Chapter 3.2
Energy

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E C S

Strategic Research and Innovation Agenda 2025

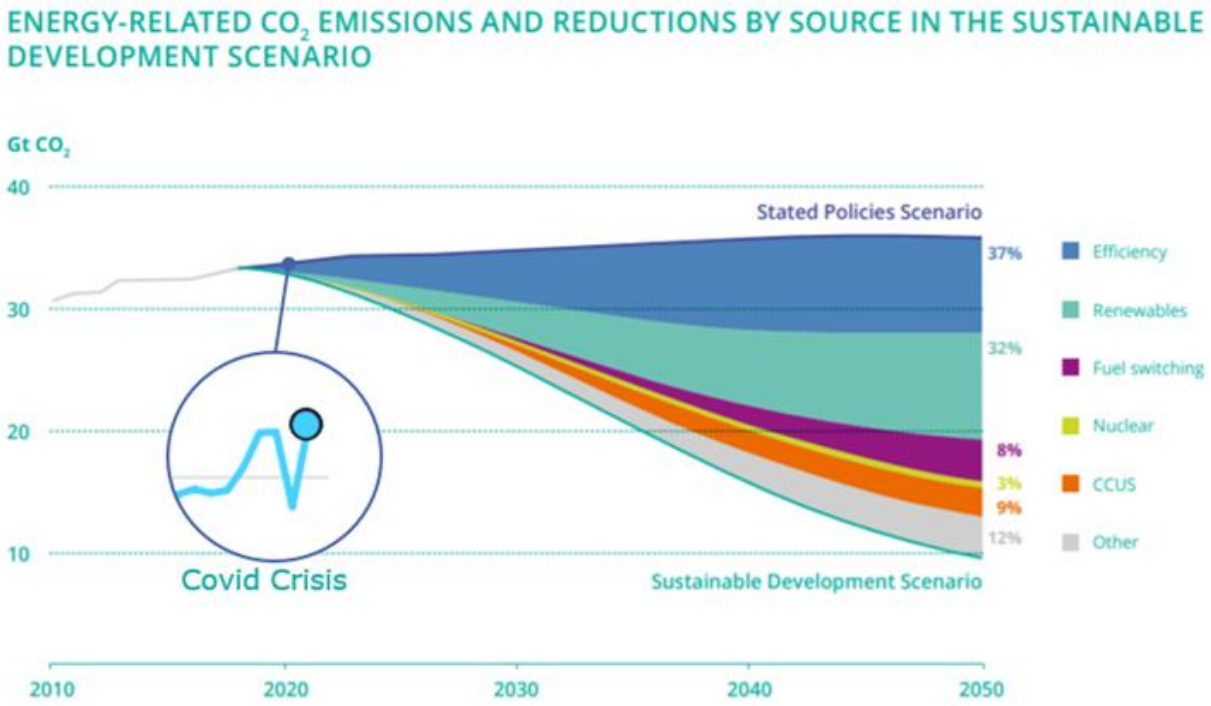
Aeneas

EPoSS. European Association on Smart Systems Integration

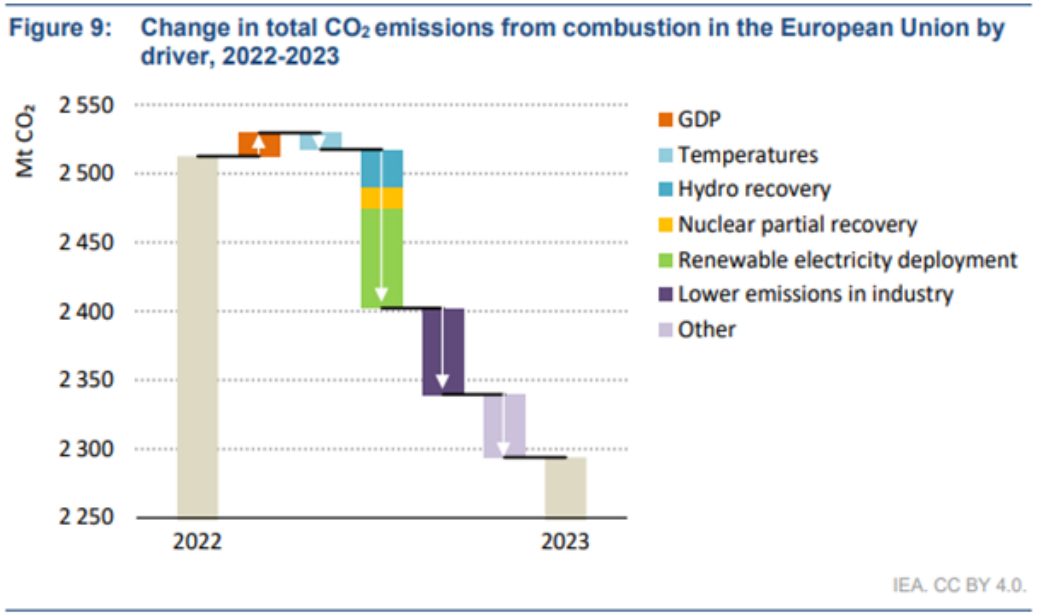
Inside Industry Association

Scope

Electronic components and systems (ECS) are key to future energy systems being optimised in both design and operation, for high efficiency, substitution to zero emission technologies, low CO2-emissions, cost, and security of supply.



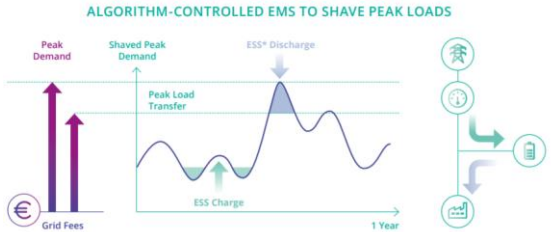
Source: IEA Global Energy Review: CO_2 Emissions in 2021

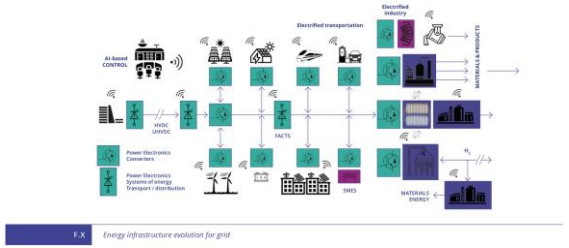


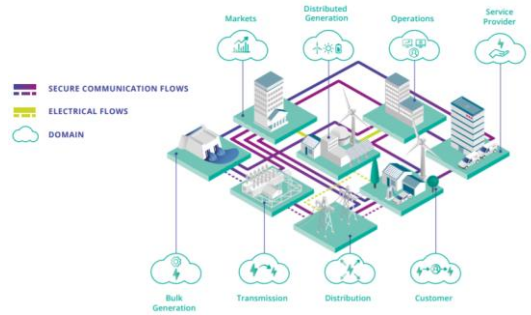
Source: IEA – CO2 emissions in 2023: A new record high, but is there light at the end of the tunnel?

Major challenges

- **Major Challenge 1**: Smart & Efficient - Managing Renewable Generation, Energy Conversion, and Storage Systems.
- **Major Challenge 2**: Energy Management from On-Site to Distribution Systems.
- **Major Challenge 3**: Future Distribution & Transmission Grids.
- **Major Challenge 4**: Achieving Clean, Efficient & Resilient Urban/ Regional Energy Supply.
- **Major Challenge 5**: Cross-Sectional Tasks for Energy System Monitoring & Control.







Key trends

- Affordability of the transition towards net zero emissions
- Increased efficiency & digitalization at all levels
- Residential, commercial, and industrial demand side management - scheduling and load adaption
- Conversion to zero emission technologies
- Security, reliability and stability of total energy system
- Hybrid solutions
- Grid stability & trans EU solutions
- Self-adaptive control based on Artificial Intelligence / Machine Learning
- Flexibility in management of energy supply
- IT security, connectivity, integrity

Application needs **translate into ECS technologies:**

- Power semiconductors, wide band gap
- Multi technology solutions, modularity
- Sustainable manufacturing, use of materials
- Design technologies
- Reliability, heterogenous integration
- Digital control, sensors
- Digital actuators, switches, substitution of fuses
- Real time low latency reaction
- Data integrity and privacy
- System solutions and interfaces for seamless integration…

R&I focus areas

- Power semiconductors, wide band gap
- Multi technology solutions, modularity
- Sustainable manufacturing, use of materials
- Design technologies
- Reliability, heterogenous integration
- Digital control, sensors
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- ….