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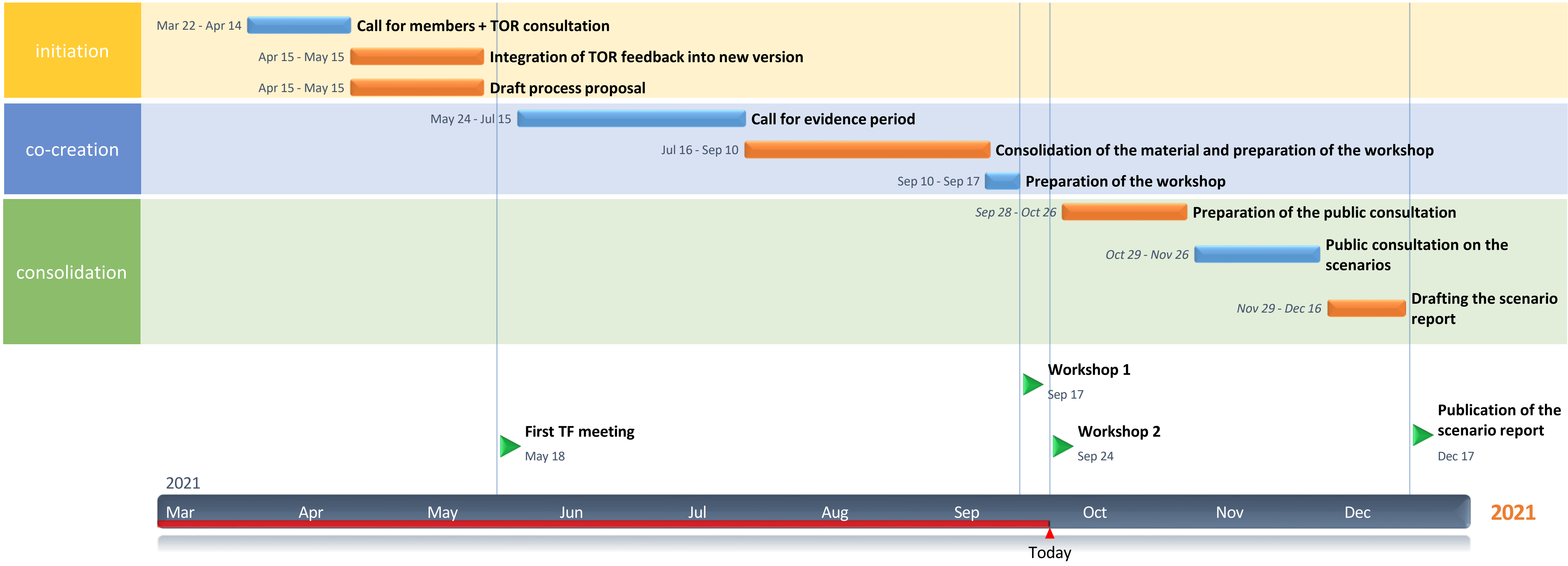
Task Force scenarios – Workshop #2 Flexibility in electricity consumption

24-09-2021

Agenda

Start	End	Timing	Topic
13:00	13:10	00:10	Welcome to the workshop
13:10	14:10	01:00	Overview of technology (CE Delft & Fluxys)
14:10	14:25	00:15	Coffee break
14:25	14:45	00:20	Introduction to key questions & drivers for Belgium
14:45	15:30	00:45	Brainstorm / discussion
15:30	16:00	00:30	Feedback + QA

Recap – Planning for 2021



Introduction

- The goal of the workshop is firstly to identify all the relevant technology for assessing the flexibility in electricity consumption from short term to mid term
- In a second step, discussions over the characteristics of each technology will take place aiming to define the technical capabilities and possible values for Belgium

Bloomberg definition

What is flexible demand?

shedding

Flexible demand refers to shifting electricity consumption to coincide with times when electricity is clean and cheap. It can be achieved primarily in two ways:

- Utilities or grid operators send economic or other signals to customers. Customers respond by reducing electricity consumption at times of high stress on grid.
- Communication and control technology automatically reshapes a customer's demand profile on an ongoing basis. For instance, a utility can preheat water, pre-cool houses at midday and time electric vehicle charging at midnight.

Definition of flexibility

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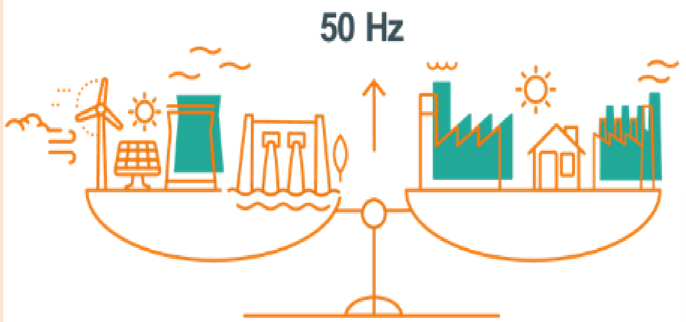
"The extent to which a power system can modify electricity production or consumption in response to variability, expected or otherwise" - International Energy Agency 2011

Flexibility drivers

- Variability of the demand
- Variability of generation
- Generation or transmission network incidents



Flexibility sources

- Generation units
- Interconnections
- Demand-side
- Storage

Focus of the workshop

Short term to mid term flexibility in electricity consumption for 2040, 2050

Overview of technology:
CE Delft

Call for evidence - Fluxys

Background and key questions

Flexibility options of the electricity consumption (focus on Belgium)

Categories

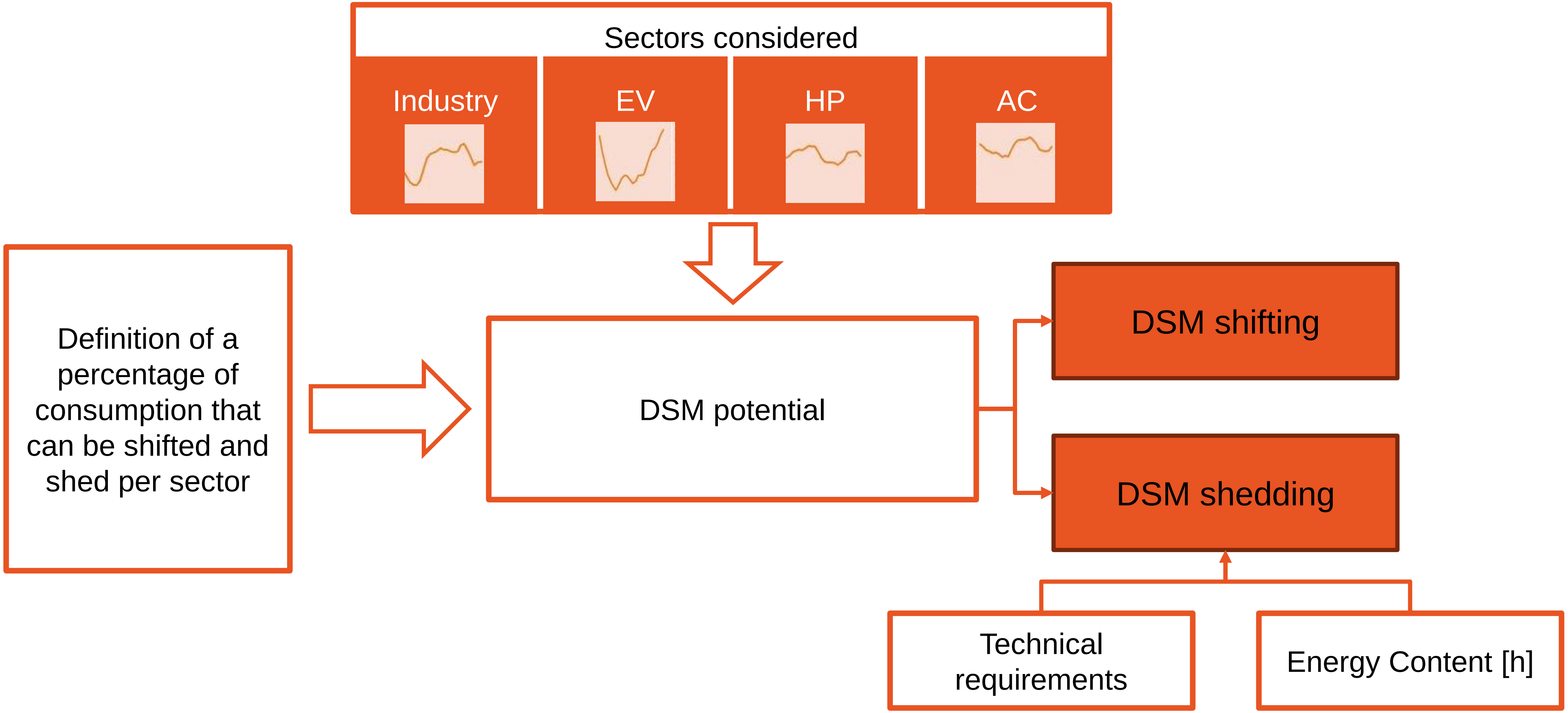
- Demand Side Response
  - Shedding
  - Shifting
- Storage
  - Small scale storage
  - Large scale storage
  - Vehicle to grid
  - Pumped storage
- Electrolyser
- Others ?

Are there any other technology/behavior changes that could be a game changer ?

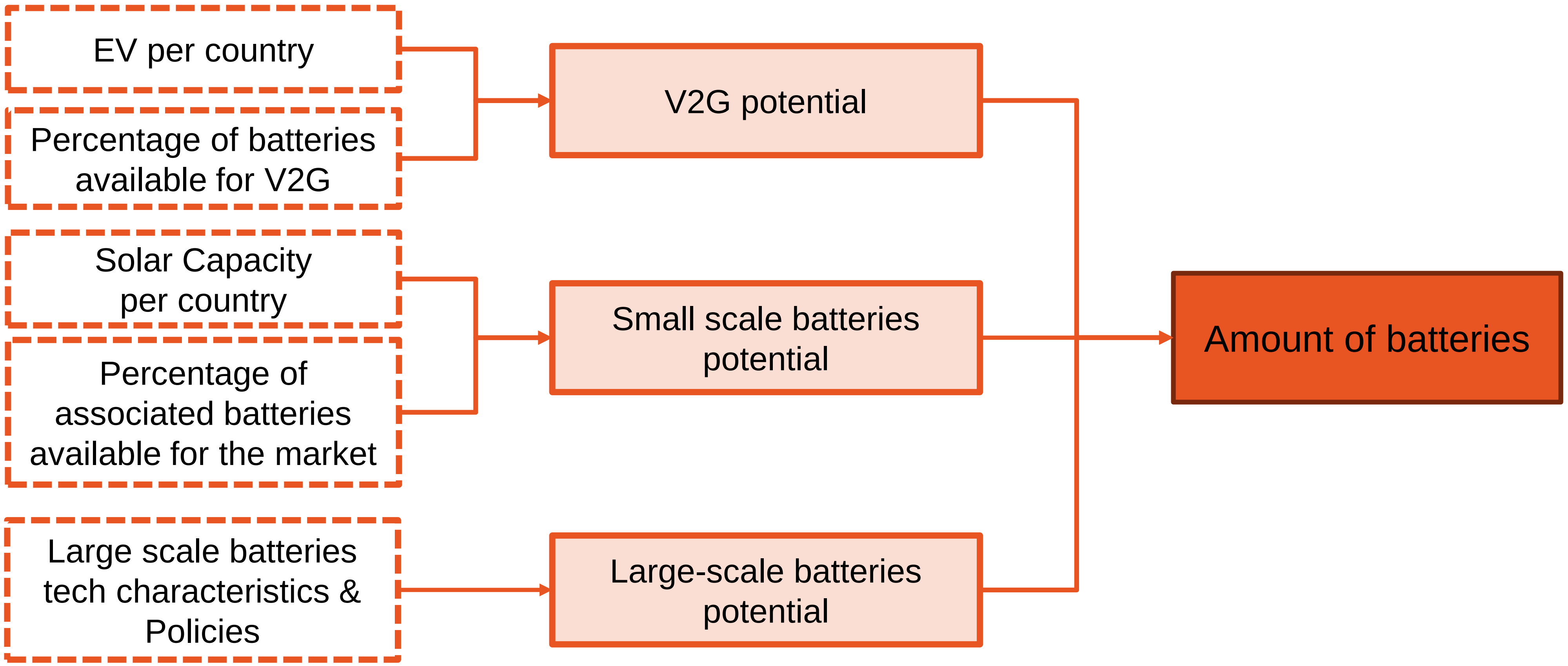
What is according to you the potential and characteristics of those technologies for Belgium ?

What are the needed drivers/enablers to unlock flexibility (linked to storylines) ?

Current methodology applied at Elia – Demand Side Response



Current methodology applied at Elia – Batteries



Current methodology to quantify DSM and storage

Up to Y+10

Values based on national ambitions

- Energy Pact
- NECP
- …

after Y+10

How to derive more long term figures ?

Example made in Electricity scenarios for Belgium toward 2050

LOAD SHIFTING ASSUMPTIONS PER SCENARIO IN EU22 (FIG. 42)

EU22

	BC	RES	DEC	Flex+	
2030	0%	5%	10%	/	% of the heat pump and electric vehicle demand that can be shifted within a day
2040	5%	5%	10%	50%	

…this translates to…

	BC	RES	DEC	Flex+	
2030	0	38	70	/	[GWh/day] of energy that can be shifted within a winter day
2040	38	86	167	835	

LOAD SHEDDING ASSUMPTIONS PER SCENARIO IN EU22 (FIG. 43)

EU22

	BC	RES	DEC	
2030	5%	7%	10%	% of the normalised peak demand of each country that is possible to be shedded with a maximum of 3 times per day
2040	7%	10%	15%	

…this translates to…

	BC	RES	DEC	
2030	26	36	51	[GW] of demand that can be simultaneously shedded in the considered perimeter
2040	36	51	77	

What would you suggest as methodology to quantify flexibility options in the long term ?

For info: storage and Demand Side Response evolutions used in the latest Adequacy & Flexibility study (up to 2030)

		Current assumption for 2030
Batteries	Large scale batteries	0.7 GW
	Small scale batteries	0.4 GW
	Vehicle-to-Grid	0.5 GW
Demand Side Response (FLEX)	Shedding (including AS)	2.4 GW
	Shifting (within a day)	1.5 GWh
Pumped-storage	Pumped-storage reservoir/capacity	1.3 GW 5.8 GWh
P2X	Electrolysis capacity	0.5 GW

Battery parameters

- Energy content per type
- Capacity for Small scale and V2G
- % of vehicles connected to the grid
- % of PV installation that are combine with a battery
- % in the market capacity

DSM types

- 1h
- 2h
- 4h
- 8h
- No limit

Overview of external studies for DSR potential

1. **Gils Study :** Assessment of the theoretical demand response potential in Europe (2014).
    - Theoretical demand response potentials are quantified for 40 European countries, including Belgium.
2. **Sia Study** : "Demand Response Prospects for Belgium" (study from 2014, updated in 2018)
    - A study on the total demand response potential and market barriers for demand response in Belgium.
3. **FTI-Compass Lexicon Study :** "DSR Participation in Power Markets: a review of Transfer of Energy Experiences“ (Annex 4)
    - A study that was done in June 2019 in the context of the study on the implementation of ToE in DA and ID markets
4. **Energy Pact numbers** representing the political ambitions for DSR in Belgium. (until 2030)
5. **E-cube Study** (requested by Elia in the context of the yearly SR volume estimation) :
    - E-cube study provides an estimate on market response evolution, but only by extrapolation of the historic market trend: this evolution is not linked to an explicit analysis of future market potential and does not take into account support measures that can further unlock additional DSR volumes that otherwise would not be developed.

Do you know any other study which could be relevant for this exercise ?

Recapitulation of key questions

Are there any other technology/behavior changes that could be a game changer ?

What is according to you the potential and characteristics of those technologies for Belgium ?

What are the needed drivers/enablers to unlock flexibility (linked to storylines) ?

What would you suggest as methodology to quantify flexibility options ?

Do you know any other study which could be relevant for this exercise ?

Other questions ?

Brainstorm

Recapitulation of key questions

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What is according to you the potential and characteristics of those technologies for Belgium ?

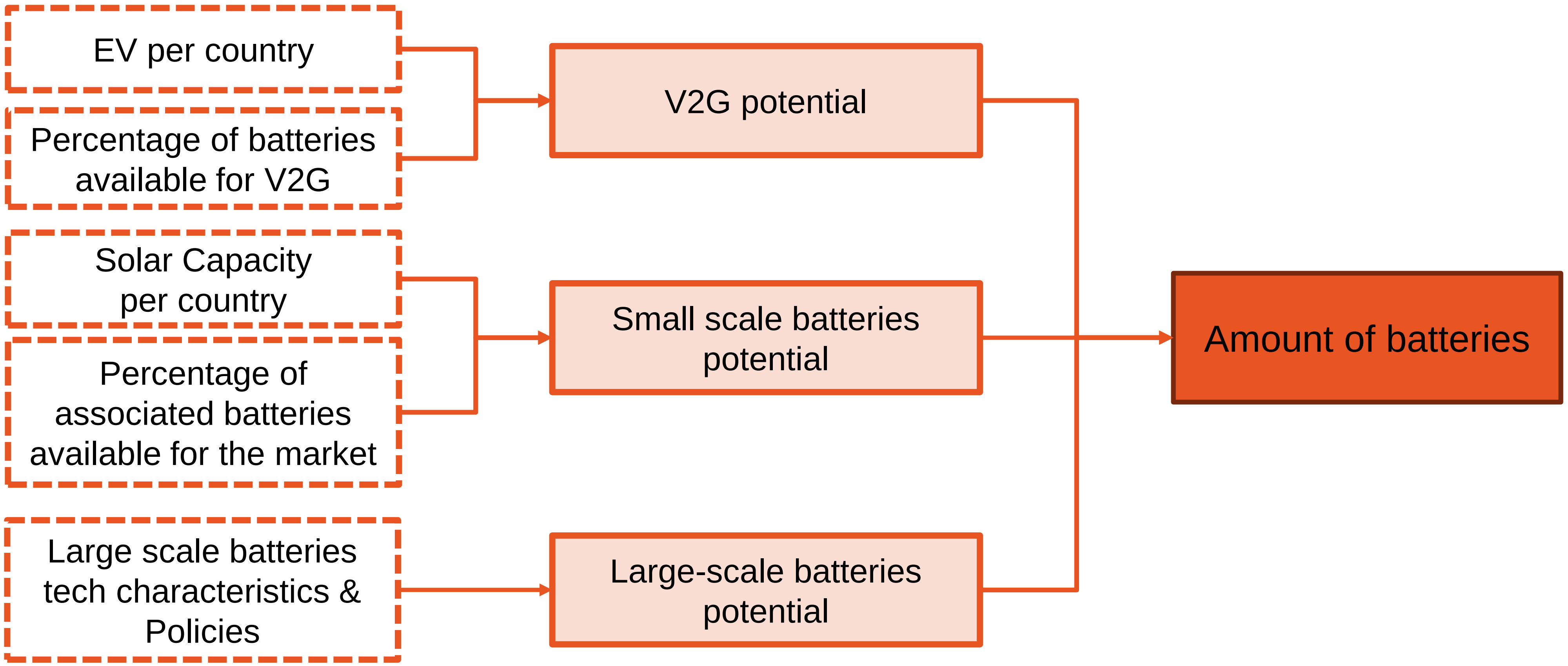
What are the needed drivers/enablers to unlock flexibility (linked to storylines) ?

What would you suggest as methodology to quantify flexibility options ?

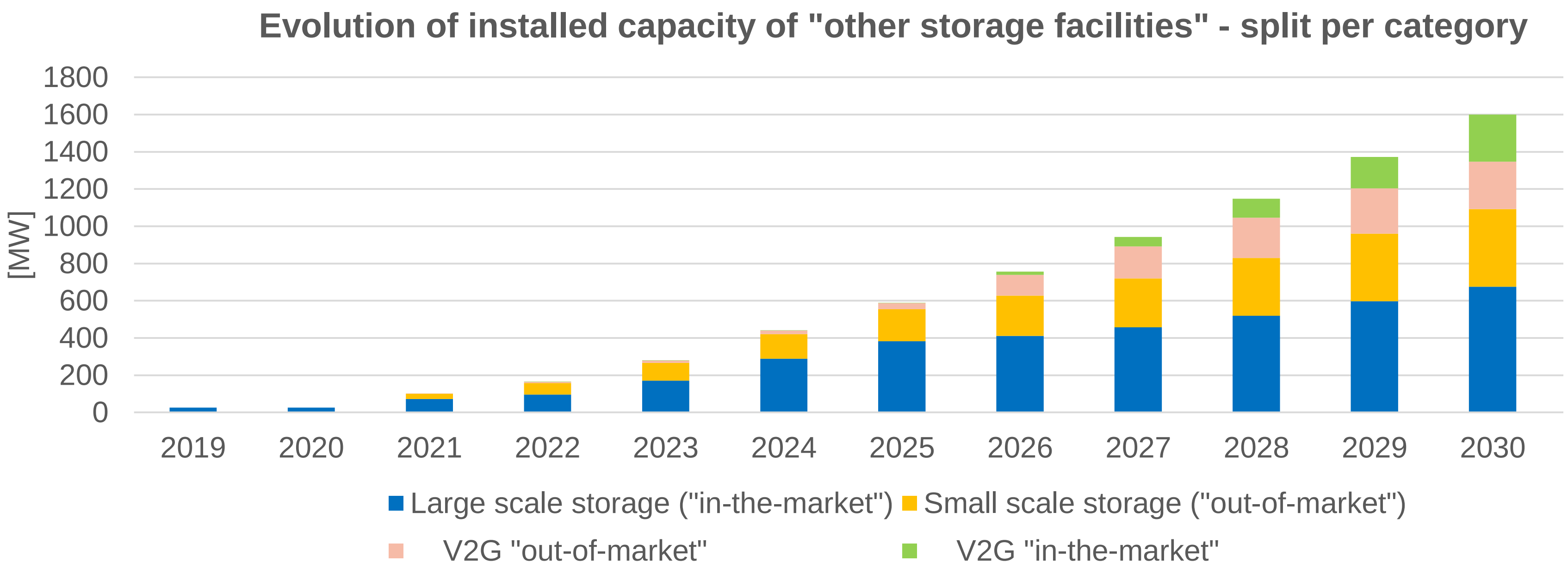
Do you know any other study which could be relevant for this exercise ?

Other questions ?

Current methodology applied at Elia – Batteries

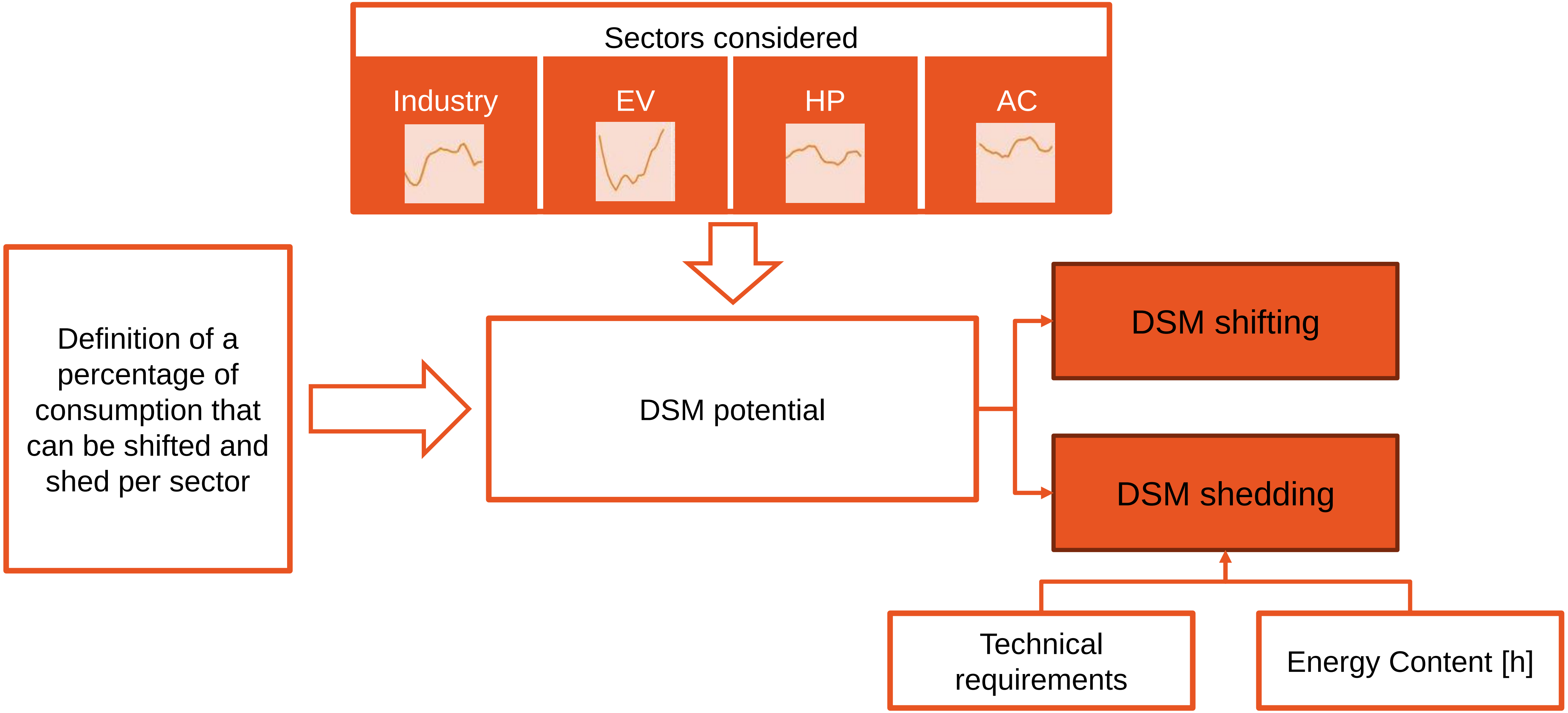


Current figures used up to 2030 based on national ambitions - storage

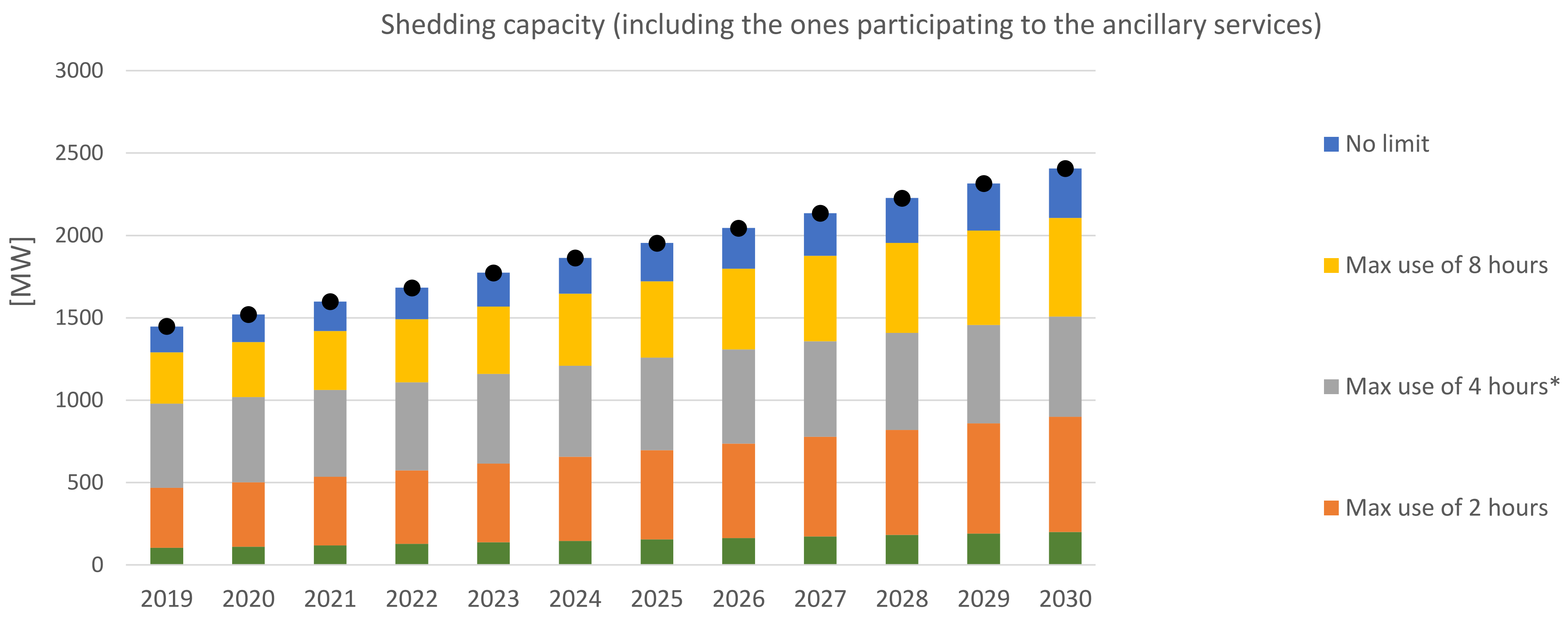


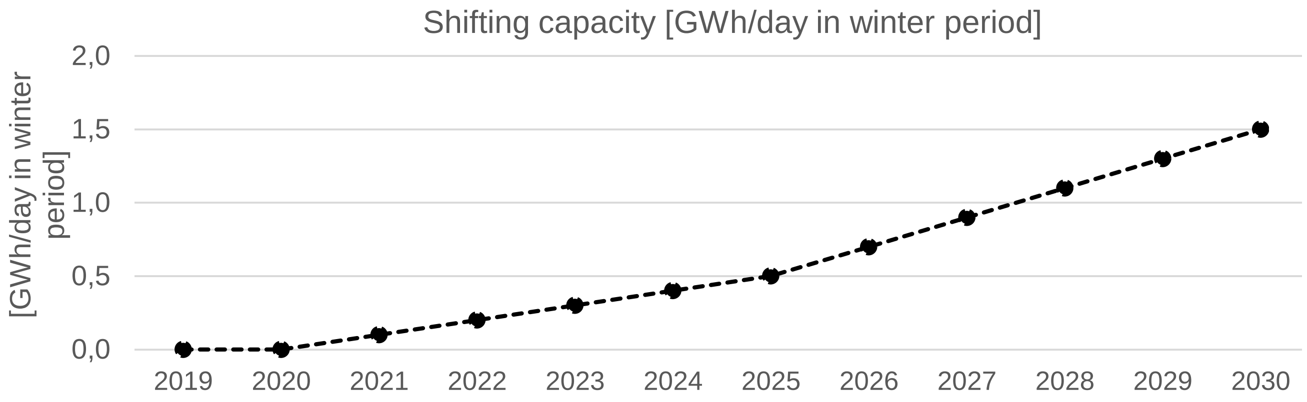
- **Large scale storage** estimations are based on projects that are at least under study and known by Elia for short-term (up to 2023) **(2h storage)**
- **Small scale storage** estimations are based on the assumption that each year **0.5% of the PV installations** add a battery capacity of the size of the PV installation (**with 3 hours of storage**)
- **V2G** are electric vehicles that allow bi-directional (dis)charging when connected to a bi-directional charger.
- In order to estimate the amount of V2G capacity (the battery capacity that would be connected permanently to the grid and that would allow bi-directional charging), we assumed that:
  - a certain amount of new EV registrations are capable of bi-directional (dis)charge and that are connected permanently to a **bi-directional charger**. we assume this to be **1% of new EV registrations in 2021 to 10% in 2030**.
  - In order to calculate the amount of storage (MWh) and capacity (kW), a charger of **7kW and 4 hours storage** was assumed.
- From this volume and capacity of storage, it was assumed that in 2021, **1%** of the V2G amount is reacting to electricity prices. The other 99% is considered as ‘out-of-market’ (is therefore taken into account in the consumption profile following the ERAA methodology). The percentage of ‘in-the-market’ is assumed to evolve up to **50%** in 2030.

Current methodology applied at Elia – Demand Side Response



Current figures used up to 2030 based on national ambitions - DSM





Example of technical characteristics

DSM

Sector	Demand Shifting Percentage	Demand Shedding Percentage	Demand shedding Constraints (h/day)
EV			
Heat pumps			
District heating			
AC			
Industry & appliances			

Batteries

V2G	Parameters
Percentage of available EV	[%]
Conversion rate	[kW/EV]
Energy Content	[h]

Stationnary **Batteries**	Parameters
Percentage of installed solar capacity	[%]
Energy Content	[h]

Large-scale batteries	Parameters
Efficiency	%
Energy Content	[h]

Other

Electrolyser	Parameters
Time constraint per day	[h]
Other ?	

Pumped Storage	Parameters
Efficiency	%
Energy Content	[h]