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Sustainable Energy – the Energy of the Future: International Experience in Advancing and Implementing Innovative Energy Efficiency and Renewable Energy Technologies in Residential and Public Buildings

02 September 2025 (hybrid format)

State Energy Institute of Turkmenistan, Mary

Development of innovative energy efficiency and renewable energy technologies - opportunities within the Horizon Europe programme

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Energy efficiency requirements for buildings in the EU

- Buildings currently account for approximately 40% of energy consumption and 36% of energy-related greenhouse gas (GHG) emissions in the European Union (EU)
- Improving buildings' energy performance will contribute significantly to achieving the EU's goal of becoming climate neutral by 2050
- To achieve this, the reduction energy consumption of buildings is critical, in parallel with decarbonizing the heating, cooling and electricity sectors. Therefore:
    - New buildings should be Nearly Zero-energy Buildings
    - Existing buildings should be renovated to improve their energy performance

Energy efficiency requirements for buildings in the EU (2)

- The most important elements in the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) include:
    - Reinforced long-term renovation strategies for EU countries
    - Nearly Zero-energy Buildings (nZEBs)
    - Energy Performance Certificates
    - Consideration e-mobility (e-charging points) and smart technology (smart meters, self-regulation equipment) in new buildings
- In addition, each EU country needs to present its strategy for tackling energy in buildings for the period until 2030 through its integrated National Energy And Climate Plans (NECPs)

Energy efficiency requirements for buildings in the EU (3)

According to the revised EPBD:

- Each EU member state need to reduce the average primary energy use of residential buildings by 16% by 2030, and 20-22% by 2035
- At least 55% of the decrease in the average primary energy use will be achieved through the renovation of the worst-performing buildings
- 16% worst-performing non-residential buildings will need to be renovated by 2030 and 26% by 2033
- EU member states have to ensure that new buildings are fit to host rooftop solar PV or solar thermal installations. Existing public and non-residential building solar will need to be installed starting from 2027

Challenges at the level of practical application

Achieving a more sustainable energy mix requires more smart technologies and solutions

- in promotion of the **use of RE** – smart grids and smart grid technologies (smart metering, demand response, smart appliances, etc.)

- in promotion of **EE in buildings – smart readiness indicators**, emerging technologies and approaches for decarbonization of the building stock, etc.

This opens opportunities for collaboration between EU-CA research institutions

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Horizon Europe

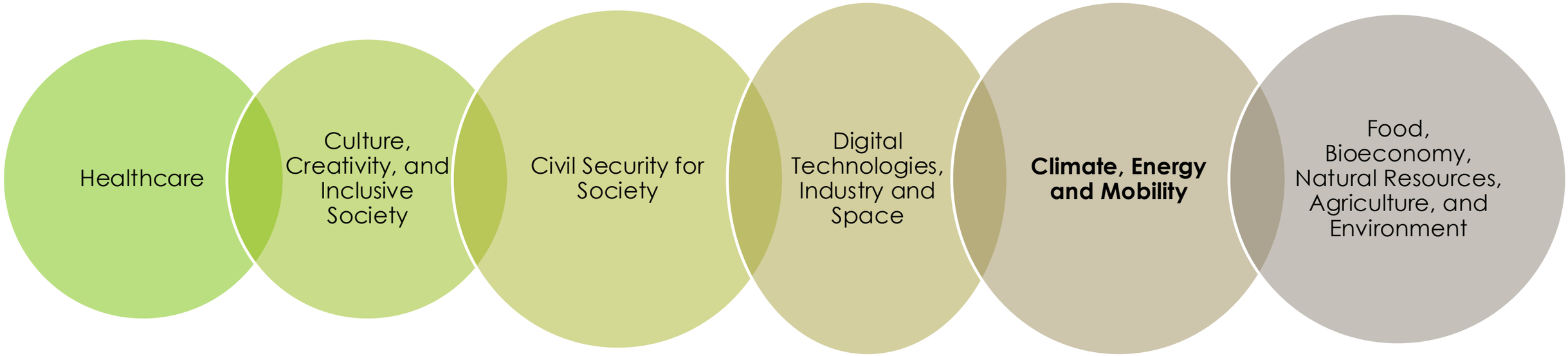
The largest program of the EU in science and innovation

Objectives: Support scientific and technological research, innovation and sustainable development in the EU and beyond

Budget and implementation period: €95.5 billion for 2021-2027

Component II Global challenges

Total budget: €53.5 billion



Budget by Clusters

Cluster	Theme	Budget
Cluster 1	Healthcare	€8.246 billion
Cluster 2	Culture, Creativity and Inclusive Society	€2.280 billion
Cluster 3	Civil Security for Society	€1.596 billion
Cluster 4	Digital Technologies, Industry and Space	€15.349 billion
Cluster 5	Climate, Energy and Mobility	€15.123 billion
Cluster 6	Food, Bioeconomy, Natural Resources, Agriculture, and Environment	€8.952 billion

Current status of National Contact Point networks in CA

- Activities under the SECCA Horizon Europe (HE) component began in May 2024 – at that time, **NCP coordinators** were established in **Kazakhstan** and **Kyrgyzstan**
- In one year:
  - ✓ **NCP coordinators** nominated in **Uzbekistan** and **Turkmenistan**
  - ✓ **NCP for Cluster 5** nominated in **Kazakhstan**, **Kyrgyzstan**, and **Uzbekistan**, and **is being discussed in Turkmenistan**
  - ✓ **The process** of nomination of the NCP **has been initiated in Tajikistan**
- This clearly demonstrates **the will and commitment of the CA countries** to enhance R&I cooperation with the EU under the Horizon Europe program

Support to Turkmenistan in developing capacity for participation in the Horizon Europe programme

- **Lectures** for faculty members and students of the State Energy Institute of Turkmenistan, “Horizon Europe – prospects and challenges” (online, 15 December 2023)

- **Info event** "Opportunities for Turkmenistan's Participation in the Horizon Europe Programme" (Ashgabat, **Turkmenistan**, 26 November 2024)

- **International Conference** "Opportunities for Turkmenistan's Participation in the Horizon Europe Programme: Prospects and Potential for Developing International Cooperation" (Ashgabat, **Turkmenistan**, 16 May 2025)

Support in developing capacity for participation in the Horizon Europe programme (2)

- **Horizon Europe Cluster 5 Regional Info Day** - Enhancing EU-Central Asia Research Collaboration in Horizon Europe (Almaty, Kazakhstan, 20 May 2025):
  - ✓ **NCP coordinators** and **NCPs Cluster 5** delivered presentations on Achievements, Research Priorities and Future Cooperation
  - ✓ **NCPs from the EU** shared experiences and lessons learned

- **Professional Development workshop for Horizon Europe NCPs** (Almaty, Kazakhstan, 21 May 2025):
  - ✓ **European network of Cluster 5 NCPs - GREENET** presented services for Horizon Europe NCPs and international cooperation opportunities
  - ✓ **CA Regional NCP Network**: Exploring Opportunities for Cooperation

Support, tools and instruments for NCPs and research institutions

- SECCA has developed **a template for research organisations** to highlight their key capacities, research interests, and areas of expertise in a structured manner

- The template was **distributed to relevant research organizations** in **Kazakhstan**, **Kyrgyzstan, Turkmenistan**, and **Uzbekistan**

- **Filled templates were received** in **Kazakhstan, Kyrgyzstan**, **Turkmenistan**, and **Uzbekistan**

- A comprehensive **database of Central Asian (CA) research institutions** created and uploaded on the **GREENET platform** – an official network of the Horizon Europe Cluster 5 National Contact Points in the EU – to support partner searches for participation in Cluster 5 of the Horizon Europe programme

Renewable Energy technologies applicable for buildings – Research and Development under the HORIZON programme

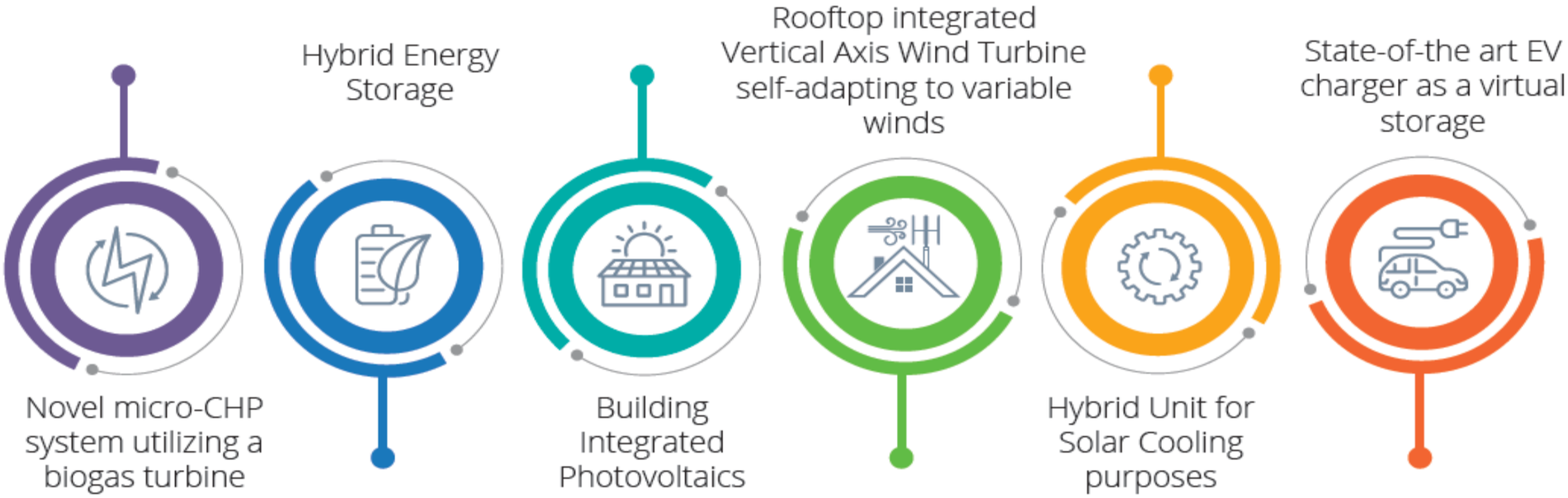
- Under the EU Research and innovation funding programme Horizon Europe, number of projects have been funded aimed at the development of technologies for nZEBs
- RE-COGNITION (2019-2022)- Renewable Energy Technologies for near Zero Energy Buildings – with the following objectives:
    - Combined application of different Renewable Energy Technologies (such as solar, wind and bioenergy) and storage systems
    - Development of software to improve self-consumption in the building/building block
    - Development a platform for the best design of the RE technology configuration and the optimal management of the technologies installed during the operations

RE technologies applicable for buildings – Research and Development under the HORIZON programme (2)

- RE-COGNITION proposed the following technologies for buildings:
  - Micro Combined Heat and Power Unit - a small-scale cogeneration system based on a microturbine able to operate with biogas
  - Lightweight Photovoltaic - in older buildings, the deployment of solar PV can be limited by the load-bearing capacity of the different building parts (i.e., roof, facade, etc.)
  - Vertical Axis Wind Turbine – is designed for rooftop and/or ground installations; the overall dimensions (1.5 m × 1.5 m) enhance building-scale integration
  - Latent Heat Thermal Storage, in which the storage volume is reduced (2-3 times compared to water storage) - important aspect for buildings where space for installation of appliances is limited

RE technologies applicable for buildings – Research and Development under the HORIZON programme (3)

RENEWABLE ENERGY SOURCES AND STORAGE TECHNOLOGIES

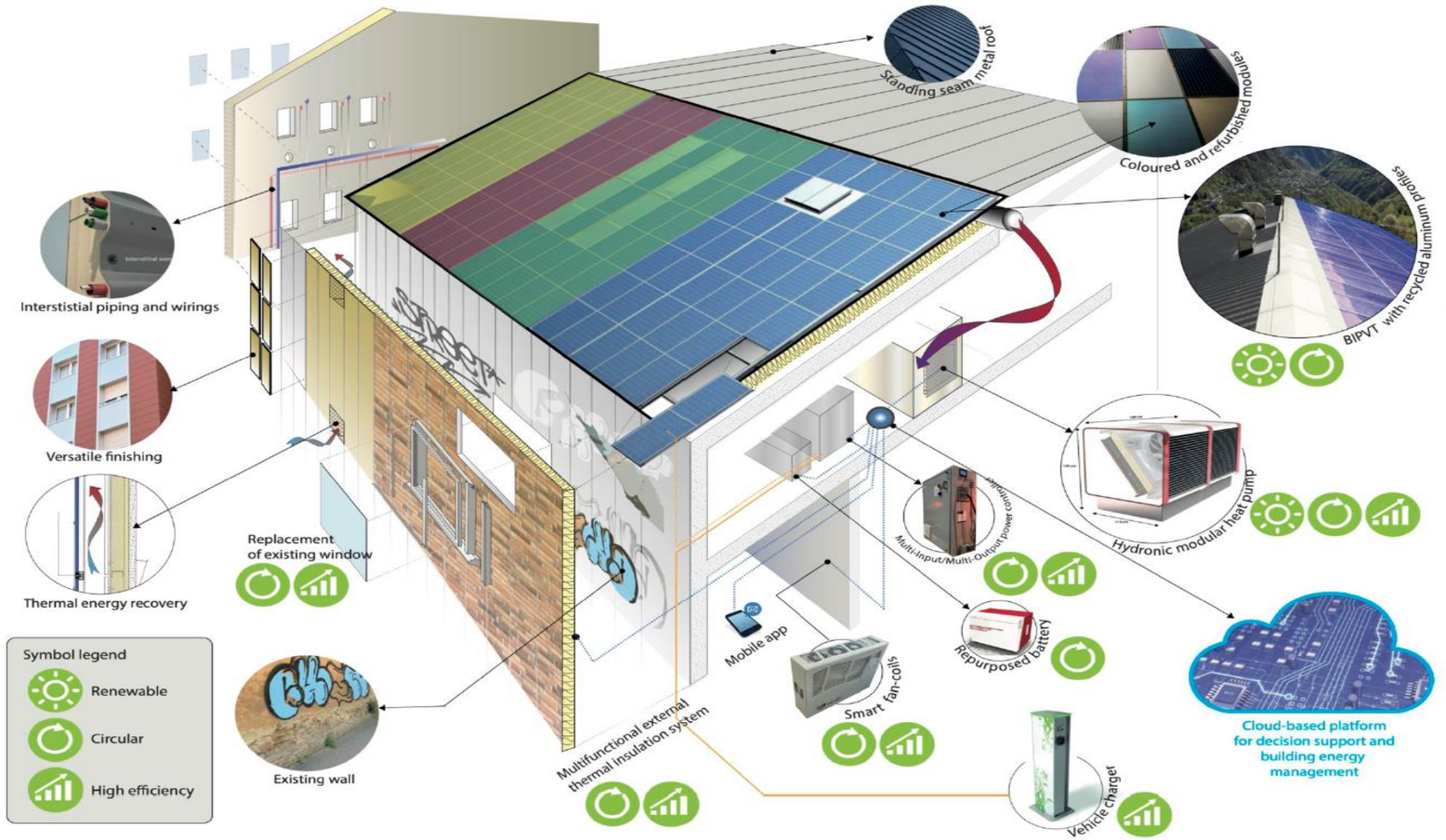


Source: RE-COGNITION-Brochure-2020

RE technologies applicable for buildings – Research and Development under the HORIZON programme (4)

- Renewable and Environmental-Sustainable Kit for building INtegration (RE-SKIN)
    - Duration: 2023-2026
    - Objective: development of an integrated and multifunctional system for energy retrofit of existing buildings (in two main subsystems, roof and façade, combined with the building's HVAC system)
    - The roof is equipped with a hybrid photovoltaic-thermal system, which produces electricity and heat and at the same time thermally and acoustically insulates the slab beneath. Electricity powers the building's loads, interacts with the grid and EV charging stations. Heat is used by a heat pump for heating and hot water preparation

RE technologies applicable for buildings – Research and Development under the HORIZON programme (5)

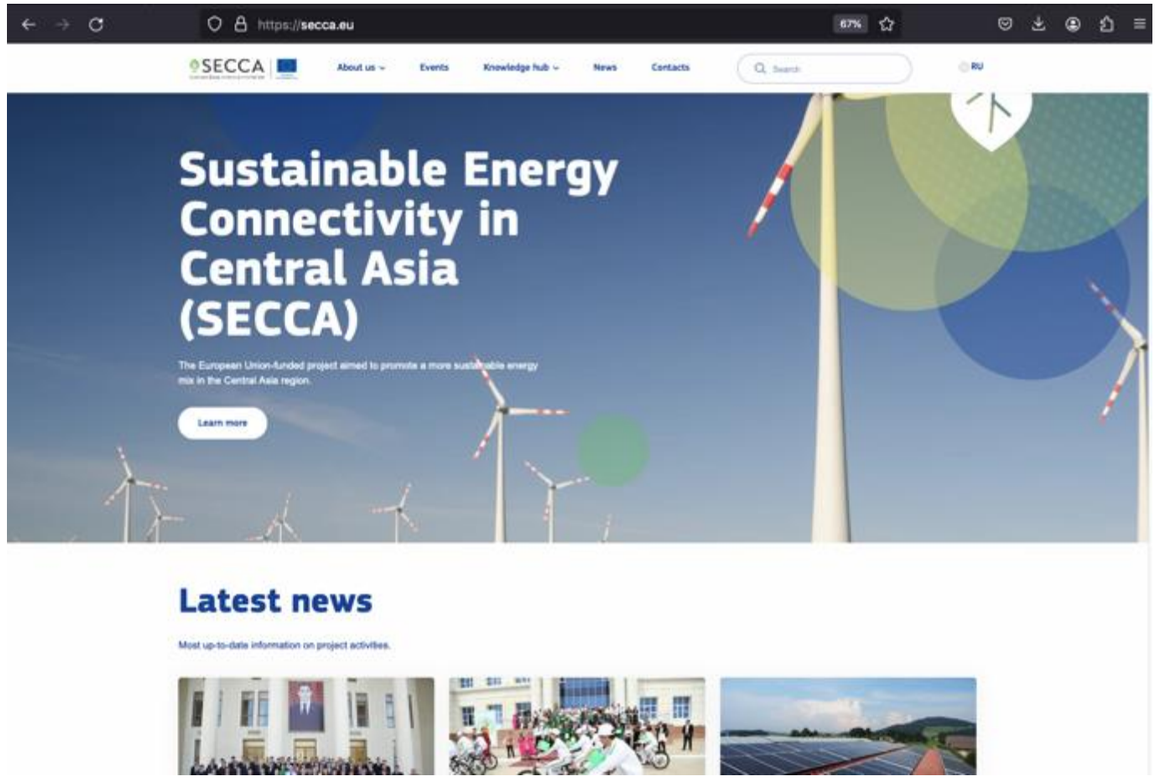


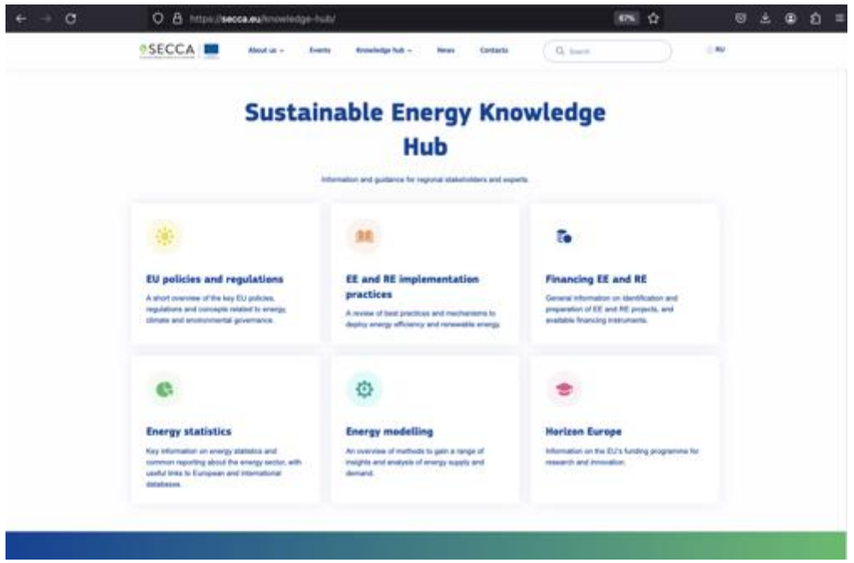
Source: https://reskinproject.eu/

HE-related section on the SECCA website

Latest News and Events

www.secca.eu





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