Workshop on Hybrid Energy and Energy Storage Systems

21-22 September 2017, hosted by Ericsson, Rome, Italy

Minutes of the meeting

These minutes gives some brief notes about discussions and comments made during the workshop. Presentations are available at EERA web-site: www.eera-set.eu for download.

Agenda Thursday 21 September

Time	Topic	Introduction by
09:00	Registration and coffee	
09:30	Opening and Introduction	Atle Harby (SINTEF/EERA JP ES) Rossella Cardone (Ericsson)
09:40	Session 1: How to benchmark hybrid energy and energy storage systems *Chair : Edel Sheridan (SINTEF/EERA JP ES)*	Manuel Baumann (KIT)
11:00	Coffee Break	
11:20	Session 2: Scenarios and requirements for hybrid energy and energy storage systems *Chair: Giovanna Cavazzini (UNIPD/EERA JP ES)*	Alberto Gelmini (RSE)
12:40	Needs and trends in telecom industry related to energy *Chair: Erich Erdle (EFCECO)*	Mats Pellbäck Scharp (Ericsson)
13:10	Lunch	
14:20	Session 3: Markets and integration of hybrid energy and energy storage systems (2030-2040) *Chair: Edel Sheridan (SINTEF/EERA JP ES)*	Arshad Saleem (InnoEnergy)
15:40	Coffee Break	
16:00	Session 4: Technologies and strategies to integrate storage in power plants *Chair: Atle Harby (SINTEF/EERA JP ES)*	Giacomo Petretto (ENEL)
17:20	Wrap up	Atle Harby (SINTEF/EERA JP ES)
17:30	**End of meeting day one**	

Agenda Friday 22 September

Time	Topic	Introduction by
09:00	Demonstration Project for Power Supply to Telecom Stations through FC technology *Chair: Erich Erdle (EFCECO)*	Vincenzo Mulone (Tor Vergata University) Rossella Cardone (Ericsson)
09:30	ON-SITE project - system modelling - technical scope and results - market perspectives *Chair: Erich Erdle (EFCECO)*	Konrad Motylinski (IEN) Marco Ferraro (CNR/EERA) Marco Filonzi (Ericsson)
10:45	FCH JU's strategic objectives and the future targeted role of the European fuel cell and hydrogen related industry on the global market *Chair: tbc*	Dionisis Tsimis (FCH JU)
11:15	Coffee Break	
11:30	Final discussion, brainstorming and conclusion: Recommendations for research, industry and policy makers *Chair: Atle Harby (SINTEF/EERA JP ES)*	All
13:00	**End of meeting**	

Some comments and discussions

Most of the people attending the workshop are involved in some way in Energy Storage. It is our goal to find arguments to convince policy makers why it is important to focus more on energy storage for the future development of the energy system.

- Metrics are essential to quantify the characteristics of energy storage technologies. Possible metrics to evaluate the goodness of energy storage are:
  - Technoeconomic: Life cycle cost (LCC): €/kW
  - Environmental: Carbon footprint: kg CO_2/kWh
  - Technology readiness level and system readiness level
- Hybrid storage covers a wider range of application and no necessarily more expensive, so considering the appropriate metric to measure these benefits is required
- The diagram showing different storage technologies along the x-axis "power capacity" and the y-axis "discharge time", needs further specification. It is also a good idea to collect data from real applications and plot them in this diagram. Theoretical application areas do not allow fair comparisons between technologies. Industrial scale and laboratory scale should be considered independently.
- Telecom operators have energy storage and batteries available that can be used also as a service for electricity storage

- In the future, we will probably not pay for energy, but for the service provided
- Storage systems generate greater value if used to supply multiple services and applications
- Integration of energy vectors and systems must be considered (electricity, heating/cooling, transport, etc)
- Providing optimal energy storage is a multi-dimensional problem including technology, business model, regulation, industrialisation, job creation, environmental impacts and social acceptance
- The interactions between energy producers, energy storage owners and Transmission System Operators (TSO's), is not optimal today and must be re-considered in most countries and markets
- Some regions already see a surplus of renewable energy, and there is a need for improved grid and more storage. An example from Sardinia in Italy was shown.
- Short term batteries can substitute fossil fuel based generation for regulation, but still there are much development needed to bring costs down, improve degradation and reliability in the long term
- Although research continues in Li batteries, some other alternatives are under r3esearch such as Aluminium and Cobalt, in order to achieve reliability, security, responsibility and recyclability.
- We need to educate people and policy makers about energy storage
- Levelized cost of energy (LCOE) is establish as a common parameter to compare energy sources. We should propose "Levelized cost of storage"
- One of the advantages of the technology of flywheels, compared with other storage technologies, is that the degradation is much lower (to be considered in the cost)
- Although Hydrogen Storage is mostly focused in transportation, the technology is very developed today and it is increasing in capacity and applications.

Conclusions

The key messages from the workshop are summarized:

- Metrics are essential to quantify the characteristics of energy storage technologies
- Maturity level (TRL & SRL) in assessment of storage options
- Reliability is important for many sectors
- Overgeneration and shortage represent a problem in case of high RES
- Location important – both RES distribution and system
  How to get the most out of the system?
- Holistic view on storage in different value chains:
  transport – electricity – natural gas grid - ICT
- No market for long-term storage today – under development
- Storage in base stations and other "hidden" storage can be used also in the grid?
- Power is more important than energy?

- Battery, transport etc as a service (service based economy)
  Energy storage is a multidimensional problem:
  Technology – business model – regulation – industrialisation – stakeholders – environment and climate
- Policy makers should also considers job opportunities
- Need to say "game over" to some technologies and "simplify" the "bubbles diagram"
- Key performance metrics:
  Cost – reliability – (system efficiency) – control – environment
- Efficiency for the whole system (not only storage) – energy efficiency
- Storage systems generate greater value if used to supply multiple services and applications
- Penalties avoided = revenues from services
- One power plant can only participate in one market today
- Smart storage (the right storage in the right place)
- Smart regulation

Recommendations

The joint recommendations from the workshop are:

- Study real applications of energy storage and put "dots" in the diagram MW – time
- Capacity markets must be developed across regions and countries
- We need to focus more on power and capability – rather than energy only:
- Focus on energy services
- Need to stack revenues from different markets and maybe change regulation?
- Make "bubble diagram" with "other axis" like CO_2-emissions, reliability, TRL etc.
- Education about storage
  - Hydrogen use
  - Safety in batteries
  - Changing operation of existing hydropower
- Explore the opportunities of integrating different infrastructures and value chains to increase overall performance
- Explore how to use "hidden storages": "Telecom to grid" (microgrids)