



FLUENCE

A Siemens and AES Company

TNC-CIGRE Webinar 2021

Electricity Energy Transition, Trends, and Technologies

OUR MISSION

Transform the way you power your world to create a more sustainable future.



Global leader in energy storage



+



Fluence (a Siemens & AES company) delivers complete, proven storage systems

OUR TRACK RECORD



13+
YEARS



150+
PROJECTS



24
COUNTRIES
AND TERRITORIES



2,750+
TOTAL MW DEPLOYED
OR AWARDED



7,600+
GW-HOURS OF DELIVERED
SERVICE GLOBALLY

INDUSTRY RECOGNITION

#1

ON NAVIGANT* ENERGY
STORAGE LEADERBOARD

#4

IN ENERGY
FAST COMPANY MOST
INNOVATIVE COMPANY



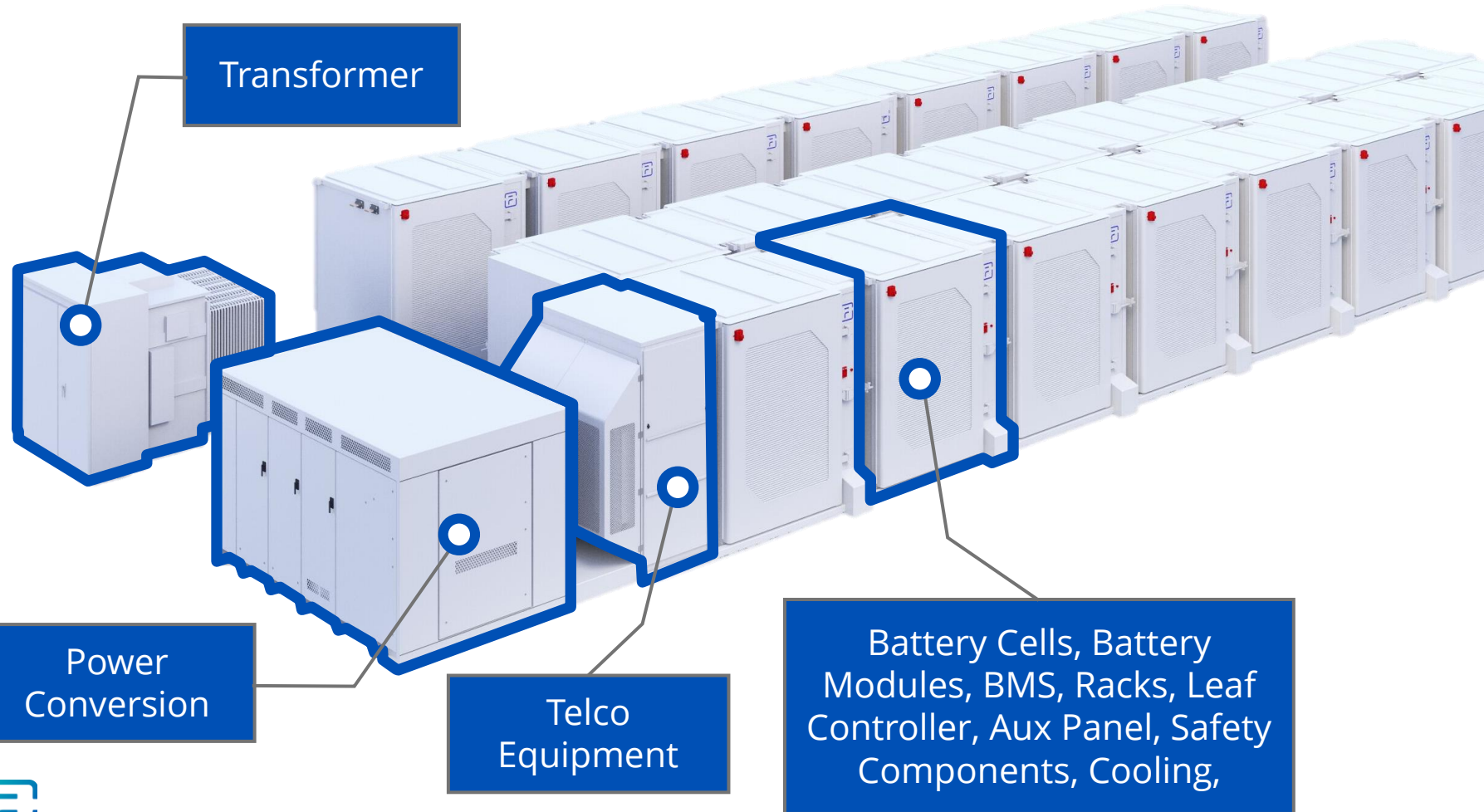
* Now Guidehouse Insights

OUR CUSTOMERS



What is energy storage?

Large-scale batteries for utility and industrial applications



Intelligence

Extensible digital intelligence and machine learning to improve system performance



Controls

Fully integrated operations platform combines comprehensive controls and asset management

We are creating the energy storage market and accelerating grid transformation

2008

1st lithium-ion battery to connect to the electric grid
INDIANA, US



2009

1st commercial grid-scale battery
CHILE



2014

Contracted first 100 MW/400 MWh energy storage peaker
ALAMITOS, CA, US



2015

First grid-scale battery project in Finland
HELSINKI, FINLAND



2017

Build largest energy storage project in the world, for the 5th time
ESCONDIDO, CA, US



2018

Bringing market participants across grid value chain together to max asset value
VIC, AUSTRALIA



2019

Largest portfolio contracted in the region with 500+MW from 20+ projects
SOUTHEAST ASIA



2020

Delivered fastest response time of grid-scale battery
IRELAND



Deploying largest project in the world, capacity peak power, 1200 MWh
CALIFORNIA, US



Industry Firsts

From 2008-2020, the Fluence team designed and delivered the first battery-based energy storage systems in 18 markets



Southeast Asia's Largest Energy Storage Portfolio

Supporting Ancillary Services

Fluence completes first projects in 470 MW / 470 MWh Philippines battery order

Fluence and its customer have worked together to develop a standardised 20 MW 'building block' BESS solution that can be quickly rolled out to sites ranging from 20 MW to 60 MW in size.

The entire portfolio scheduled for commissioning by the end of 2022.



Frequency Regulation and Generation Enhancement

AES Andres

Santo Domingo, Dominican Republic

10 MW / 10 MWh

SERVICES

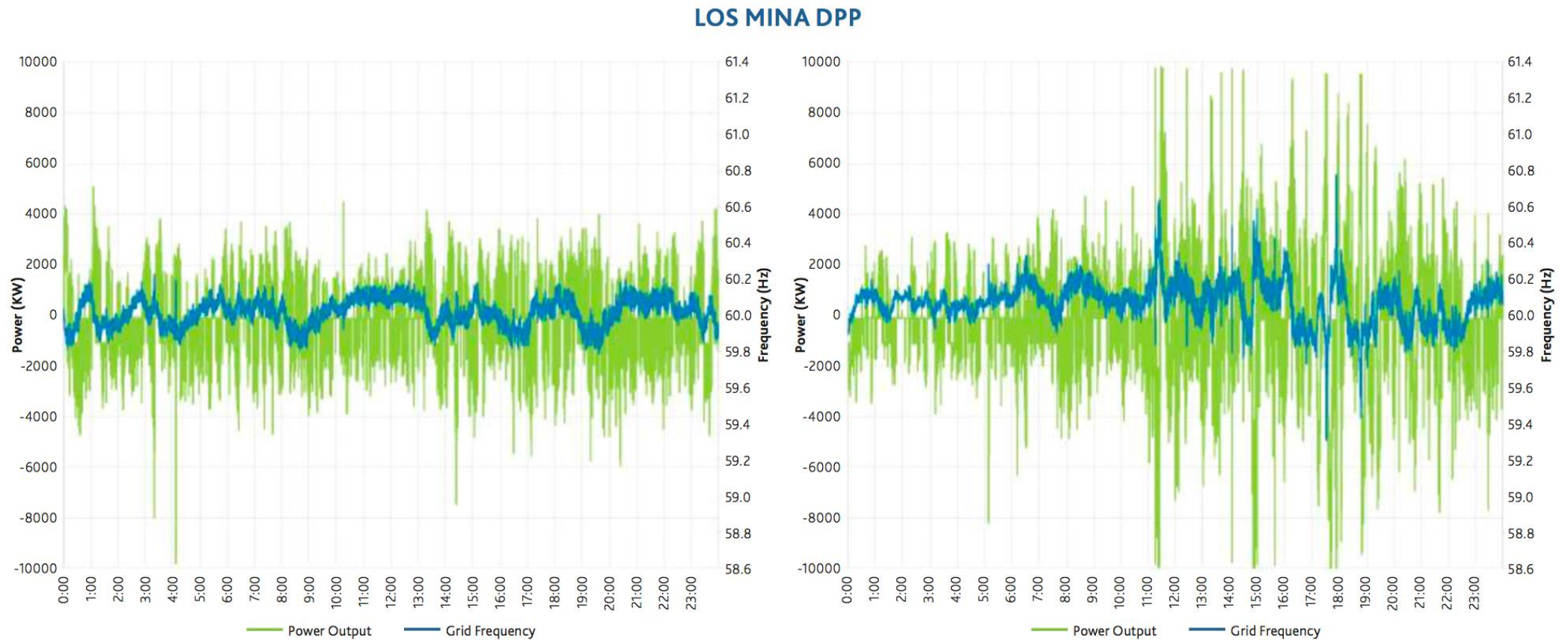
- Frequency Regulation/Control

IMPACT

- Alternative to generators
- Supports grid resiliency during storm conditions



Dominican Republic



BESS operating profile during typical weather conditions (one week prior to 2017's Hurricane Irma)

BESS operating profile during severe storm conditions (during Hurricane Irma)



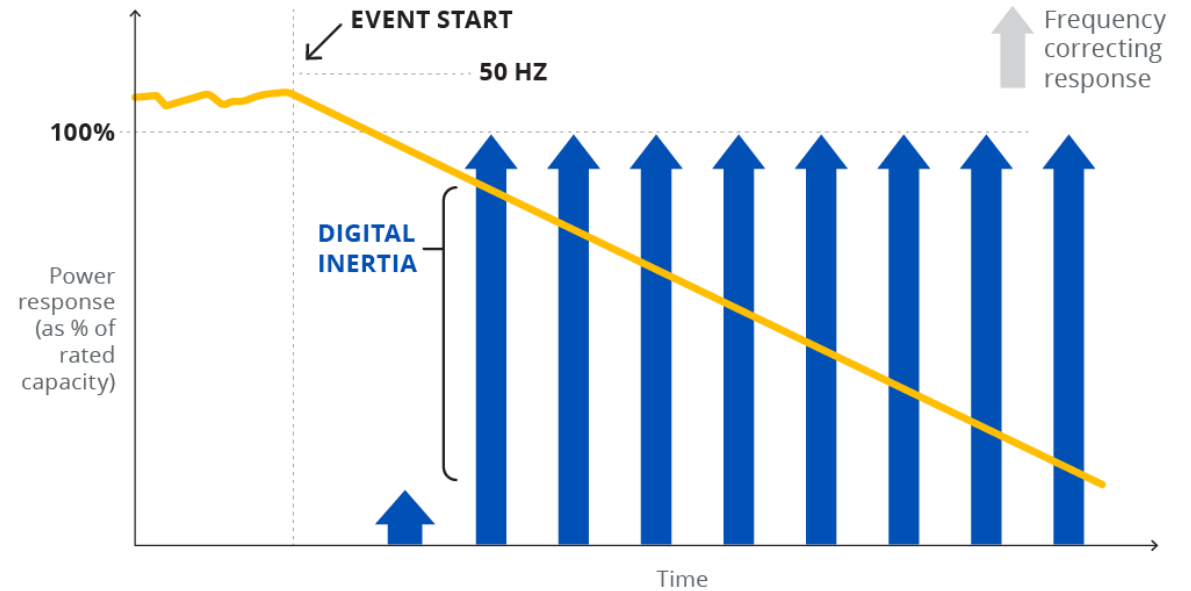
Frequency Regulation (150ms)



Kilathmoy
IRELAND

11 MW / 5.5 MWh

Frequency Response with Energy Storage



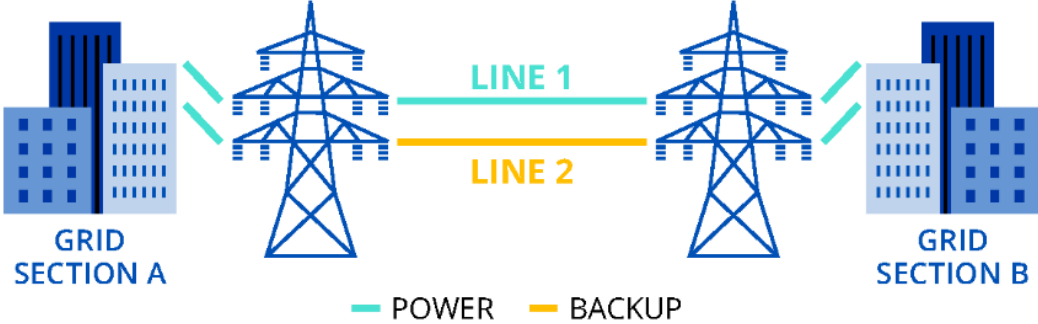
BENEFITS

- Cost-effective way to manage second-to-second fluctuations and maintain stable frequency
- Can both deliver and absorb power (bi-directional)
- Faster response than thermal generation

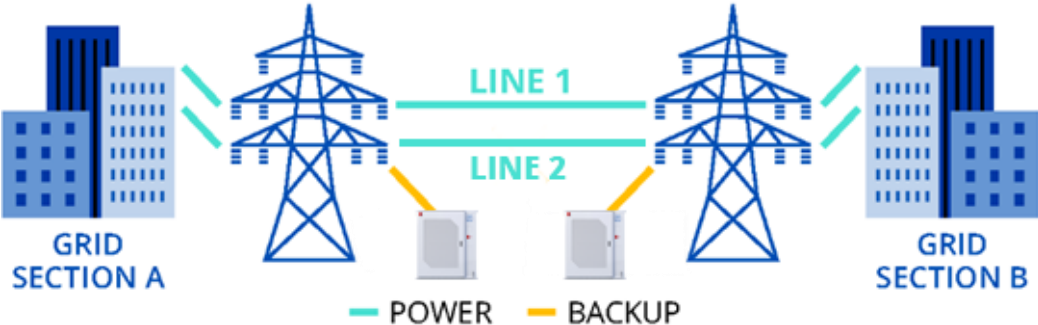
Energy Storage as Virtual Transmission



Without Virtual Transmission



With Virtual Transmission



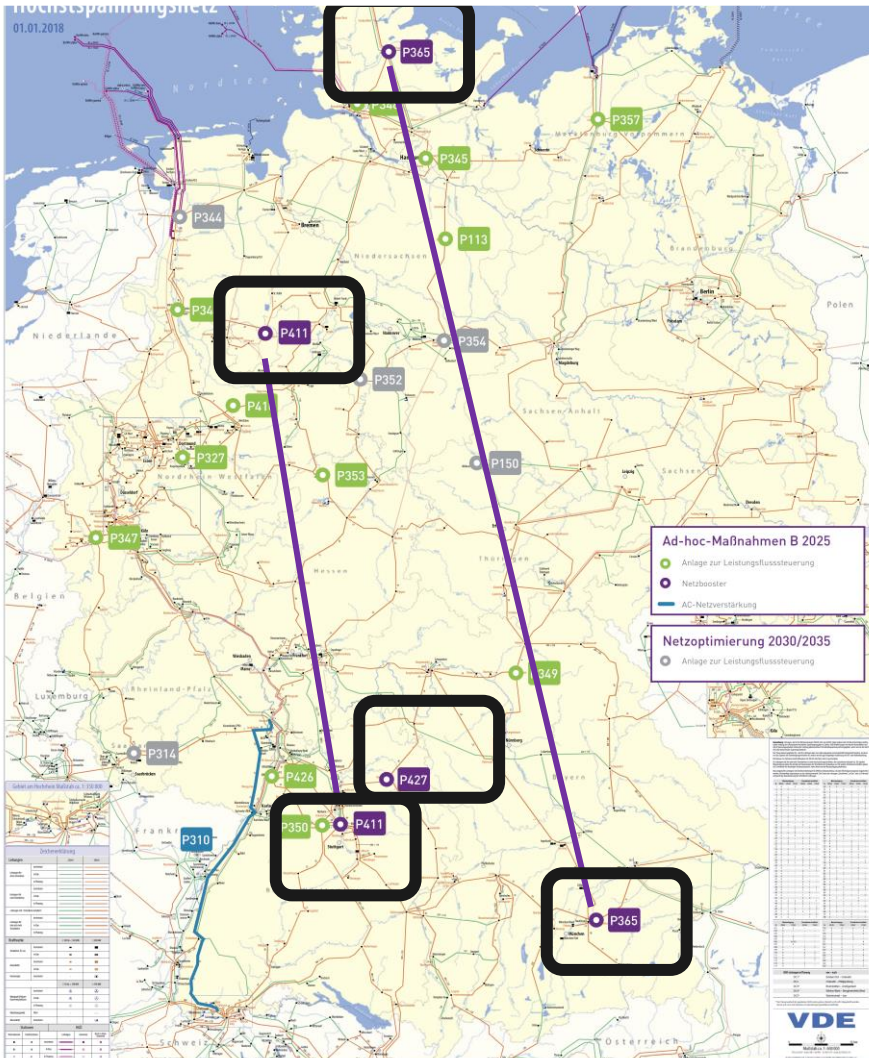
BENEFITS

- Avoid or defer building new lines
- Operate existing lines closer to thermal limit with active power
- Provide additional ancillary services



“Grid Development Plan”– Scenario B2025 shows 3 Ad-hoc Gridbooster systems decreasing redispatch costs by 9.3%

1.3 GW Storage Grid Booster – Germany - Saves 350,000€ / Day in redispatch costs



Storage systems as Gridbooster – BackUp system for higher utilization of existing grid

P365-M583	2 * 100MW (tandem) Audorf/Süd und Ottenhofen	TenneT
P411-M625	2 * 300MW (tandem) Wehrendorf und Hoheneck	Amprion
P427-M646	1 * 500MW Kupferzell	TransnetBW
Total	1300MW	



T&D Enhancement

Rohini, New Delhi, India

10 MW / 10 MWh

Located at a substation owned by Tata Power Delhi Distribution Limited (TPDDL)

SERVICES

- Frequency control
- Distribution reliability
- DSM Mitigation

IMPACT

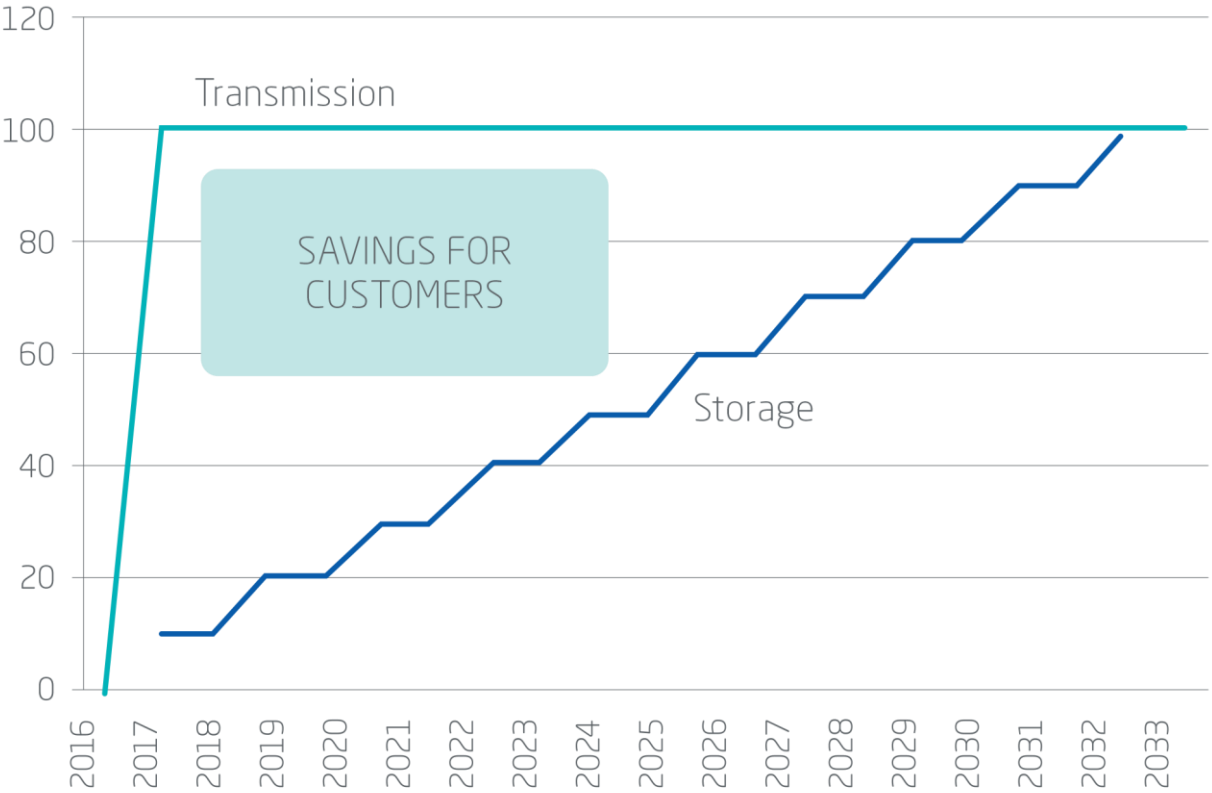
- Provide capability to manage frequency and manage load growth in local area.



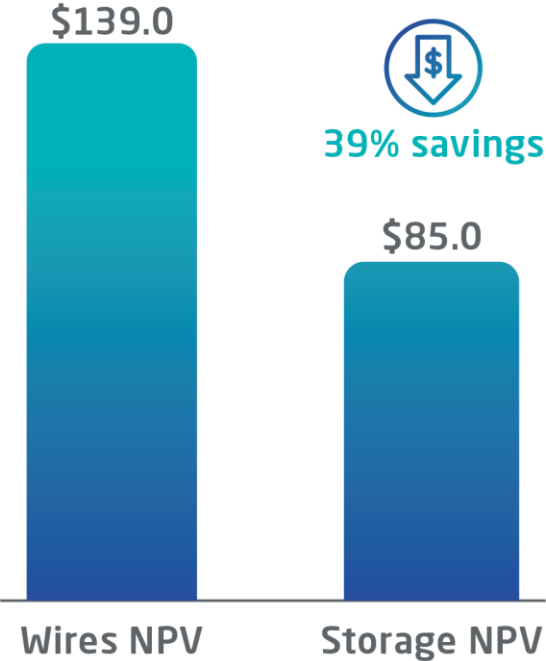
Indicative Value Comparison – Network Peak Load Relief

T&D Enhancement

Transmission vs Storage - Lumpiness of Investment



20-year cost of solution (NPV\$, MM)



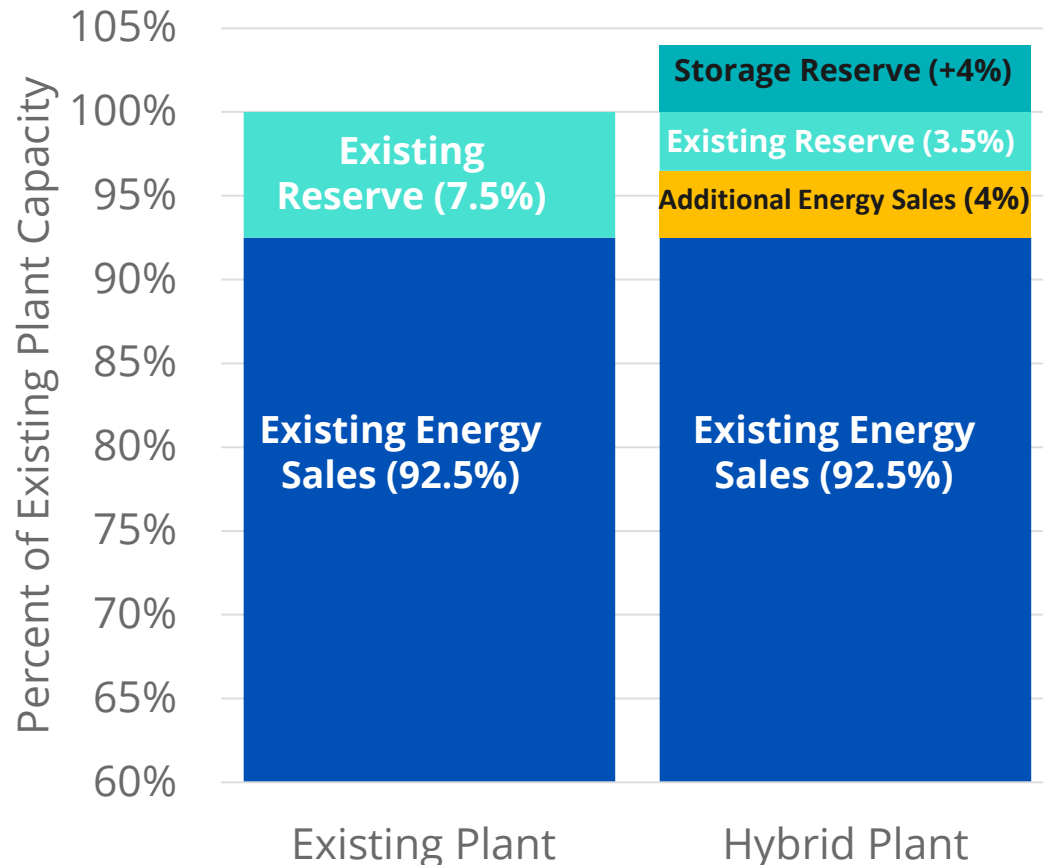
Transmission project development costs start occurring 3-5 years before project is put into service. These costs are not highlighted separately here, but rather considered part of total capex.



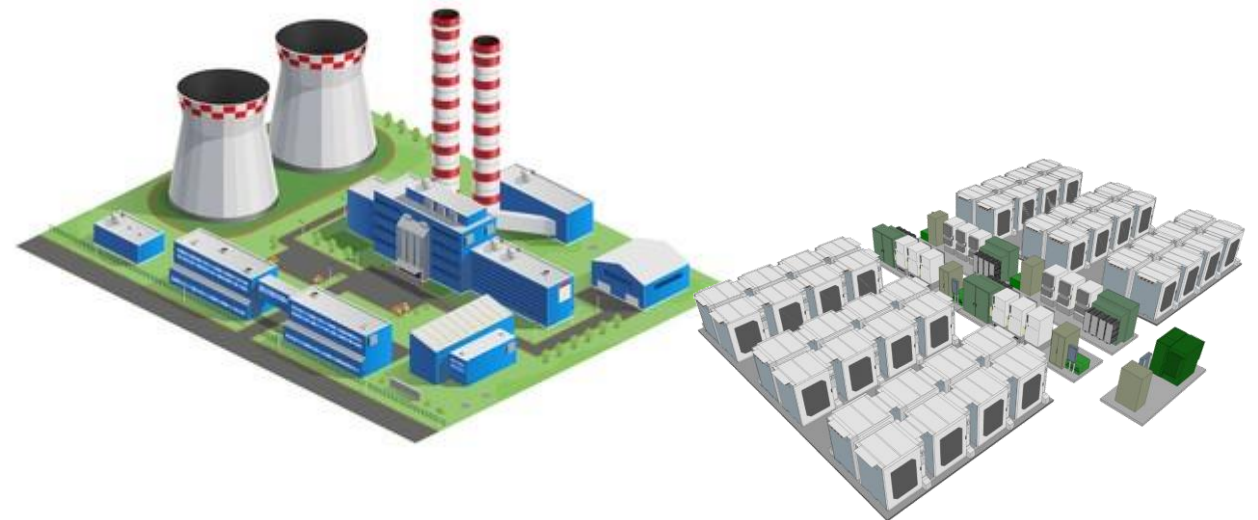
Generation enhancement- Capacity Release Case Study:

Storage enabled the plant to sell an additional 130 GWh per year

How Does It Make Money?



- Storage can be used for Reserve that was maintained at plant or Frequency services
- Growing demand; plant can be used at higher CUF



Notes: Restricted Axis. Based on a 550 MW plant and 20 MW/5MWh battery



Capacity Release at a Coal Plant

AES Gener Angamos

Mejillones, Chile

20 MW / 5MWh

PROBLEM

Grid rules mandate the power plant must withhold a portion of their capacity as spinning reserves, lowering the total energy output of the system, which lowered plant revenue.

IMPACT

The speed, efficiency, and reliability of 20 MW/5 MWh battery enabled it to provide the spinning reserves for the power plant. This released the plant's withheld capacity to grow its revenues by increasing output by 4% (~130 GWh per year).



Storage projects - from Inception to Operation

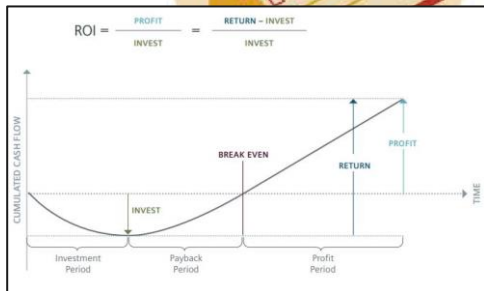
To be successful, best is to work with bankable, experienced integrators who are here to help you managing risks and creating value at each steps of your journey

Business case & Policy Support

Structuring, pricing and contracting the BESS solution

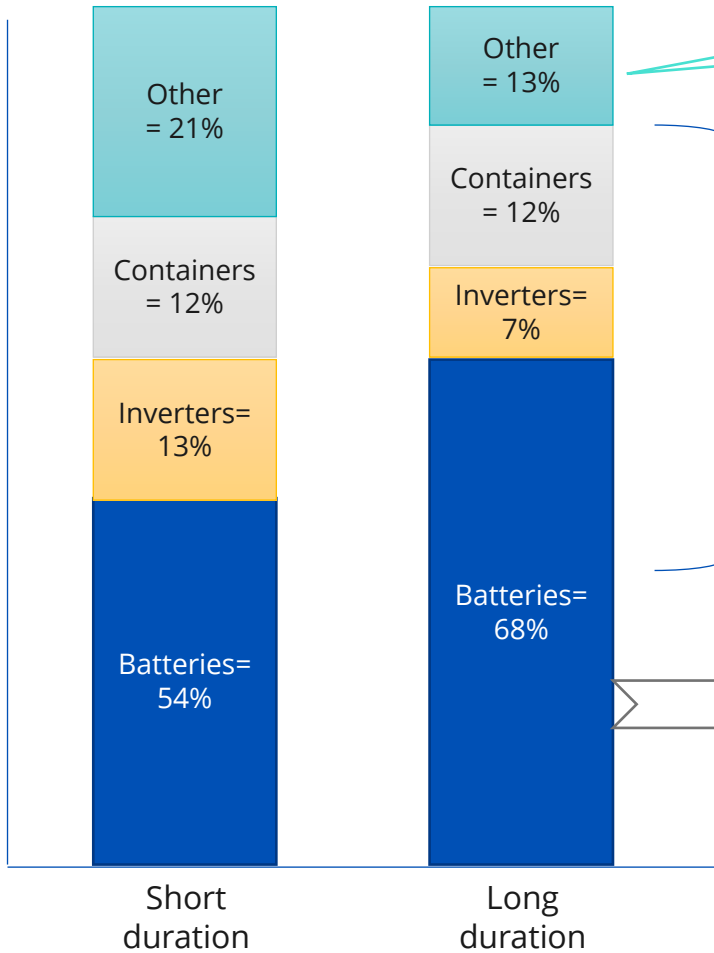
Deployment and Execution

Operation, Maintenance & Revenue optimization



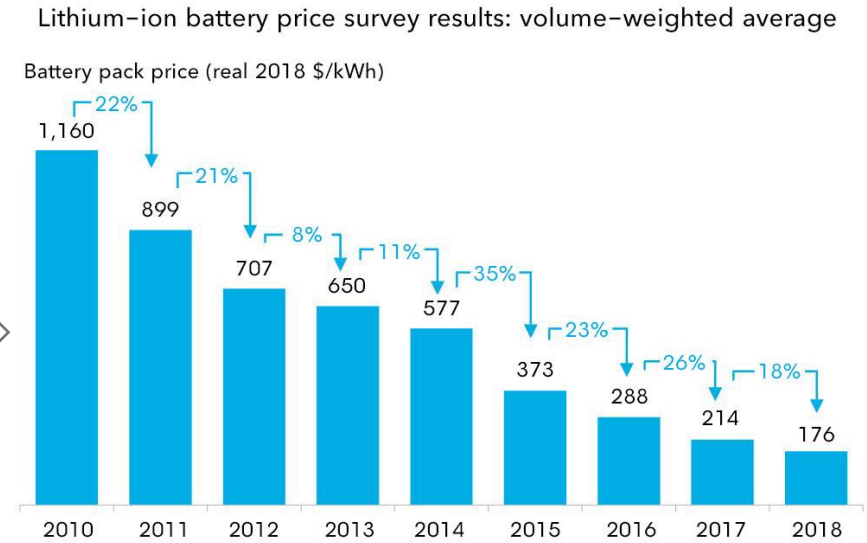
Price Expectations (*Seek prices*)

- Commissioning costs/ test
- Safety
- HVAC
- Design
- Commercial tools/Warranties
- Labor



Fluence global supply agreements/flexibility with different suppliers ensure long term availability/support and best pricing (eg: 7GWh in 2021)

Battery prices are only one component



Source: BloombergNEF



No BOP included/ Fluence strong on EPC support (Providing Turnkey in many countries)

Operation and Service (LTSA) considerations

A BESS' operational costs are generally lower than its thermal counterparts; however like thermal generation, a BESS also requires certain preventive and reactive services to be contracted with supplier

What happens from Degradation?
How to augment capacity?



What happens if the supplier/
product is not in the market anymore



How will the assets be maintained?

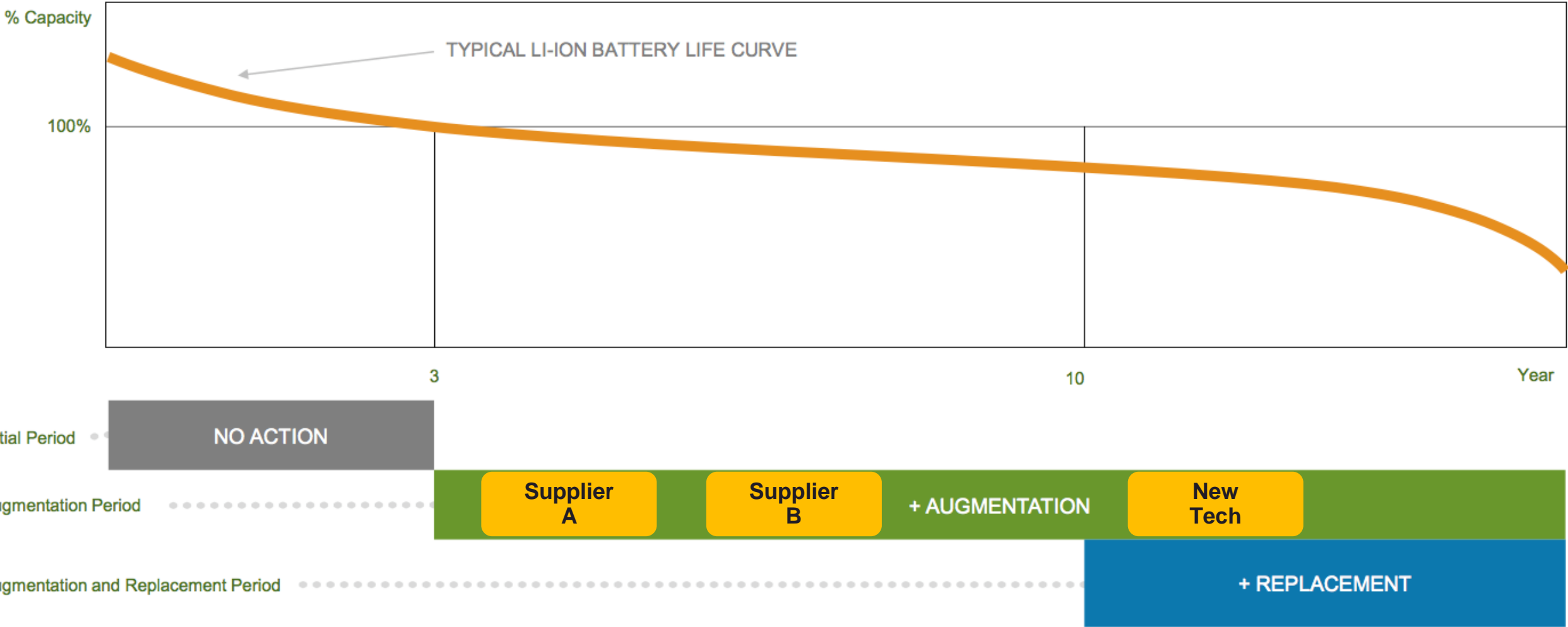


How will parts availability be ensured?



Is your integrator locking you in with 1 supplier? Whats cost over life?

Strong bankable integrators focused on Supply solutions are important to ensure long-term operation



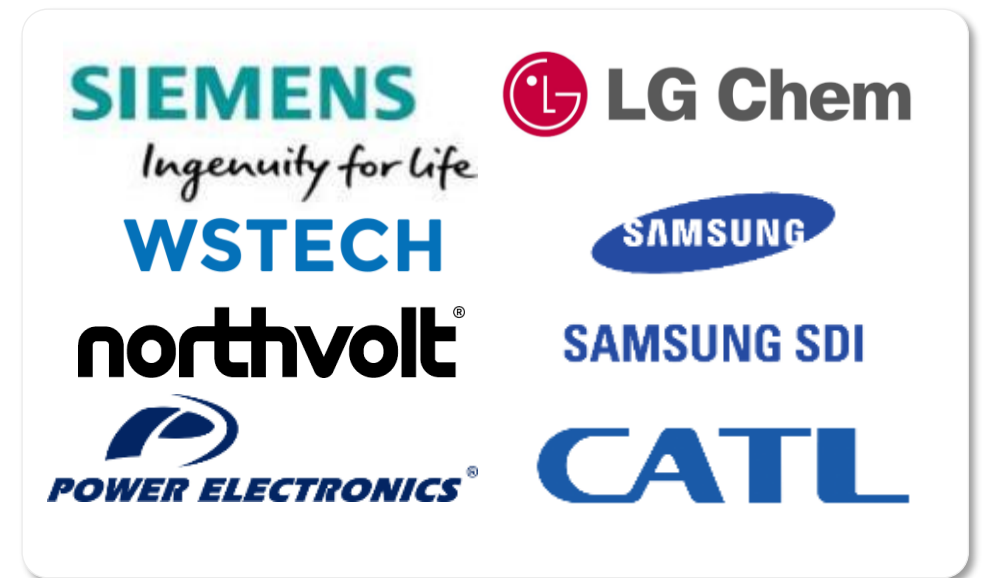
Supplier qualification by your technology supplier is critical

Through our technology agnostic approach, Fluence partners with leading suppliers and conducts rigorous prequalification and testing to ensure the quality and safety of components

Vendors go through an extensive pre-qualification process, including battery tests, PCS at limits of intended use, and corner cases to see how the equipment performs and if they are operating safely. Fluence operates two labs which perform comprehensive component and system testing.

Qualification requirements include:

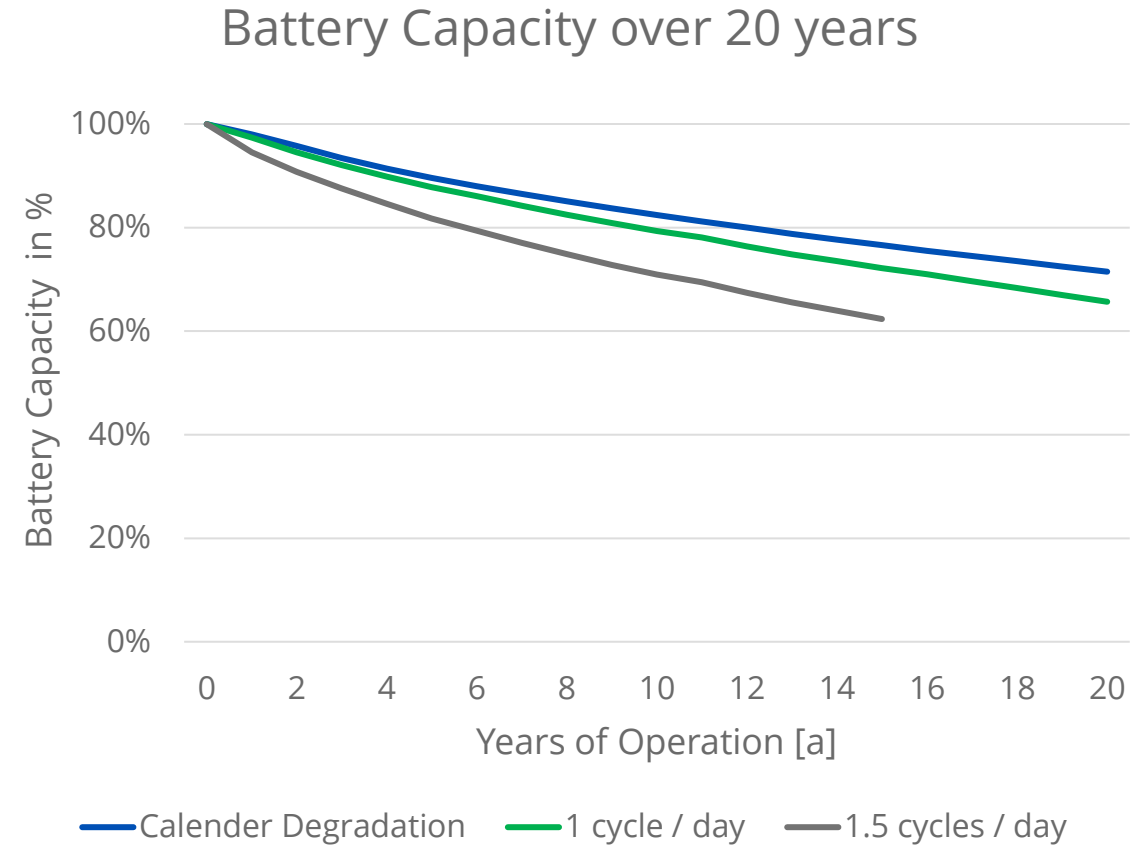
- ISO9001 & 14001
- Battery cells are certified to IEC62619
- Modules and low voltage switchgear certified to UL1973 and IEC61000-6
- Low-voltage directive compliance for the EU (LVD 2014/35/EU).
- Transportation of dangerous good compliance to UN 38.3



Flexible Performance

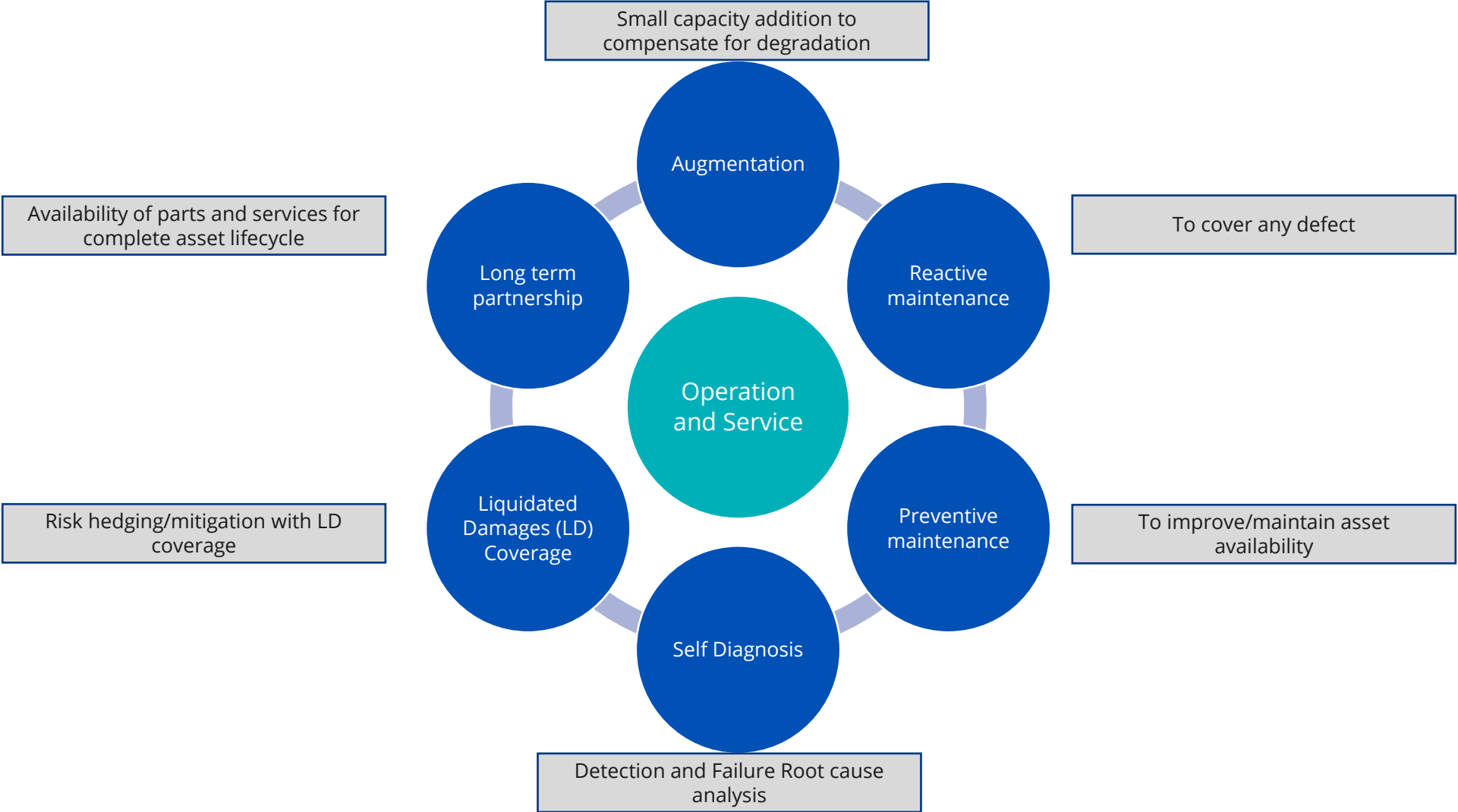


- Performance warranty for available discharge energy and efficiency for an operation period of up to 20 years
- Warranties based on the actual utilization of the storage systems
- Continuous flexible adjustment of warranties to allow for different applications in the future



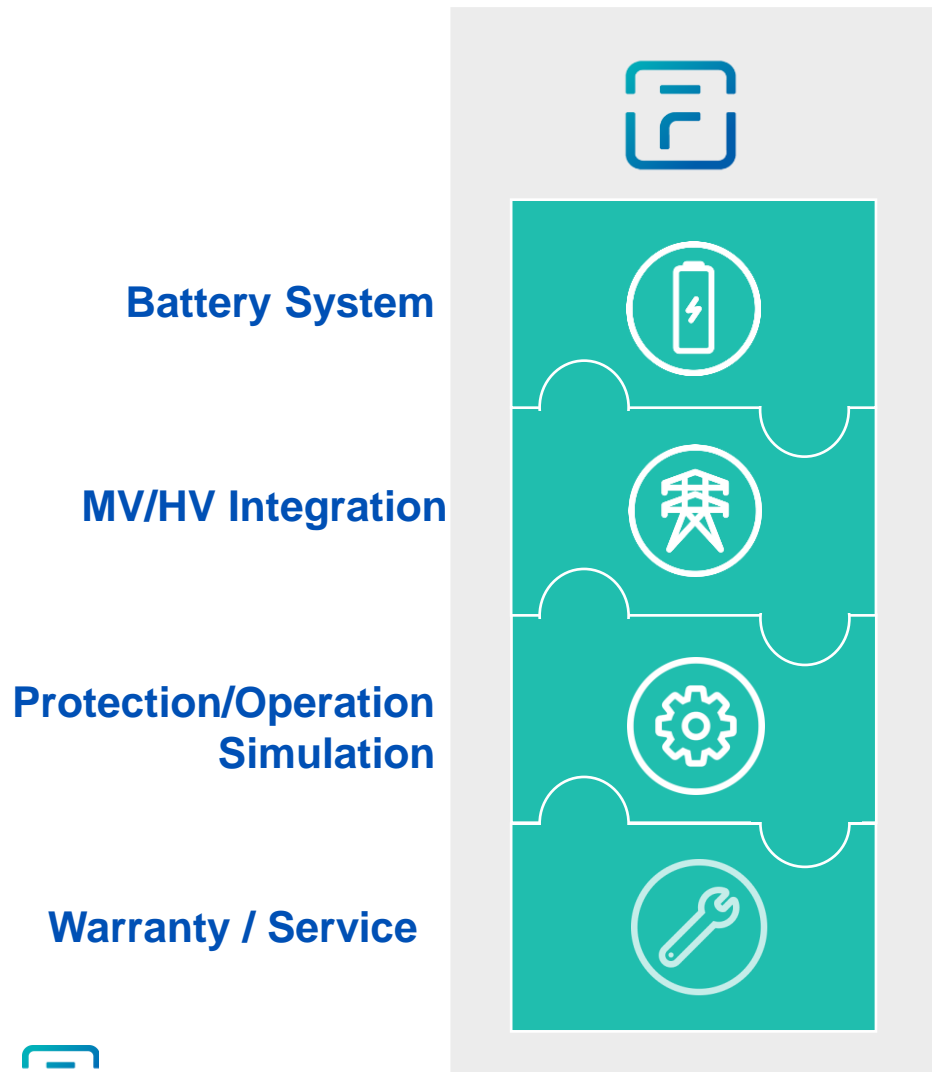
Operation and Service: example of a long-term service agreement

To have a dependable BESS asset, a range of maintenance and optimization services are critical for long life and strong performance. A good long-term service agreement with a responsive partner is the answer.

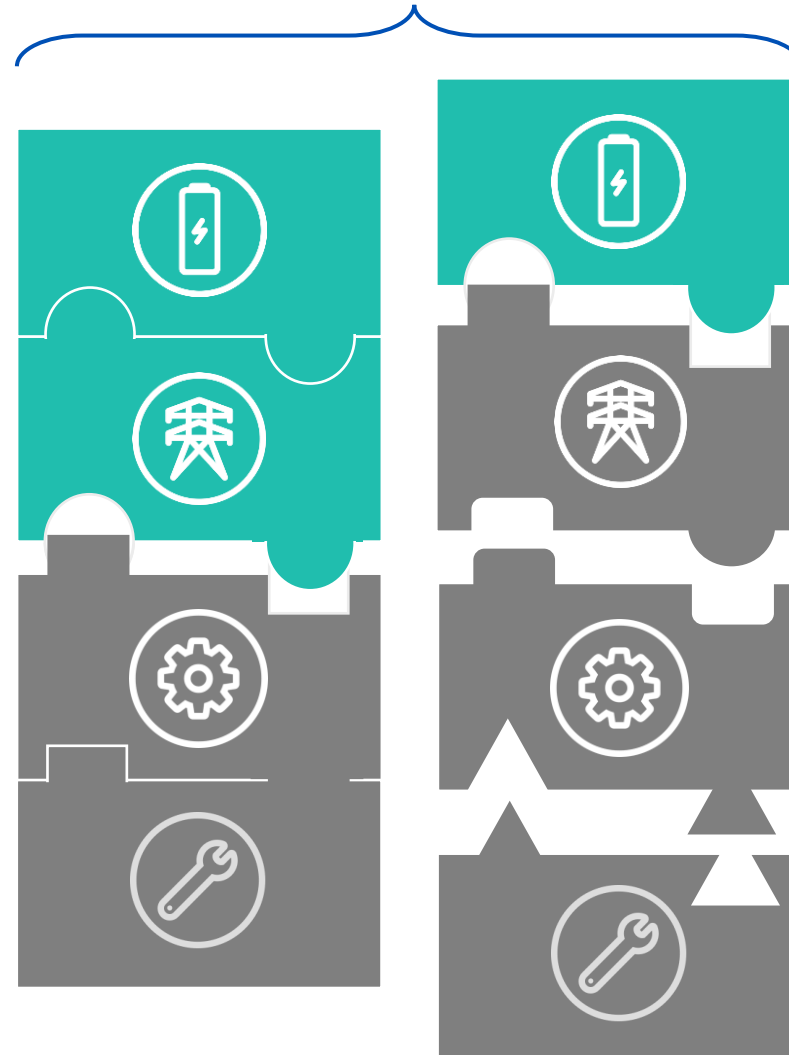


It is important to ensure you look for “one common solution”

In your bids, ensure you ask for the right integrated system and quality



There is a lot of risks with other integrator approaches



Critical Risk Factors to consider from integrators:

Is technical expertise properly aligned?

Which party's component is responsible for a system failure?

Is the OEM likely to honor a warranty claim?

Who is backing integrator's credit?





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Thank You

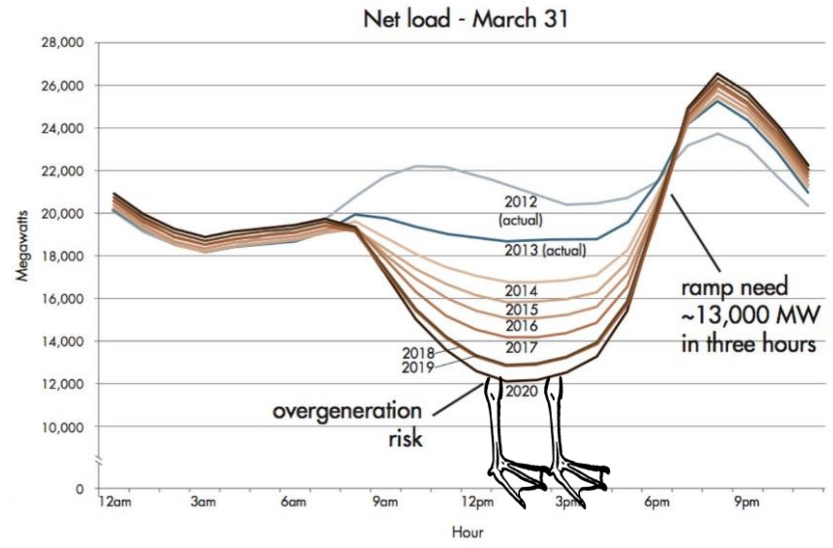
ACHAL SONDHI

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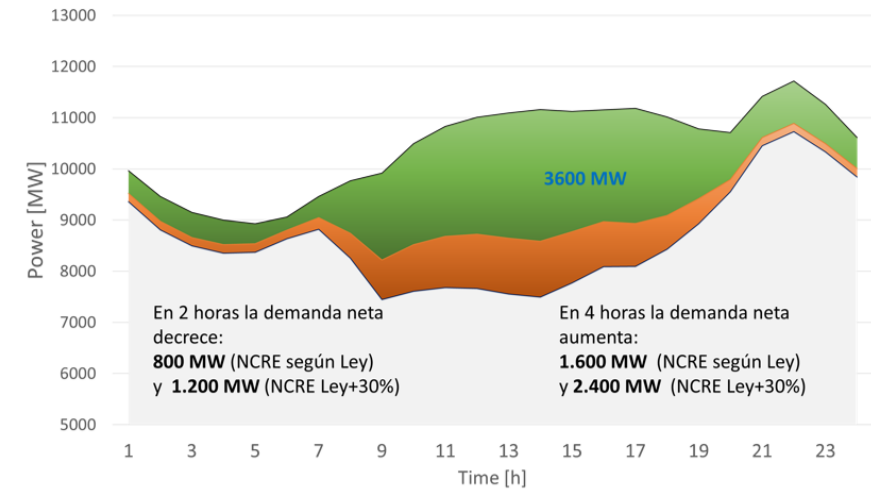
Appendix

Ducks, kangaroos, condors, and elephants – strong peaking capacity needs showing up globally

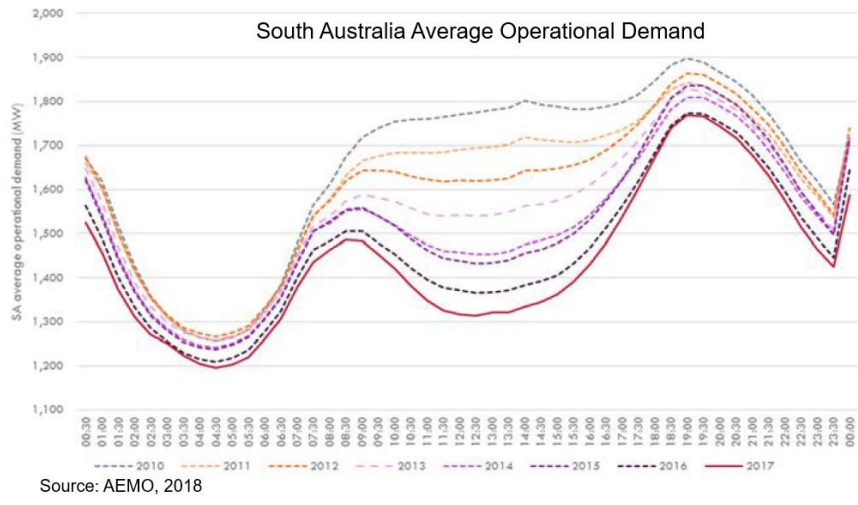
California



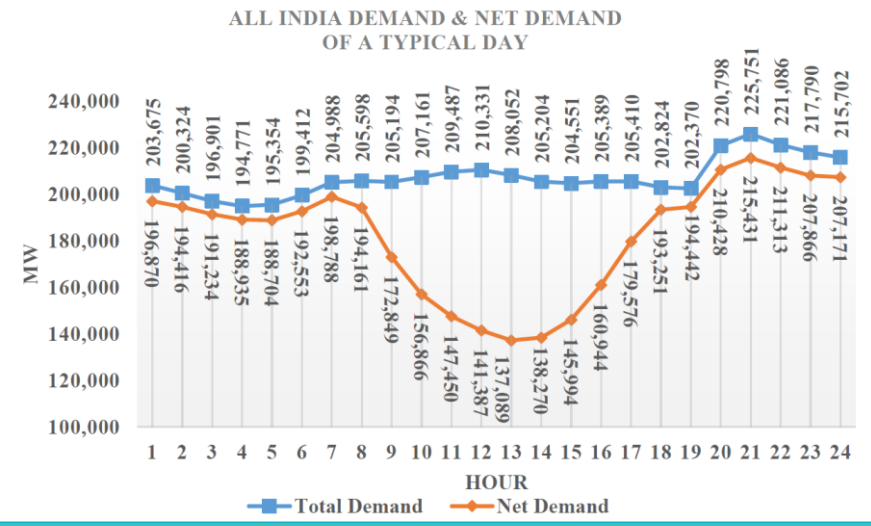
Chile



Australia



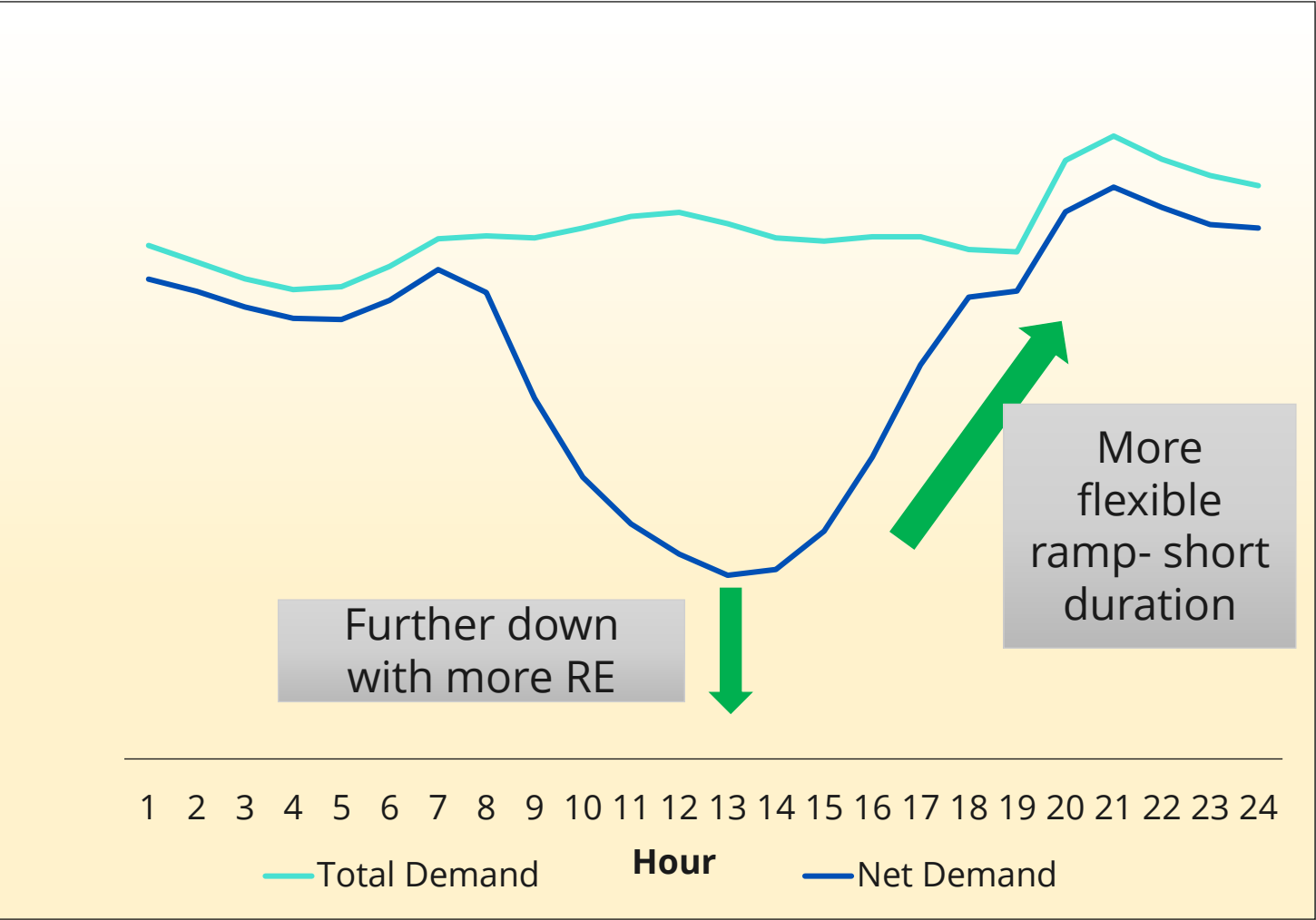
India



Is this happening in ASEAN? Your Country? A particular part of your Grid?

Peak requirement to remain; Ramp to increase

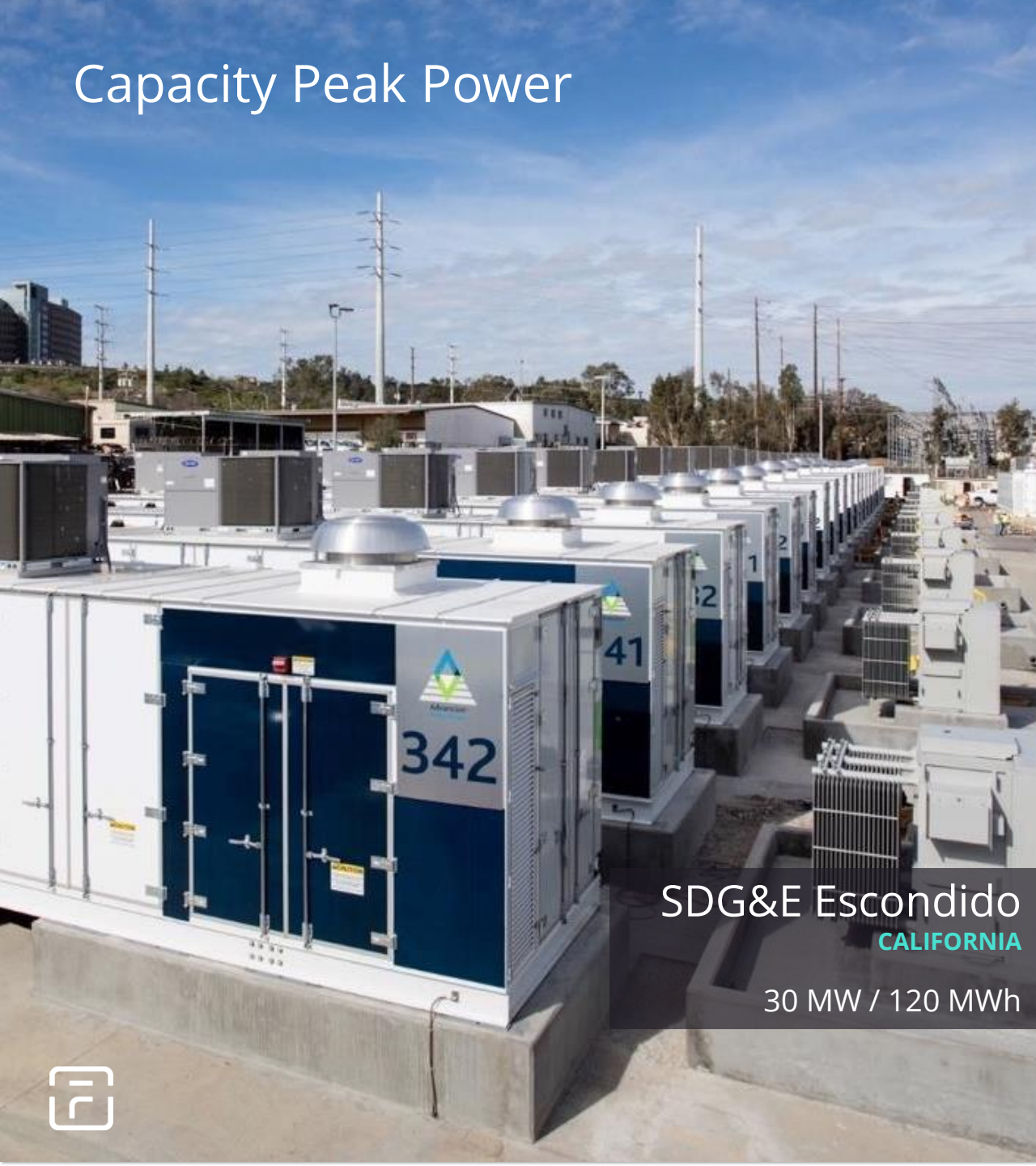
Select Right Technology for a job done only a few times a year



- ☞ RE deployment will push the required flexibility and increase the need for peak power at short duration
- ☞ Need for flexibility and transmission will push procurement of high capex assets that will be under-utilized in the future;
- ☞ Curtailment
- ☞ Potential learnings and technology transfer will occur very slowly due to slow adoption; **Not pushing fast enough**

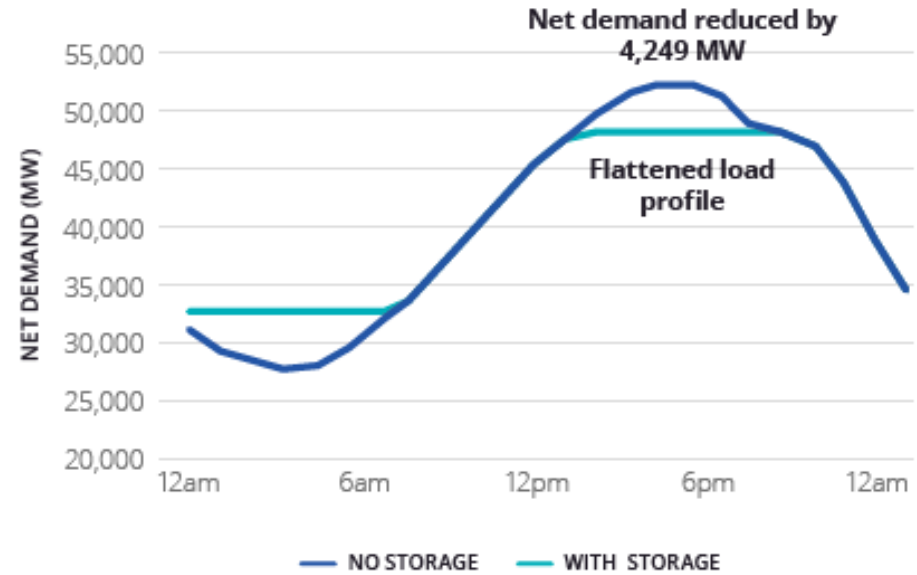


Capacity Peak Power



SDG&E Escondido
CALIFORNIA
30 MW / 120 MWh

Reducing Peak Demand with Energy Storage



Potential storage impact of 4-hour dispatch on net load on the peak demand day in CAISO

BENEFITS

- Provides flexible peaking capacity with 24/7 availability and no start up / shut down costs
- Fast ramp rate compared to traditional resources
- Can provide additional ancillary services to the grid



We bring experience to deployment and execution

Different Altitudes

Switzerland
20MW/20MWh



Chile (Solar + Storage)
112MW/560 MWh

NEWS

Construction starts on Chile's first solar-storage project, featuring LatAm's largest battery

By Andy Colthorpe

October 20, 2020

Power Plants, Projects, Storage

Americas

LATEST

Facebook Twitter LinkedIn Reddit

UK ROUND-UP: Solar Energy UK calls for 40GW target; Utility Solar Summit highlights post-



Seismic Zones

Philippines portfolio:
13 sites across nation
on different islands
470MW/470MWh



Brownfield



San Diego
(30MW/120MWh) &
Alamosa
(100MW/400MWh)



Cloud-based tools can put operational data at your fingertips with full asset lifecycle data Like a modern power plant, your BESS needs to be monitored and supported



Data Access

Immediate access to system performance data and metrics



Advanced Drilldowns

Full asset lifetime data repository with time-period drilldowns and CSV exports



Customizable Metrics

Ability to add new metrics, features, or users on an ongoing basis



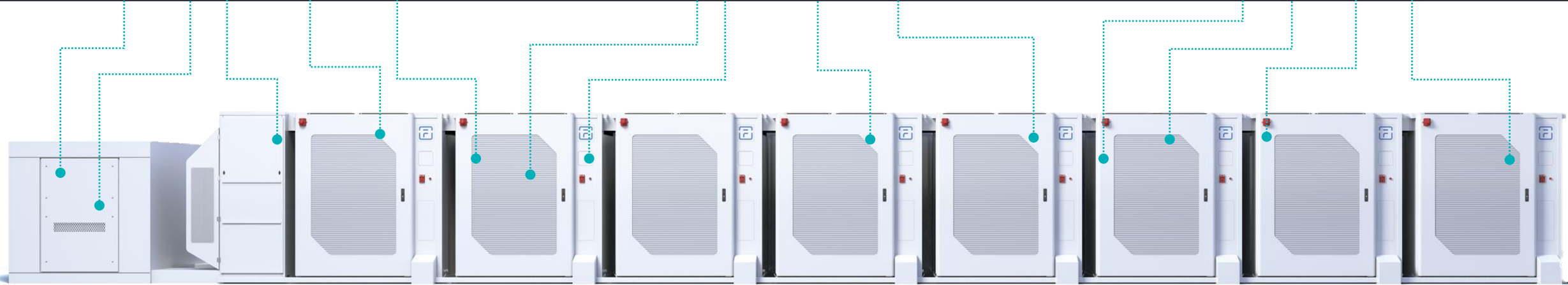
Performance Indicators

Asset-specific performance indicators and contractual limits



Maintenance Updates

Review past and upcoming scheduled maintenance activities

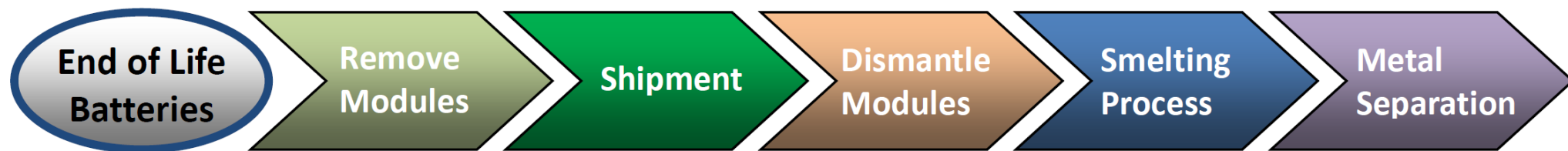


Waste Handling and Disposal Management

Supervisory services at the customer's site during battery system de-energizing, rack system dismantling including withdrawal of battery modules, and packaging of modules for shipment

Arrange for disposal and material recycling of EOL battery cells in accordance with applicable government laws via approved Recycling Partners

Shipment of EOL battery modules to Battery Manufacturers designated location.



Battery Recycling Process

Safety: Does your bid ask for an approach on safety engineering ?



Undertake a continual safety engineering process which assesses risk potentially associated with battery-based energy storage.



Consider all phases of a potential event, with mitigations seeking to prevent an event, limit the extent of an event, and safely conclude an event.



Incorporate both design mitigations and procedural mitigations in system engineering and delivery.



Participate in global standards committees related to safety to both learn from and influence latest industry norms.



**Integrated Safety
from Cell to System**

GROUND FAULT DETECTION

Electrical isolation monitoring devices are present on each DC battery bus to detect faults and disconnect the system before a serious problem occurs.

EMERGENCY SHUTDOWN

E-stop functionality is automatically triggered by Cube safety features in response to incipient gas or smoke detection and sudden changes in battery operating parameters (via [Fluence OS](#)). Manual e-stop can also be performed by operators or first responders.

FIRE SUPPRESSION

A fire detection and suppression system is used to detect and extinguish a non-battery fire before it spreads to cells.

DEFLAGRATION PANELS

Deflagration panels compliant with NFPA 68 are used to direct the force of any internal pressure upwards.

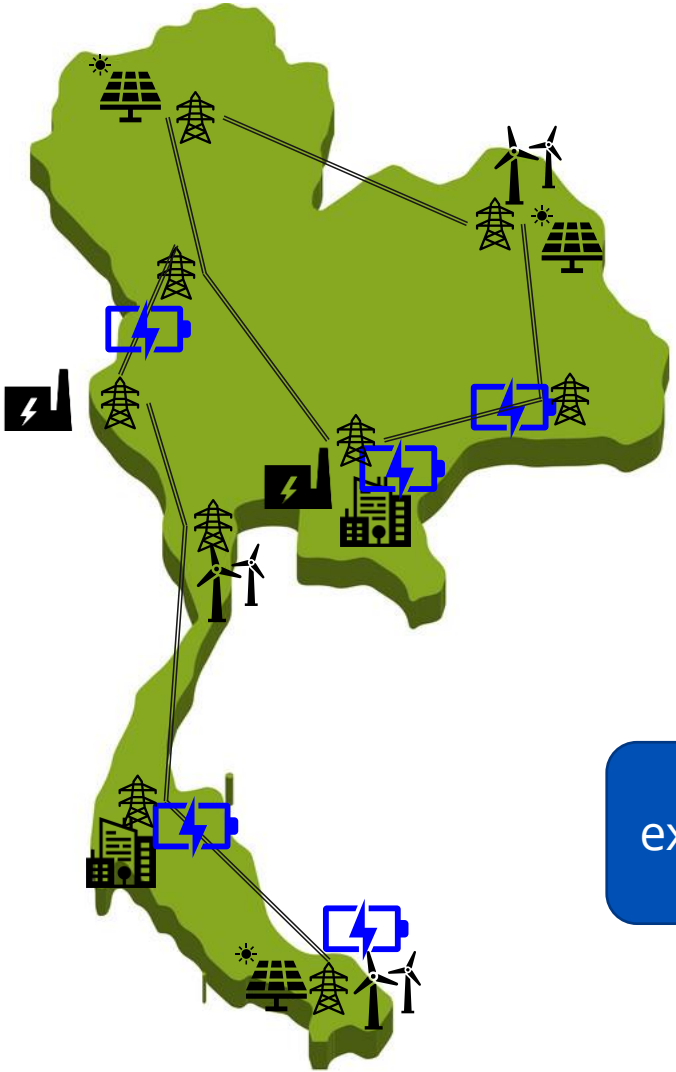
ADDITIONAL SAFETY FEATURES

Lockable disconnect switch, open door sensor, gas spring damper, and sliding door lock features ensure the Cube can be safely operated by personnel.

Systems need to be designed to meet UL and IEC standards at the cell, module, rack, container, and system levels, including **UL1973, UL9540a, IEC62619, IEC61508, NFPA 855** and more. We partner with leading suppliers and conducts rigorous qualifications and certifications on all hardware components and subsystems.



Deploying BESS across a Grid to support changing Load and Generation



BESS to support Load centre security

BESS to support New Generation flows & stability needs

Including a BESS to expand existing line capacity to evacuate RE power to load centre

Increasing RE Generation



Increasing Demand at Load Centres

