

Distributed energy resources

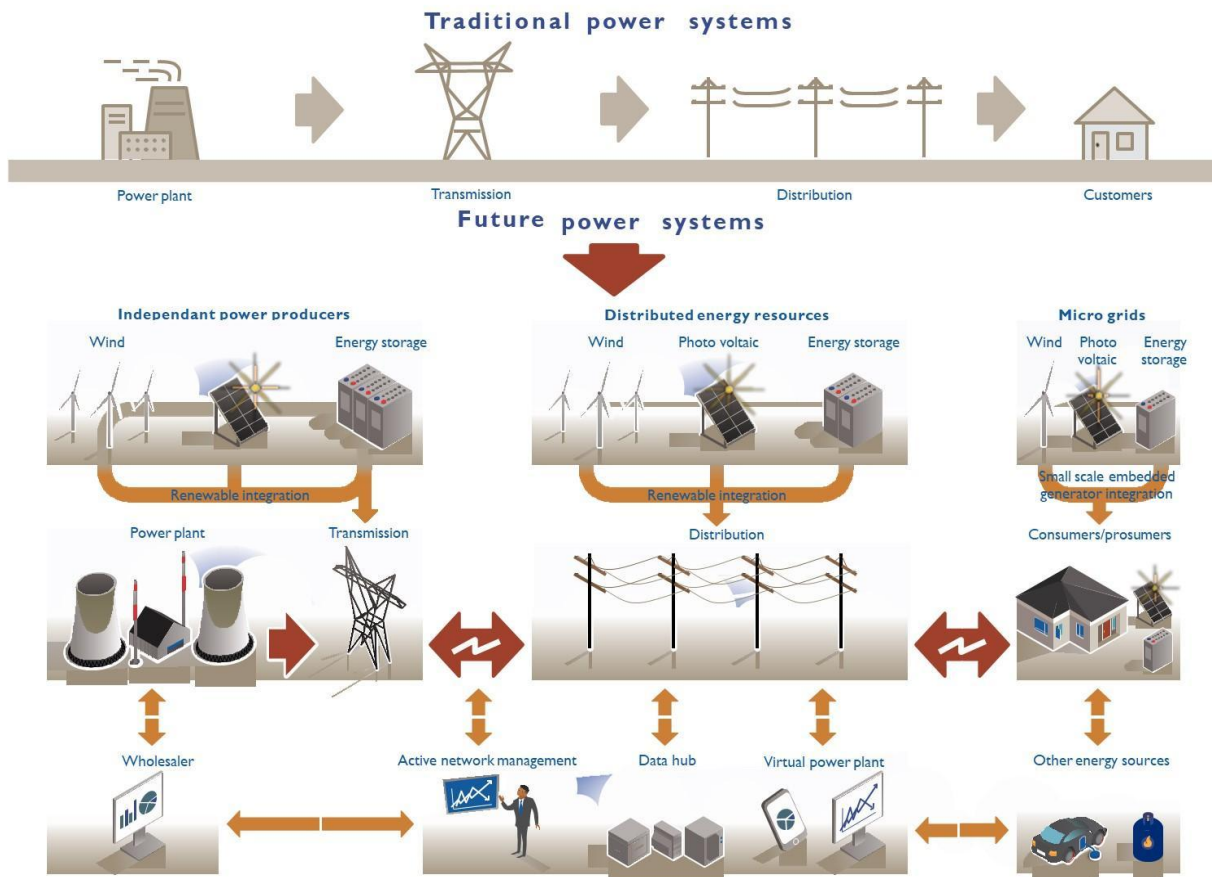
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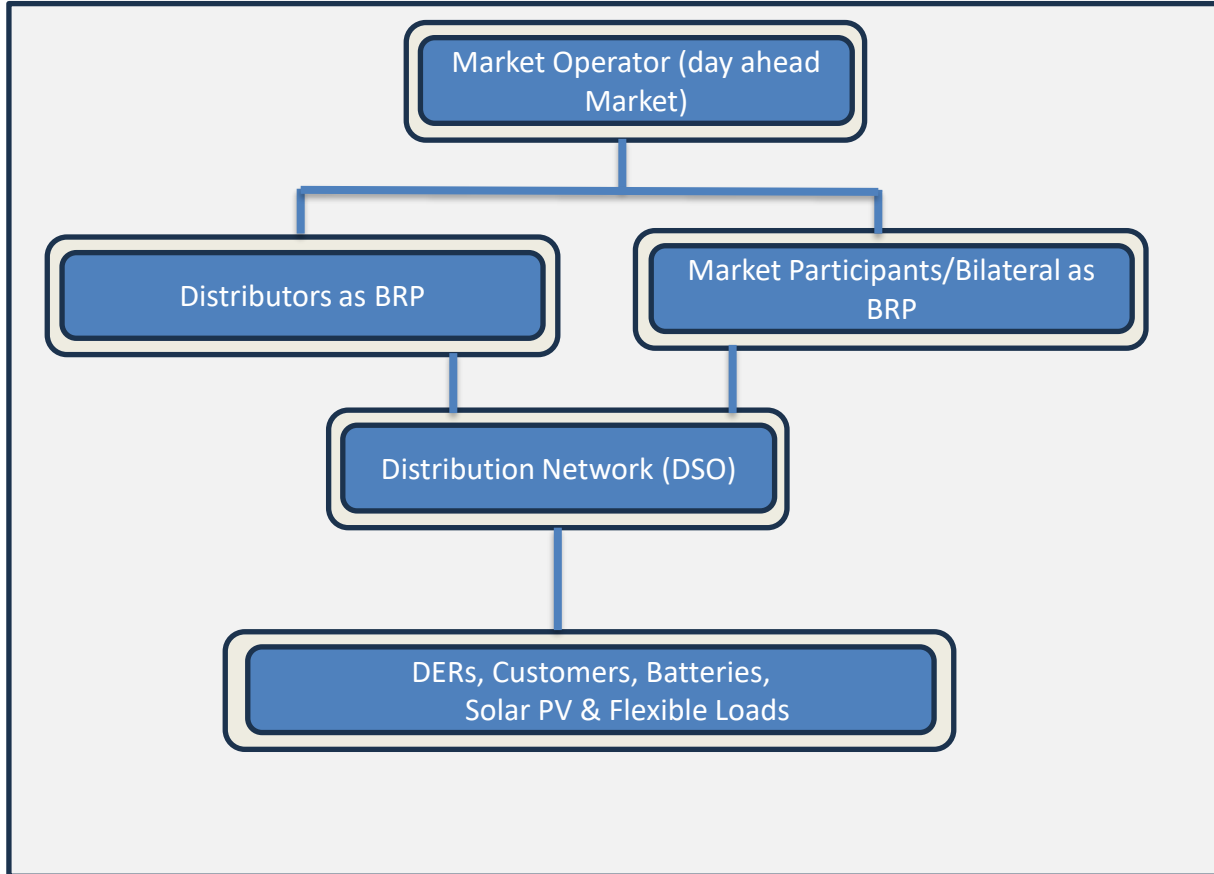
- Background
- Competitive Electricity Markets
- The unintended impact of DER growth
- Value in harnessing DER
- Key Enablers
- Benefits of VPP aggregation
- Current constraints
- Eskom Dx BESS use case

- The future grid is no longer built around large power stations. It is increasingly built around millions of distributed energy resources connected to distribution networks. Rapid DER adoption across Networks



Policy shift toward decentralised supply

- 2021 initial exception of the generation license requirement cap raised from 1MW to 100MW
- 2022 (current) Cap Removal
- ERA Act 2024: introduction of competitive markets, enabling aggregation of smaller DER to the day-ahead market



DERs can now:

- ☀ Sell energy through the Day-Ahead Market
- 🏠 Participate via aggregators or VPPs
- ⚡ Enter wheeling agreements with customers
- 📈 Provide flexibility and ancillary services
- Become BPRs: ensuring the forecast matched the actuals

- Balance Responsible Party (BRP) Obligation
- Distribution Utilities becoming system operators, the need for flexibility and control is rising
- Market dispatch decisions affect distribution networks.
- Network constraints must be visible to market participants.
- Coordination between DSO, TSO, MO and BRPs becomes essential

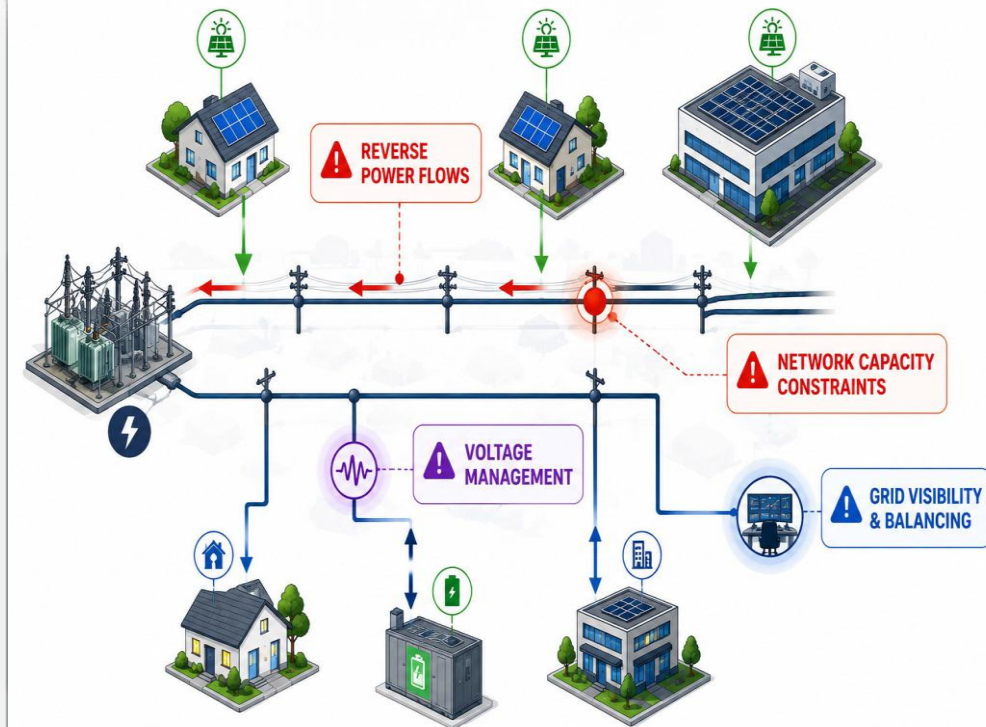
The unintended impact of DER growth

Network Impact

- Reverse power flows
- Voltage instability
- Congestion
- Active Network management

Competitive Market Risk

- BRP Obligation
- Forecast deviations
- Unintended output curtailment
- Real-time Dispatch



- Day-ahead scheduling capability with real-time dispatch

1 NETWORK CONGESTION MANAGEMENT

Use DER flexibility to relieve congestion and keep the network operating within safe limits.

DER SOLUTIONS

-  Flexible batteries
-  Demand response
-  Curtailable solar generation

WITHOUT DER FLEXIBILITY

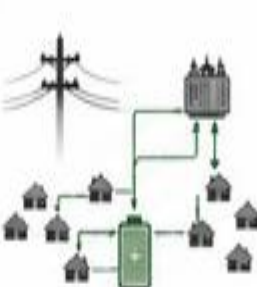
Network congestion



- ✗ Feeder overloads
- ✗ Voltage violations
- ✗ Reverse power flows
- ✗ Risk of outages

WITH DER FLEXIBILITY

Managed network



- ✓ Relieve congestion
- ✓ Maintain voltage
- ✓ Manage power flows
- ✓ Avoid network constraints

BENEFITS

-  Reduce feeder overloads
-  Manage reverse power flows
-  Maintain voltage compliance
-  Avoid costly network upgrades
-  Improve reliability for customers



TRADITIONAL SOLUTION

- Upgrade transformer
- Build new feeder
- Reinforce network



DER SOLUTION

- Dispatch flexibility when and where it is needed

Right flexibility.
Right place.
Right time.

2 ANCILLARY SERVICES FOR DISTRIBUTION OPERATIONS

DERs provide fast, local support services that improve reliability and operational performance.



BENEFITS

-  Improve local reliability
-  Support network operations
-  Reduce operational risk
-  Enhance resilience during contingencies
-  Defer infrastructure investment



DERs are not just energy sources – they are valuable operational assets that keep the distribution network secure and resilient.



3 ALTERNATIVE TO INFRASTRUCTURE STRENGTHENING

Use DER products as a cost-effective alternative or complement to traditional network investment.

TRADITIONAL NETWORK INVESTMENT



FLEXIBLE NETWORK SOLUTION



VS

OUTCOME

- ✓ Lower capital expenditure
- ✓ Faster deployment
- ✓ Deferred network upgrades
- ✓ Improved asset utilisation
- ✓ More resilient and flexible network



Meet demand and manage constraints with flexibility — before you build.



4 ENHANCED BRP AND MARKET PARTICIPATION

Visibility and forecasting of DERs and flexibility improve BRP performance and enable better participation in the market.

VISIBILITY CREATES FORECASTABILITY



BENEFITS

- Better Day-Ahead forecasts
- Lower imbalance exposure
- Improved scheduling accuracy
- Reduced balancing costs
- Influence and control dispatch patterns

INFLUENCE & CONTROL DISPATCH PATTERNS

Better forecasts and visibility allow you to:

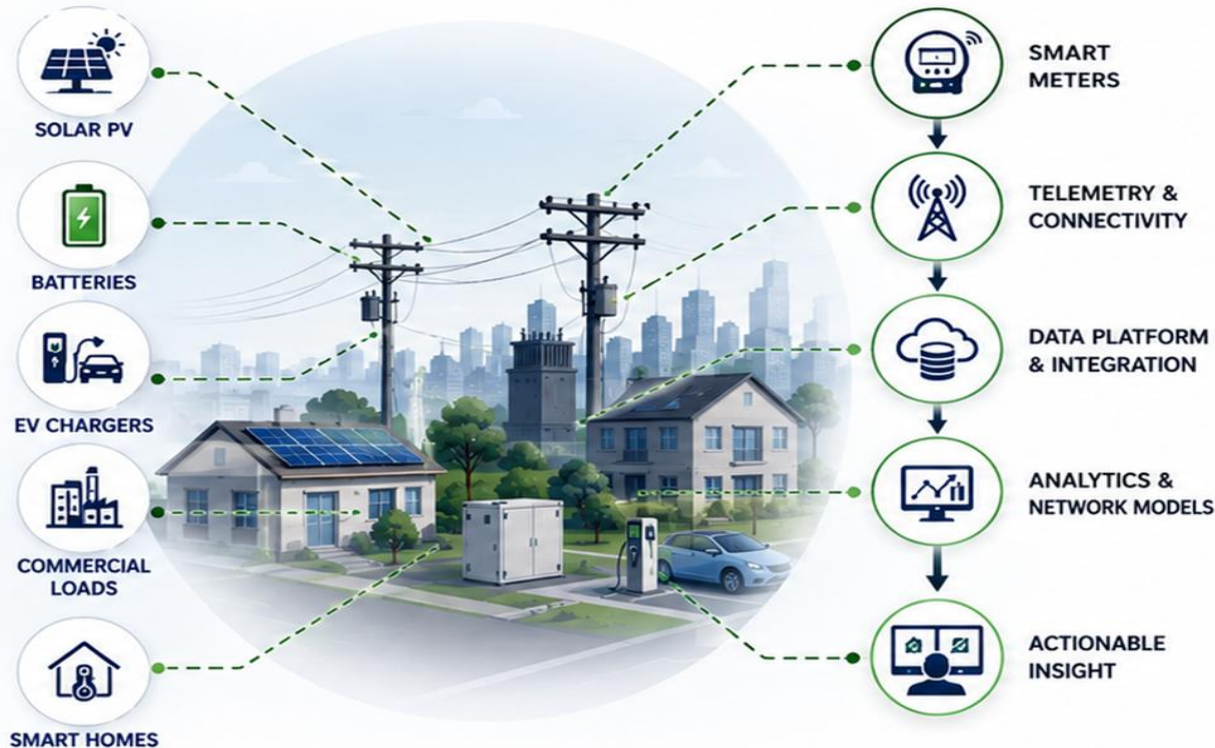
- Participate confidently in the Day-Ahead Market
- Offer the right flexibility at the right time
- Manage portfolio risk and costs
- Respond to network needs and market signals



Better information. Better forecasts. Better outcomes.
Stronger BRP performance and more value from DERs.

DER VISIBILITY: THE KEY ENABLER

You cannot manage, optimise or monetise what you cannot see.



Visibility of distributed energy resources (DERs) and network conditions is the foundation for a modern, flexible and reliable distribution system.

Smart metering, real-time telemetry and integrated data platforms provide the insight needed to understand what DERs are connected, where they are located, how they are performing and how they impact the network.

This visibility enables accurate forecasting, faster problem detection, proactive constraint management and confident dispatch of flexibility when and where it is needed.

VISIBILITY UNLOCKS VALUE



SAFE & RELIABLE NETWORKS

Detect issues early, maintain voltage and thermal limits, and prevent outages.



OPTIMISED OPERATIONS

Better situational awareness improves decision-making and operational efficiency.



EFFECTIVE USE OF FLEXIBILITY

Target and dispatch DER flexibility to relieve constraints and defer upgrades.



LOWER COSTS & DEFERRALS

Use data-driven insights to avoid unnecessary build and operating costs.



MARKET & BRP ADVANTAGE

Improve forecasting, reduce imbalance exposure and strengthen market performance.



DER visibility is the first step to integration, optimisation and value creation.
It transforms DERs from unknowns on the network to controllable, valuable assets.

PROPER AGGREGATION STRATEGY THROUGH VPP

Unlocking the Value of Distributed Energy Resources at Scale



A well-designed aggregation strategy through a Virtual Power Plant (VPP) transforms numerous small, distributed energy resources into a **single, dispatchable and reliable resource**. This enables participation in electricity markets, provision of ancillary services and local network flexibility while maximizing value for customers and the grid.

1. DIVERSE DER PORTFOLIO

Many small resources with variable availability and capabilities



2. AGGREGATION THROUGH VPP PLATFORM

Advanced software, controls and analytics to aggregate, optimise and manage DERs in real time



3. DELIVERING VALUE

VPP participates in markets and supports the distribution network

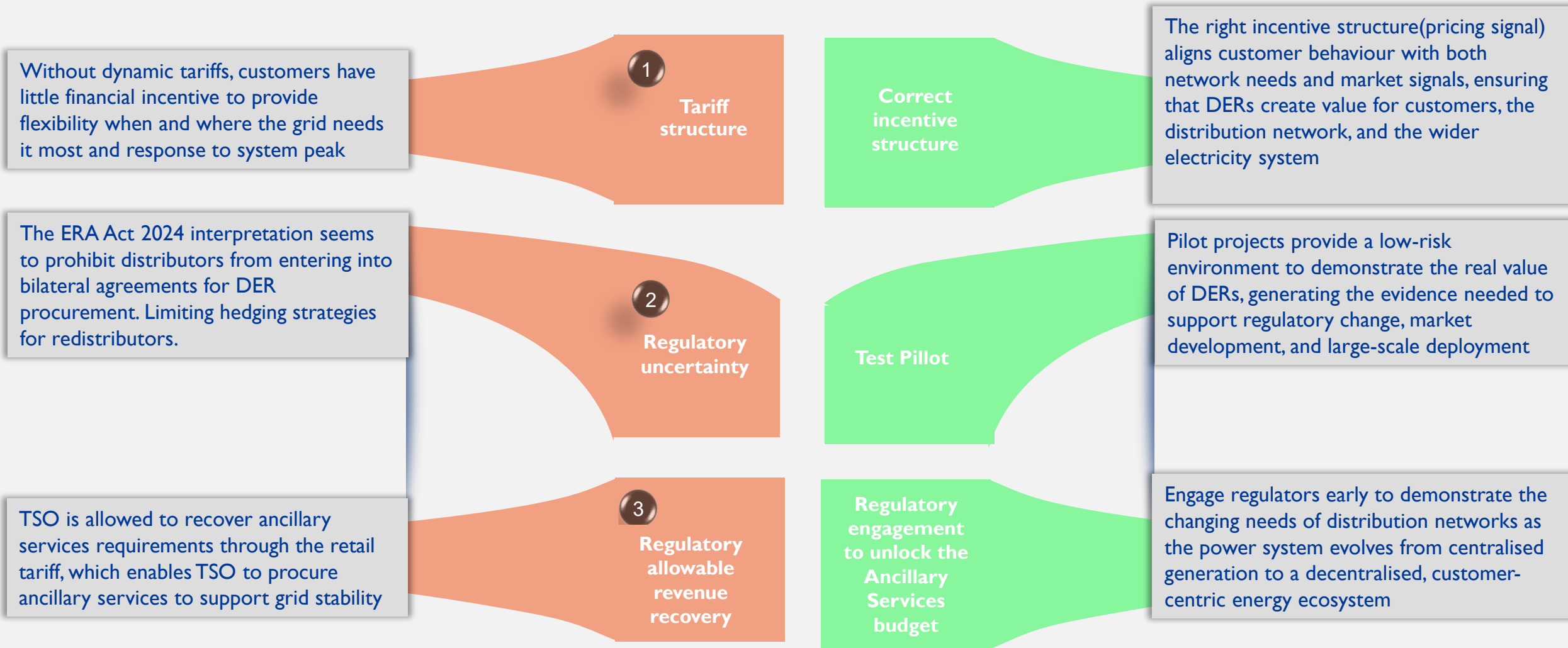
MARKET PARTICIPATION



NETWORK & CUSTOMER VALUE



Current constraints



BESS PILOT PROJECT

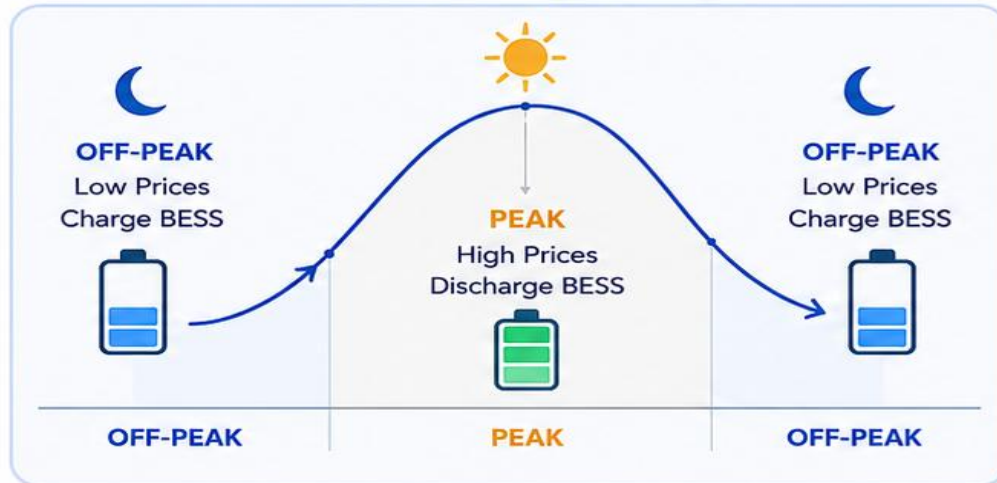
Delivering Value Through Energy Arbitrage & Ancillary Services



PHASE 1

ENERGY ARBITRAGE

Charge low, discharge high.
Optimize energy costs and capture market opportunities.



OUTCOME

Lower energy costs, improved financial returns and optimized system performance.



PHASE 2

ANCILLARY SERVICES

Provide critical grid support by responding quickly to changes in system frequency.



INSTANTANEOUS RESERVE

Responds within **ten seconds** to a drop or increase in system frequency.

RESPONSE TIME

TEN SECONDS



10-MINUTE RESERVE

Responds within **ten minutes** to restore system frequency and balance following a contingency.

RESPONSE TIME

TEN MINUTES



SUPPLEMENTAL RESERVE

Resources available to generate or reduce load within **thirty minutes** to six hours of notice.

RESPONSE TIME

THIRTY MINUTES TO SIX HOURS



OUTCOME

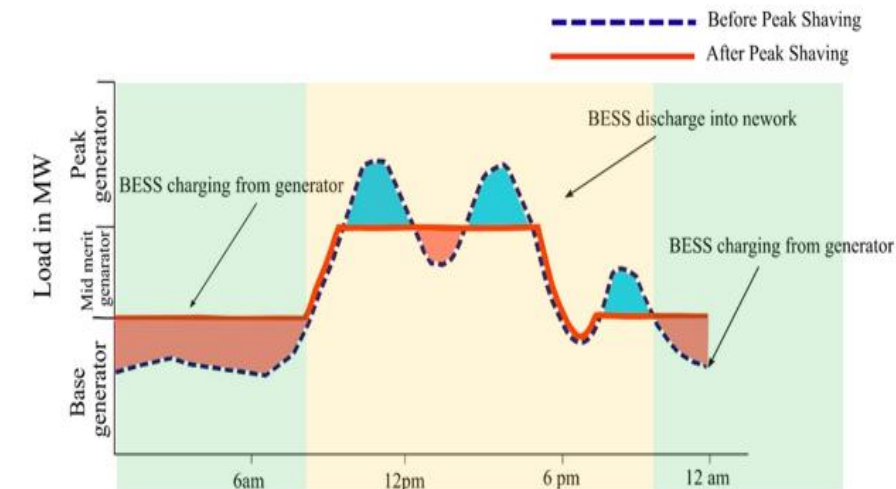
Enhanced grid stability, reliability and increased system resilience.



To enable the provision of ancillary services from commercial and industrial customers, a dedicated panel incorporating under-frequency (U/F) and over-frequency (O/F) relays will be required to be installed at the customer's site.

The detailed panel specification is currently under development; as such, this component will be implemented as Phase 2 of the project.

Energy arbitrage



Investment deferral



Outage management

- Manage voltages during planned outage
- Reduced the number of customers not picked up during planned outages

Charging aligned to system peak

Charging	Low off-peak prices	} Price Δ = Revenue / Saving
Discharging	Higher peak prices	

Charging and discharging aligned to local network constraints

- Feeder constrained only during the summer season
- Only a few hours of the day

Value stacking is critical

- Energy arbitrage critical during peak season
- Address local constraints during location constraints
- Transmission system operator reserve offering from DERs



Thank you