

STORY – DEMONSTRATING THE ADDED VALUE OF STORAGE IN DISTRIBUTION SYSTEMS

Johanna PUCKER¹, Heribert VALLANT¹, Stefan MARKSTEINER¹,
Andreas TÜRK¹

Introduction

Today, an increased share of highly variable renewables already challenges the European energy grid. In the future this situation will be intensified, as the EU has set a target of at least 27% for the share of renewable energy consumed in the EU in 2030. The European Commission's Energy Union strategy [1], published in February 2015, states the commitment of the European Union to become the world leader in renewable energy. To fulfil these aims and targets, storage technologies are outlined as a major requirement.

Therefore, energy storage is the focus of the HORIZON 2020 project STORY. STORY aims at

- Developing new ways to use storage and demonstrating these on a number of sites;
- Analysing impact of large scale rollout of the demonstrated storage technologies;
- Developing various business model archetypes and determining the required policy and regulatory framework supporting them;
- Communicating the findings to a wider public through systematic strategies for impact creation.

These topics are addressed by the STORY project team consisting of 18 European institutions from 8 countries, which started their work in May 2015 and will work together until 2020.

First, this paper presents the demonstration cases, which are the key activity of the project, on which further analysis builds. Second, it describes the role of ICT in integrating storage technologies into the grid. Third, it gives an outlook on the analysis of the impact of a large scale rollout of storage technologies in Europe.

Demonstration cases

STORY presents six different demonstration cases, each with different local/small-scale storage concepts and technologies, covering industrial and residential environments. Table 1 gives an overview of the investigated demonstration cases.

		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
		Residential building scale	Residential neighbourhood scale	Storage in a factory	Storage in residential district	Large scale storage unit	Roll out of private multi-energy grid
Type of storage	thermal storage	✓	✓			✓	✓
	battery	✓	✓	✓	✓	✓	✓
	CAES				✓		
Connected to the power grid		✓	✓		✓	✓	
Energy technology	CHP					✓	✓
	vacuum solar collectors	✓	✓				
	heat pump	✓	✓				
	PV	✓	✓	✓		✓	✓
	wind power plant				✓		
	tidal energy plant				✓		
	biogas plant				✓		
fuel cell	✓	✓					
User sector		residential	residential	industrial	residential	residential & industrial	industrial
Location		Belgium	Belgium	Spain	Northern Ireland (UK)	Germany & Slovenia	Belgium

Table 1: Overview of the investigated demonstration cases.

¹ Joanneum Research Forschungsgesellschaft, Leonhardstraße 59, 8010 Graz, www.joanneum.at
{Tel.: +43 316 876-1433, johanna.pucker@joanneum.at},
{Tel.: +43 316 876-1197, heribert.vallant@joanneum.at},
{Tel.: +43 316 876-1163, stefan.marksteiner@joanneum.at},
{Tel.: +43 316 876-1337, andreas.tuerk@joanneum.at}

ICT as a supporting service

The focus of ICT as a supporting service for the management of STORY systems in smart multi-energy grid is to facilitate communication, integrate control algorithms, increase interoperability and provide measurement services. One major challenge is that STORY energy requests and sensed measured data is reliably transferred both internally within the demo site and externally outside of the company's network. This reliable transfer includes, besides availability and robustness, also additional security and privacy issues that arise when data is transferred outside the company's network. To cover these issues, a novel gateway will be developed, capable to perform some local optimisation regarding local needs and also to enable the distribution system operators to access and perform grid support actions under secure conditions.

Outlook: Large-scale impact assessment

The results from the six demonstrations feed into a large-scale impact assessment with the central question being: "What if a large amount of storage is integrated in the distribution grid?" The assessment considers challenges to the grid infrastructure, the impact on the integration of local decentralized and large scale centralized renewable energy sources. It includes economic, social and environmental impacts as well as the identification of business model archetypes and business preconditions.

Acknowledgement



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646426 Project STORY-H2020-LCE-2014-3

References

- [1] European Commission (2015) Energy Union Package Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, COM(2015) 80 fin, Brussel, 25.2.2015, http://ec.europa.eu/priorities/energy-union/docs/energyunion_en.pdf, accessed 26.11.2015