

Energy Storage Discussion Paper

October 2019

Sections to this presentation

1. **Why RGI and CAISO did this discussion paper?**
2. **Overview in Europe and the US**
3. **Storage Technical Capabilities Required in a RES Dominated System**
4. **Barriers to deployment**
5. **Recommendations**

RGI and CAISO have joined forces for this paper

Europe and California are leaders in the energy transition

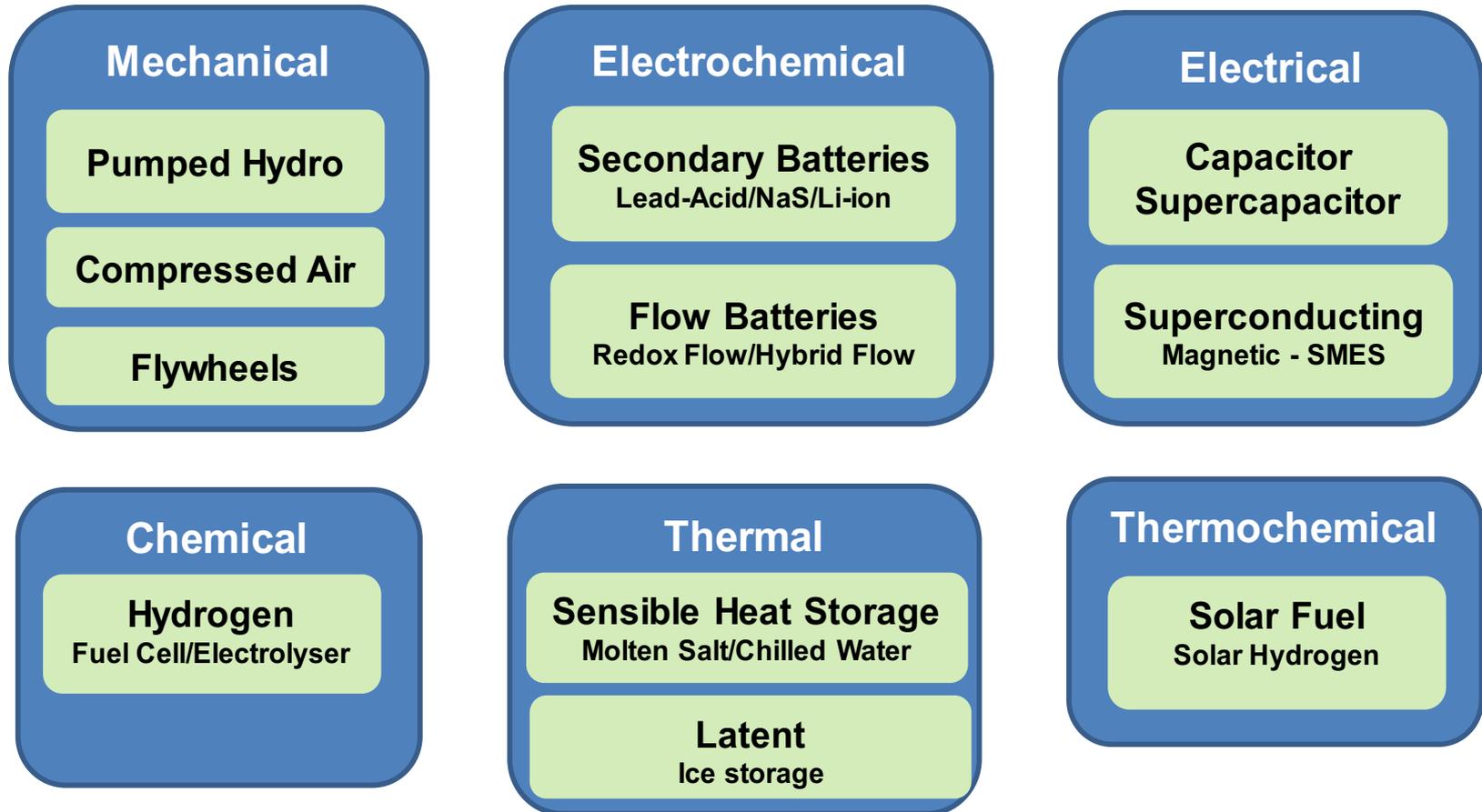
RES integration and fossil phase out require new services for the stability of the system

Storage has played and will play a much stronger role in the electricity system of the future

We need to learn from each other



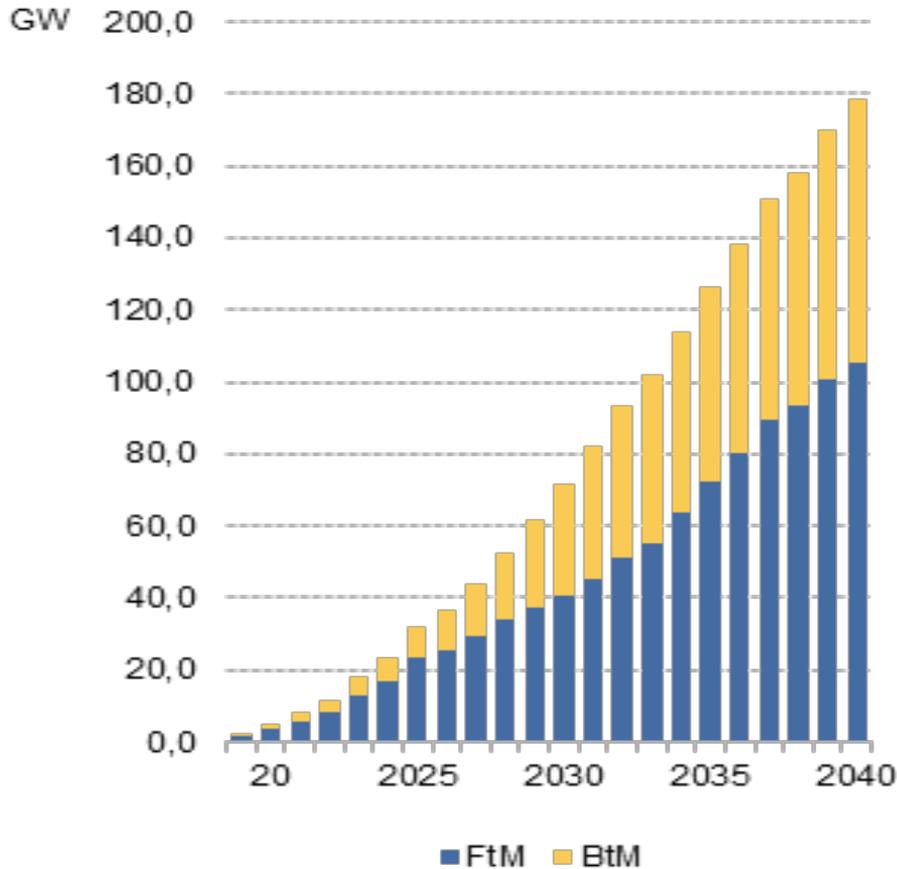
A family of Storage Technologies



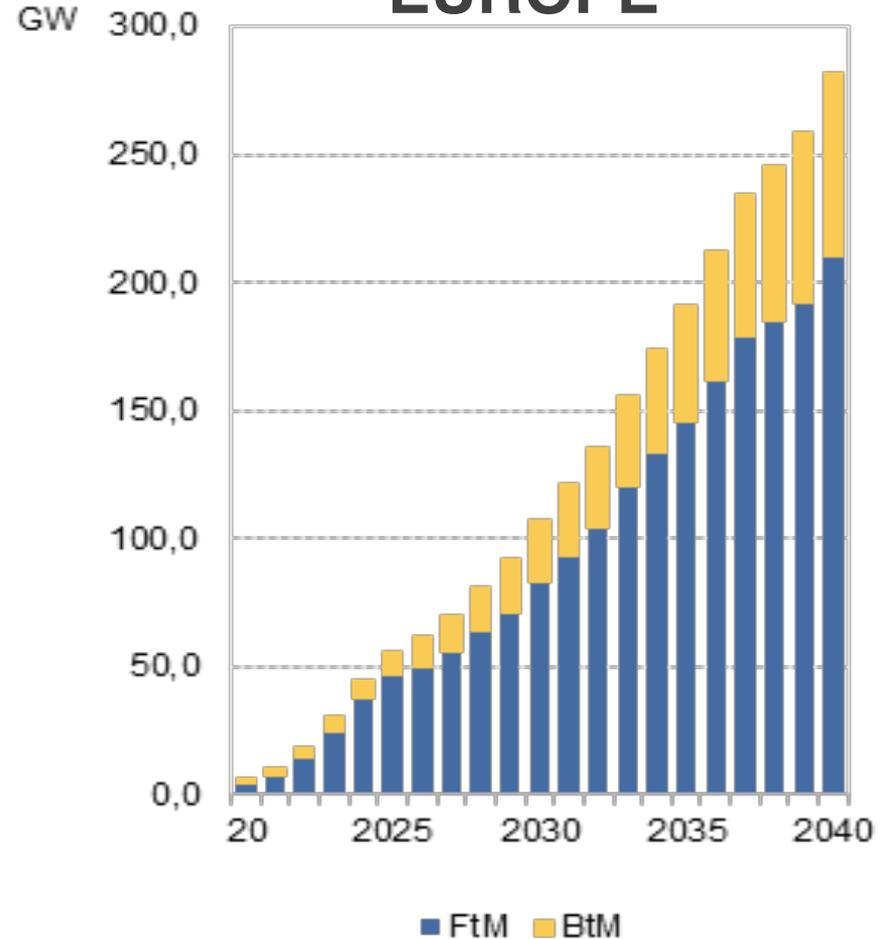
Source: Science Direct, Applied Energy

Battery Energy Storage Forecast

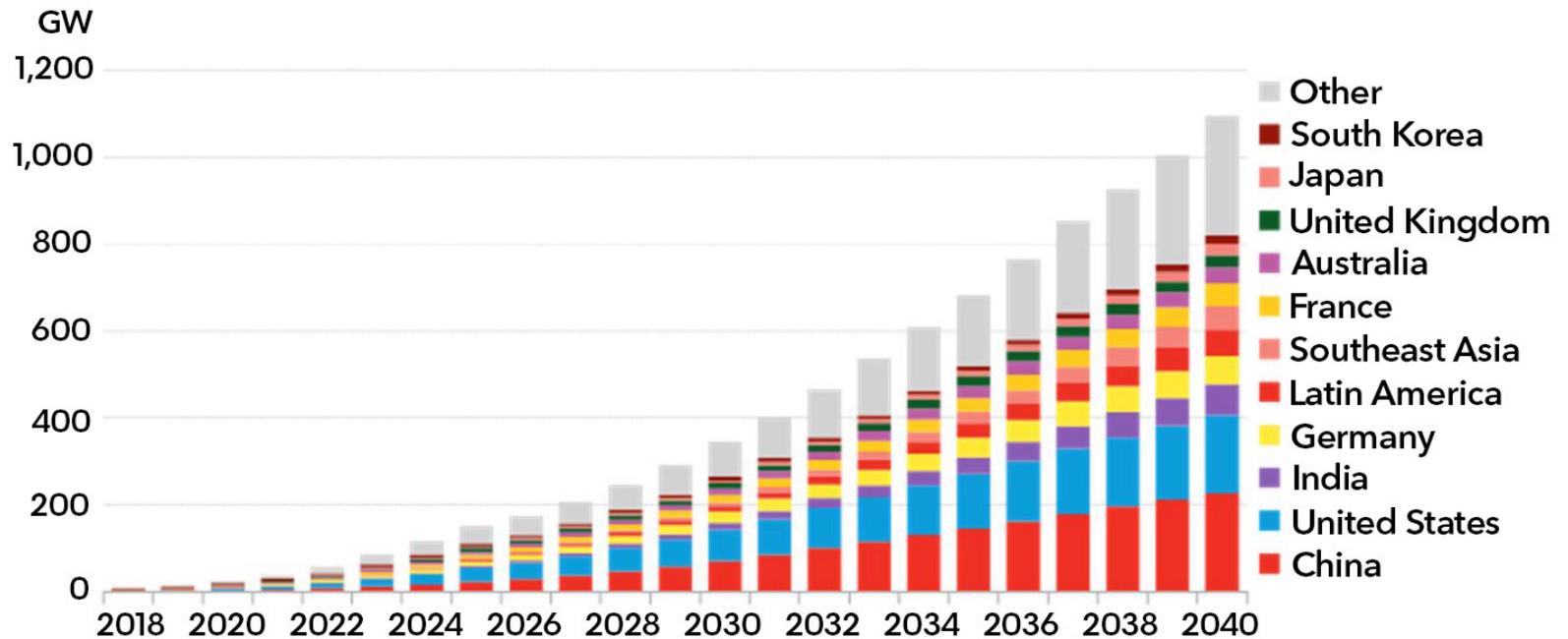
US



EUROPE



Similar Global Trends



Source: BloombergNEF 2019 Long-Term Energy Storage Outlook

- **By 2040:** battery energy storage installations alone will increase to 1,095 GW

Storage Technical Capabilities Required in a RES Dominated System

- Voltage control
- Frequency control
- Active power management (ramping)



Energy Storage Services

Stores and smooths renewables generation

Improves reliable operation of power grids when operating with a higher proportion of RES

Defers or substitutes costly investments in transmission, distribution or generation infrastructure

Provides back-up power

Contribute in Reducing Greenhouse Gas Emissions

Barriers to Deployment

- Market and regulatory
- Technological
- Strategic
- Economic



Recommendations moving forward

Market enabled to provide essential grid services

Observability/visibility necessary

Deployed to address RES curtailment

Support load shifting

EVs represent an important storage asset

Recommendations moving forward – energy storage

Market incentivisation schemes are needed

More research is needed on BtM storage

More R&D needed on long-term storage applications (inc. power to X)

Safety standards, societal acceptance and environmental issues must be considered urgently

Thank you!



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