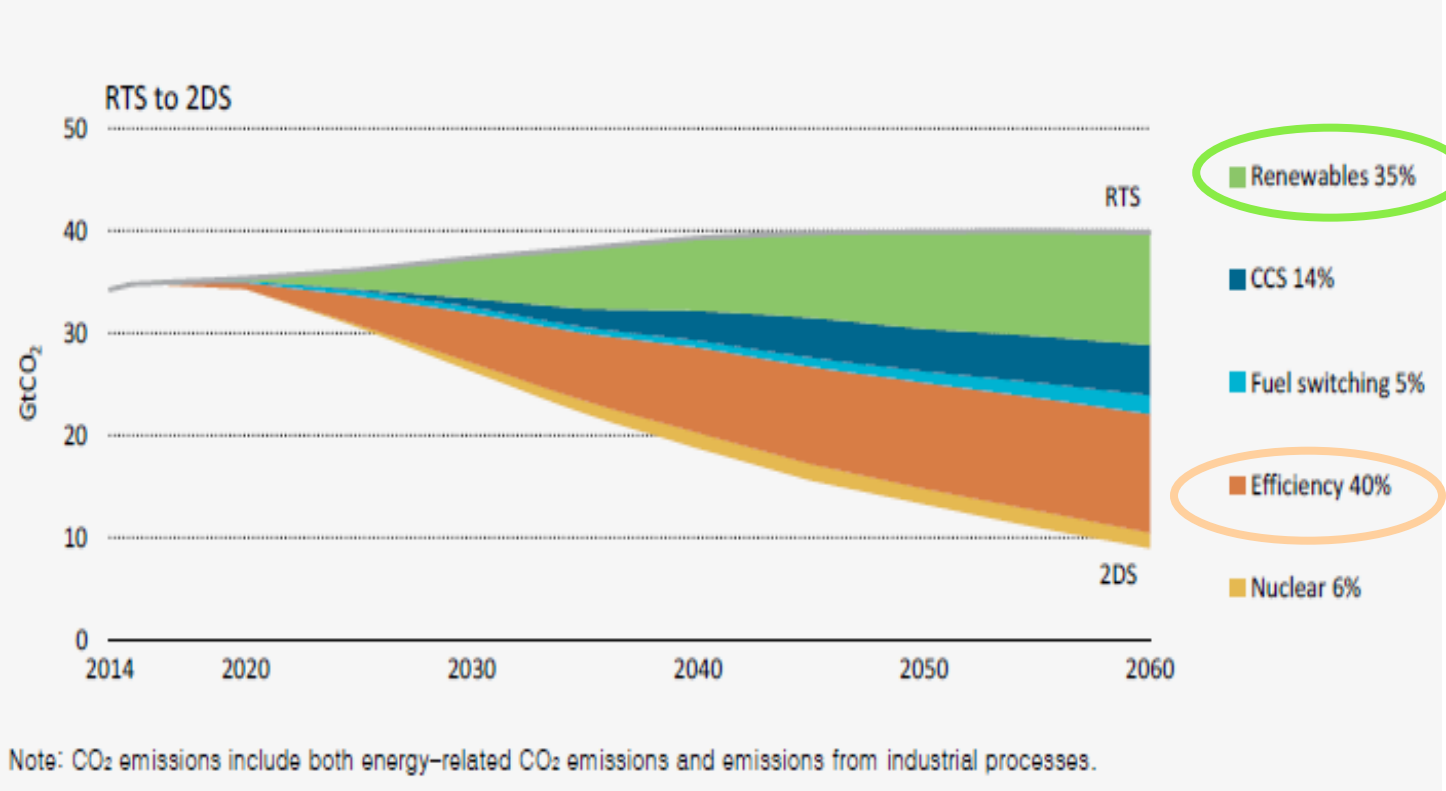
Netherlands Enterprise Agency

Controversy?

Energy Efficiency is the First Fuel

Renewables is All You Need

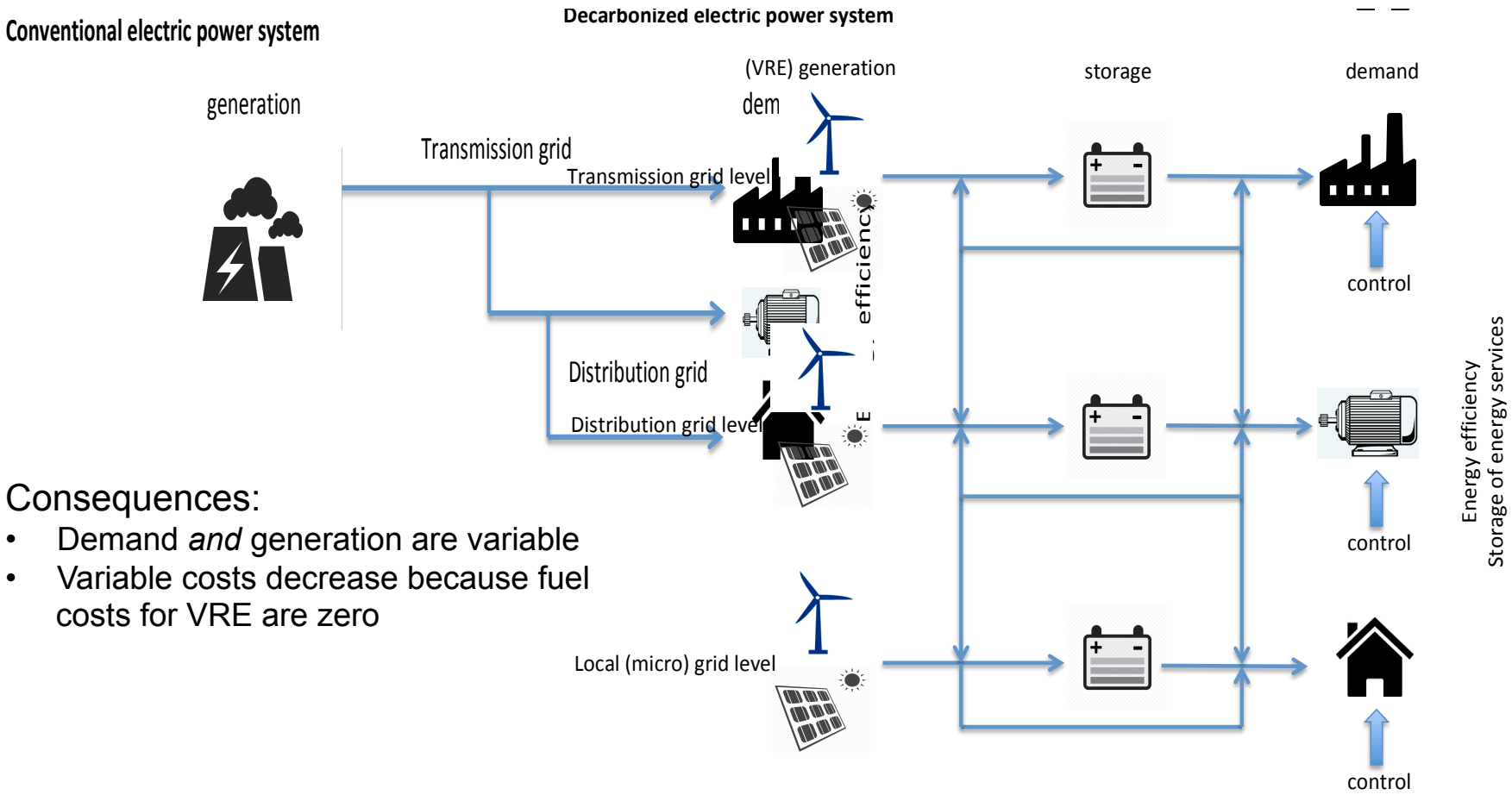
Answer from the IEA



Note: CO_2 emissions include both energy-related CO_2 emissions and emissions from industrial processes.

Source: Energy Technology Perspectives 2017, IEA, Paris, p. 31

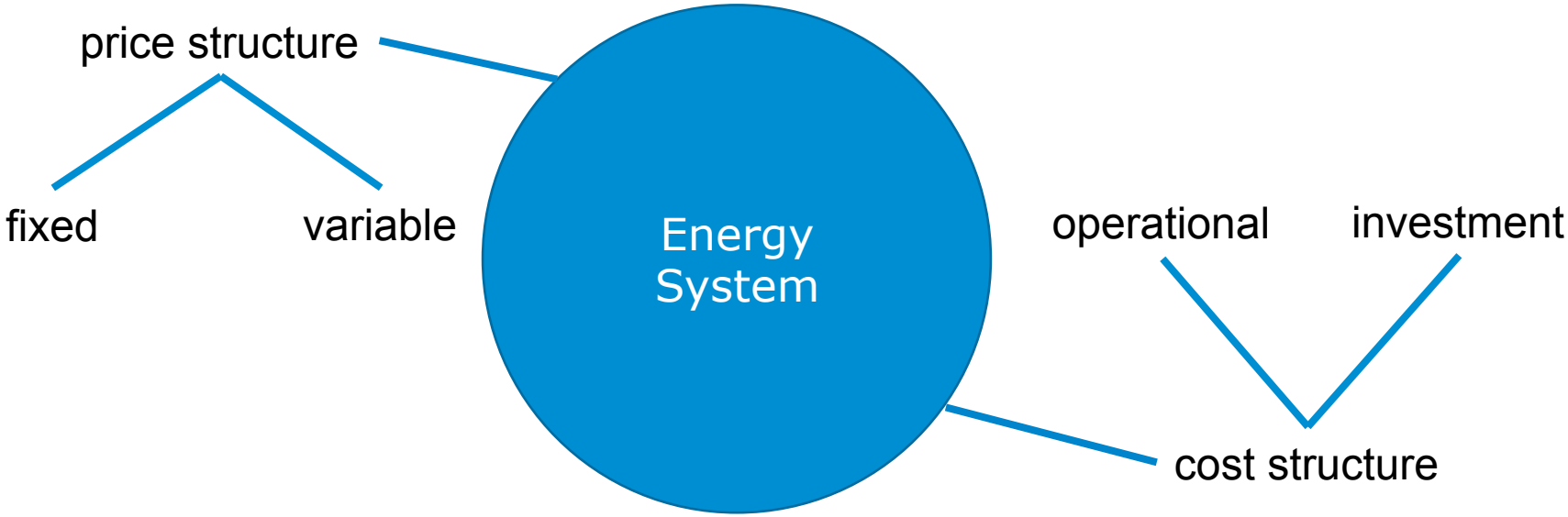
Conventional vs decarbonized



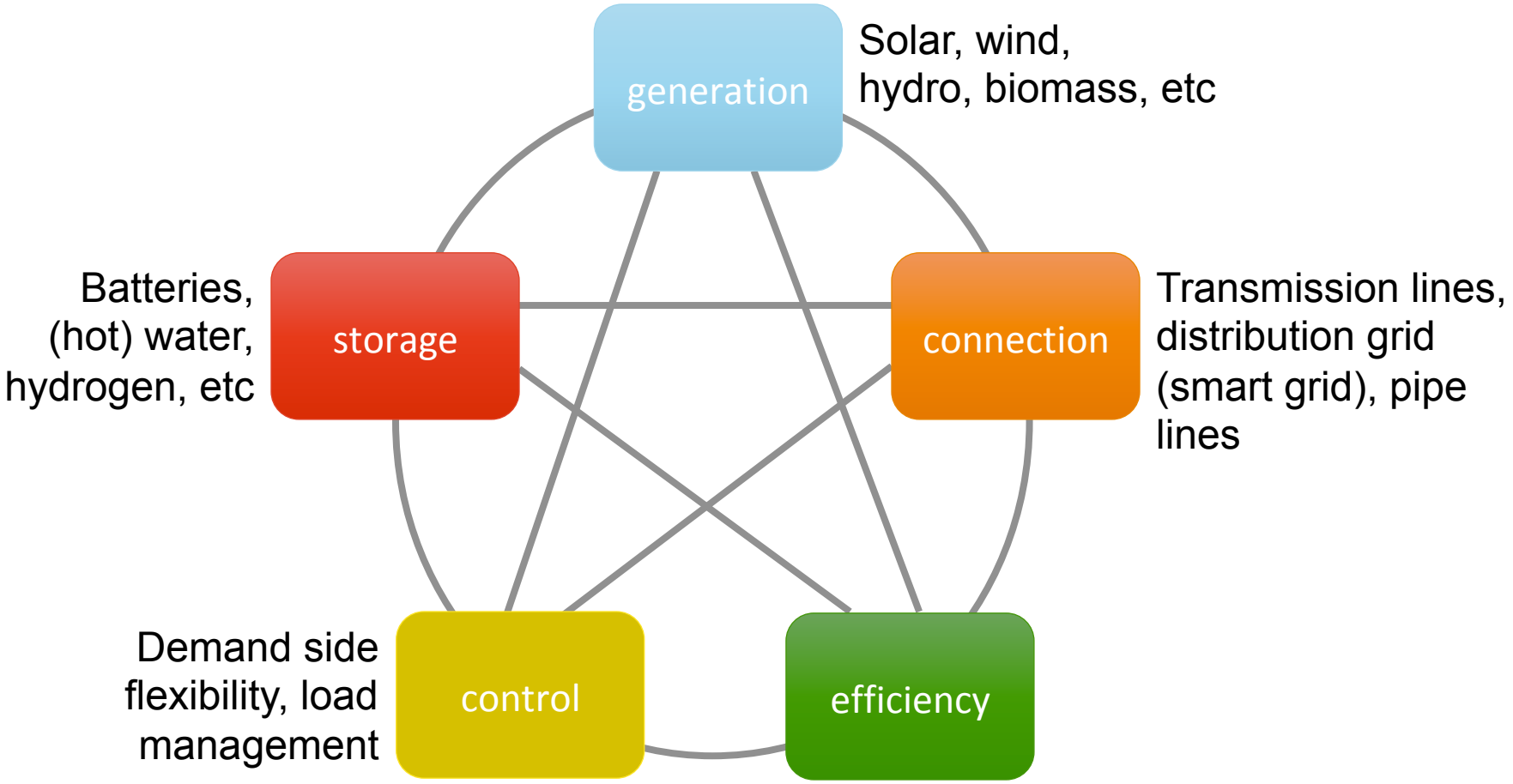
Consequences:

- Demand *and* generation are variable
- Variable costs decrease because fuel costs for VRE are zero

Cost and price structure



Elements of an electric power system



Challenges

- Flexibility is needed:
  - To manage variability in generation and demand
  - By means of storage, demand-side control and connections (transmission and distribution)
  - But energy efficiency is not flexible

- Increasing complexity (technical and policy)
  - Generation, demand-side control and storage at all levels
  - Overall cost minimization versus use of markets
  - Competition between flexibility tools, and between generation and efficiency:
    - Improving energy efficiency versus more VRE generation
    - Increasing interconnection versus using storage
    - Using demand-side control versus using storage

More challenges

- Role of variable pricing:
  - To manage variability in generation and demand
    - Dealing with on-site electricity generation
    - Flat fee as alternative
  - How much variability (in prices) is needed and allowed?
    - On short run, electricity use is fairly inelastic
    - For most end-users, energy costs are a small part of their budget

- The role of markets
  - Long term planning: back to integrated resource planning?
  - Coordination between the elements in an electric power system
  - Markets and investments
    - Dealing with resource adequacy: capacity markets
    - Markets and infrastructure investments

Relation between energy efficiency and renewables

Centralized model

- Flexibility is dealt with at highest level: large storage and interconnection, integration of larger power plants.
- Fixed costs (grid and storage) increase, variable costs decrease.
- Energy efficiency measures less attractive for individual end-users, but still attractive for society (public good character).

Decentralized model

- Flexibility is dealt with at lowest level: end-users are stimulated to generate the electricity they use, including using flexibility tools to minimize impact of grid.
- Energy efficiency measures attractive for individual end-users.
- Free-rider issues: end-users that do not invest still profit from measures from others.

Asking the right questions

- Where lies the balance between renewable energy and efficiency: how far can or need demand be reduced by means of energy efficiency in order to generate this demand by means of VRE sources?
- Which designs – technical, market and regulatory – can realize a decarbonized electric power system?
- How to deal with energy efficiency in a decarbonized power system?
- How to manage the transition from the current power system to a decarbonized power system?

Thank your for your attention.

Questions?

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