

I. Introduction to SES

1. Sustainability

1.1 Sustainable energy systems

The energy system comprises all energy extraction, conversion, storage, transmission, and distribution processes that deliver **final energy** to the end-user.

1.1.1 Environmental sustainability

- Addresses ecological issues such as reducing GHG emissions
- Objective: protect the planet and preserve natural resources
- Focuses on environmental quality and resource conservation

1.1.2 Economic sustainability

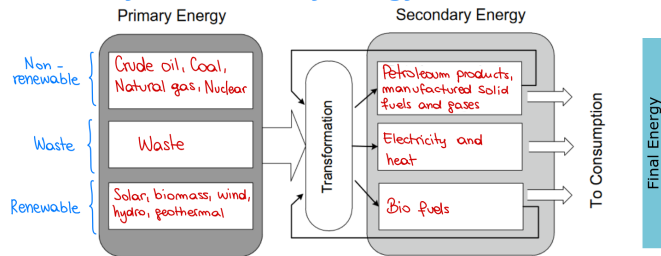
- Concerns long-term economic performance
- Objective: ensure financial viability without exhausting resources
- Focuses on economic stability and business continuity
- Recent debates also consider degrowth and zero growth

1.1.3 Social sustainability

- Promotes a stable, fair, and inclusive society
- Objective: safeguard human dignity and human rights across generations
- Focuses on poverty, work, and the fair distribution of social burdens

2. Current and future energy sources

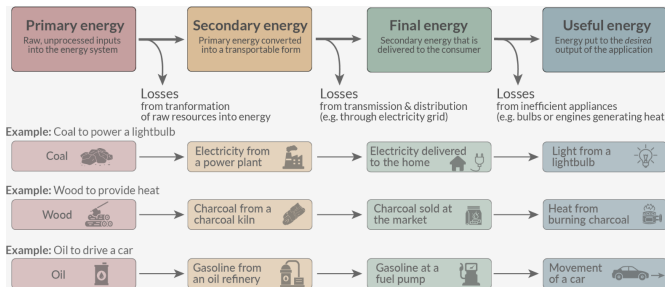
2.1 Primary and secondary energy sources



Primary energy is the energy extracted or captured directly from the environment

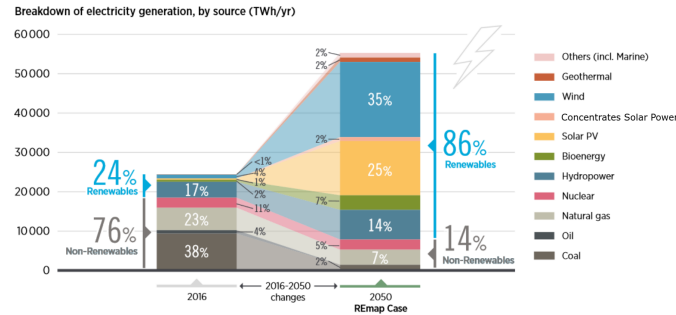
The primary energy is transformed to secondary in the form of electrical energy or fuel to make it transportable.

2.1.1 From primary energy to useful energy



2.1.2 Future energy systems

Gross power generation would almost double, with 86% coming from renewables and 60% from solar PV and wind power.



2.1.3 Energy perspectives 2050+ for a climate-neutral CH

