

Storage: solution for us or for our children?

FEBELIEC Info session

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The answer always depends on how old and how fit you are ...



1. CONTEXT

- Storage as a source of flexibility for the system: storage is not the solution but is a part of the solution
- CREG study 1412 about the *rentability of electricity storage in Belgium*
- Objectives of the study:
 - i. Identify the storage technologies currently available;
 - ii. Identify the costs related to storage in Belgium, whether they are specific to a technology or to Belgium;
 - iii. Identify measures that the governments can take to promote electricity storage in Belgium.

2. STORAGE TECHNOLOGIES CURRENTLY AVAILABLE

- Different technologies are available (pumped hydro, CAES, flywheel, power-to-gas, SMES, supercapacitor, batteries, ..)
- Each technology has its own specificities (maturity, energy density, losses, loading time, instant power, response speed, lifetime ...)
- Those different specificities could respond to different system flexibility needs
- The short term system flexibility needs are not the long term system flexibility needs
- The choice between the different technologies should not only be based on costs but also on specificities

3. COSTS RELATED TO STORAGE

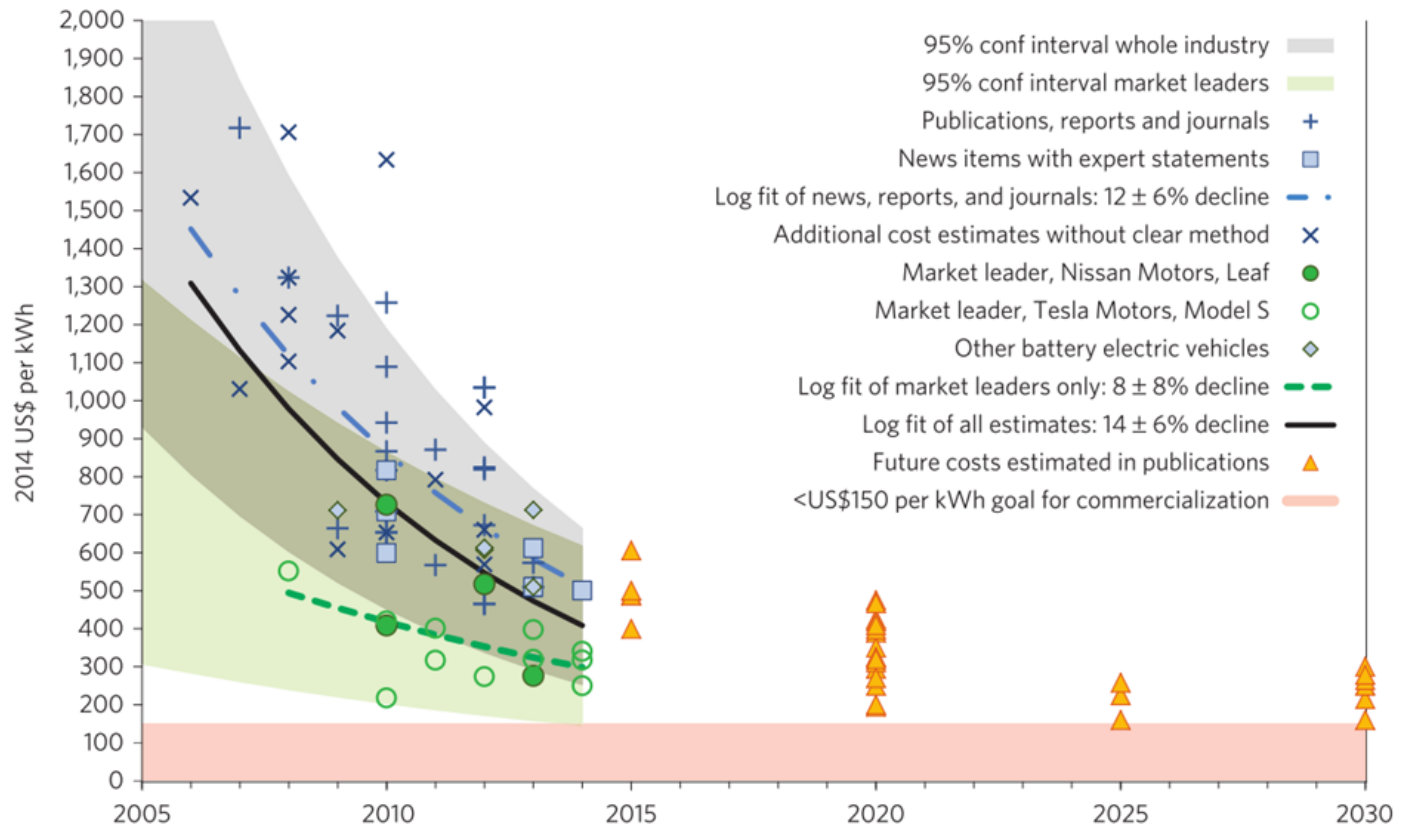
3.1. COSTS RELATED TO A TECHNOLOGY (1/3)

- Main focus on investment costs
- Broad estimates for a given technology because of:
 - geographic specificities (cf. labor costs & topology)
 - technological change
 - economies of scale
- For certain technologies (cf. pumped hydro) costs will be stable or will increase in the future
- For certain technologies (cf. batteries) costs will clearly decrease in the future
- Current cost estimates should be carefully used as references for the future

3. COSTS RELATED TO STORAGE

3.1. COSTS RELATED TO A TECHNOLOGY (2/3)

- For certain technologies (cf. batteries) costs will clearly decrease in the future. Illustration: EV battery costs estimates.



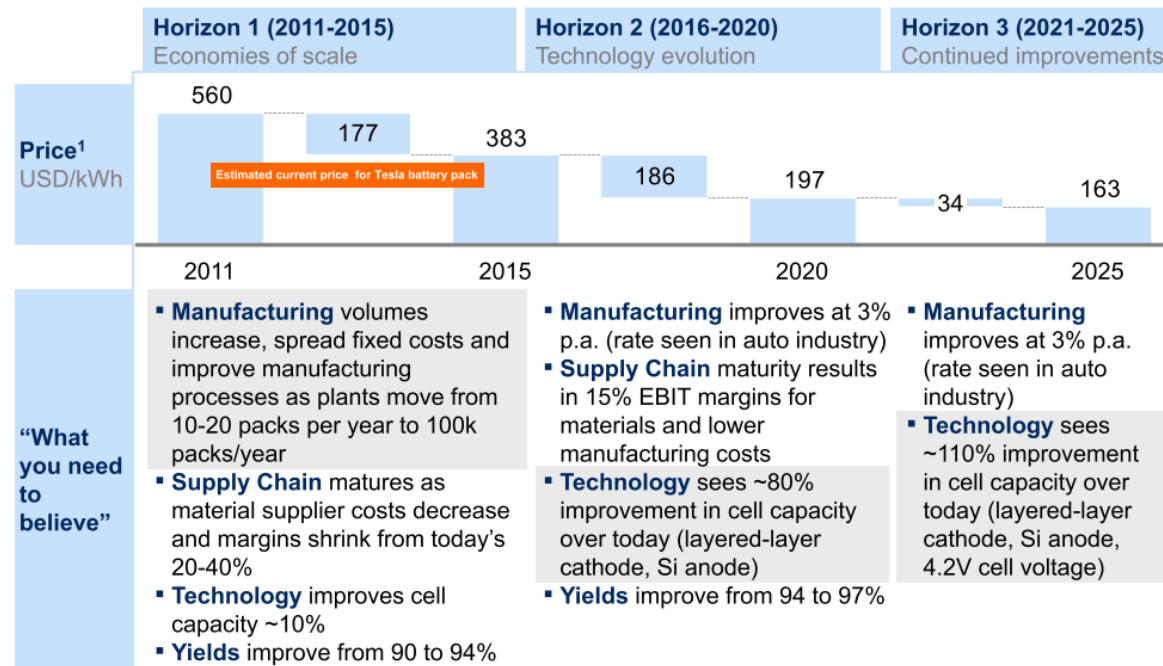
3. COSTS RELATED TO STORAGE

3.1. COSTS RELATED TO A TECHNOLOGY (3/3)

- For certain technologies (cf. batteries) costs will clearly decrease in the future. Illustration: EV battery costs estimates.

EV battery costs could drop materially to ~USD 200/kWh by 2020 and ~USD 160/kWh by 2025 Major source of improvement

Large format pack price evolution at 70% depth of discharge



¹ Price is to auto OEM for entire vehicle pack assuming 8.7 kWh (PHEV 20) with pack and BMS, 70% depth of discharge, made on US assembly lines

3. COSTS RELATED TO STORAGE

3.2. COSTS RELATED TO BELGIUM (1/4)

- Legally, storage is alternatively considered as consumption and production. As a result, a storage plant directly connected to the grid currently has to:
 - i. pay grid tariffs;
 - ii. compensate grid losses on the 380/150 kV grid;
 - iii. pay all taxes & levies.
- One exception: pumped hydro plants located in Wallonia are exempted from the green certificates quotas
- Those costs are mainly function of (i) the amount of energy consumed, (ii) the tension level of the connection and (iii) the region where the connection takes place

3. COSTS RELATED TO STORAGE

3.2. COSTS RELATED TO BELGIUM (2/4)

- Illustration – main assumptions:
 - 500MW pumped hydro plant consuming 1.000.000MWh/year
2 connection configurations (TSO in WA and FL)
 - 1MW battery consuming 1.000 MWh/year
6 connection configurations (TSO + DSO LV in the 3 regions)
 - tariffs, taxes & levies observed in March 2015
 - if applicable, characteristics needed to benefit from exemption and/or degressivity are fulfilled (cf. “accord de branche” etc)

3. COSTS RELATED TO STORAGE

3.2. COSTS RELATED TO BELGIUM (3/4)

- Illustration – details:

Lieu du raccordement		Centrale de pompage turbinage		Batterie					
		GRT Wallonie	GRT Flandre	GRT Flandre	GRT RBC	GRT Wallonie	GRD BT Flandre (IVERLEK)	GRD BT RBC (SIBELGA)	GRD BT Wallonie (ORES Hainaut)
Coûts fixes annuels									
- Tarif de la puissance souscrite pour le réseau de transport	EUR/an	6.640.600,00	6.640.600,00	13.281,20	13.281,20	13.281,20	0,00	0,00	0,00
- Cotisation fédérale	EUR/an	252.750,00	252.750,00	0,00	0,00	0,00	0,00	0,00	0,00
- Tarif pour obligations de service public pour le financement de certificats verts imposé à ELIA	EUR/an	250.000,00	250.000,00	0,00	0,00	0,00	0,00	0,00	0,00
- Tarif activité de mesure et comptage pour le réseau de distribution	EUR/an	0,00	0,00	0,00	0,00	0,00	9,42	12,87	27,32
Coûts variables - prélèvements									
- Tarifs de réseau de transport	EUR/MWh prélevé	1,80	1,80	1,80	1,80	1,80	8,98	10,77	13,55
- Cotisation fédérale	EUR/MWh prélevé	0,00	0,00	2,04	2,04	2,04	2,04	2,12	2,04
- Tarif pour obligations de service public pour le financement de certificats verts imposé à ELIA (cf. Surcharge certificat vert)	EUR/MWh prélevé	0,00	0,00	3,26	3,26	3,26	3,26	3,32	3,26
- Tarif pour obligations de service public pour le financement du raccordement des parcs éoliens offshore imposé à ELIA	EUR/MWh prélevé	0,06	0,06	0,06	0,06	0,06	0,07	0,07	0,06
- Tarif pour obligations de service public réserve stratégique imposé à ELIA	EUR/MWh prélevé	0,61	0,61	0,61	0,61	0,61	0,61	0,62	0,61
- Coût lié à la compensation en nature des pertes actives sur le réseau de transport 380/220/150kV	EUR/MWh prélevé	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
- Tarifs de réseau de distribution	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	60,38	46,64	56,56
- Tarif pour obligations de service public pour le financement des mesures de promotion de l'utilisation rationnelle de l'énergie imposé à ELIA	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	0,07	0,00	0,00
- Tarifs pour obligations de service public pour le financement des mesures de soutien aux énergies renouvelables et cogénération imposé à ELIA	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	0,56	0,00	2,07
- Surcharge pour couvrir les coûts facturés à ELIA pour occupation du domaine public	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,35
- Tarifs pour obligations de service public imposées au GRD	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	45,31	11,04	10,55
- Surcharges pour couvrir les coûts facturés aux GRDs en matière de charges et pensions non-capitalisées	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	1,56	4,54	2,24
- Surcharges pour couvrir les coûts facturés aux GRDs en matière de droits de voirie et autres rétributions	EUR/MWh prélevé	0,00	0,00	0,00	0,00	0,00	0,74	10,34	2,67
- Coûts liés à l'obligation de présenter certificats verts et cogénération pour couvrir les prélèvements	EUR/MWh prélevé	0,00	2,15	17,30	4,34	23,55	17,30	4,34	23,55
Coûts variables - injections									
- Tarifs de réseau de transport	EUR/MWh injecté	0,91	0,91	0,91	0,91	0,91	0,00	0,00	0,00
- Tarifs de distribution	EUR/MWh injecté	0,00	0,00	0,00	0,00	0,00	4,21	0,00	0,00
- Surcharges charges et pensions non-capitalisées	EUR/MWh injecté	0,00	0,00	0,00	0,00	0,00	1,56	0,00	2,24
- Surcharge droit de voirie et rétributions	EUR/MWh injecté	0,00	0,00	0,00	0,00	0,00	0,74	0,00	0,00

3. COSTS RELATED TO STORAGE

3.2. COSTS RELATED TO BELGIUM (4/4)

- Illustration – summary:

		Centrale de pompage turbinage		Batterie					
Lieu du raccordement		GRT Wallonie	GRT Flandre	GRT Flandre	GRT RBC	GRT Wallonie	GRD BT Flandre (IVERLEK)	GRD BT RBC (SIBELGA)	GRD BT Wallonie (ORES Hainaut)
Compétence fédérale									
Coûts fixes annuels	EUR/an	7.143.350,00	7.143.350,00	13.281,20	13.281,20	13.281,20	0,00	0,00	0,00
Coûts variables - prélèvements	EUR/MWh prélevé	2,97	2,97	8,27	8,27	8,27	15,46	17,41	20,02
Coûts variables - injections	EUR/MWh injecté	0,91	0,91	0,91	0,91	0,91	0,00	0,00	0,00
Compétence régionale									
Coûts fixes annuels	EUR/an	0,00	0,00	0,00	0,00	0,00	9,42	12,87	27,32
Coûts variables - prélèvements	EUR/MWh prélevé	0,00	2,15	17,30	4,34	23,55	125,91	76,89	97,98
Coûts variables - injections	EUR/MWh injecté	0,00	0,00	0,00	0,00	0,00	6,51	0,00	2,24
Compétence fédérale + Compétence régionale									
Coûts fixes annuels	EUR/an	7.143.350,00	7.143.350,00	13.281,20	13.281,20	13.281,20	9,42	12,87	27,32
Coûts variables - prélèvements	EUR/MWh prélevé	2,97	5,12	25,56	12,60	31,81	141,37	94,30	118,00
Coûts variables - injections	EUR/MWh injecté	0,91	0,91	0,91	0,91	0,91	6,51	0,00	2,24

4. REVENUES RELATED TO STORAGE

4.1. ARBITRAGE

- “Buy low, sell high” ... but cover the energy losses costs
- Electricity can be bought and sold on BELPEX and on the imbalance market

4.2. ANCILLIARY SERVICES

- Mainly R1, R2, R3 (but also black start and voltage control)
- Tendency to shorter sourcing across Europe
- R1 and R2 reservation prices were high over the past years mainly due to the clean spark spread evolution
- Additional operational constraints imposed for R1 and R2 participation (cf. continuous functioning and regulation)
- Dimensioning of offered volumes is key to avoid high penalties

5. BARRIERS TO STORAGE DEVELOPMENT

5.1. BARRIERS FACED BY ALL TECHNOLOGIES

- High grid tariffs, taxes & levies
 - drastically reduce arbitrage opportunities & margins
 - especially problematic for storage plants directly connected to the grid
 - for an auto producer, could - paradoxally - be an incentive to install local storage (cf. battery)
- Not well-suited BELPEX & balancing products
 - no “storage order” on BELPEX
 - constraints related to the activation period & availability imposed for some balancing products

5. BARRIERS TO STORAGE DEVELOPMENT

5.2. BARRIERS FACED BY SOME TECHNOLOGIES

- Mismatch between:
 - important fixed costs on the long term (> 50 years) and;
 - volatiles revenues with a short term visibility (< 1 month).
- Important delay (> 5 years) between the investment decision and the commissioning
- NB: those barriers are also faced by some production technologies

6. HOW GOVERNMENTS CAN ENCOURAGE STORAGE

- General principles:
 - i. all decisions should be technology neutral because:
 - there will be technological evolutions in the near future
 - the system flexibility needs are evolving
 - ii. key focus should be on barriers specific to Belgium (cf. taxes & levies but also grid tariffs) that are faced by all storage technologies
- “Quick wins” are identified and their impact are simulated in the study (concerning a.o. the federal contribution, the federal levy green certificate & the regional certificate schemes)

7. CONCLUSION: solution for us or for our children?

- Storage is not the solution, it is a part of the solution
- The pace at which storage will enter the market depends on:
 - i. the evolution of the system flexibility needs
 - ii. the technological evolutions and the economies of scale
 - iii. the measures (not) taken by the government(s)

8. FURTHER READING?

- CREG, study 1412 about *the rentability of electricity storage in Belgium*, April 2015
Available on: <http://www.creg.info/pdf/Etudes/F1412FR.pdf>

