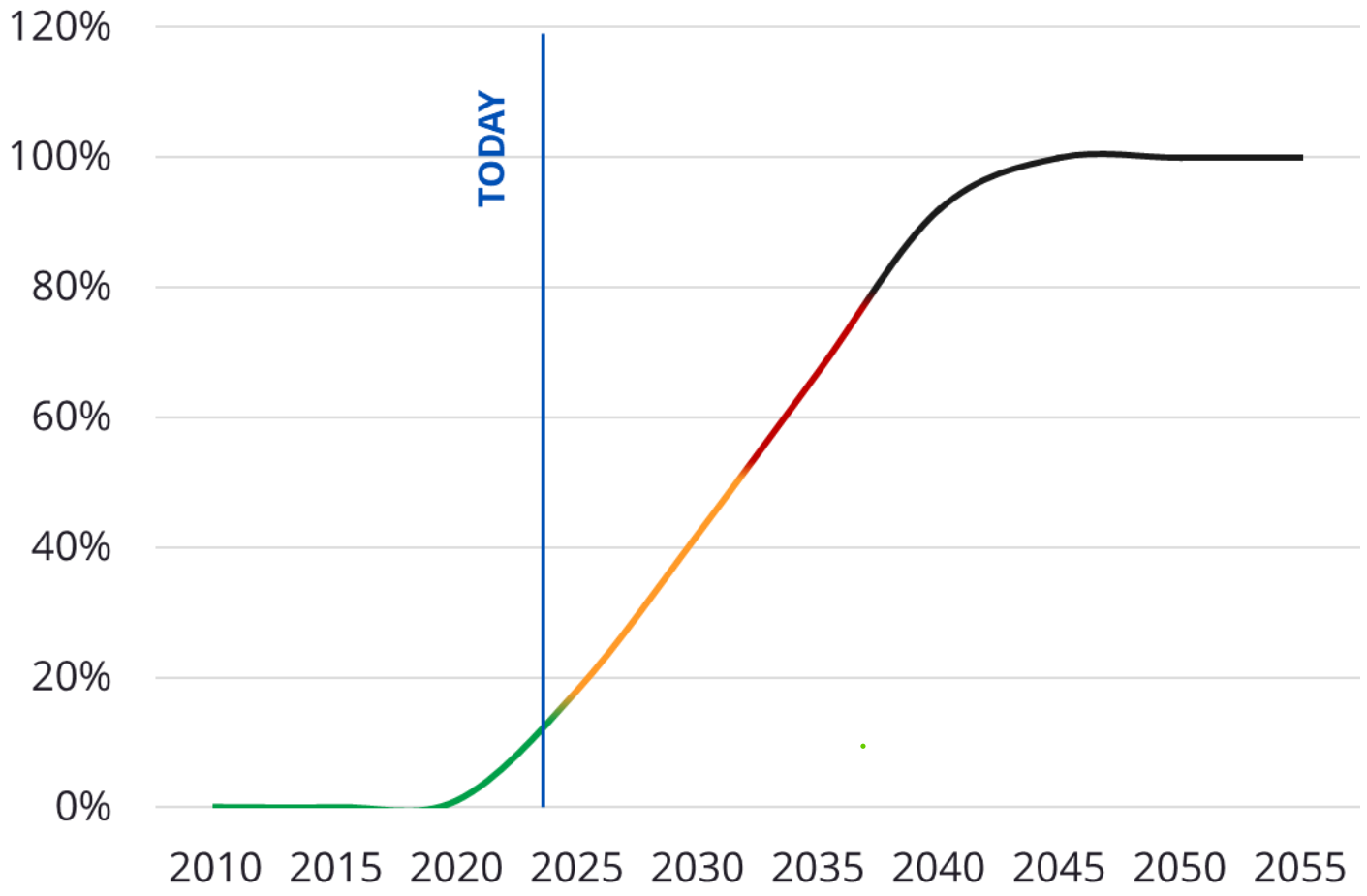
FLUENCE
A Siemens and AES Company

ENERGY STORAGE PARTNERSHIP (ESP) – JUNE 2023 - LOUGHBOROUGH

Lessons to accelerate market development for energy storage

JULIAN JANSEN
Senior Director – Strategy, Market Development, Policy (EMEA)

Energy Storage Adoption



OUR MISSION

Transform the way we power our world to create a more sustainable future.

PURPOSE-BUILT PURPOSE-DRIVEN

ENERGY STORAGE SOLUTIONS (1)

6.5+
TOTAL GW

225+
PROJECTS

SERVICES (2)

5.0+
TOTAL GW

CLOUD-BASED SOFTWARE (3)

MOSAIC

10.7+
GW OF AI-OPTIMIZED BIDDING OF RENEWABLES AND STORAGE

NISPERA

9.9+
GW OF RENEWABLE AND STORAGE ASSETS UNDER MANAGEMENT

(1) Deployed and contracted as of March 31, 2023

(2) Assets under management or contracted as of March 31, 2023

Over a decade of storage innovation

Opening Markets | Developing New Applications | Unlocking Revenue Streams

2010 — **First battery connected to PJM interconnection for frequency regulation**
AES, Pennsylvania

2011 — First utility-scale hybrid wind + energy storage facility using lithium-ion batteries
12 MW AES Laurel Mountain, West Virginia

2012 — First hybrid thermal power plant + energy storage
12 MW AES Gener, Chile

2013 — **First grid-scale battery to receive long-term capacity PPA (with SCE)**
100 MW Alamitos, California

2014 — Largest battery supply agreement for energy storage
LG Chem + AES

2015 — Largest energy storage project for the 5th time
30 MW Escondido, California

2016 — First structure with storage owned by transmission and leased to a market participant
30 MW, Ballarat, Australia

2017

2018 — **Largest Solar + Storage project in South America**
112 MW, Andes Solar, Chile

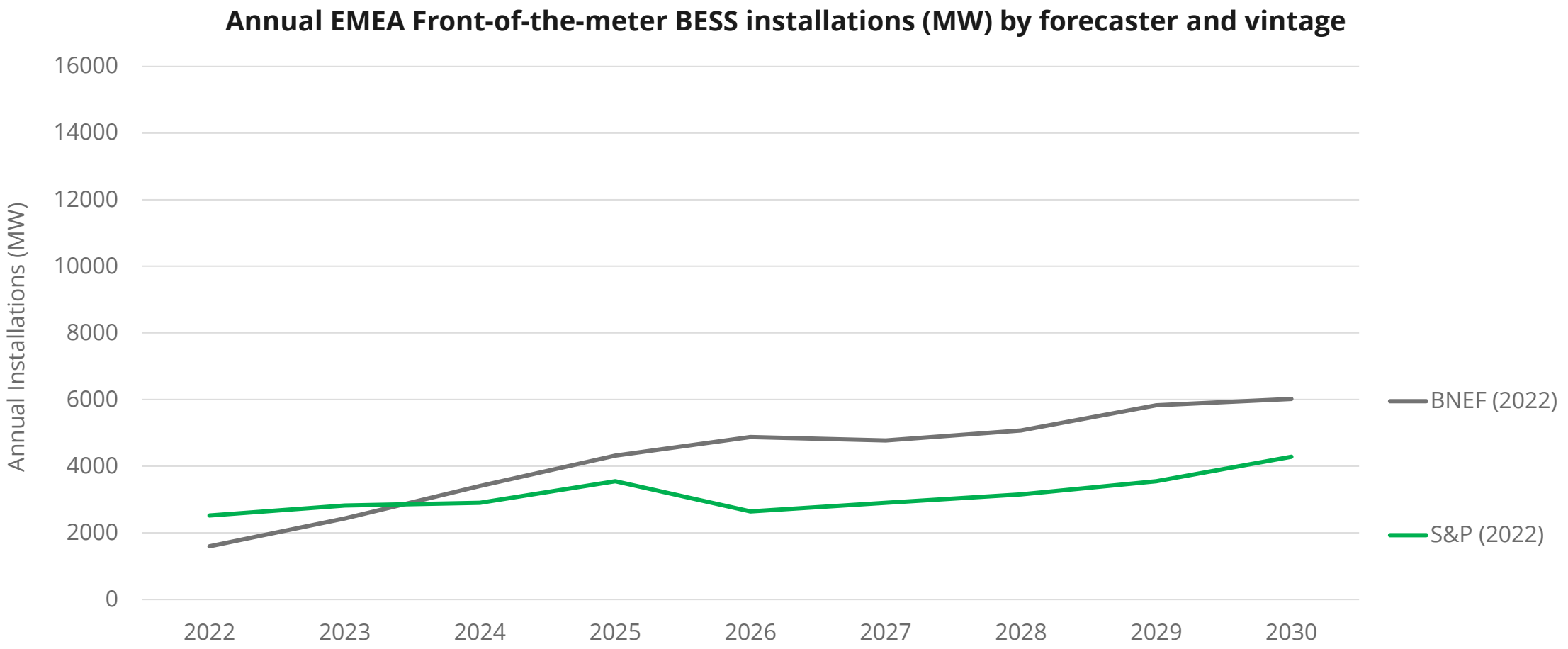
2019 — **Fastest frequency response battery in the world**
11 MW, Statkraft Kilathmoy, Ireland

2020 — Largest portfolio in SE Asia
SMC Portfolio of 500+ MWs across 20+ projects

2021 — Largest storage portfolio in Europe
ESB Portfolio of 208 MWh

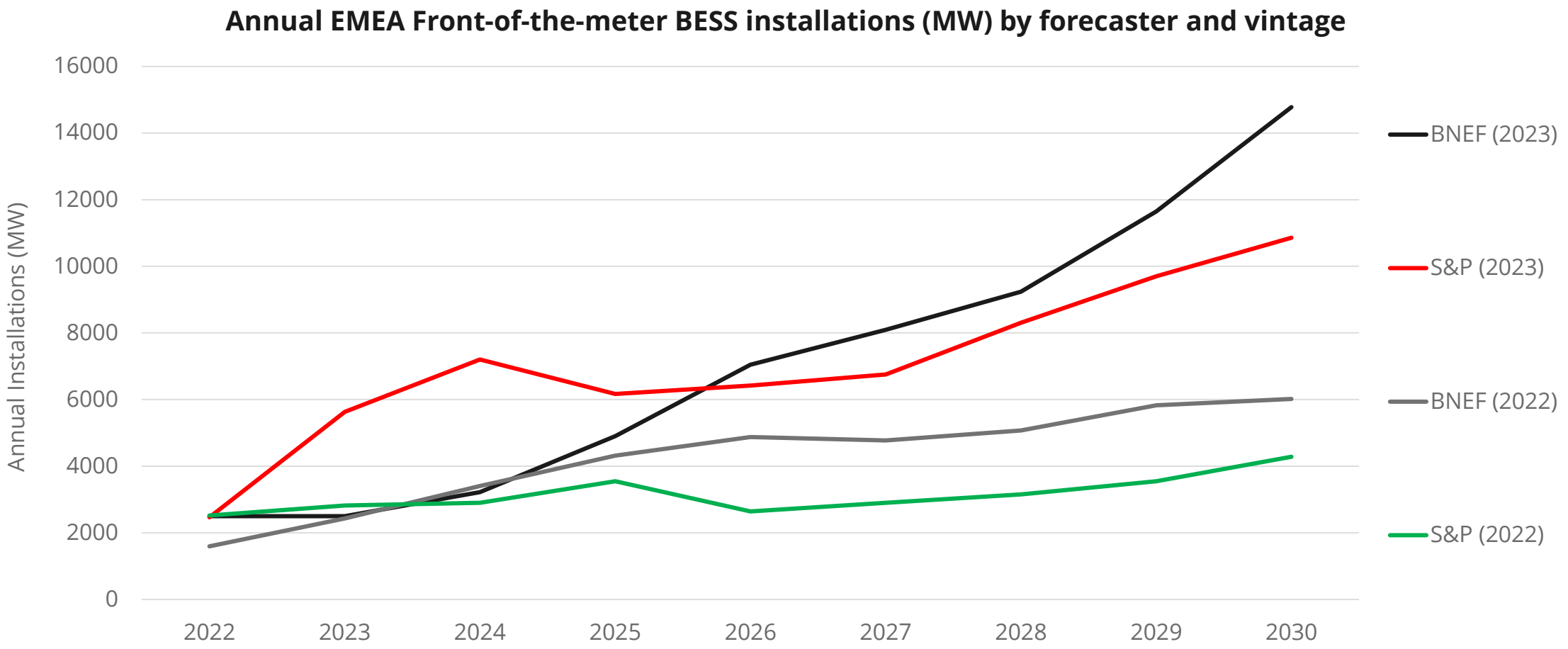
2022

The growth of the EMEA battery storage market is at a critical inflection point as revenue diversifies, new markets open and policy acts as an accelerator



Sources: S&P Global, BNEF, Fluence

The growth of the EMEA battery storage market is at a critical inflection point as revenue diversifies, new markets open and policy acts as an accelerator



Sources: S&P Global, BNEF, Fluence

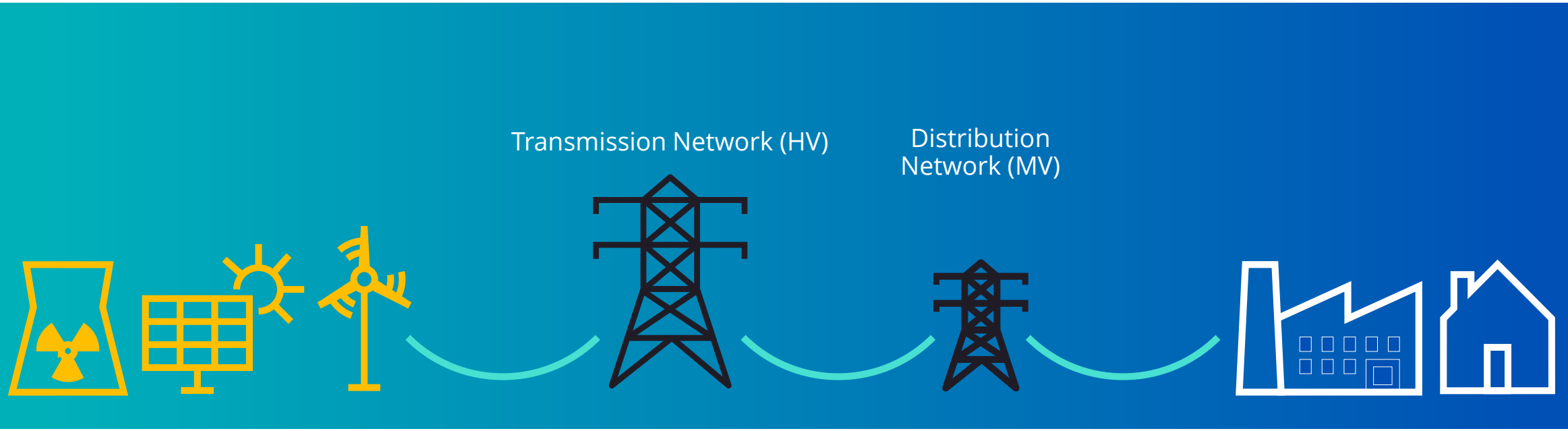
Building the right foundations to create a sustainable long-term market for energy storage

Understanding the use cases

Technological proof

Market and regulatory design

Acceleration through reform and incentive structures



POWER PRODUCERS

Electricity is produced from conventional and renewable energy sources.

GRID OPERATORS / OWNERS

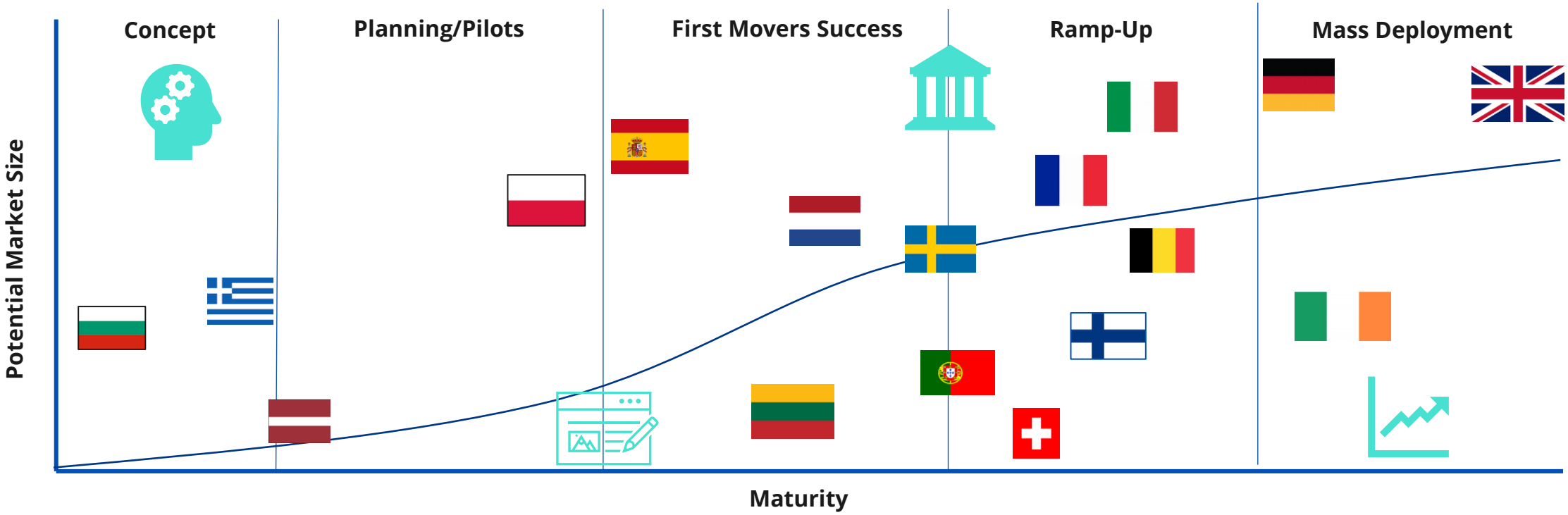
Transmission system owners and operator together with the distribution system owners and operators ensure that electricity gets to the consumers.

CONSUMERS

Use the electricity fed by the producer into the power transmission grid.

Development curve of European energy storage markets – unlocking barriers and facilitating market access

European market maturity and growth by country (illustrative)



Common barriers

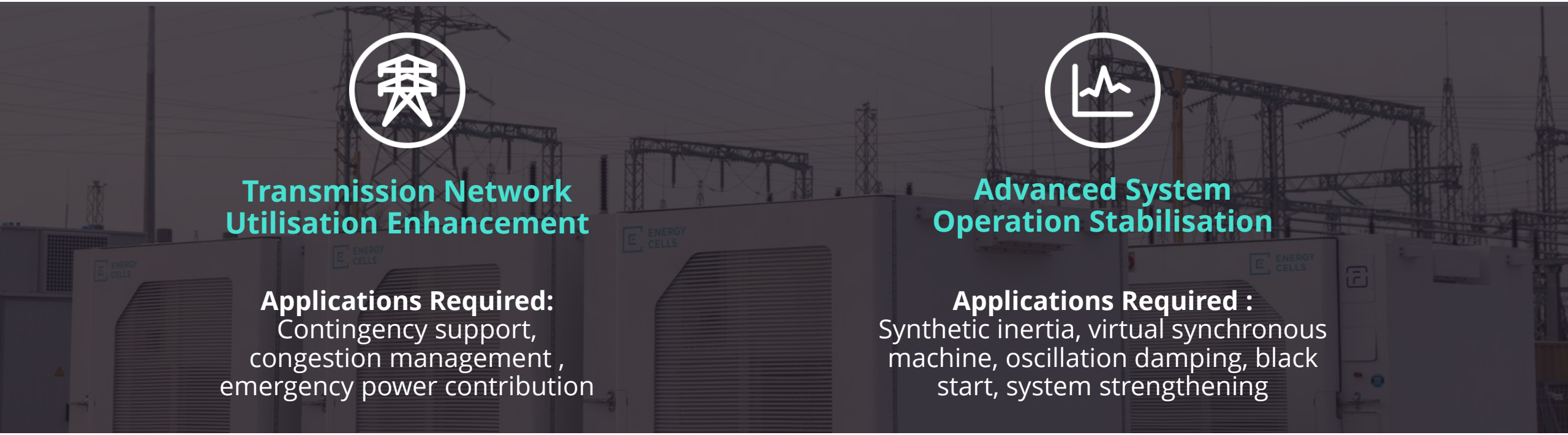
- (Double) charging of grid fees, levies, taxes
- Access to ancillary service, wholesale and capacity markets

Further potential to unlock energy storage

- Local flexibility markets, market-based congestion management
- TSO/DSO procured Flexibility Services
- Curtailment Prevention

Enabling the Future Grid with Next Generation Energy Storage

Often overlooked, it is critical to think ahead, targeting the two primary value drivers for System Operators and Network Owners



Transmission Network Utilisation Enhancement

Applications Required:
Contingency support, congestion management , emergency power contribution

Advanced System Operation Stabilisation

Applications Required :
Synthetic inertia, virtual synchronous machine, oscillation damping, black start, system strengthening

Key value proposition

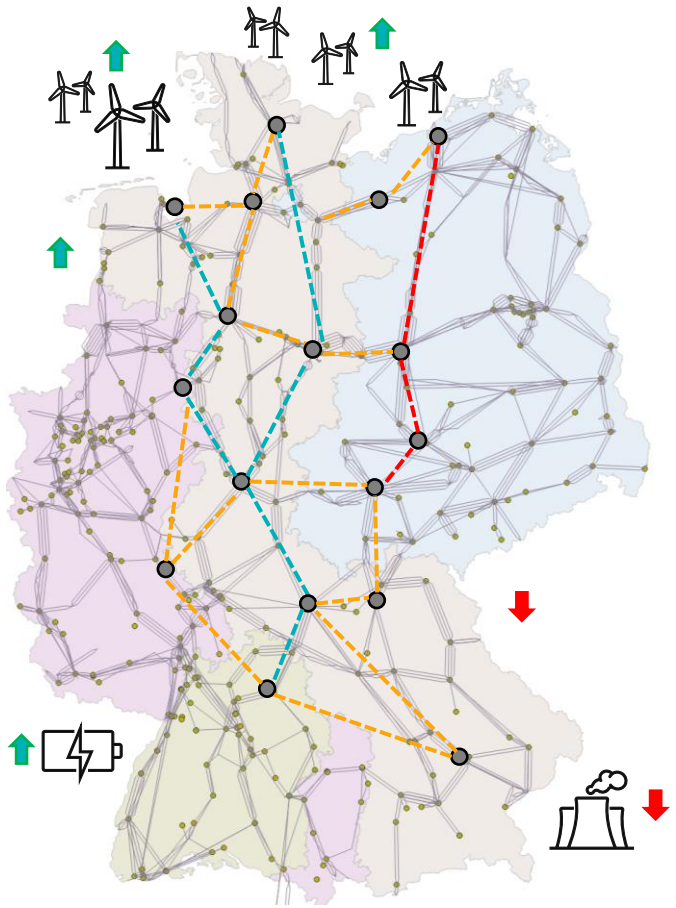
Reducing redispatch or curtailment costs and optimising system-wide dispatch by increasing line utilisation

Key value proposition

Providing extensive set of next generation Ancillary Services from TSO owned or operated resources

Utilising innovative grid solutions to counter rising costs for transmission system operation

Case Study: TransnetBW GridBooster project Kupferzell



Energy Policy Goals

- **04/23**: phase-out of nuclear power plants
- **2038**: phase-out of coal power plants (minus >30GW)
- **2030**: 80% RE-share in energy consumption
  - e.g. >30GW offshore
  - e.g. >115GW onshore

Consequences

- Growing imports to Baden-Württemberg
- Growing difference in generation & load (north – south)
- Growing costs for curtailment, redispatch and system operation

Solutions

- Accelerate grid expansion for large grid projects through changes in regulation
- Optimize utilisation of & load factor for existing lines through innovative solutions

***2018**: **first concept idea** for grid boosters, **2019**: **confirmation of TransnetBW** Grid Booster project in national Grid Development Plan*

Grid Booster - TSO asset of the future

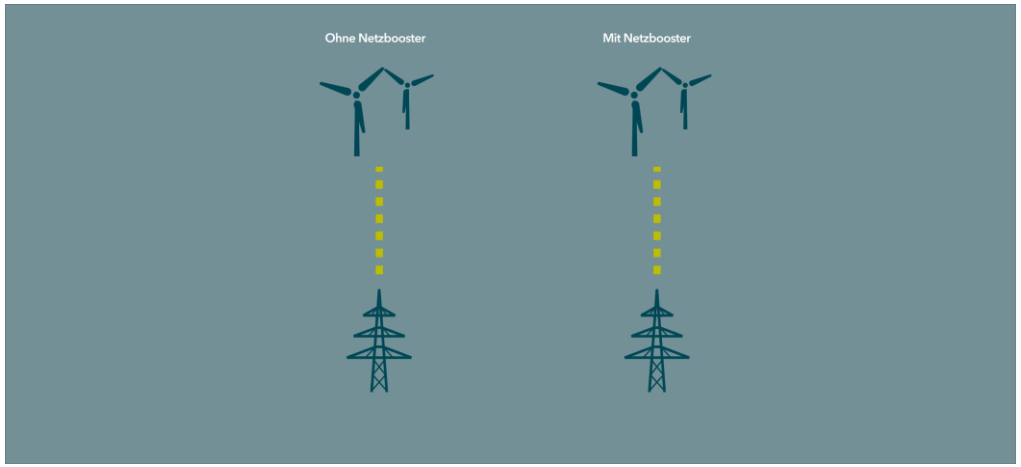
Case Study: TransnetBW GridBooster project Kupferzell

"Old World" – Today's Grid Operation

Preventive use of fossile redispatch power plants

"New World" - Grid Operation in the Future

Curative use of large scale batteries and volatile RES generation

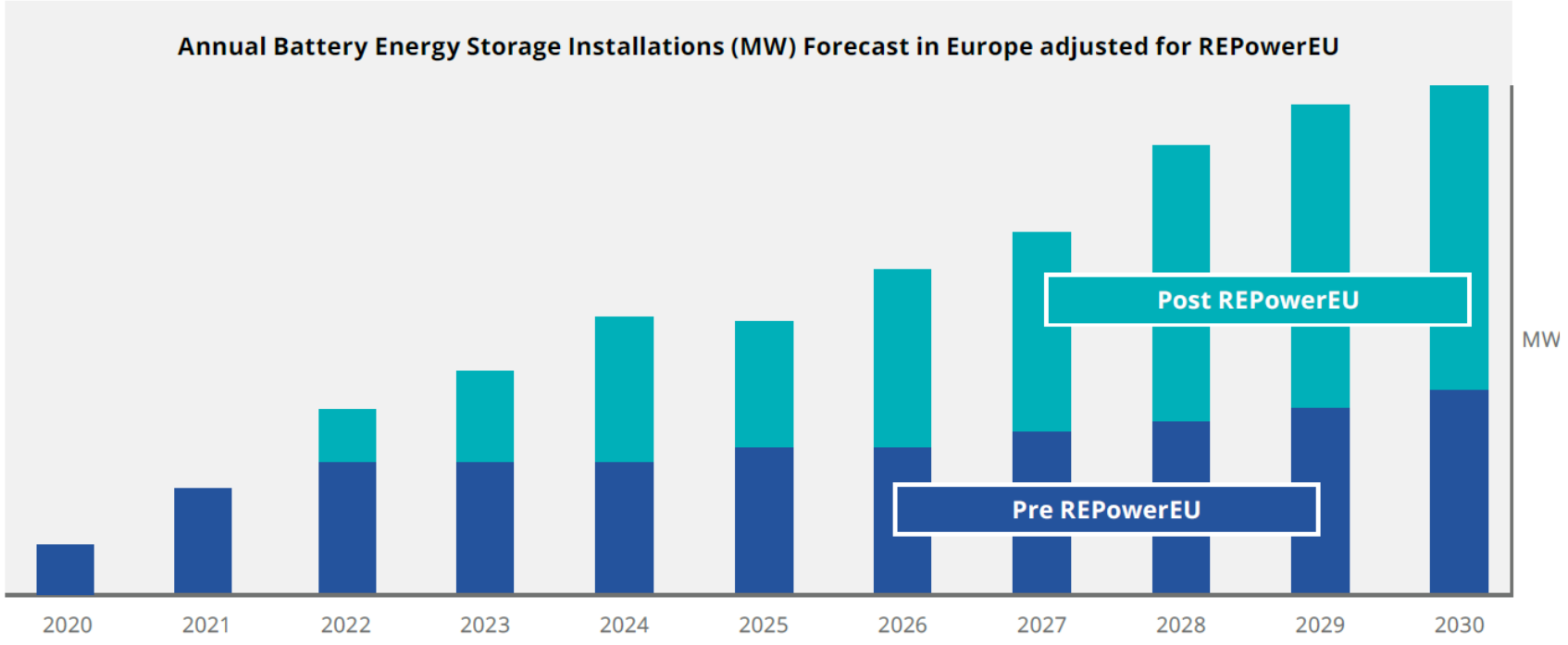


- Fast response for grid stability and security through use of batteries
- Increasing the efficiency of existing grid infrastructure by using n-1 contingency reserves by maintaining the same grid security level
- Lowering the number of required preventive measures (redispatch) in system operation
- Avoiding RES curtailment and contributing to a ZERO CARBON energy system!

2022: Geopolitical disruption and rethinking of European energy security has led to a boost for Energy Storage

Energy Crisis → RePower EU → Need for flexibility assets

45% renewable → 1,236 GW by 2030



+41 GW of battery-based energy storage needed to integrate accelerated renewable buildout targeted under REPowerEU

How to drive investment to meet our energy security goals?

Source: Data adapted from range of sources including IHS Markit/S&P Global, BNEF, WoodMac., and Data includes some markets outside of the EU such as the UK

2023: EU Electricity Market Design create strong tailwinds for Energy Storage deployment in the 2020s in a second wave

Lessons to be learned from how to effectively de-risk and accelerate storage deployment to drive ahead of future flexibility needs

Electricity Market Design

FLEXIBILITY NEEDS' ASSESSMENT

Member States to assess flexibility every 2 years

1st assessment – Jan 2025

+

NATIONAL OBJECTIVES

National objectives for Demand Response and Energy Storage in NECPs

+

FLEXIBILITY SUPPORT SCHEMES

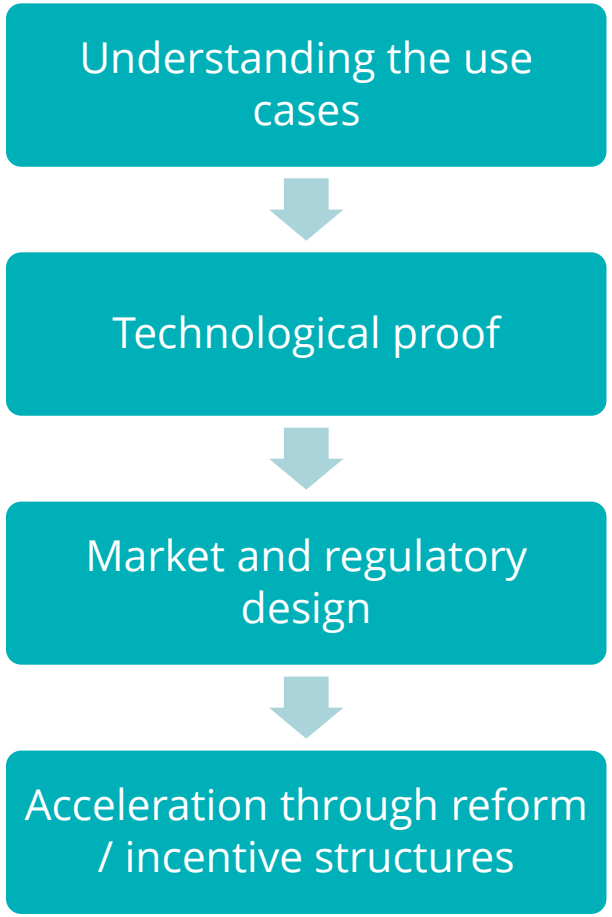
Support mechanisms for non-fossil flexibility can be implemented

Redefine of CM to promote low-carbon flexibility

Defined principles for Flexibility Support Schemes

Creating the foundations for growth through sound market development will be critical to meet future flexibility and grid-operation needs

- The storage industry is at the start of its adoption curve – use cases are diversifying and technology development accelerating
- Battery energy storage is being deployed across all parts of the power systems – as markets develop we have to focus beyond generation
- Building out storage ahead of the renewable adoption curve is critical to ensure flexibility requirements are met
- Grid operations of the future will require the curative use of battery energy storage to integrate volatile renewables



Julian Jansen
Senior Director
Strategy, Market Development, Policy (EMEA)
julian.Jansen@fluenceenergy.com

Thank You!

