Energy Overview – Conservation and Efficient Use of Energy Resources

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Energy Audits in Industrial Small Medium Enterprises (SMES) - Training Course

Sunday, 8 December 2019 – Cairo, Egypt

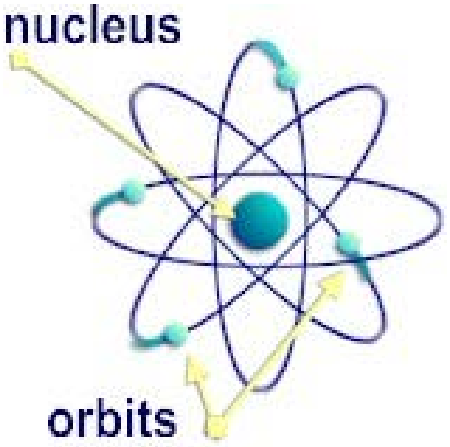
Funded by the European Union

What is Energy and its Forms?

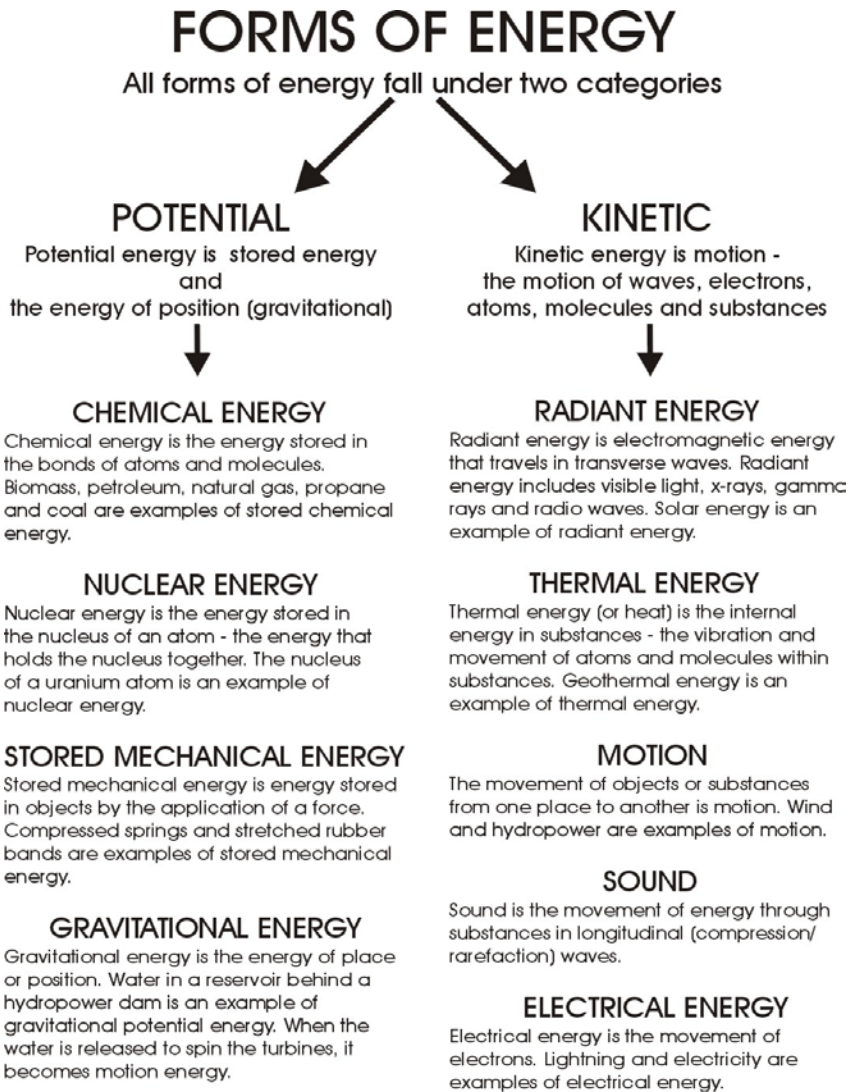
- ***Energy*** is the ability to do work or cause a change.
- ***Forms*** of Energy are;
  - Potential
  - Kinetic
- ***Resources:*** all materials in the environment that can be used.
- ***Reserves:*** quantities of resources that are known and are legally and economically extractable with current technology.
- ***Projected Reserves:*** current reserves plus all resources that may become reserves due to improved technologies and changing prices.
- ***Renewable Resources:*** such as farmland soil, water, solar, forests, and fisheries, where the sustainable rate of use can be no greater than the rate of regeneration.
- ***Solar-based renewable energy:*** are ultimately powered by the sun: solar, wind, hydropower, wave and biomass.
- ***Non-renewable resources:*** substances such as fossil fuels, high grade mineral ore, and fossil groundwater.

Potential and Kinetic Energy

- The potential energy is the energy stored, i.e. ice on top of the mountain, water behind dams, any mass elevated, …. Etc.
- The kinetic energy is the movement of objects or substances from one place to another conducting work.

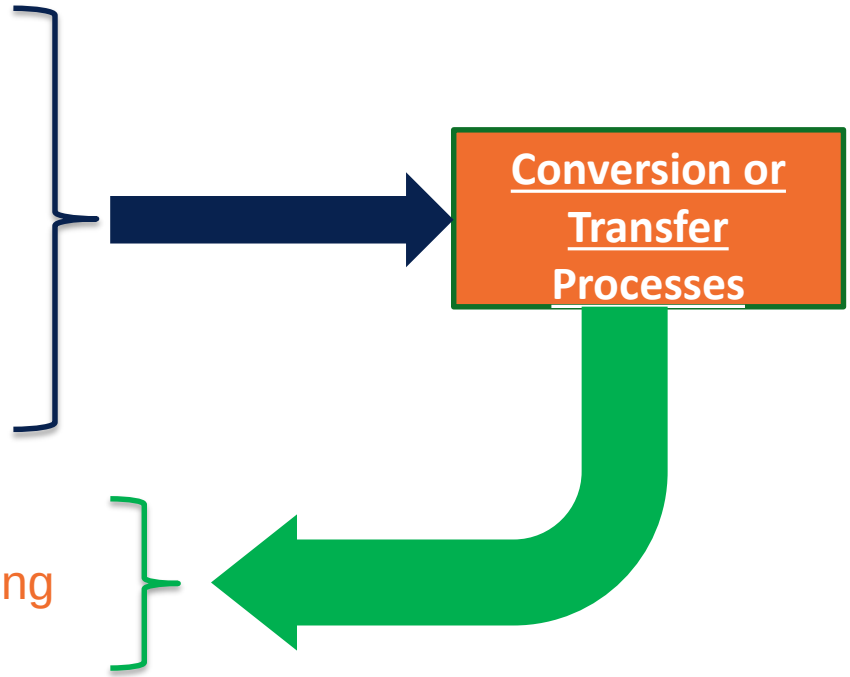


Potential and Kinetic Energy



Energy Resources Categorization

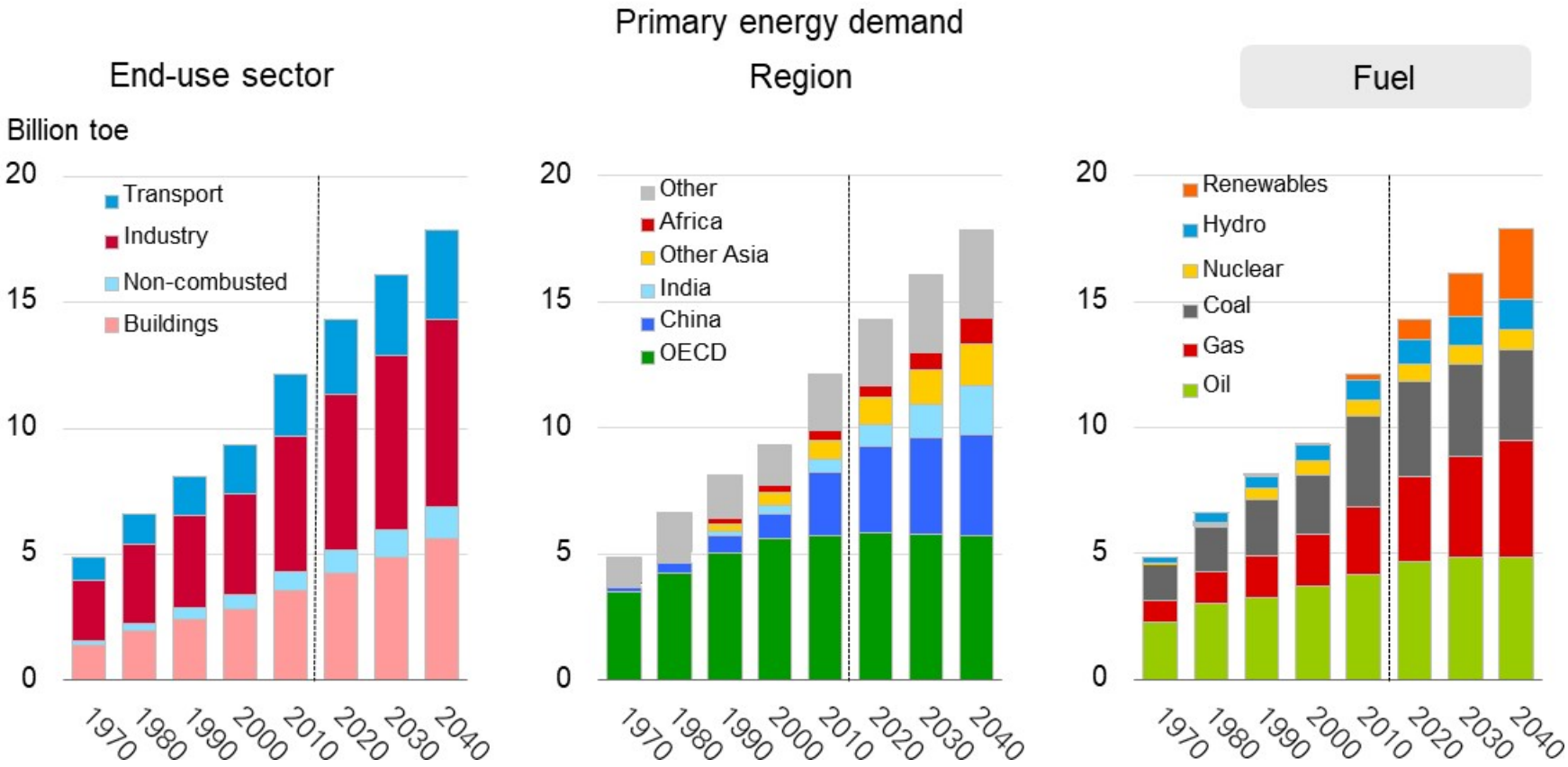
- Primary Energy;
  - Fossil Fuel
  - Solar
  - Wind
  - Geothermal
  - Hydro
  - Wastes
  - Biofuels
  - Biomass
- Final Energy
  - Electrical
  - Heating/Cooling
  - Mechanical



Energy Resources versus Demand

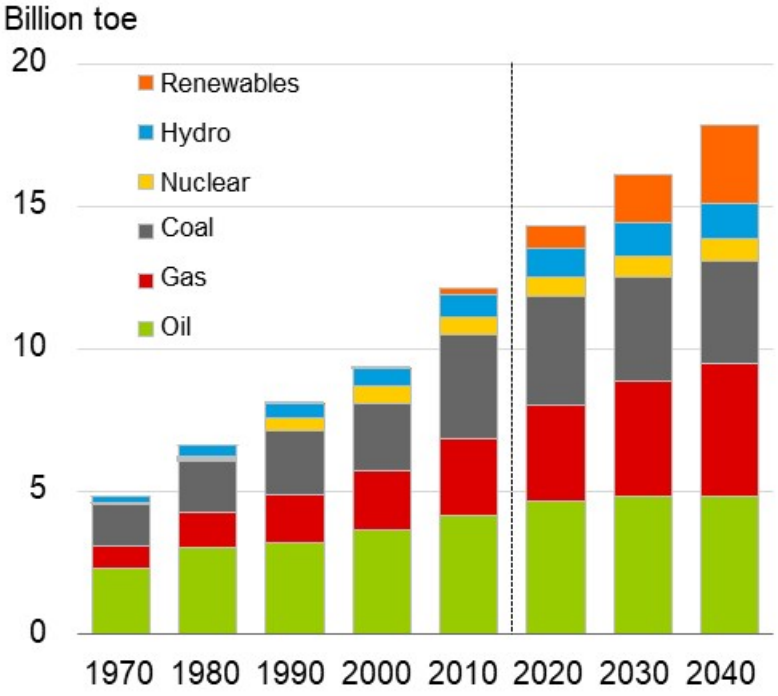
- The energy resources are the supply side that should meet the demand in secured and sustainable mode.
- The planning for future demand should consider:
  - Energy Conservation Opportunities:
    - To improve the consumption pattern and to reduce the consumption level.
    - To set policies, regulate the energy reforming, and to publicize the programs for energy conservation tools.
  - Energy Efficiency (EE) Opportunities:
    - To update the list for energy efficiency technologies (if any).
    - To adapt the technologies implementation, capacities needed, resources requirements, ….etc.
    - To link the EE technologies with the Green Economy aspects.
  - Renewable Energy (RE) Resources:
    - To plan for the replacement of non sustainable energy resources by the RE resources.
    - To plan for the Potential RE resources to be introduced either on supply side or the demand side.
    - To promote for the RE resources implementation versus the avoided Greenhouse Gases (GHG).

Energy Outlook 2019

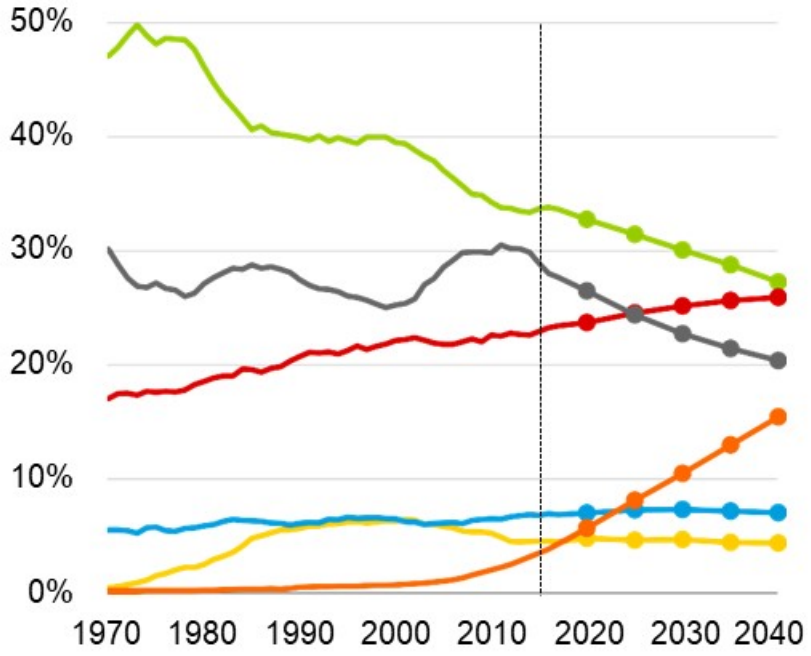


Global Energy by Fuel

Primary energy consumption by fuel



Shares of primary energy



Why Energy Conservation and Efficiency?

- The energy utilization is in most cost effective way because of:
  - Energy Prices increase.
  - Energy Security Level.
  - Climate Change.
  - Green Economy Formulation.
  - The Sustainability Development Approaches.
- Benefits to End-Users:
  - Cost Cutting to final products and services.
  - Strengthen the competitiveness.
  - Lowering the GHG emission to be strong marketing tool for products and services.

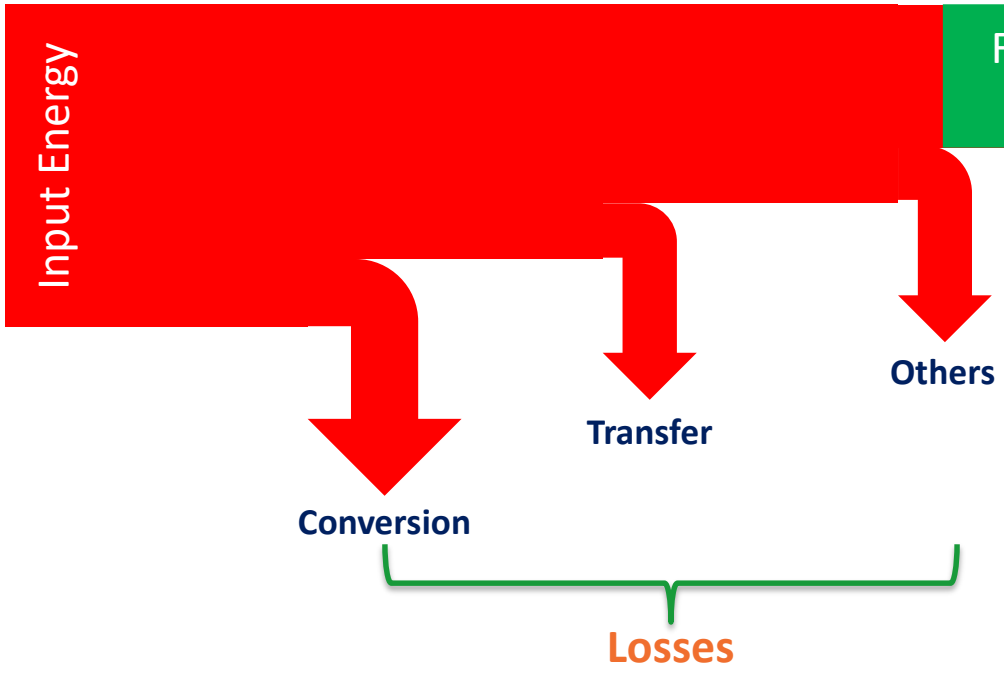
Systems to Apply EE Opportunities

- Heating Ventilation, and Air Conditioning (HVAC).
- Air Compressors.
- Heat Generators (Thermal/Cooling) , i.e. boilers, heaters, furnaces, driers, Chillers, ..etc.
- Lighting Systems.
- Wastes Treatment.
- Motors and Drives.
- Processes, Services optimized performance.
- Refrigeration Systems.
- Distribution Networks (Electrical, Piping, …..etc.)

Energy Efficiency and Renewable Energy Barriers to Implementation

- Lack of awareness and perceived risks.
- Conflict of investment priorities.
- Financing and Financial Mechanisms.
- Lack of Benchmarking (Best Practices).
- Absence of Technologies.
- Regulating pressure.
- Policies enforcement.
- Human Capacities.

Energy Balance and Efficiency

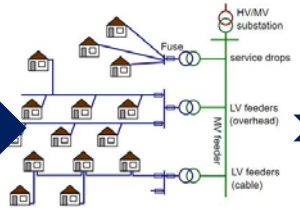


$$\text{Efficiency } (\eta) = \frac{\textit{Final Energy}}{\text{Input Energy}}$$

Power Generation 41%

Transmission 95%

Substation 97%



Distribution 92%

Motor 91%

Overall Efficiency 32%

RCREEE

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