

# Facilitating energy storage to allow high penetration of intermittent **renewable energy**



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# stoRE: Main Facts

- From May 2011 to April 2014
- **Aim:** facilitate the high penetration of intermittent renewable energies in the European grid by unlocking the potential for energy storage infrastructure
- **Overall objective:** help creating the regulatory and market conditions that will give incentives for development of the necessary storage infrastructure



# Project Summary

stoRE will support the development of ES infrastructure in Europe to the extent necessary for the accommodation of the planned RE installations to the electricity grid, through:

- Analysis of the energy storage status and potential
- Assessment of the environmental considerations for the development and operation of energy storage facilities
- Identify, assess and review together with the key stakeholders the regulatory and market framework conditions in Europe and in the target countries
- Dissemination activities for improving the understanding of the benefits of energy storage for the energy systems of Europe.

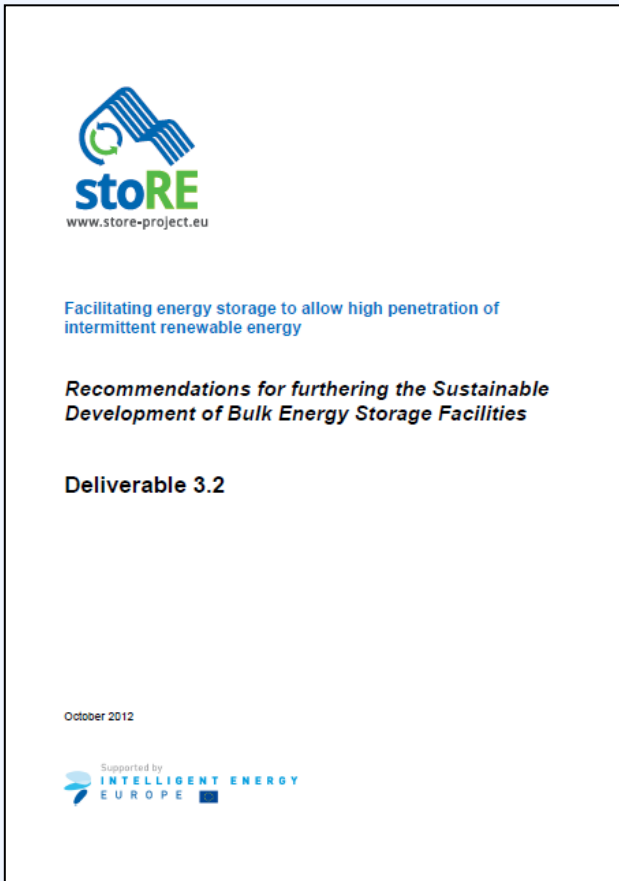


# Presentation Structure

***Part I: Recommendations for furthering the Sustainable Development of Bulk Energy Storage Facilities***

***Part II: Review of the Regulatory and Market Framework Conditions ← Open consultation***

# Recommendations for furthering the Sustainable Development of Bulk ES Facilities



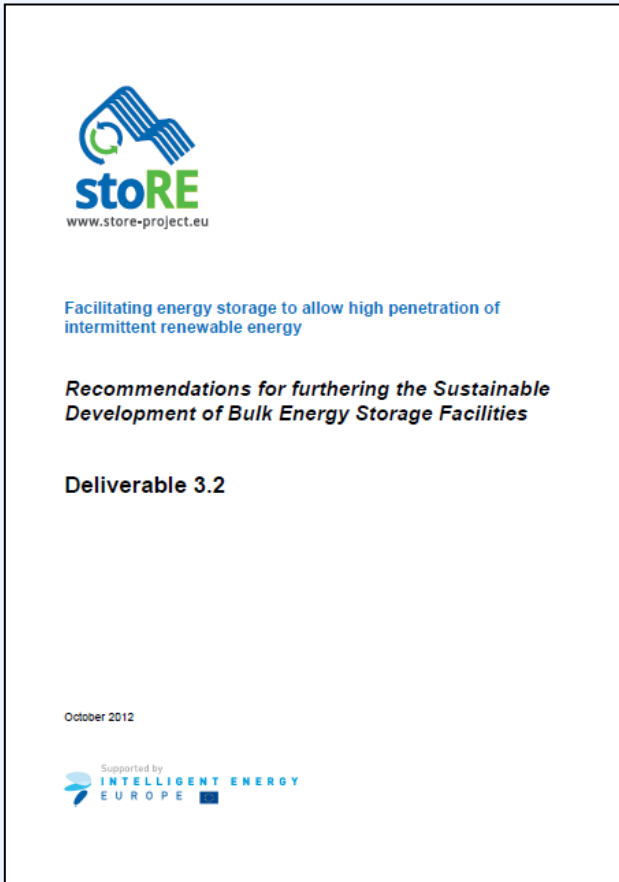
[Link to report](#)

**Aim:** Provide policy makers, planners & developers with recommendations to further the sustainable development of bulk EST projects by eliminating or reducing adverse environmental effects.

## **Methodology:**

- Wide stakeholder consultation process
- 3 RT discussions with relevant stakeholders
- Previous stoRE reports + extens. literature review
- Expert input from the assessment team

# Recommendations for furthering the Sustainable Development of Bulk ES Facilities



## Relevant Directives for Project Development:

- Renewable Energy Directive (Directive 2009/28/EC)
- Water Framework Directive (Directive 2000/60/EC)
- Directives Relating to Biodiversity and Natura 2000 Network
  - Habitat Directive (Directive 92/43/EEC)
  - Birds Directive (Directive 2009/147/EC)
- Directives Relating to Environmental Assessment
  - SEA Directive (Directive 2001/42/EC)
  - EIA Directive (Directive 2011/92/EEC)

[Link to report](#)

# Recommendations for furthering the Sustainable Development of Bulk ES Facilities

## *Recommendation 1: Identify the Need*

*Once the need for bulk EST has been identified, it is essential that energy storage policy and clearly discernible objectives are developed at EU and MS level.*

## *Recommendation 2: Develop Plans and Programmes*

*Where MS acknowledge the need for energy storage in their NREAP they should consider this technology at a strategic planning level, the early stage of the decision-making cycle, and develop sustainable plans and programmes to facilitate the national and regional deployment of bulk EST as appropriate.*



## *Recommendation 3: Identify Viable Sites at Strategic Level*

*It is recommended that physically viable sites be identified and tested (subject to environmental assessment) at a strategic level during the development of PHES plans and programmes.*

# Recommendations for furthering the Sustainable Development of Bulk ES Facilities

## *Recommendation 4: Develop Clear Guidelines and Document Best Practice*

*Clear MS guidelines for sustainable project development, best practice guidelines and guidelines for planning are required to further the sustainable development of bulk EST.*

## *Recommendation 5: Facilitate Planning and Approval Procedures*

*It is recommended that the efficiency and speed with which bulk EST projects are considered during the planning approval stage be improved with the establishment of appropriate mechanisms.*



# Presentation Structure

***Part I: Recommendations for furthering the Sustainable Development of Bulk Energy Storage Facilities***

***Part II: Review of the Regulatory and Market Framework Conditions ← Open consultation***

# Review of the Regulatory and Market Framework Conditions

## **Aim:**

Identify the key elements of the existing European framework that potentially create unfavorable conditions for the development and operation of ES infrastructure and provide recommendations for improvements

## **Methodology:**

- A critical review of EC Directives and energy market regulations
- Open stakeholder consultation
- 3 RT discussions with relevant stakeholders
- Expert input from the assessment team

# Collected feedback

## Current Business Model: Feasibility

The **spread between off-peak and peak prices** has been **decreasing** (partly because of high generation by volatile RES) ---> Smaller profit margins for ES plants ---> Uneconomic to build new PHES

**Additional income** streams for ESF vary in different MS and include reserve markets, ancillary services markets, balancing markets, capacity markets and portfolio effects. **But** market design is not clear and price trends in these markets are difficult to foresee ---> Financing difficulties

ESF have to pay **grid fees** for both consuming and generating energy ---> further profitability reduction

# Collected feedback

## Market Design: Grid Fees

### Possible recommendation:

- No double grid access fees
- Common rules across the EU regarding grid access fees in order to avoid deployment of an ESF in one MS for use in another MS with less favourable rules

# Collected feedback

## Current Business Model: Financial Support

**Infrastructure package:** Financial support possible for transmission lines and certain types of ESFs but not for PHES ---> Market distortion

**Equally open support** to all ESTs

**Removing support** from all ESTs

} Level-playing field between PHES and other ESTs

# Collected feedback

## Regulatory Framework: Unbundling principle

Electricity Directive:  
Electricity generation  
not controlled by TSOs

+

ES is treated  
as generation

=

**TSOs shouldn't have  
any control over ESFs**

TSOs should define the products needed for balancing and stability of the system and use **market based mechanisms** for procuring these products

**However**, there is still **legal uncertainty** regarding the implementation of the unbundling principle on ES ---> Example: controversial regulation in Italy where TSO owns and operates batteries.

**ENTSO-E** in the latest TYNDP: *“In terms of regulatory issues, open questions are related to which players (private market operators contributing to system optimization or regulated operators) shall own and manage storage facilities*

# Collected feedback

## Regulatory Framework: Unbundling principle

The on-going discussion does not help ES to progress in a clear framework. **A definition of storage should be included in the Electricity Directive, the unbundling principle has to be officially clarified**

**Option 1:** The unbundling principle should apply also to ES  
---> No TSO control over ESFs

**Option 2:** Allow control by TSOs on ESFs but subject to conditions that would ensure the functioning of an open, fair and transparent market

**Option 3:** None of the above gives the optimal technical, economic and social result on a system level when transmission vs. storage decisions need to be made ---> introducing the option of exceptions defined with clear and transparent criteria implemented under the supervision of ACER

# Collected feedback

## Market Design: Market failure

Clear **market signals** on expected income from the provision of their services are needed ---> These signals would be interpreted by ES operators

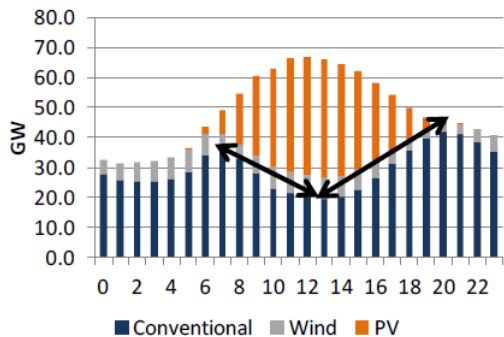
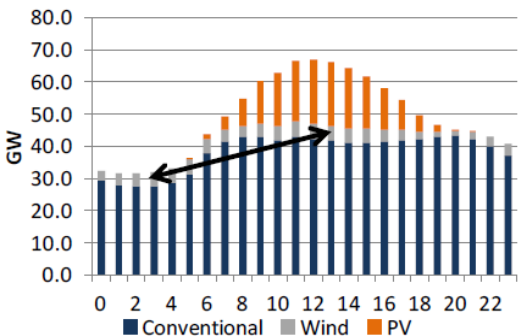
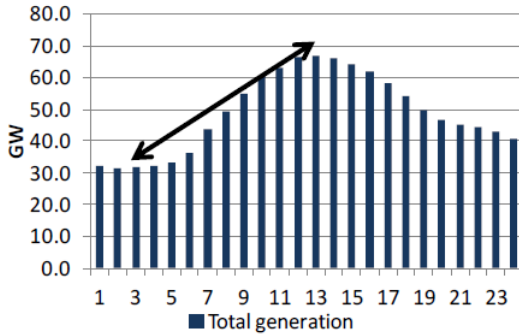
**Adequate market signals are in place.** If PHES or other ESS are not viable in certain MS, this means that there are **other resources** that can provide the needed services **more efficiently**

**Market signals alone are not enough** for the **timely** indication of the need for storage in a market with financial support for RES and transmission infrastructure



# Collected feedback

## Market Design: Market failure



Source: Simon Mueller, IEA

Medium term: Solar energy helps to smooth the residual load curve reducing the need for ES.

Long term: The need for ES is expected to grow again.

Currently there is no market signal pointing in this direction. But **PHES** has **development** times that can be **over 10 years**. So, if energy storage will be required in the period 2020 to 2030, the **markets signals should be available now**. <--- **Market failure**

**Use models for predicting future ES needs in order to design a suitable intervention in the market design**

# Collected feedback

## Market Design: Ways to overcome the market failure

Introduction of elements that **reward flexibility in RES support mechanisms** could reduce distortion in the market and make the market signals for flexibility and storage requirements more clear

Support storage only when storing **excess RES-e**

Establish a **forward services market** in which the service is bought sufficiently far forward

**Capacity payments or tenders** where the capacity contribution of ESF will be defined according to clear and widely accepted rules

# Collected feedback

## Market Design: Balancing Market

Stakeholders are keen to see the full transposition of **transparent and market based mechanisms for balancing** and the development of the **network guidelines on balancing**, allowing them to participate in cross border balancing activities

- Draft report available for feedback very soon
- stoRE event within EUSEW (late June 2013)

# Thank you!