Denmark's Contribution to the IEA ES Task 43 – Update Report for the 99th ExCo Meeting

The IEA ES Task 43, titled *"Storage for Renewables and Flexibility through Standardized Use of Building Mass"*, is an international initiative under the IEA Energy Storage TCP that aims to leverage **Thermally Activated Building Systems (TABS)** as a key technology for energy storage and flexibility. Launched in January 2023, the task focuses on standardizing the use of thermal building mass in new constructions and renovations to support the integration of renewable energy and decarbonization of building stock. The task is structured around four core subtasks: (A) Construction and Materials, (B) System Integration and Control, (C) Non-technical Challenges, and (D) Standardization and Key Performance Indicators (KPIs).

Denmark plays a prominent and multifaceted role in Task 43, with strong institutional involvement and leadership. Two major Danish universities—**Aalborg University (AAU)** and the **University of Southern Denmark (SDU)**—have been instrumental in advancing both technical and non-technical aspects of the project.

Aalborg University (AAU) leads **Subtask C – Non-technical Challenges**, which explores legal, regulatory, financial, and societal barriers to implementing TABS as flexible thermal energy storage. Under AAU's coordination, a comprehensive study involving 42 expert interviews across six countries, including Denmark, has been conducted. The findings—integrated with recent literature—are being prepared for publication in a peer-reviewed journal (*Energy and Buildings*). AAU emphasizes that current regulatory frameworks are misaligned with the technical readiness of decentralized energy flexibility, calling for dynamic pricing schemes, improved aggregator regulation, and better recognition of thermal inertia in energy performance policies. Through this leadership, AAU ensures that Task 43 does not only address technical challenges but also identifies concrete pathways for policy innovation and user acceptance.

The University of Southern Denmark (SDU) is actively involved in **three subtasks: A (Construction and Materials), B (System Integration and Control), and D (Standardization and KPIs)**. In **Subtask A**, SDU contributes to the exploration of sustainable materials such as low-carbon composites and PCM-enhanced solutions, which improve heat storage capabilities and support circular economy principles. In **Subtask B**, SDU participates in the development of simulation models and system control strategies, including work on model predictive control and integration of TABS with other technologies at the building and district levels. SDU's technical input supports the development of systems that are not only efficient but also adaptable and user-friendly. In **Subtask D**, SDU contributes to defining performance indicators that can be used across Europe and supports alignment with existing regulatory frameworks.

The **active involvement of Denmark** was also reflected in the organization and participation of expert meetings. Notably, the second expert meeting was hosted in **Copenhagen**, reinforcing Denmark's central role in the Task's development. Danish researchers from both AAU and SDU have participated consistently in all major expert workshops held in Austria, Germany, and Spain, contributing to scientific discussions and the shaping of final deliverables.

In conclusion, IEA ES Task 43 represents a coordinated international effort to make TABS a scalable solution for energy flexibility and storage. **Denmark's contribution— through the leadership of Aalborg University and the broad technical engagement of the University of Southern Denmark—stands out as both strategic and comprehensive**. Together, these institutions help bridge the gap between technical readiness and market uptake by combining innovation in materials and control with evidence-based policy and regulatory insights. Their efforts significantly advance the goal of integrating building mass as a standardized, flexible, and sustainable energy storage solution for the future energy system.