Host Utilities

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India Smart Grid Forum

India SMART UTILITY Week 2024

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MINISTRY OF HEAVY INDUSTRIES
GOVERNMENT OF INDIA

CENTRAL ELECTRICITY AUTHORITY

Session 5: VPP & Power System Flexibility

Presented By

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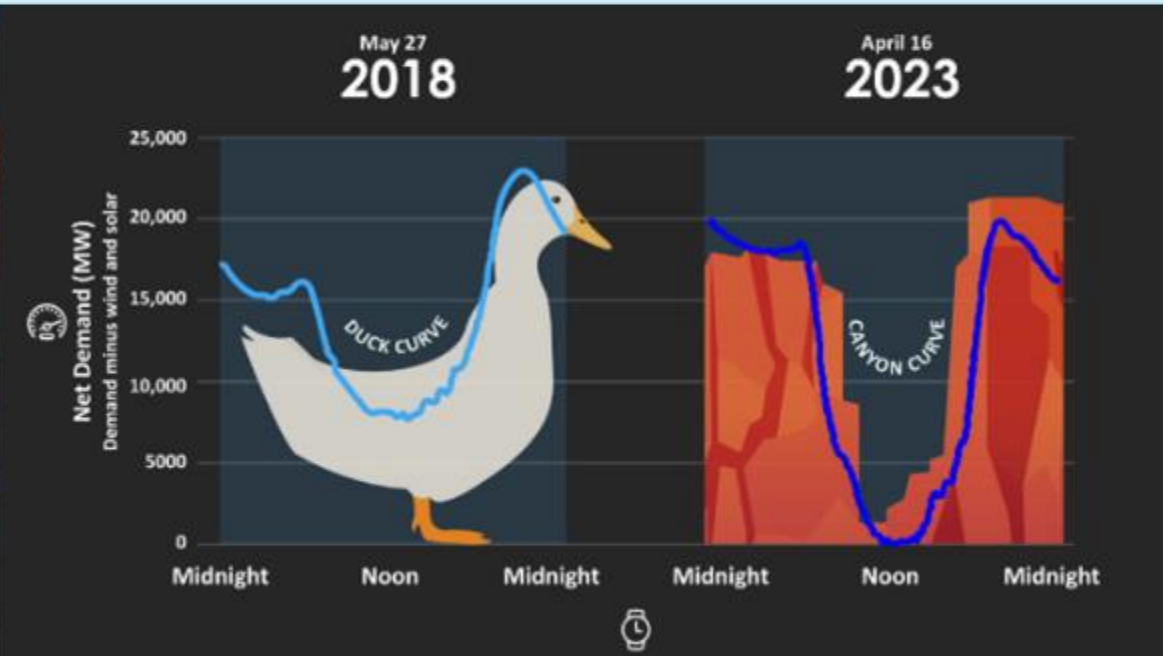
Digital Energy Solutions
Power Transmission & Distribution

Need for Power System “Flexibility”

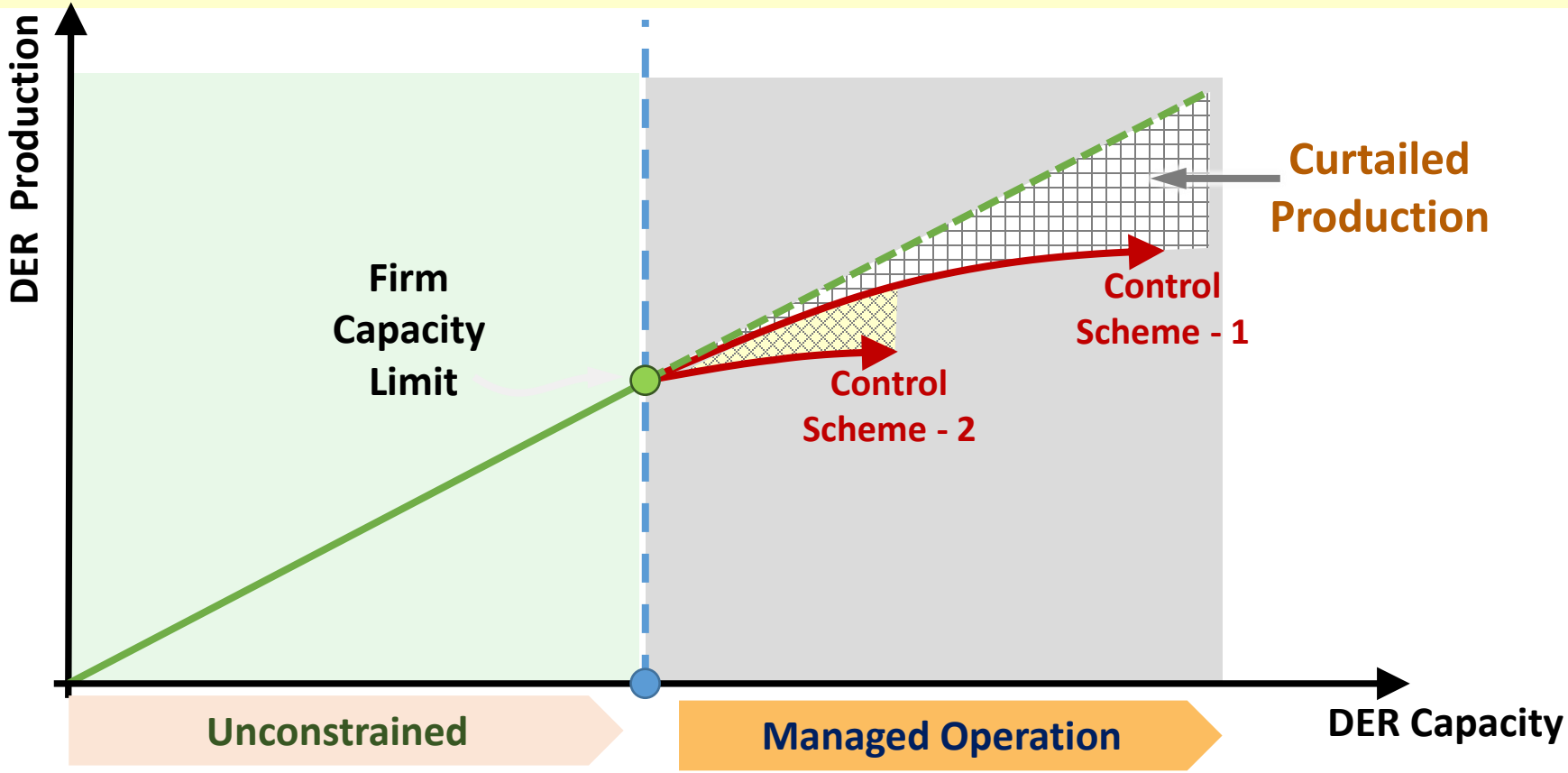
- What do we need to do to meet the needs of the future energy system?
- How do we provide customer resilience as we experience more frequent extreme weather events?
- How do we keep system reliability as IBR and intermittent renewable generation increases?
- What resources can provide the flexibility required for steep ramping of net load?

Resilience Reliability Flexibility



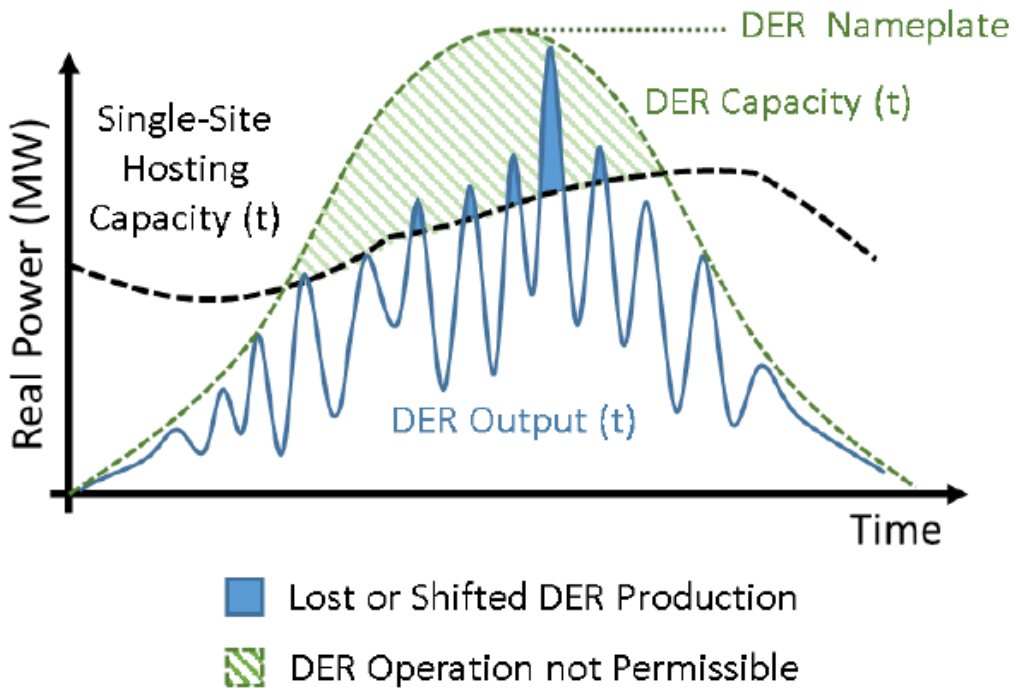
What is Flexible Interconnection?

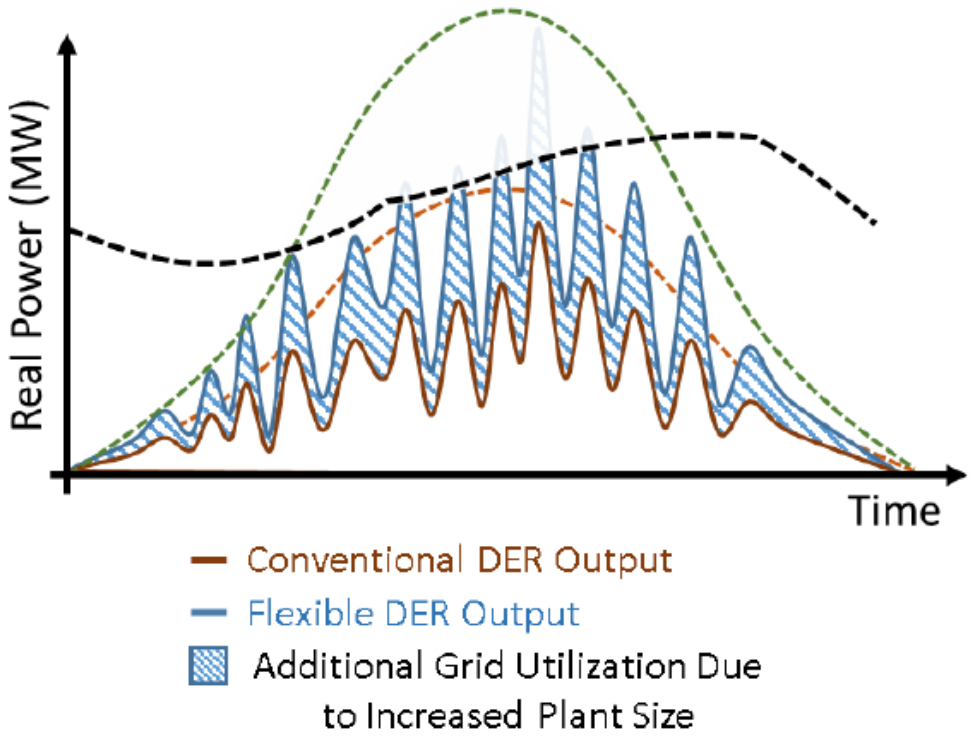
*Arrangements enabling **more DER capacity to interconnect** by DER **control schemes** managing DER **power** output to stay within **grid constraints**.*



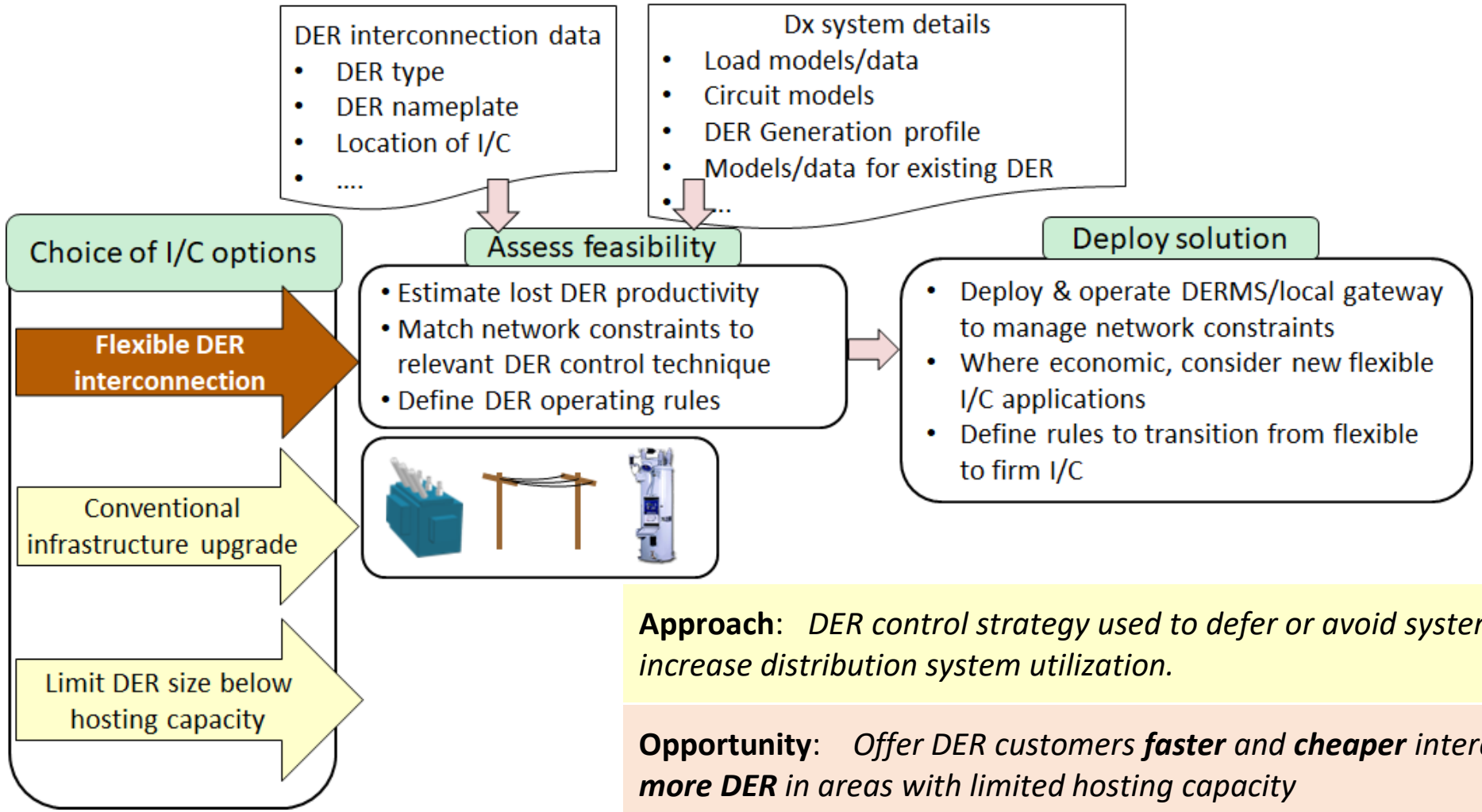
Maximize Hostable DER & Asset Utilization

Arrangements enabling ***more DER capacity to interconnect*** *by DER* ***control schemes*** *managing DER* ***power*** *output to stay within* ***grid constraints****.*





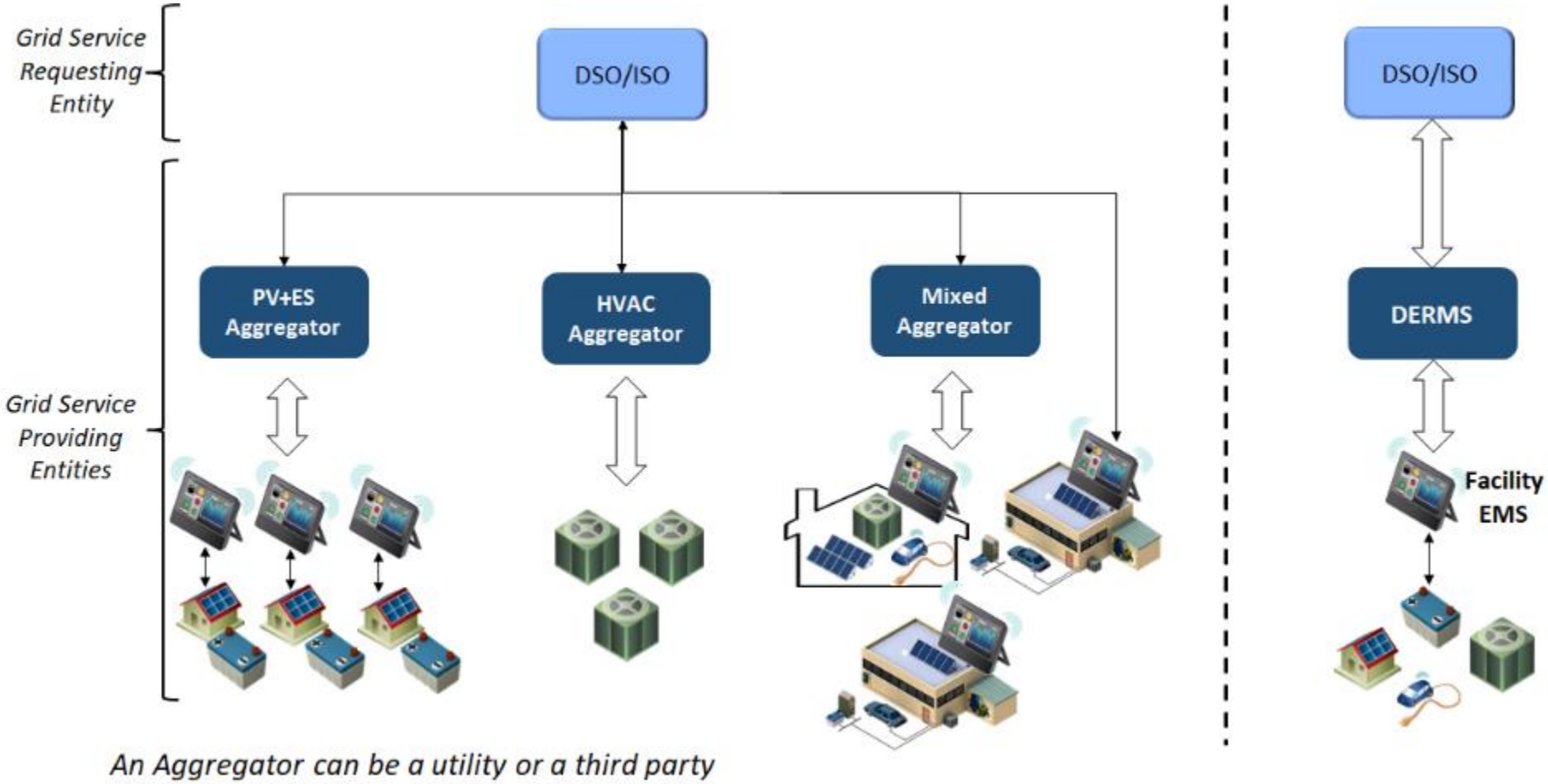
The Process of Flexible Interconnection



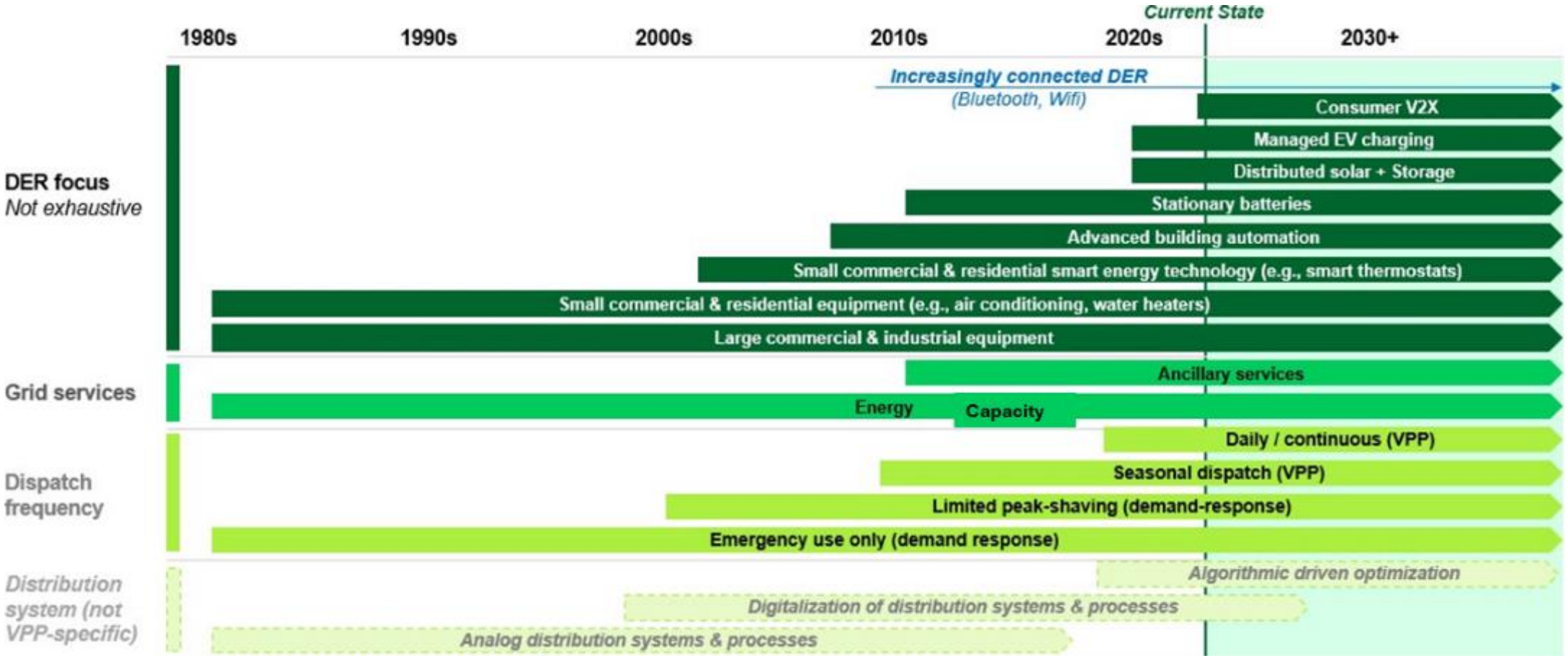
Approach: *DER control strategy used to defer or avoid system upgrades and/or increase distribution system utilization.*

Opportunity: *Offer DER customers **faster** and **cheaper** interconnection to integrate **more DER** in areas with limited hosting capacity*

Control Hierarchy

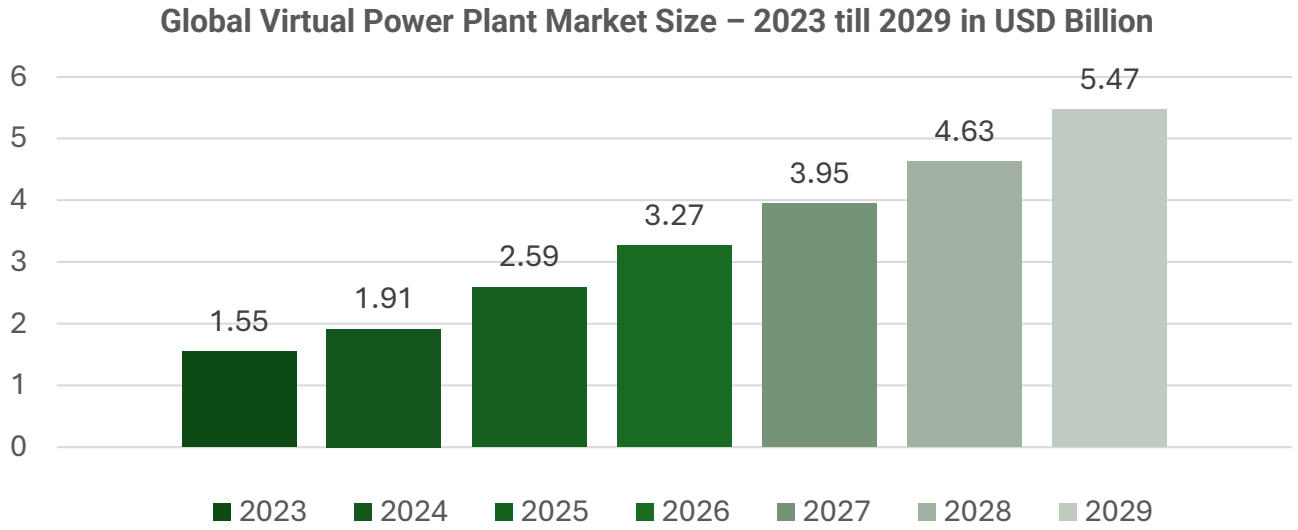


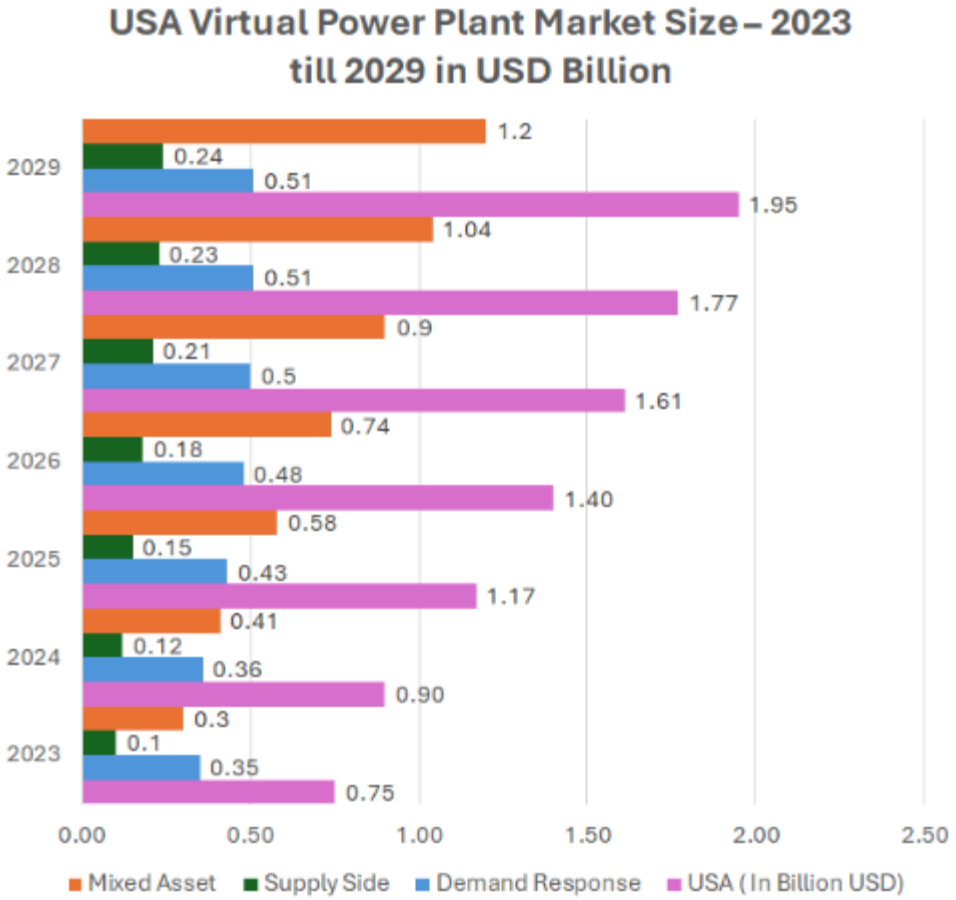
Evolution of VPP over the years

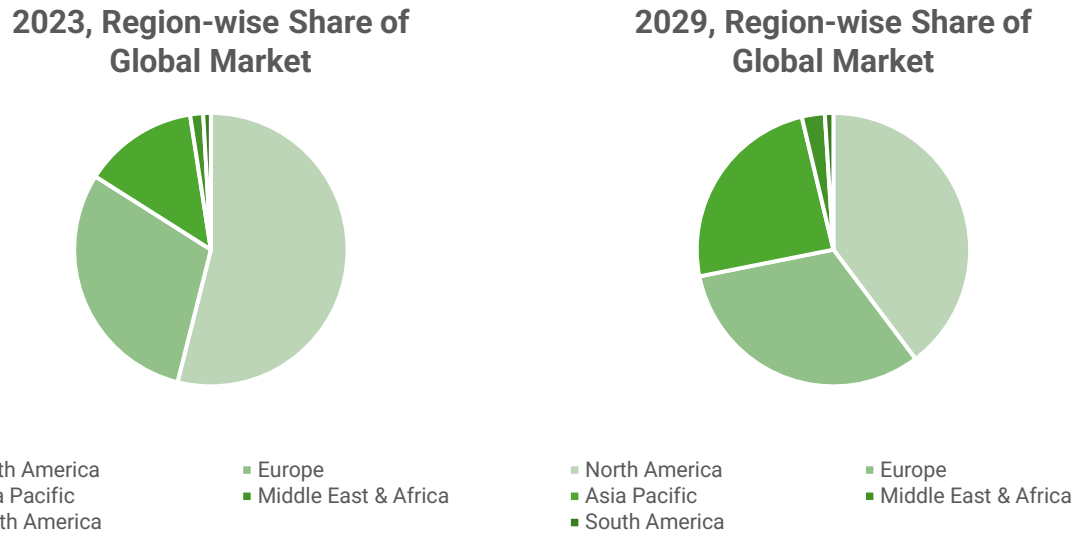


Source: National Renewable Energy laboratory(NREL) & Department of Energy(DOE)

Global Market Trends for VPPs







Source: NREL, DOE, Guidehouse Insights, markets & Markets, Companies Annual Reports & Analyst Briefings

- The global VPP market is forecasted to expand from $1.65 billion in 2023 to $5.47 billion by 2029
- US: Largest share of the VPP market in 2023
- Asia Pacific: Substantial market growth by 2029

VPP Use Cases & Potential Impact

Use Cases	Category
Reduce Capital Requirements	Grid service
Support Resource Adequacy	Grid service
Frequency Response	Grid service
Peak shaving	Grid service
Voltage regulation	Grid service
Increase system resiliency	Grid service
Provide local resiliency	Economic development
Reduce electricity bills	Economic development
Support workforce and economic development	Economic development
Reduce Greenhouse Gas Emissions	Public health
Reduce Noise and Indoor/ Outdoor Air Pollution	Public health

1.Grid Services and Cost Savings: VPPs can provide multiple grid services, such as frequency response, peak shaving, and voltage regulation, which can reduce electricity costs and improve system efficiency. They can also reduce capital requirements by deferring the need for traditional infrastructure investments, potentially saving billions annually in the power sector.

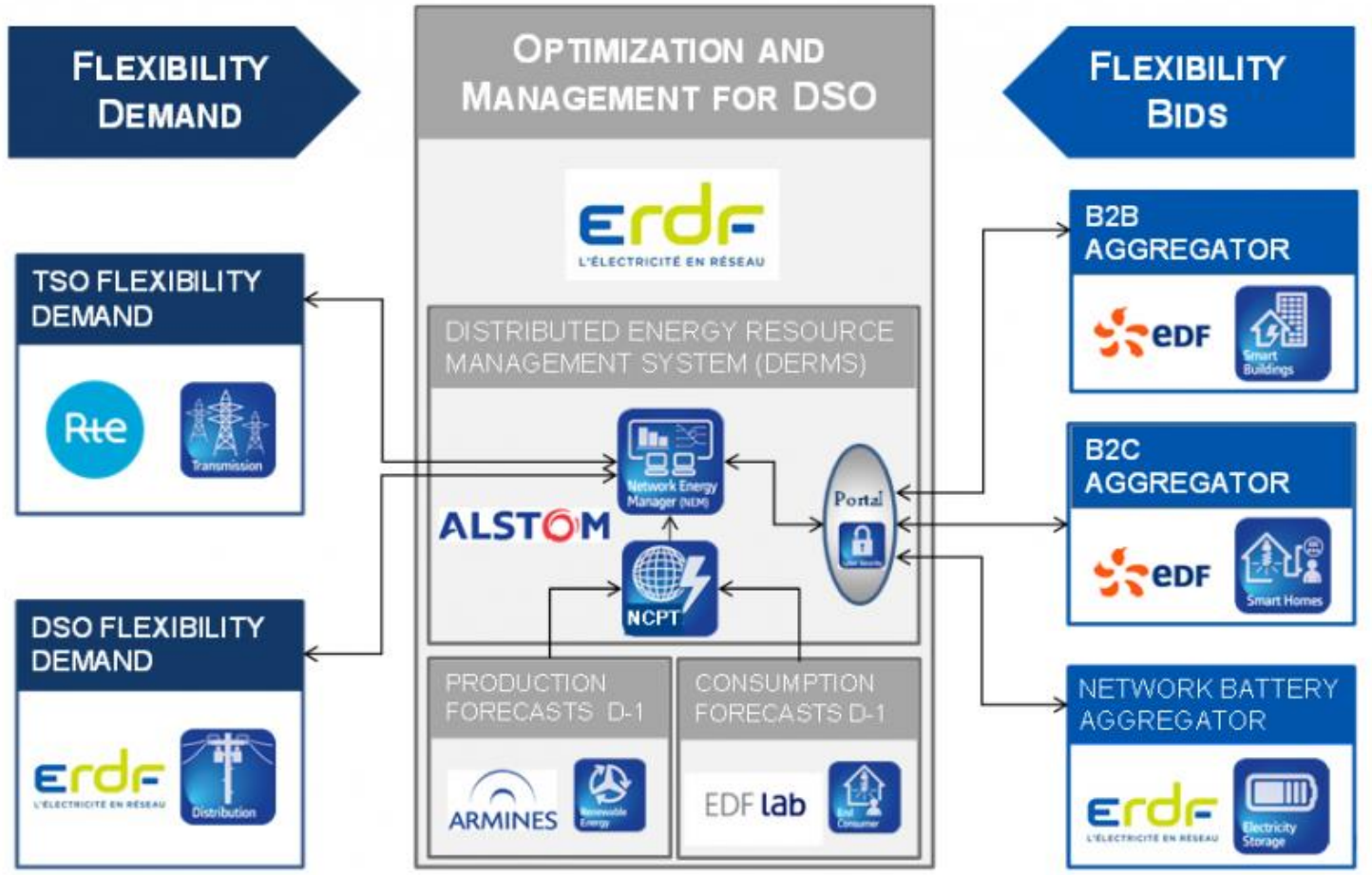
2.Supporting Resource Adequacy: VPPs can contribute to resource adequacy by ensuring that peak demand can be met reliably, which can result in significant cost savings for utilities and customers. Examples include Swell Energy and Hawaii Electric's solar plus storage VPP, which supports Hawaii's electric grid with grid services and defers the need for new fossil fuel infrastructure.

3.Increasing System Resiliency: VPPs can enhance system resilience by providing backup power and reducing strain on the grid during peak hours. Projects like Sunrun's VPPs in Hawaii and Puerto Rico aim to increase reliability and reduce outages by aggregating solar-powered battery systems.

4.Economic Development: VPPs can support economic growth by creating jobs in sectors like installation, manufacturing, and maintenance of DERs. They can also provide local resiliency and reduce electricity bills for customers, further supporting economic development in underserved communities.

5.Reducing Emissions and Pollution: VPPs can support electrification and reduce greenhouse gas emissions, contributing to climate goals. They can also reduce noise and air pollution by encouraging the use of electric vehicles and electrifying the built environment, leading to health and environmental benefits.

VPP Example Project

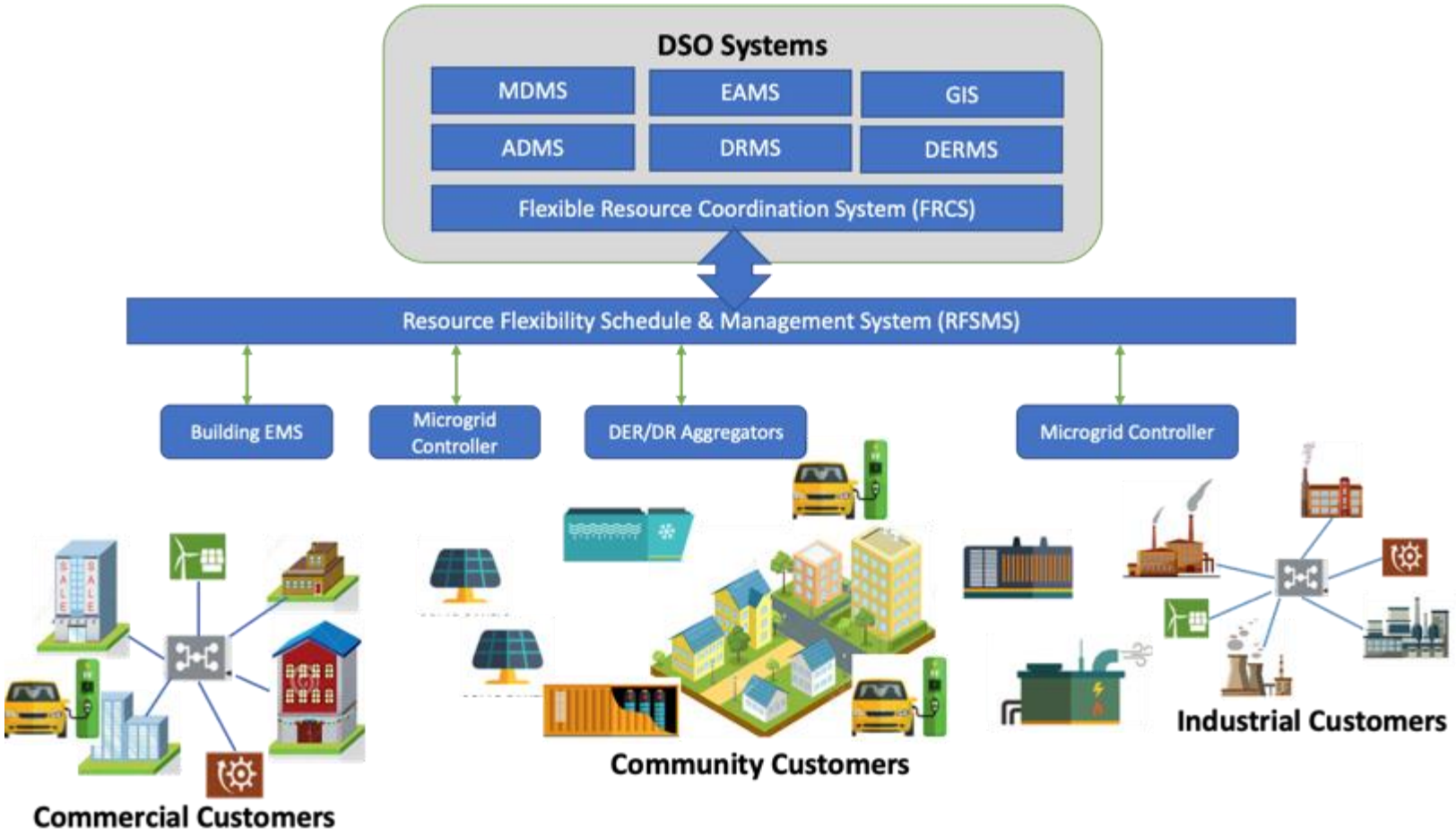


Nice Grid was one of six demonstration projects in the GRID4EU initiative funded by the European Commission.

The project brought together 6 DSOs, covering over half of metered electricity customers in Europe, and 27 other partners, including utilities, energy suppliers, manufacturers, and research institutes.

https://www.think-grid.org/nice-grid-makes-everyone-happy

L&T Solution for DSO System Implementation



L&T Solutions for DSO System Implementation

- Microgrid Controller &
- Hybrid EMS
- Demand Response Management System
- Asset Performance Monitoring & Management
- EVSE Infrastructure Management System
- Transactive Energy & Asset Management System

THANK YOU