Energy Storage, a solution to facilitate renewables integration in the electric power system

Q ENERGY France – Louis POULAIN

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Q ENERGY France : a renewable energy specialist with 4 activities

24 years of
experience

+ 250
employees

5.6 GW
Of projects under development

1,7 GW
Of project developed or built

4 technologies
Onshore Wind, Offshore Wind,
PV, Storage … and H2

2.7 GW under Dev

RFP ongoing

2.5 GW under Dev

400 MW under Dev

Q ENERGY, a company part of Hanwha Group and a key player in renewable energy in Europe

Part of an international group

Hanwha

- Turn-Over : 66 B$
- 277 / 500 Fortune Global Company
- 7th Largest Conglomerate in South Korea

qcells

qenergy

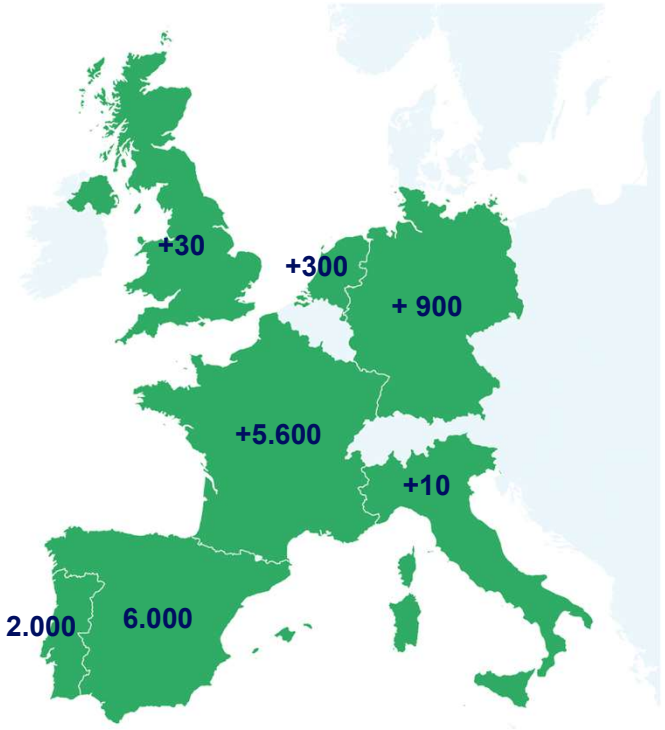
- Germany (headquarter)
- France
- Spain
- Portugal
- UK
- NDL
- Italy

More than 15 GW of projects under development in Europe

+11.5 GW

+2.5 GW

+1 GW



MW under development

Our Storage portfolio in France

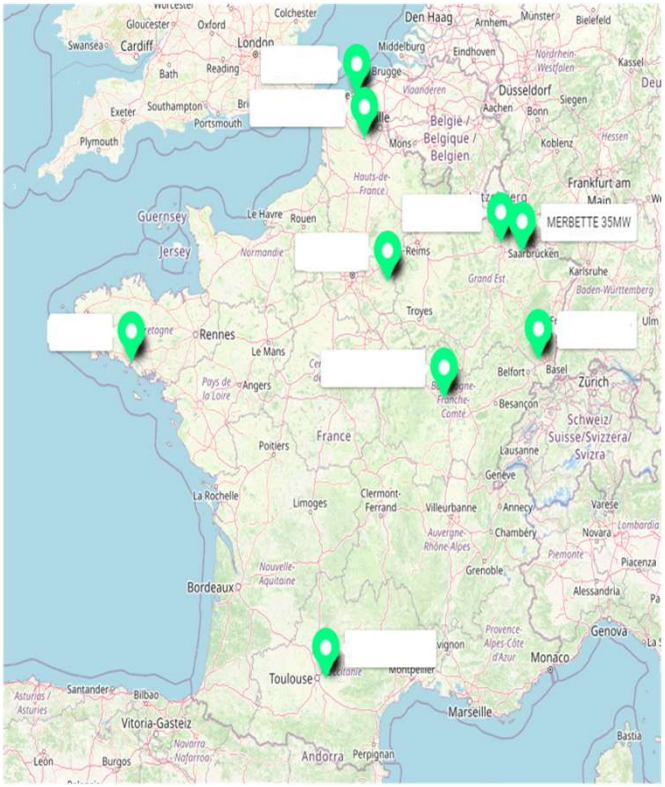
Qenergy

1 1st Project : 35 MW / 44 MWh under construction

ST AVOLD Project : *4th largest ESS in France installed on a Coal Plant (closed to German Border)*

2 400 MW of large ESS under development

- Typical ESS Size : 30 MW / 60 MWh



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Storage, to do what ?

We believe storage will play a key role in the energy transition as it contributes to solve at least 3 main challenges

1 

Ancillary Services /
Stabilize the electricity network

2 

Store Energy / Energy Shifting

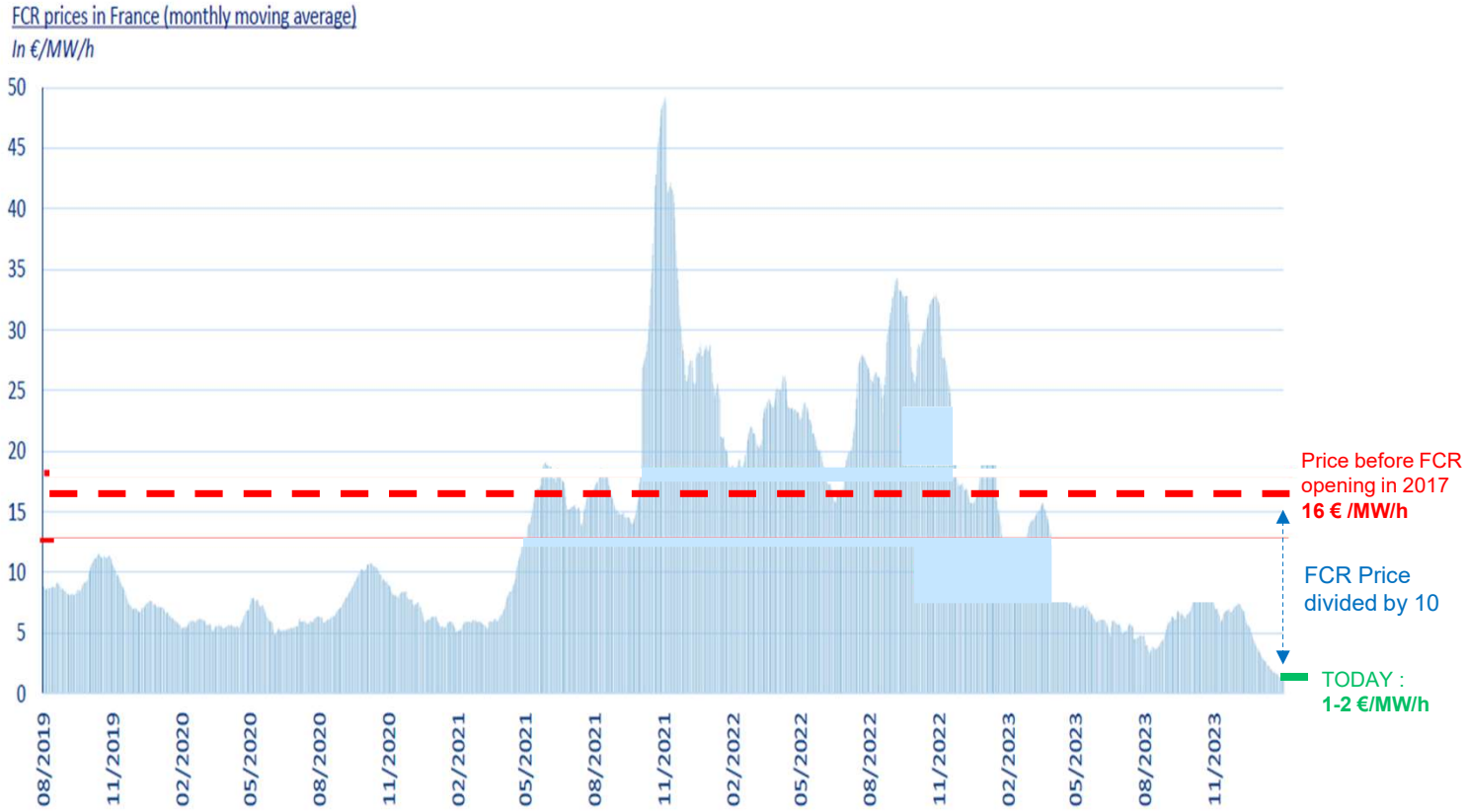
- **Deliver REN even when there is no sun or no wind**
- **Protect REN against cannibalization / negative prices**

3 

Ease Grid Connection of Renewables

1 Ancillary Services / Stabilize the electricity network

Storage, the most suitable asset to perform Ancillary Services



1 Lower price :

ESS delivers FCR at the best cost for the system (FCR price divided by 10 since market opening in 2017).

And should be the same for aFRR in coming years.

2 Better service :

ESS delivers the service more efficiently (faster response time, thanks to its power electronics)

3 Most efficient for the overall system :

Better for the system to mobilise ESS on ancillary services and re-allocate conventional production assets (nuclear, hydro, gaz) to energy production for the overall security of supply

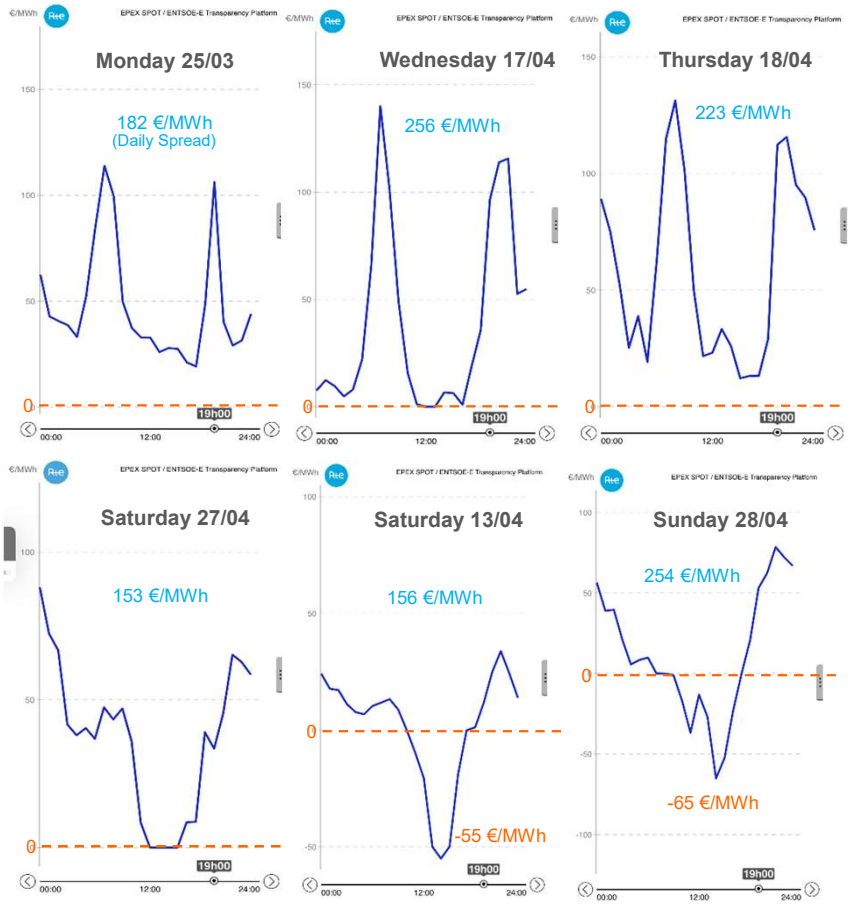
** Chart from Clean Horizon*

2 Store Energy / Energy Shifting

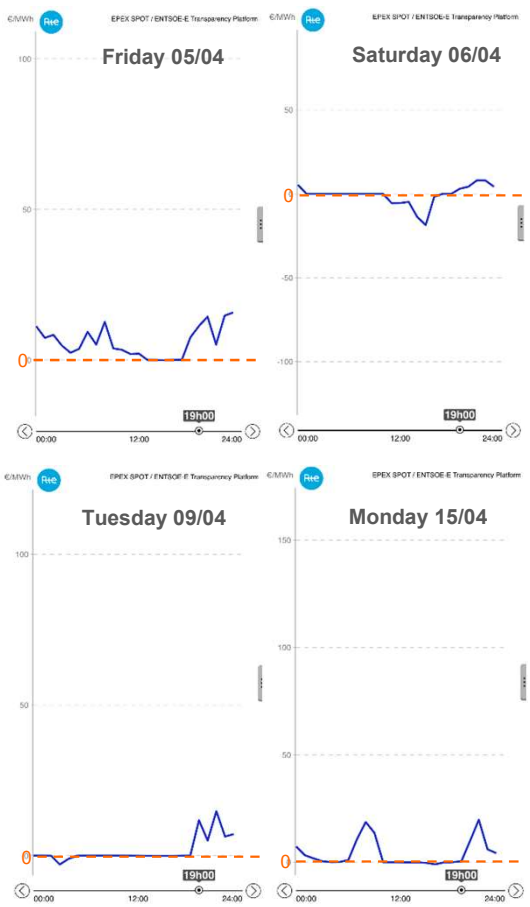
Renewables are already significantly impacting electricity prices on Spot Market ; more CLEAN Flexibility is required !

Overview of French Spot Market from 23 March to 30 April 2024 (39 days) :

Days of Type 1 : Duck / Canyon / « M » Curve (60%)



Days of Type 2 : Flat Curve (40%)



Key Facts :

- Duck Curve is already a reality (and NOW since March !)
- 90 h (10%) in negative prices already (vs 150 h total in 2023)
- 125 h (14%) of price btw 0-1 €/MWh
- Average DA price : **29 €/MWh**

Avg DA Price	Full Period	Working Days	Work. Days excl. Flat
7 am - 9 am	**48 €/MWh**	64 €/MWh	**96 €/MWh**
9 am - 6 pm	**16 €/MWh**	24 €/MWh	39 €/MWh
6 pm - 8 pm	**40 €/MWh**	46 €/MWh	**68 €/MWh**
8 pm - 7 am	**35 €/MWh**	38 €/MWh	58 €/MWh

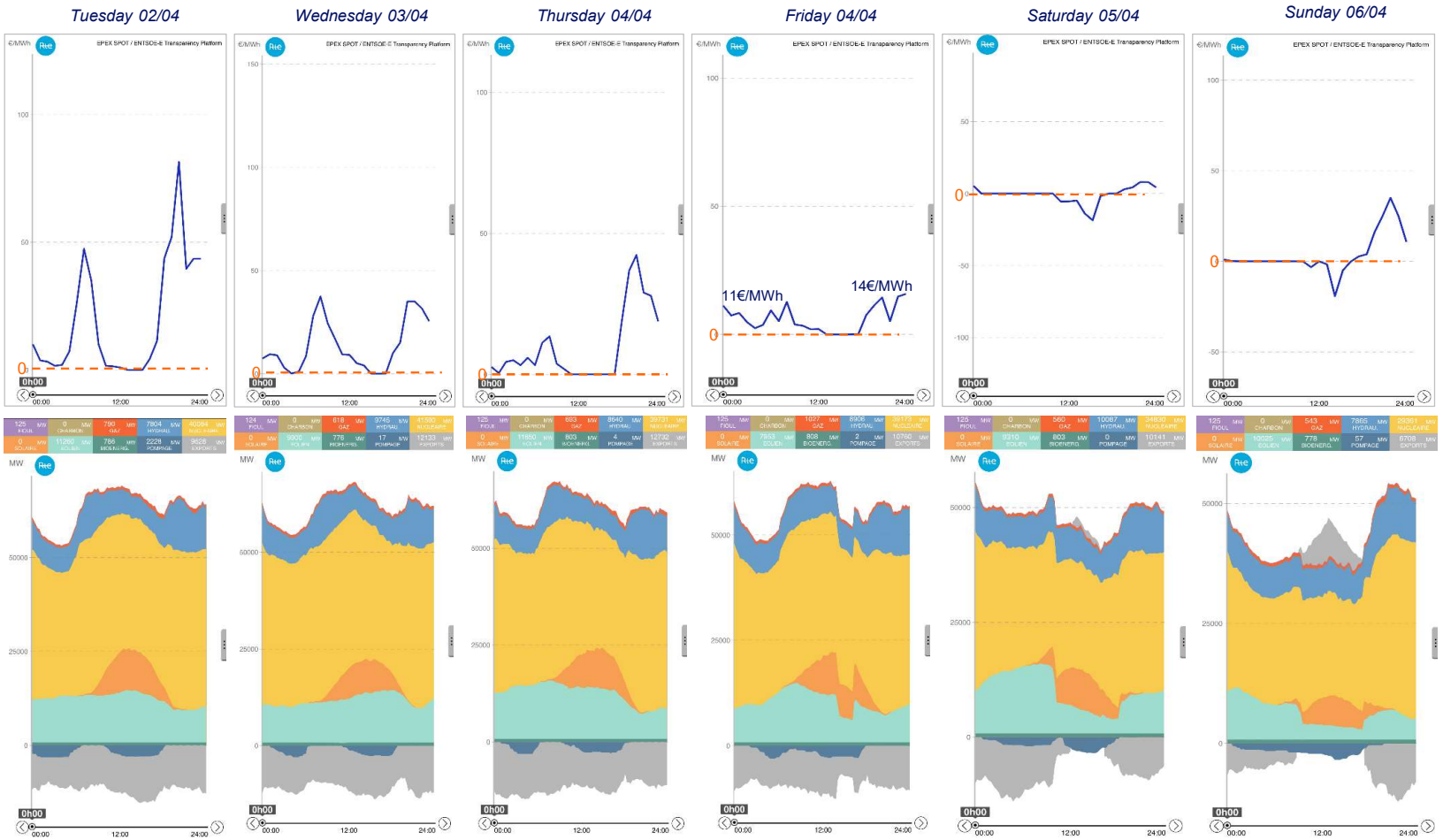
Key Learnings :

- High price volatility intra-days / between days
- Need for FLEXIBILITY :
  1. To Manage PEAK : need for COMPETITIVE and CLEAN flexibility assets :
     - Hydro : OK for H1 2024 but will not be each year the case
     - Gas : no CO2 free + activated only for peak management (cost)
     - Nuclear : not unlimited modulation
     - Storage : CO2 free and cost effective (in future) with revenue stacking (multi-services, not deployed only for Peak mgmt)
  2. During Day Time :
     - High Risk of valorisation for PV assets (peakload < baseload : Market Change)
     - Interconnexions : challenging as mainly saturated (PV production in all neighbouring countries during day time)
     - Others : DSM or Storage (ideal to combine it with peak + other services such as ancillary services and grid optimisation)

2 Store Energy / Energy Shifting

Renewables are already significantly impacting electricity prices on Spot Market ; more CLEAN Flexibility is required !

Zoom on 1st week of April 24



Over the week :

- 21 h (13%) in negative prices
- 28 h (17%) at 0 €/MWh
- Average DA price : **9.88 €/MWh**

On PV production time :

- 20% in negative prices
- 18% at 0 €/MWh
- Average captured price : **2.42 €/MWh**

Curtailment :

- 20-30% of Wind & PV (several GWs)
- Interconnexions saturated *(overproduction of PV in all neighbouring counrtries)*
- Export of Nuclear stopped (import actually)

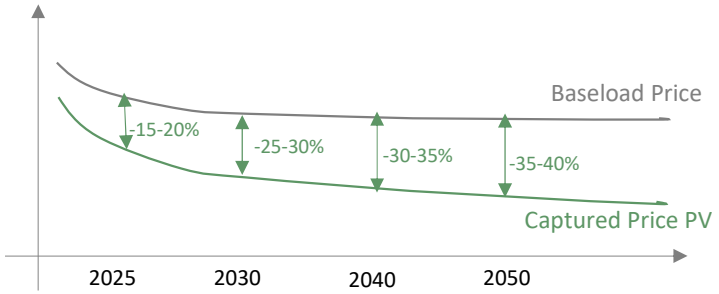
And this only with 19 GW of PV and 23 GW of Wind !

And now since early April !

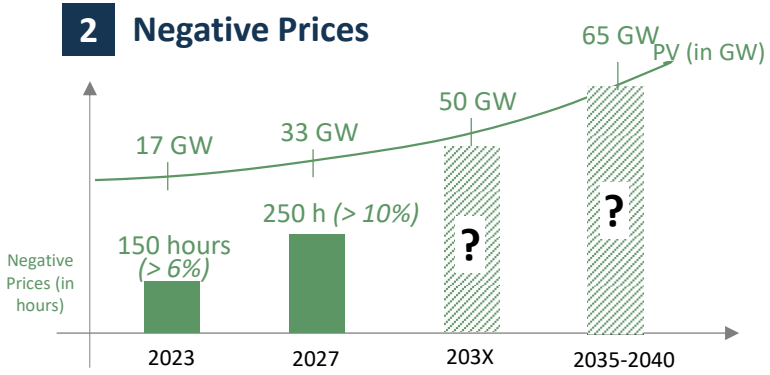
2 Store Energy / Energy Shifting

In coming years, cannibalization and negative prices could impact significantly PV development

1 Cannibalisation (Trend)



2 Negative Prices



A. Impacts for PV projects:

- PV plants could be disconnected 10%-20% of time
- **Financial Risk :** high risk of valorisation for PV assets
- Without viable « economics », **possible impact on future PV development and achievement of our targets of 60-80 GW by 2035**
- **CPPA Projects :** offtakers may request « profiled » CPPA with storage and/or wind to manage this risk of valorisation
- **Auction (AO CRE) Projects :** negative prices currently covered by the tarif (beyond 15h per year). However, in the future we could imagine RFP requests bidders to manage progressively part of negative prices if negative prices > 10-15-20% and if a solution (storage) exists
- **Non Optimal scheme :** mobilise land, grid connection, financing, raw materials, etc. to disconnect PV plants 10%-20% of time => not efficient !

B. Impacts for the Electric Power System:

- **Customers** need decarbonised and affordable energy **which matches their consumption profile (they do not want intermittency)**
- Intermittency has multiple impacts on electric power system management : production forecast, grid balancing, nuclear modulation, decarbonised peak management, etc…
- Interconnexions can not play their flexibility role during day time when there is PV overproduction in all neighbouring countries

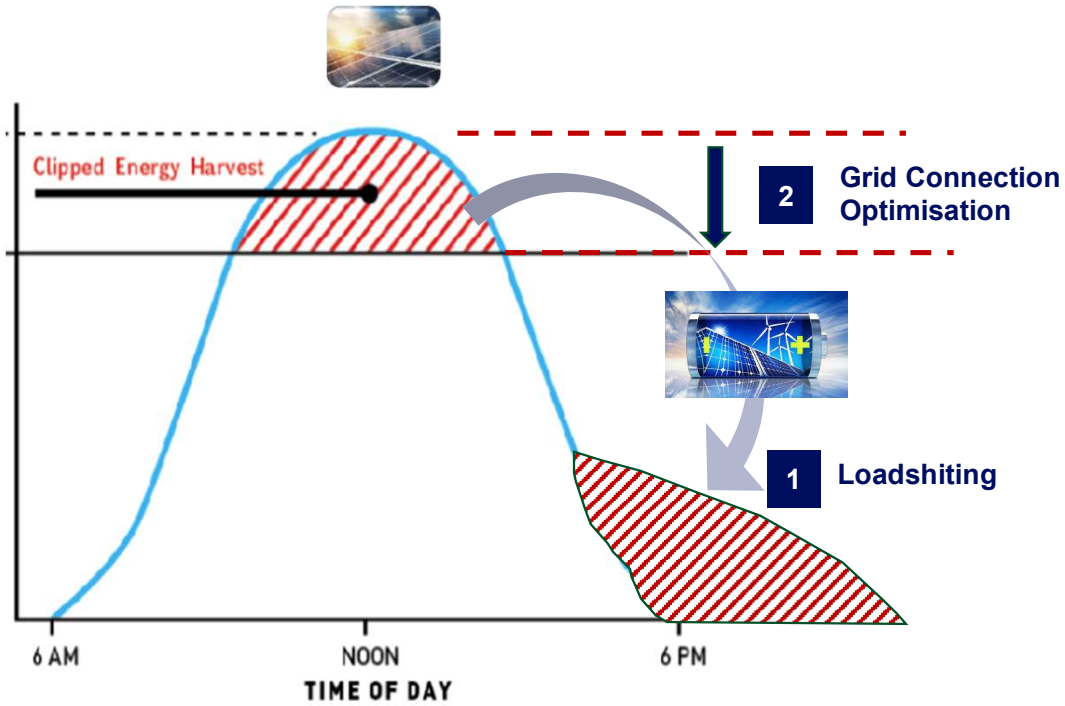
One solution

Storage

- **Ideal to deliver both Flexibility during Peak & Day Time**
- **Ideal to mix with PV** (most competitive renewable energy) and provide Dispatchable Renewable whilst protecting PV from cannibalisation & negative prices
- **Remain the question of Cost ?**
  1. **R&D :** costs still decreasing by 10% per year
  2. **Business Model :** optimal revenue stacking (ancillary services, grid optimisation, etc.) to minimise remaining costs for flexibility
  3. **Need to improve financing !**

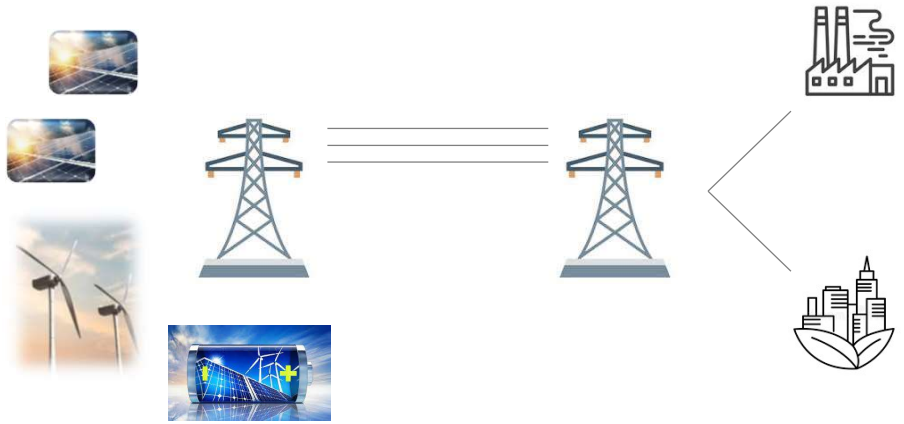
3 Ease Renewables Grid Connection

1. At ASSET level via PV + Storage



- Connect more PV with same grid capacity (+25-35%)
- In some cases, connect PV to neighbouring lines instead of MV SS

2. At GRID level via « Virtual Lines »



- RTE « AO Flex » model
- Battery stores renewable energy when it exceeds grid line capacity and re-inject it when renewable production is lower
- Optimise, defer grid investment or connect faster renewables to the grid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STORAGE
Thanks !