
www.alpstore.info

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AlpStore Project Brief

Topic: Strategies to use a variety of mobile and stationary storages to allow for extended accessibility and the integration of renewable energies

Consortium: 19 partners and subcontractors in all 7 Alpine Countries (Germany, Austria, Switzerland, Italy, France, Slovenia and Liechtenstein)

Supporters: over 70 formal observers

Budget: 3,3 Mio EUR

Funding: 76 % from ERDF/ Alpine Space Programme

24 % national funds

Runtime: July 2012 through December 2014

Leadpartner: B.A.U.M. Consult GmbH, München; alpstore@baumgroup.de
Guiding Questions

• What are the real **threads to the future energy system** in the Alpine Space?

• Which **needs for short and long term storage** will we face?

• Which **storage technologies** are and will be available?

• What can **mobility systems** contribute to the solution?

• What are the known **restrictions and benefits** of using storage technologies in the Alpine Space? (regional development, ecology, economy, acceptance etc.)

• How can appropriate technologies be **implemented today** in various Alpine frameworks (spatial, legal, political)?
## Assessment of Options

<table>
<thead>
<tr>
<th>Technology</th>
<th>Market availability</th>
<th>Storage period</th>
<th>Storage volume</th>
<th>Response time</th>
<th>Local option</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage of energy before conversion (biogas)</td>
<td>+++</td>
<td>days</td>
<td>+</td>
<td>medium</td>
<td>+++</td>
</tr>
<tr>
<td>Power-to-Gas (methylene in gas grid)</td>
<td>0</td>
<td>weeks</td>
<td>+++</td>
<td>quick</td>
<td>0</td>
</tr>
<tr>
<td>Power-to-Gas (hydrogen in gas grid)</td>
<td>0</td>
<td>weeks</td>
<td>+</td>
<td>quick</td>
<td>--</td>
</tr>
<tr>
<td>Power-to-Gas (hydrogen local)</td>
<td>--</td>
<td>days</td>
<td>-</td>
<td>quick</td>
<td>+</td>
</tr>
<tr>
<td>chemical storage (zeolite etc.)</td>
<td>+</td>
<td>days</td>
<td>0</td>
<td>slow</td>
<td>+</td>
</tr>
<tr>
<td>compressed air storage</td>
<td>+</td>
<td>weeks</td>
<td>0</td>
<td>medium</td>
<td>0</td>
</tr>
<tr>
<td>pump storage (regional in AS)</td>
<td>0</td>
<td>days</td>
<td>0</td>
<td>quick</td>
<td>++</td>
</tr>
<tr>
<td>pump storage (Scandinavia etc.)</td>
<td>+</td>
<td>weeks</td>
<td>++</td>
<td>quick</td>
<td></td>
</tr>
<tr>
<td>fly wheels (small-sized)</td>
<td>+++</td>
<td>minutes</td>
<td>--</td>
<td>very quick</td>
<td>+++</td>
</tr>
<tr>
<td>fly wheels (large-sized)</td>
<td>--</td>
<td>weeks</td>
<td>0</td>
<td>very quick</td>
<td>0</td>
</tr>
<tr>
<td>mobile batteries (electric vehicles)</td>
<td>--</td>
<td>hours</td>
<td>-</td>
<td>very quick</td>
<td>+++</td>
</tr>
<tr>
<td>stationary batteries</td>
<td>0</td>
<td>days</td>
<td>-</td>
<td>very quick</td>
<td>+++</td>
</tr>
</tbody>
</table>
STORM?
Smart Storage and Mobility

A model to develop and decide upon holistic solutions to increase regional RES supply and outbalance volatility with appropriate buffering means.
STORM Workflow

1. Investigate future regional generation and consumption patterns
2. Investigate storage needs and assess regional storage potential
3. Create a master plan for RES use and storage until 2030
4. Develop a pilot installation to start implementation of master plan
Work Process and Key Deliverables

- **2012**
  - Public Relations
  - Evaluation
    - Desk Research
    - Regional Masterplans

- **2013**
  - Public Relations
  - Evaluation
    - Pilot Implementations

- **2014**
  - Public Relations
  - Evaluation
    - Assessment and Dissemination

- **National Frameworks**
- **White Book**
- „STORM“ Guideline with Case Studies
Who shall use STORM?

- Local and regional power suppliers and grid operators
- Planning departments in local and regional administrations
- Investors and regional business entities
- Scientific institutes
**AlpStore Goals**

- To show how with **reliable energy provision** for Alpine regions to stay attractive as living habitats, working spaces and recreational sites.

- To provide a **model to develop and decide upon holistic solutions** to increase regional RES supply and outbalance volatility with appropriate buffering means.

- To test if with storage technologies **scattered habitats** (e.g. small villages Jezersko and Saint-Denis) and **combined business and living habitats** in metropolitan areas (e.g. Euroimpresa in Legnano) can become self-contained **energetic cells** on the grid.

- To show how **integrating mobility and energy** supply enables the establishment of entrepreneurial collectives managing local generation, storage and consumption cells.

- To **involve research and technology transfer institutions** and a big group of observers as supporters for intelligent regional master plans and implementation concepts.
Stationary and Mobile Batteries

- Smart Homes
- Smart Factories
- Smart Mobility
- Smart Grids
My Home - My Energy System?

- grid parity of PV!
- decentralised energy management ...
- energy autarky?
Smart Buildings on Smart Grids
AlpStore Oberallgäu: PV-Storeplus Haus

Electric Mobility

G2V
+ V2G
= V4G
Second Live Batteries from Electric Vehicles

- electric vehicle batteries

  ➞ stationary batteries:
  - home solutions
  - E-bike charge spots
AlpStore Oberallgäu: **PV-Store** plus **E-Bike**
Wildpoldsried: the 2020 village in the Allgäu

- 2,500 people
- 2,500 cows
- 9 windmills, biogas plant, 25,000 m² PV
- 50 full electric vehicles
- controllable substation
- 138 kWh battery (for grid management)
- 180 PMUs
Pump Stores and Hydropower

- Local balancing of renewable generation
- Transnational solutions
- Compatibility with nature and tourism aspects
Hydro power meets art (hydro power station in Kempten)
Biogas

- Balancing fluctuating generation with biogas CHPs?
  - Optimal capacity of gas store?
  - Additional heat store?
- Raw biogas for heating?
- Biogas in vehicles?
Power to Gas: Hydrogen and Methane

Diagram showing the process of converting electricity into hydrogen and further into methane. The process involves the following steps:

- **Electricity** + **H₂O** → **H₂** + **O₂**
- **H₂** + **CO₂** → **CH₄**

The diagram also illustrates the use of biogas, radiation, and wind power for generating hydrogen and gas stores. The resulting products include gas storage, electricity, mobility, heat, and other products.
Storing in the gas grid
Compressed Air

- Availability of technology?
- Storage in salt dome caverns?
- Flexibility of compressed air in production facilities?
STORM Guidance for Investors (draft)

- Continue installing RE and **don’t wait for better storage systems**.
- In Germany, make use of the **federal support programme** for battery systems.
- Complement new biogas plants with **up-grading facilities**.
- Complement existing biogas plants with **further CHP and extended biogas storage tanks**, operate the plants in a flexible mode and **sell the electricity via an aggregator**.
STORM Guidance for Regional Energy Utilities (draft)

• Invest yourself in renewable electricity generation.

• Optimise the installation of new generation facilities in pattern with the grid extension.

• Invest in pilot storage facilities to gain experience with different storage technologies.

• Develop new service options and business models to manage smart buildings and factories.

• Participate in projects to gain a better understanding of connecting intelligent objects and vehicles to the distribution grid and using their flexibility potentials.

• Support the development of a new design of the energy market.
STORM Guidance for Regional Authorities (draft)

• Establish an integrated regional energy development plan for generation, energy saving, demand side management and storage.

• Motivate citizens and companies to invest in energetic refurbishment of buildings and use of renewable energies.

• Support established enterprises and startup companies to develop and install intelligent solutions in residential and business buildings.

• Foster the development of sustainable mobility patterns including gas or electricity driven vehicles.

• Allow for storage technology when it contributes balancing services for the optimal operation of the local supply and consumption system.
We want! We can! We will!