

Switzerland energy storage for resilience

SURE is a research project sponsored by the Swiss Federal Office of Energy's "SWEET" programme (Call 1-2020) and coordinated by the Paul Scherrer Institute.

SWEET - "Swiss Energy research for the Energy Transition" - is a funding programme of the Swiss Federal Office of Energy (SFOE). SWEET's purpose is to accelerate innovations that are key to implementing Switzerland's Energy Strategy 2050 and achieving the country's climate goals.

A research project which builds on the expertise of ten research partners and a stakeholder forum with major representatives from the Swiss energy sector. The project SURE spans over six years until 2027 and can be characterised along the following three main lines:

Extending existing research in this field, a novel quantitative model- and data-based framework will be developed and applied based on combining holistic systemic approaches, comprehensive indicator databases, energy infrastructure and system modeling, and explicitly representing social and policy aspects.

The results from the model- and data-based framework feed into a stakeholder-informed, multi-objective decision support tool to develop strategies and policy measures to design an energy system that is more robust against disruptions and allows for rapid recovery in case a disruption takes place. Ultimately, the project will provide recommendations and guidelines to stakeholders on possible strategies towards a more sustainable and resilient energy future.

FIGURE 1. Global average power produced by renewable energy converters (CleanTechnica, 2020a).

TABLE 1. End energy use in Switzerland in case of an energy carrier, e.g., fossil fuels, hydrogen, and synthetic hydrocarbons, and in the hypothetical case of complete electrification.

FIGURE 3. (A) Monthly demand for energy in Switzerland. (B) Calculated monthly demand for electricity in Switzerland, if all energy is electric except the jet fuel.

TABLE 2. Relationship between the relevant parameters of photovoltaics (PVs), e.g., average power of 1 kW.

FIGURE 4. Monthly average solar irradiation. Dotted lines represent the annual average intensity. Ref.

FIGURE 5. Capital cost of energy storage versus the gravimetric energy density.

FIGURE 6. Efficiency loss along the conversion chain [light gray for substitution of fossil fuels through



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electrification (ELC), dark gray for substitution of fossil fuels by hydrogen (HYS), and black for substitution of fossil fuels by synthetic hydrocarbons (HCR)] relative to the electricity produced by photovoltaic (PV) (100%).

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