



# *Concepts and definitions for characterising energy technologies*

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Introductory lecture – Energy commodities and technologies

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# Energy supply chain

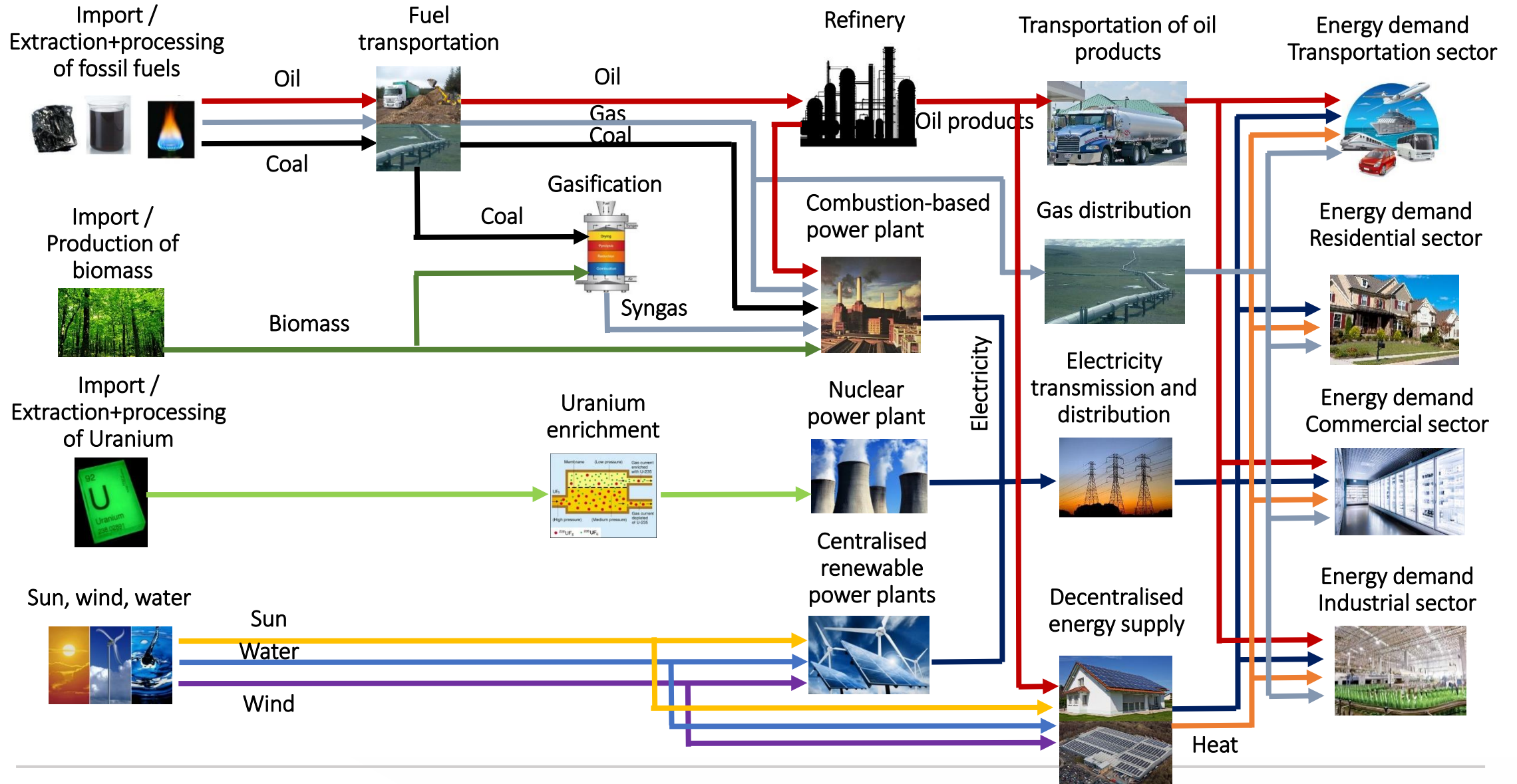


It is the technological chain which allows the primary energy resources to be converted and transported for use by the consumers.

We call the schematic representation of an energy supply chain:

*Reference Energy System*

# Sample Reference Energy System



## Input commodity

- *Source*
- *Quality*
- *Availability*
- *Price*
- *Domestic availability / import capability*
- *Impact*



## Output commodity

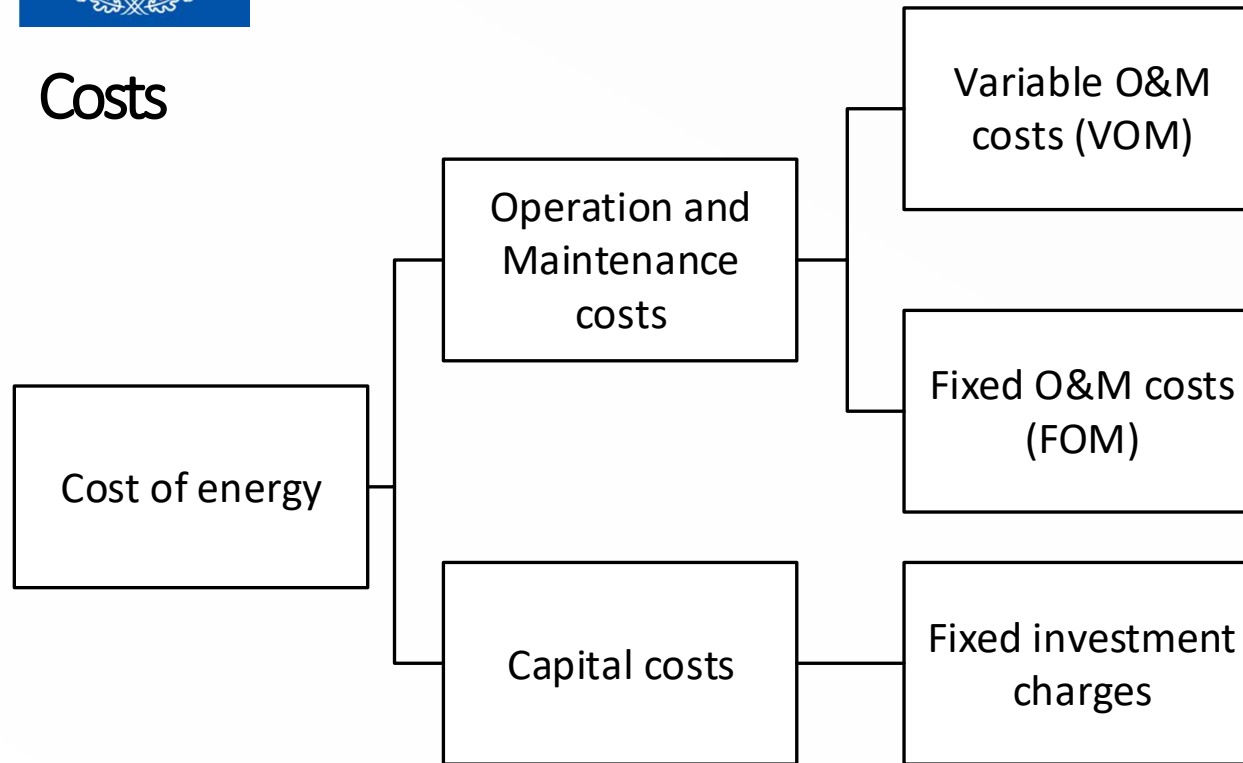
- *Demand level & type*
- *When is it needed*
- *Energy content*
- *Production targets*
- *Export targets*
- *Impact*

## Techno-economic-environmental characteristics

- Capital cost
- Variable & Fixed Operating costs
- Emission factor
- Efficiency
- Energy intensity
- Availability
- Capacity factor
- Lifetime
- Ramping capability

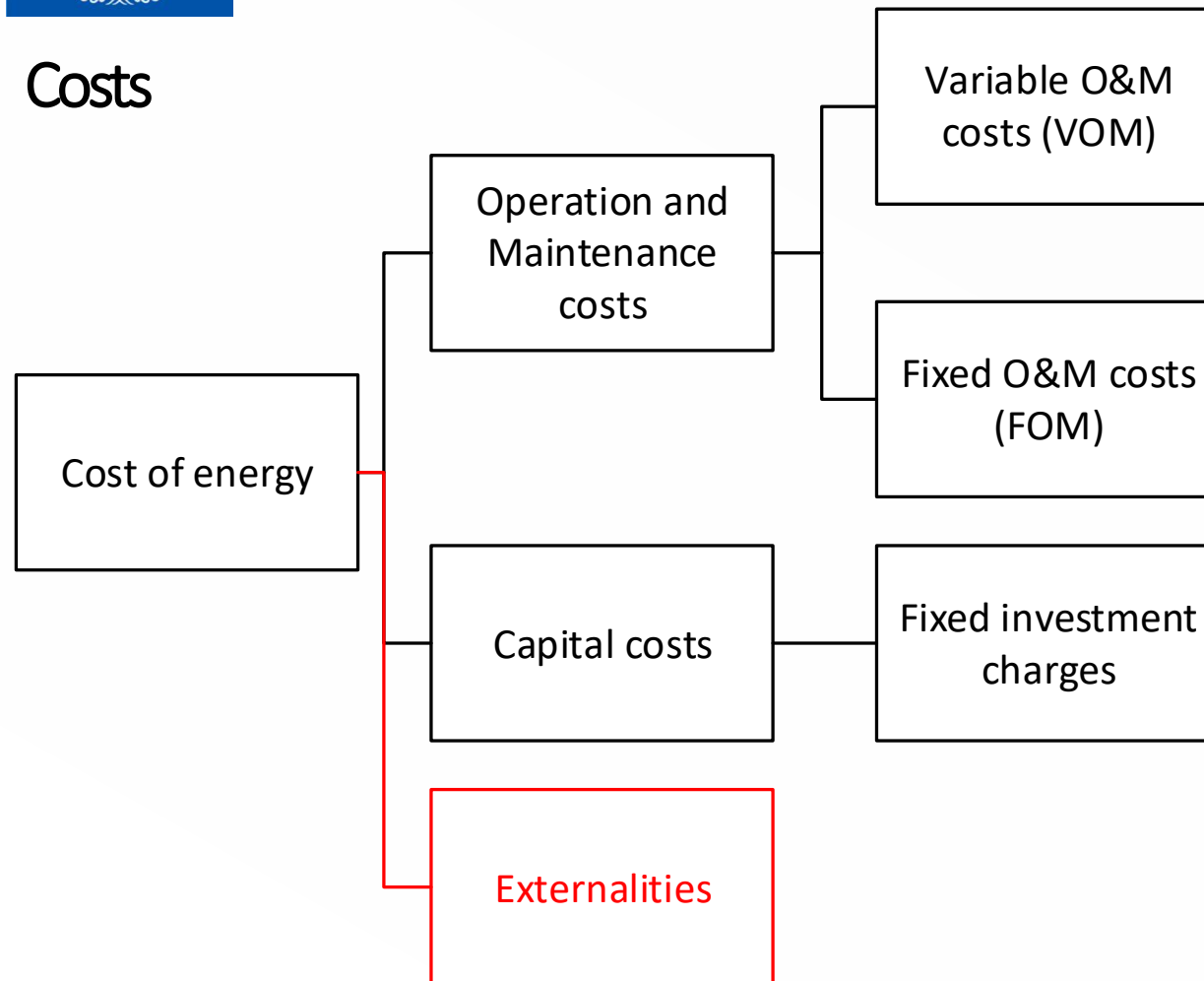
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## Costs



- Fuel
- Other consumables (e.g. chemicals, detergents, etc.)
- Salaries
- Taxes and insurance
- Fixed fuel costs
- Depreciation
- Return on investment
- Other one-time fixed charges

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- Depreciation
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- Other one-time fixed charges
- Social costs
- Environmental costs



# Techno-economic-environmental characteristics



**Emission factor.** Quantity of emission of substance  $x$  per unit production of output commodity.

**Efficiency.** Quantity of produced output commodity per unit input commodity.

**Energy intensity.** Quantity of required input commodity per unit produced output commodity (reciprocal of the efficiency).

**Availability.** Ratio between the maximum number of hours in one year a technology can work at its full capacity and the total number of hours in one year (8760).

**Capacity factor.** Ratio between the production of output commodity in any time interval and the maximum production the technology could achieve in the same time interval.

**Lifetime.** Number of years a technology is able to produce the output commodity before being decommissioned.

**Ramping capability.** Maximum rate at which a technology can vary its output.



# Changelog and attribution



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