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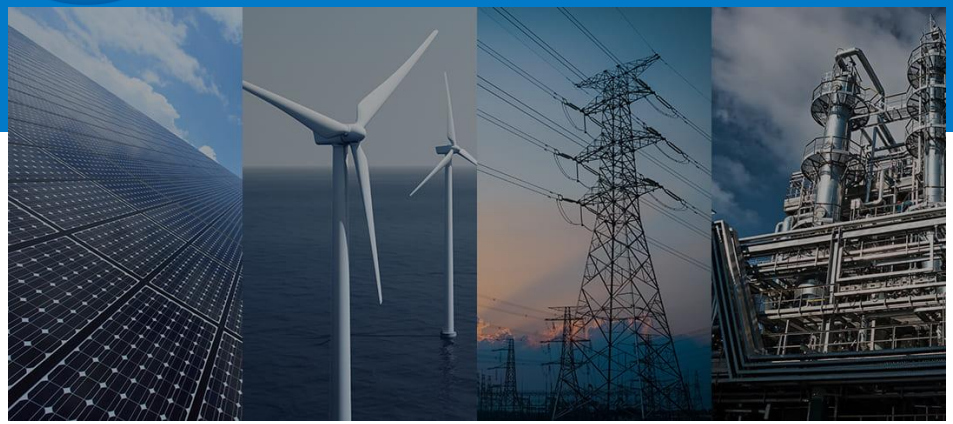
The Energy Storage Experts



# 30 mins Debrief: Global Battery Storage Forecasts

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**Michael Salomon**
CEO
**ms@cleanhorizon.com**
**+33 1 78 76 57 03 (direct)**
**+33 6 72 61 27 34 (cell)**


**Belén Gallego**
CEO & Moderator

# Country forecast for energy storage in 2019

**South Africa**

France

South Korea

United States

Small players: some opportunities but nothing transcendental

# **South Africa:** the new World Bank testbed for large-scale battery storage

## The ambitious and heavily supported South African energy transition

- Ambitious renewable targets aim to alleviate the dependency to coal and cope with the 35 GW peak demand:
  - 2.4 GW of intermittent renewables installed today
  - 18 GW of renewables by 2030
  - 55 GW of renewables by 2050

- The World Bank dedicated more than USD 5 billion in funding by 2025 for storage.
- South Africa is the first country to benefit largely from this storage fund and become the World Bank's testbed for stationary storage.

- This programme originates from the 100 MW Kiwano CSP project: 60%*100MW*24h = 1,440 MWh/day (60% is the estimated CSP load factor)

| Phase | Financed | Number of sites | Storage capacity | Storage active power |
|---|---|---|---|---|
| Phase I | Yes by a combination of DFIs | 47 | 800 MWh | 200 MW |
| Phase II | Not yet | 43 | 640 MWh | 170 MW |

- **South Africa's ambitious renewable energy goals are attracting remarkable investment sums**
- **South Africa will benefit from DFI investments to finance more than 1440 MWh of projects**
- **ESKOM's monopoly over the energy market limits opportunities for developers.**

DFI: Development Finance Institution

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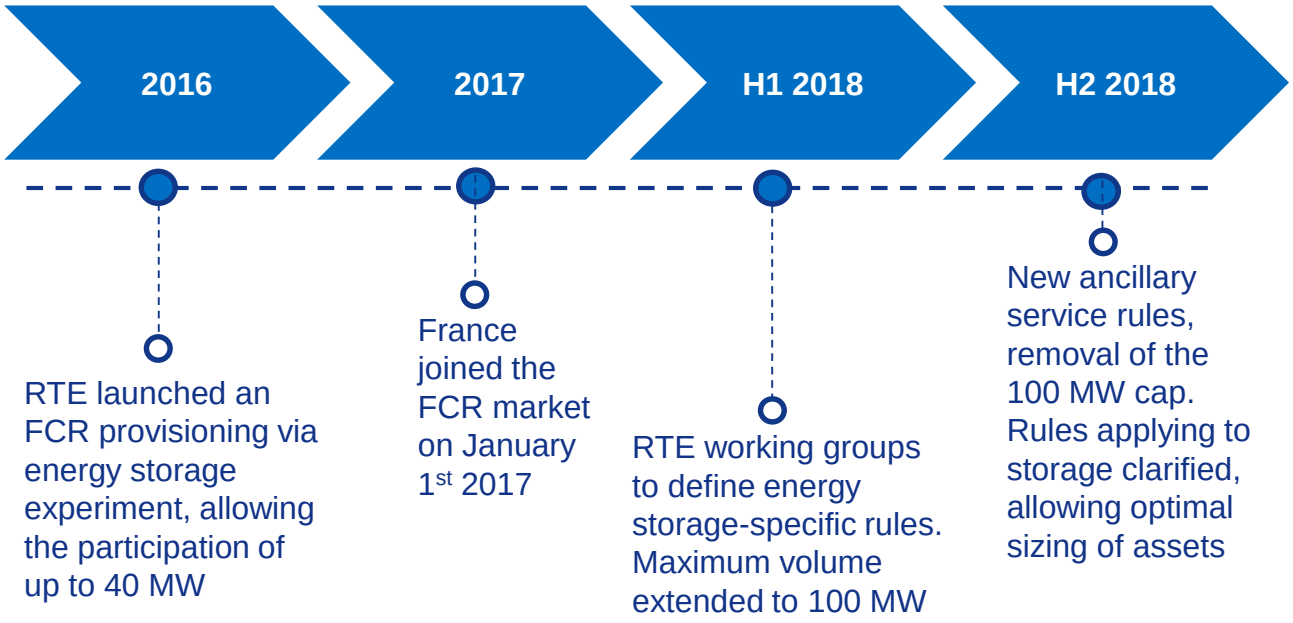
# **France:** the best short-term opportunities for utility-scale storage in Western Europe

**France: a large European market opening up to energy storage for frequency regulation**




- These evolutions favour large-scale energy storage deployment in France:
  - A 6 MW Neoen project commissioned
  - A 1 MW NW Energy project commissioned
  - Two 20 MW projects from Renault
  - Clean Horizon expects other projects to follow

- **Once limited, energy storage opportunities are emerging with the opening of the French energy market thanks to the continuous alleviation of entry barriers and clarification of the participation rules**
- **The FCR market remains limited (561 MW for France plus export)**

Source: https://www.cre.fr/Documents/Deliberations/Approbation/Regles-Services-Systeme-frequence-proposees-par-RTE

# **France:** the best short-term opportunities for utility-scale storage in Western Europe

**The best short-term opportunities for utility-scale storage in Western Europe**

- The French capacity market is an interesting stackable revenue:
  - Producers and demand response providers are remunerated for being available so that the system has a sufficient capacity margin at all times.
  - Energy storage participation clarified in December 2018:
    - 70% de-rating factor for batteries, leading to an additional revenue of **12.6 k€/MW/year** (based on 2018 auction prices)
    - 7-year contracts auctioned at a fixed price will be available
- Overseas territories make up a captive market for energy storage:
  - Limited energy resources and high generation costs
  - Over 100 MW of storage already deployed and more to come thanks to ongoing standalone energy storage development schemes

- **The unique French capacity mechanism offers an additional revenue for storage systems that can capture up to 70% of a conventional generator's capacity obligation**
- **Limited energy resources and new initiatives turn overseas territories into attractive markets for energy storage**

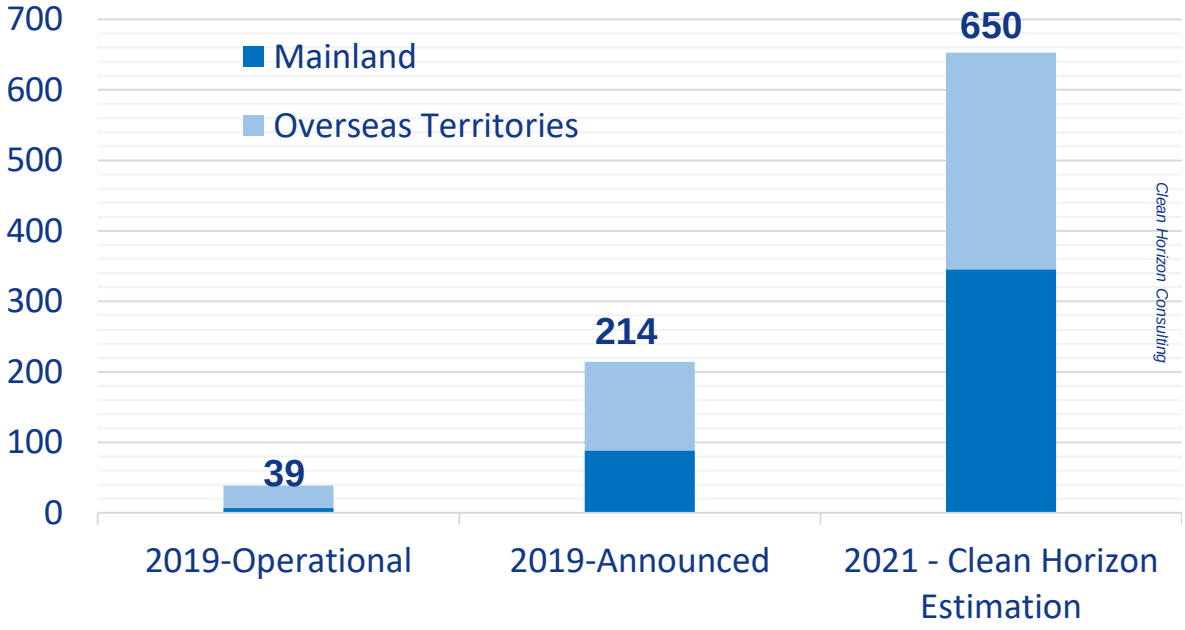
# **France:** the best short-term opportunities for utility-scale storage in Western Europe

## A large European market opening up to energy storage

- Over the next two to three years:
  - Energy storage deployments in continental France could amount to 200 to 300 MW (FCR provisioning mainly)
  - Between 100 and 200 MW of storage will be deployed over in overseas territories

Cumulative installed energy storage capacity in France

*In MW*




**France is currently one of the most favorable European countries for utility-scale energy storage development**

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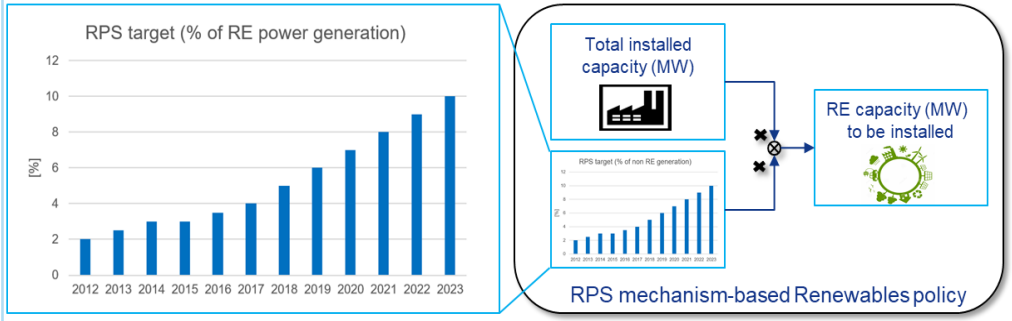
# **South Korea:** energy storage adoption motivated by incentive programs and national schemes

## Main South Korean energy policies are motivated by market-based incentives

- The Renewable Portfolio Standards (RPS) mechanism helps reaching targeted renewables' shares in the energy mix
  - Profits are composed of wholesale system marginal prices (SMP) plus the sale of RECs (Renewable Energy Certificates)

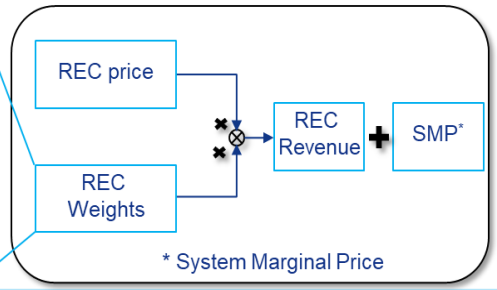
*(a) RPS mechanism based on renewables policy*

*Clean Horizon Consulting*




*(b) REC weight based on grant principle*

| Installation type | Details | REC weights |
|---|---|---|
| Solar + Storage | Effective in 2016, 2017 | 5.0 |
| Wind + Storage | 2015 | 5.5 |
| | 2016 | 5.0 |
| | 2017 | 4.5 |




**When paired with storage, renewable energy assets can increase their gains thanks to higher REC weights.**

# **South Korea:** energy storage adoption motivated by incentive programs and national schemes

**Energy storage schemes offer remarkable opportunities up until 2022**

- Utility-scale energy storage capacity is expected to grow from 400 MW in 2017 to 1,000 MW by 2030
- The current behind-the-meter energy storage scheme:
  - Offers up to 50% reduction on recharging costs
  - Capacity-dependent weighting factors (the higher the capacity, the higher the pay)
  - Available till 2020
- Over 210 MW of energy storage have already been installed under this scheme
- Following a Ministry of Trade, Industry and Energy recommendation, 650 MWh of energy storage will be dedicated to peak load reduction in public institutions (peak loads higher than 1 MW) by 2020

**Large opportunities for C&I energy storage in South Korea are available thanks to the scheme in place until the end of 2020. It is however unknown whether such opportunities will persist after that.**

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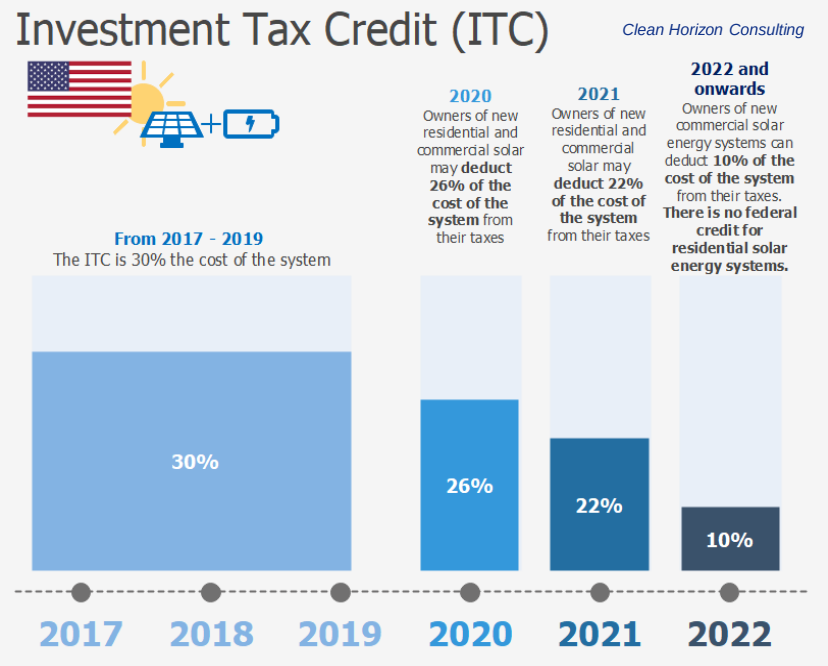
# **United States:** New York and Massachusetts are stealing the spotlight

## Energy storage adoption to benefit greatly from Federal and governmental support

- Three main states are leading the way in energy storage development through remarkable energy efficiency budgets:
  - California: $1.4 billion/year
  - Massachusetts: $620 million/year
  - New York: $450 million/year

- Beyond these states, the Investment Tax Credit (ITC) remains and is offering the most lucrative incentives in 2019




**New York and Massachusetts are the states to watch in 2019.**

# **United States:** New York and Massachusetts are stealing the spotlight – New York

## New York: an example of the economic viability of energy storage for the transformation of electric power networks

- New York is one of the most ambitious states in the United States with targets of 1,500 MW of energy storage by 2025 and 3 GW by 2030

| Entity | Type of Player | Goal | | Funding ($) |
|---|---|---|---|---|
| **NYSERDA** | State public-benefit corporation | NYSERDA Market Acceleration Incentives | Retail Incentives | 310 million |
| | | | Bulk Storage Incentives (350 MW) | 40 million |
| | | Regional Greenhouse Gas Initiative (RGGI) | | 52.9 million |
| | | Reforming the Energy Vision (REV) (50% of energy from renewables in 2030) | | - |
| | | PON 3541 | | ≤ 50% of demonstration |
| **Green Bank** | Bank | 1,500 MW by 2025 (e.g. via requests like RFP 10) | | 200 million |
| **NYSERDA and Green Bank** | Collaboration | Clean Energy Fund (CEF) | | 5.32 billion (2016 – 2025) |
| **NYPA** | State power authority | Grid flexibility (150 MW) | | 250 million (2019) |
| | | Clean Distributed Energy Resource (DER) Grant Program | | 5 million (2018 – 2025) |

**New York's target to deploy 1,500 MW of energy storage in the next five years renders it an attractive scene for energy storage in the U.S.A.**

# **United States:** New York and Massachusetts are stealing the spotlight – Massachusetts

## Governmental and federal initiatives go hand in hand to support energy storage adoption

- The state has set an energy storage target of 200 MWh by January 1, 2020, with a potential future target for 1,000 MWh by 2025
- Massachusetts became the first state to make battery energy storage eligible for energy efficiency incentives

| Entity | Type of Player | Goal | | Funding ($) |
|---|---|---|---|---|
| **(DPU) National Grid, Eversource, Unitil, etc.** | (Regulator) Utilities | Massachusetts Energy Efficiency Plan (2019 – 2021) | | 2.8 billion |
| **DOER (and MassCEC)** | Agency under Governor and Executive Office of Energy and Environmental Affairs | Energy Storage Target (200 MWh) | | 10 million (2020) |
| | | Energy Storage Initiative (ESI) | ESI Demonstration Program Advancing Commonwealth Energy Storage (ESI ACES) | 26 million *(already distributed)* |
| | | Solar Massachusetts Renewable Target (SMART) program | | Decreasing block/tiered incentives |

**The Solar Massachusetts Renewable Target (SMART) program, coupled with governmental initiatives, provides additional profit sources for energy storage**

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# **Puerto Rico:** when hurricanes plunge a state into darkness and force it to adopt energy storage

**Ambitious solar-plus-storage targets to counter the power system's resiliency issues**

- Due to recurrent hurricanes, the Puerto Rican power system suffers from serious resiliency issues

**PREPA's Integrated Resource Plan**

- **1,080 MW worth of energy storage** of which at least 900 MW need to be operational by 2022 with a 1,200 MW solar PV capacity
- Easier access to private actors (third-party producers, prosumers) and development of distributed grid resources
- Segregation of the national grid into 8 smaller minigrids
- Creation of RFPs allowing the colocation of solar PV and storage assets

PREPA: Puerto Rico Electric Power Authority

RFP: Request For Proposals

**Open market access and resiliency improvement needs are the major drivers for energy storage development in Puerto Rico**

# **Puerto Rico:** when hurricanes plunge a state into darkness and force it to adopt energy storage

**Ambitious solar-plus-storage targets to counter the power system's resiliency issues**

**Business opportunities and market accessibility**

- The "Puerto Rico Green Energy Incentives Act" ("Act 83"):
  - $290 million Green Energy Fund
  - Tax exemptions reaching 100% on property taxes, dividends and/or profit distributions
  - Ongoing RFPs for four microgrids fostering storage and generation assets
- Enforced regulations are holding the market back:
  - Direct power transactions between producers and consumers are limited
  - Earlier projects relied on governmental recovery funds and the role for private capital is still limited

PREPA: Puerto Rico Electric Power Authority

RFP: Request For Proposals

**Multiple projects and business incentives are available but still suffer from regulatory hurdles**

# **The Middle East:** a hotbed for large-scale energy projects without clear energetic roadmaps

## Ambitious solar-plus-storage targets to counter the power system's resiliency issues

*More details are discussed in the January edition of Clean Horizon's Update From The Field and our Middle-East Market Analysis*

| Country | Application | When will market opportunities arise? | Comments |
|---|---|---|---|
| **Israel** | Renewable integration | End of 2019 | Market opportunities to emerge once the final version of regulations is in place |
| **Lebanon** | Renewable integration | N/A | - 200MW/200MWh project (operational by 2022)<br>- Energy storage roadmap for 2030 |
| **Jordan** | Renewable integration | N/A | Two projects:<br>- Irbid Philadelphia Solar 4MW/12 MWh project (commissioned)<br>- MDA project 30MW/60 MWh project (ongoing) |
| **Saudi Arabia** | Renewable integration | End of 2020 | New tender to evaluate energy storage uses |
| **UAE** | Renewable integration | N/A | Other preferred storage solutions (thermal, pumped-hydro) |

**Several initiatives towards energy storage are being pursued in Jordan, Lebanon and Israel but no specific market or clear opportunities for future deployment are foreseen in the short term**

# Thank you for your attention

**Further details are available in the February edition of our**

***Update From The Field***

***https://www.cleanhorizon.com/product/update-from-the-field-february-2019-country-forecast-for-energy-storage-in-2019/***

For further inquiries, contact us on:
*reports@cleanhorizon.com*

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CLEANHORIZON
The Energy Storage Experts

CLEANHORIZON

The Energy Storage Experts


**Europe (France)**
**Clean Horizon Consulting**
**Paris**
**europe@cleanhorizon.com**
**Direct: +33 1 78 76 57 04**

**Americas (USA)**
**Clean Horizon Americas**
**Miami, FL**
**americas@cleanhorizon.com**
**Direct: +1 (786) 901-7784**