Technology Collaboration Programmes

Energy Conservation through Energy Storage: (ECES TCP)

Gaps & Barriers for Energy Development and Deployment

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About ECES TCP

Mission and scope

The TCP-ECES mission is to contribute in the energy transition toward a renewable energy based energy system by:

- Joint RD&D + pre-standardisation work.
- Scope: Both heating & electricity; Central & Decentralised
- Integral solutions, impact on other domains like Solar, Heat pumps, SG, DHC, Energy Conservation etc.

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<th>Participating countries</th>
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<td>Contracting Parties</td>
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Current high-priority themes for energy storage in ECES

- **Thermal energy:**
  - Underground energy storage,
  - Compact thermal storage

- **Electrical energy:**
  - Integration aspects in grids,
  - Storage in buildings and electric mobility

- **Modelling:**
  - Improve position of energy storage in models
The transition of our energy system

- SMART GRIDS: remote operation, DSM, Variable rates and tariffs, gamification
- CENTRAL RENEWABLE ENERGY PRODUCTION: Wind, Hydro, Large Solar, Bio-energy
- "PROSUMERIFICATION": Local energy consumption and renewable production connected
- ENERGY STORAGE: Heat/Cold and Electricity (electrical vehicles)
- DATA MANAGEMENT & CONTROL

"old model"
The transition of our energy system

- Abundant (variable) renewable energy production
- (Changing) variable load profiles

Flex & Storage
Gaps & Barriers

- Development
  - Historical focus only on production and conservation
  - New domain: matching variable production and variable load profiles (incl. EV)
  - Sector coupling required for comprehensive approach (P2G, P2H, P2P, P2M2P, etc)

→ Position of Energy Storage and Flexibility:

(Variable) renewable Production → Storage & Flexibility ↔ Load / demand profiles
Gaps & Barriers

- **Deployment**
  - Regulatory barriers i.e.:
    - role of DSO/TSO
    - Dynamic pricing
    - Grid access
    - Prosumerfication
    - E-mobility
  
  - Value ($€) of flexibility and storage:
    - Grid cost vs cost for flex and storage
    - Pricing in energy markets
    - etc
Highlight of activities

Need for more fact-based information and development of technological solutions addressing efficient energy storage.

- Electricity grids (sec- hours);
- Buildings (to facilitate prosumerfication- both E & H)
- Low-temp heating / cooling by combined (compact) Storage & Renewables, like solar and heat pumps
- High temp. industrial applications (facilitate flex)
- Storage (and flex) in models
- Power to Heat, Power to Gas, etc
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BACK-UP
Priorities for Energy Storage R&D

- Everything will be connected to everything
  - Sectorial Cross-overs
  - Flexibility and deployment of energy storage

- Electricity
  - Balancing (sec-minutes) + Storing to match production and demand
  - Power to “x”

- Heating
  - Collective heating and cooling, using underground storage
  - High temperature, new materials and applications
  - Electrification, where (compact) storage can reduce impact on (smart) grids, integration with E-mobility, heat/cold batteries for prosumers

- Focus
  - Existing building stock (compactness and price), further electrification and providing integral solutions.
Mission Innovation Challenges

1. **Smart Grids**
2. **Off-Grid Access to Energy**
   - 2 challenges to enhance energy storage to become “smart” or “off-grid”.
3. **Carbon Capture**
4. **Sustainable Biofuels**
5. **Converting sunlight**
6. **Clean Energy Materials**
7. **Heating and Cooling of Buildings**
   - 3 Priority Areas addressed:
     1. **Thermal Energy Storage**
        - Adapting variability of renewable sources,
        - Improving match with weekly and seasonal demand profiles
        - Responding to decentralised market demands
     2. **Heat Pumps**
     3. **Heat Rejection**