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South Asia Clean Energy Forum 2023

Catalyzing Partnership for Clean Energy Transition

**Distributed Energy Resources (DER) for Demand
Flexibility and Grid Resilience**

Topic: Pathways for enabling resilience from DER

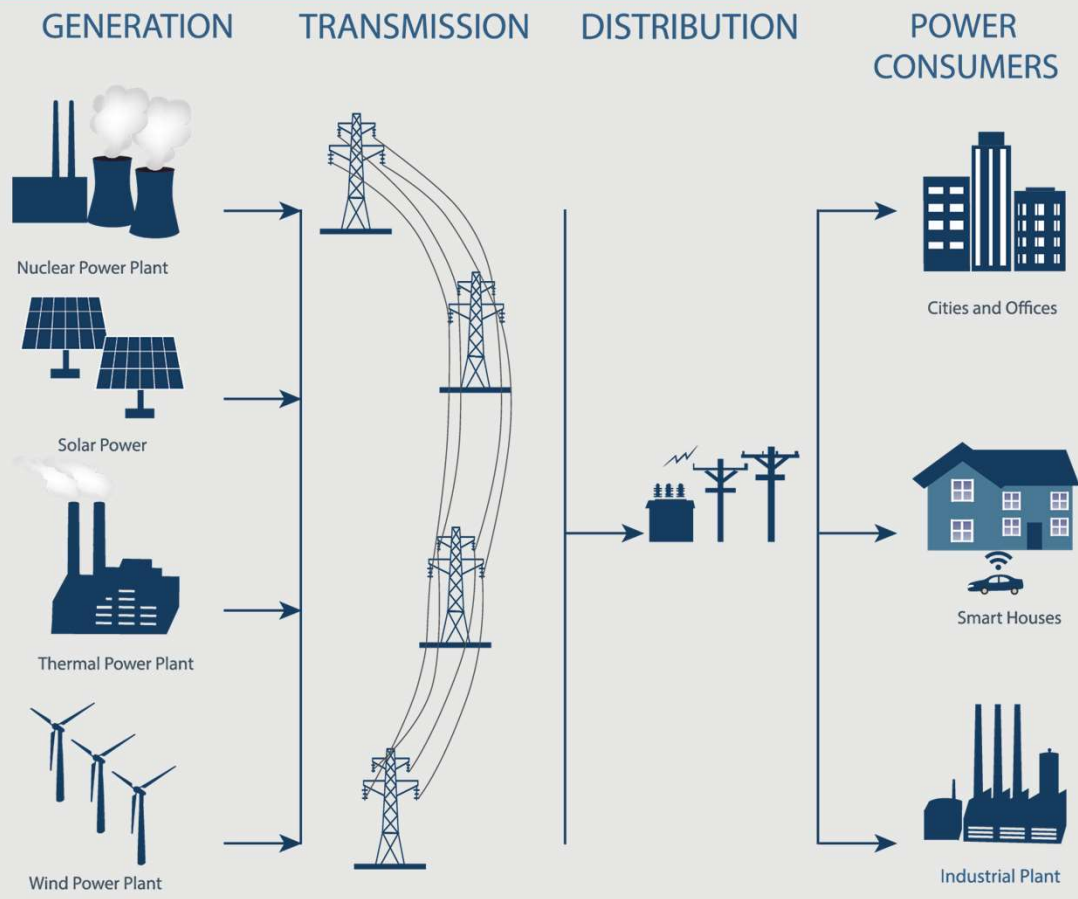
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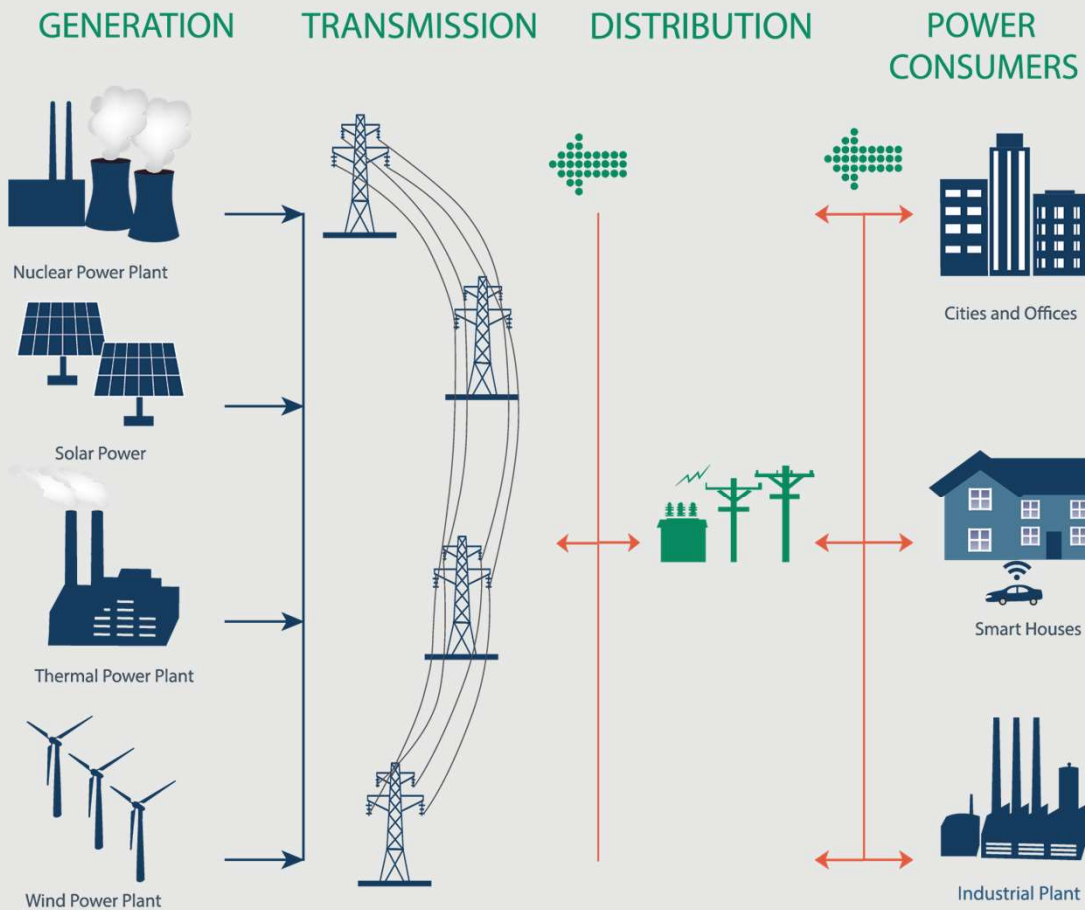
National Renewable Energy Laboratory



PAST → Consumers decided the generation



FUTURE Consumers manage their demand



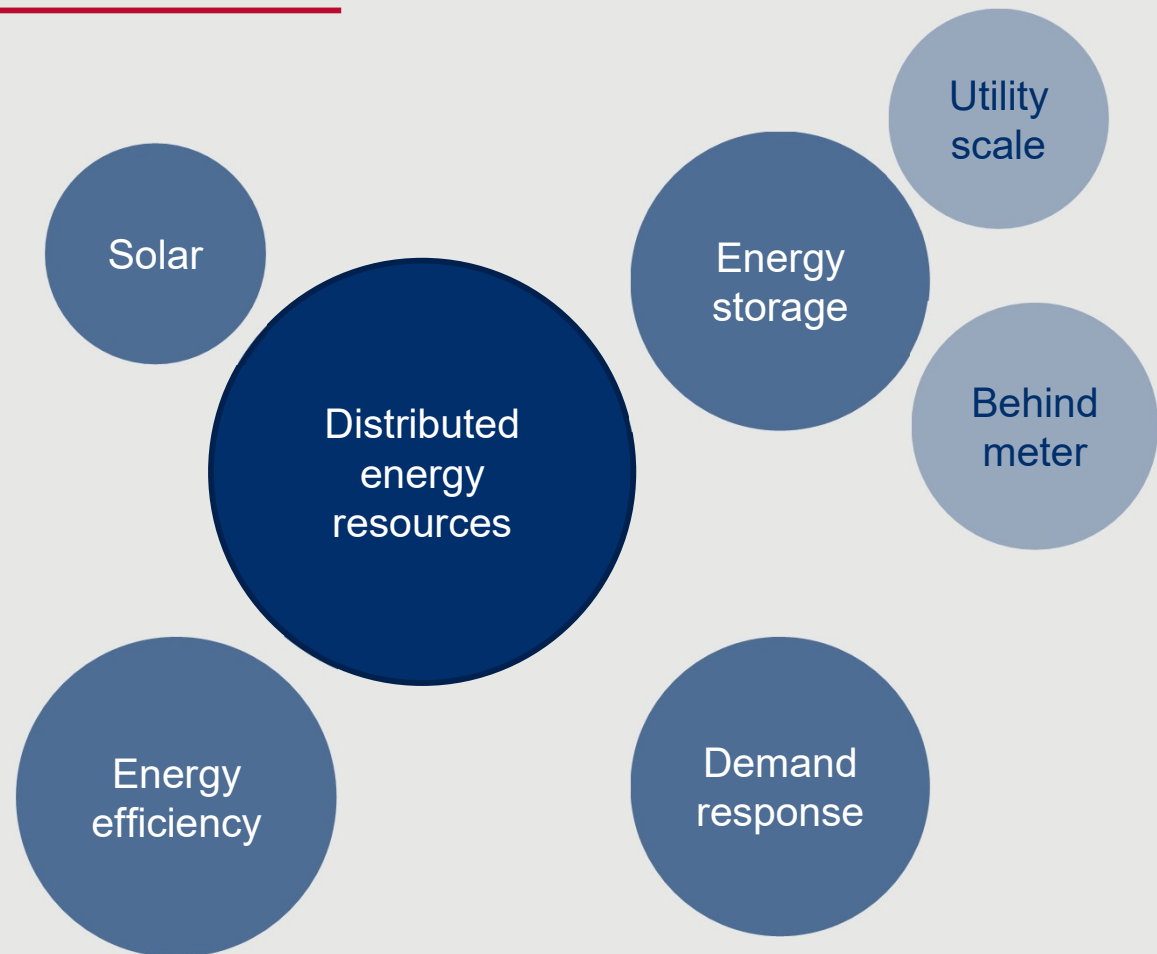
Solar

Energy storage

Demand response

Context setting: Distributed energy resources

- Technologies are driving the market for distributed energy resources
- DERs are transforming the way customers use and generate electricity

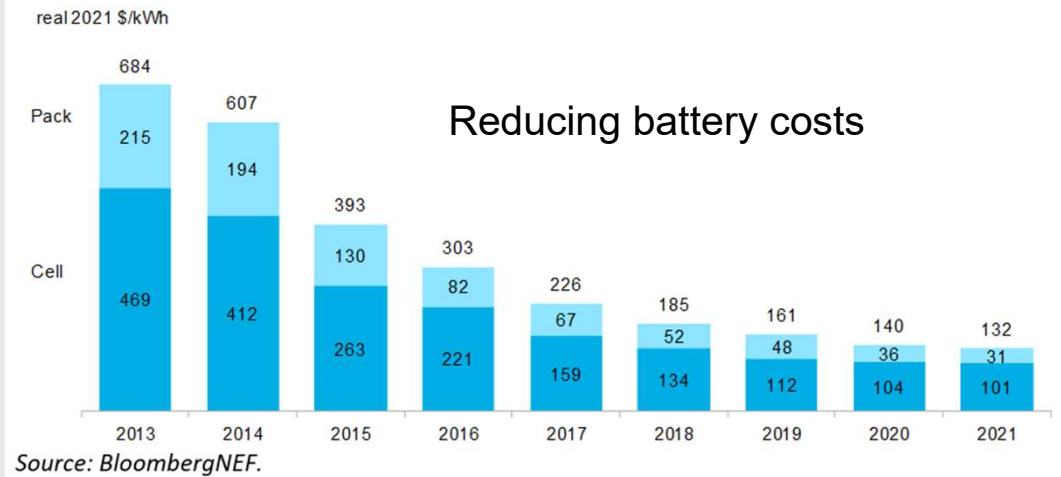


Case study 1 – Flexibility from energy storage

Co-locating energy storage with distribution transformers enables resilience

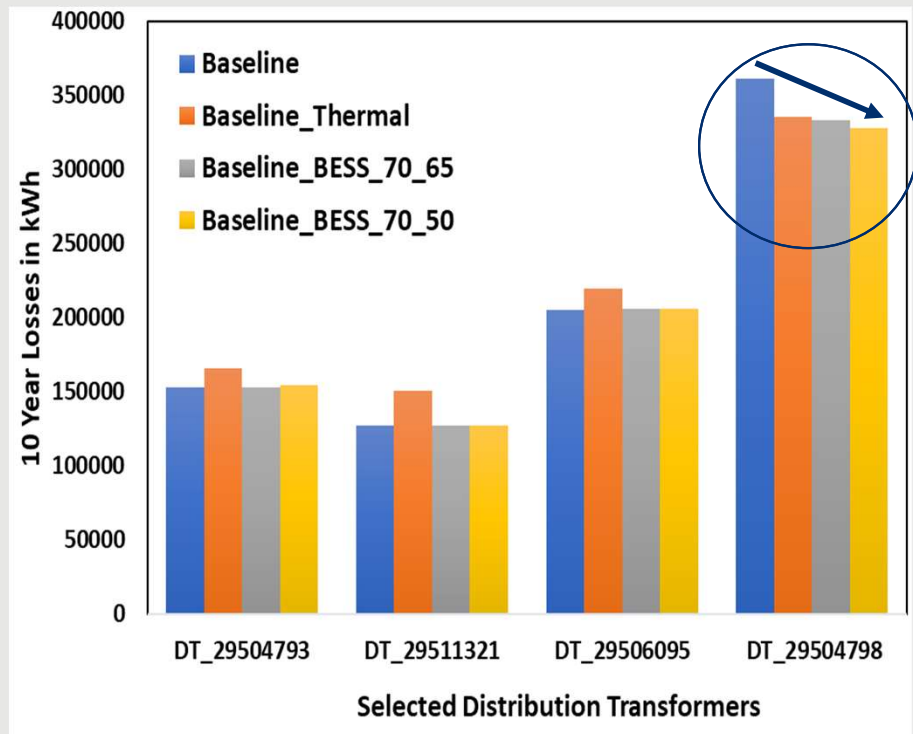
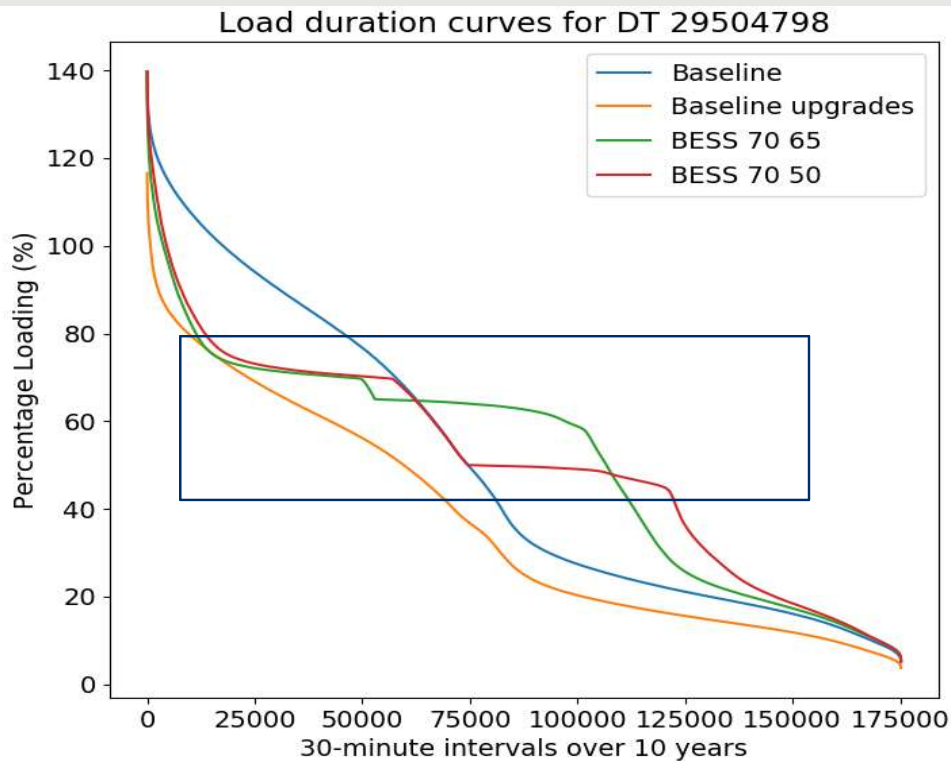


Figure 1: Volume-weighted average pack and cell price split



Reduced transformer losses because of energy storage

Due to operation in higher efficiency region DTs with storage generally experience reduction in losses compared with the baseline values.



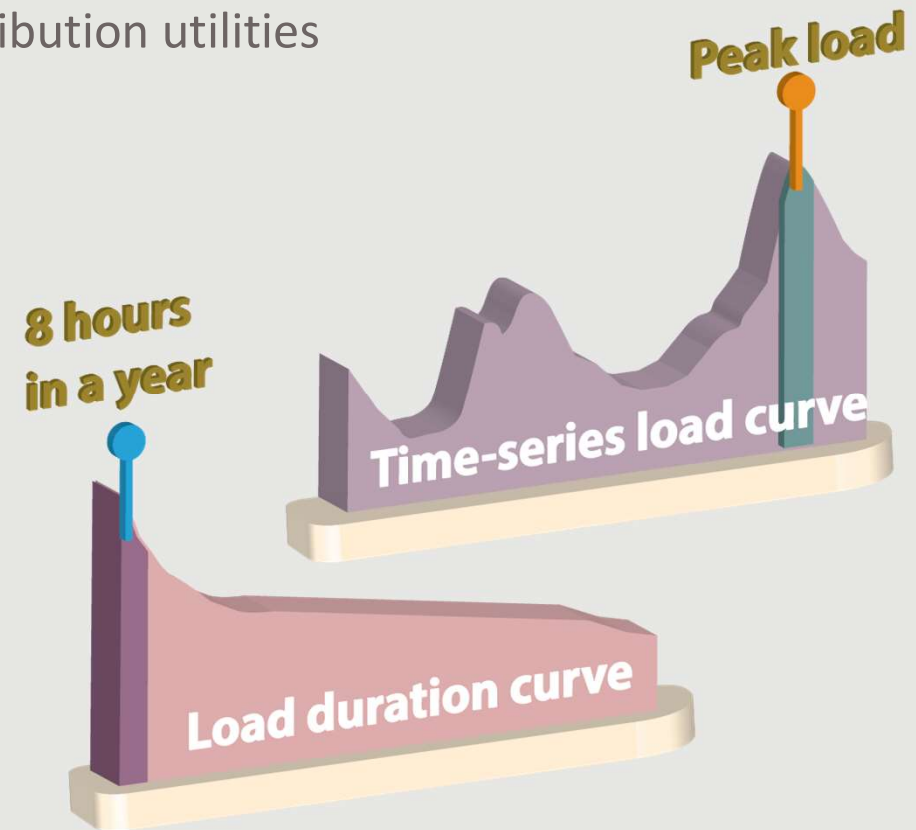
Case study 2 – Demand response for flexibility and resilience

Demand side management can help distribution utilities

Enable resilience

Operational benefits

Economic benefits



Demand side management two ways

DSO/aggregator based

Incentive mechanism

Regulatory needs

Standards and protocols

Customer knowledge

Rate structure based

Duration of peak hours

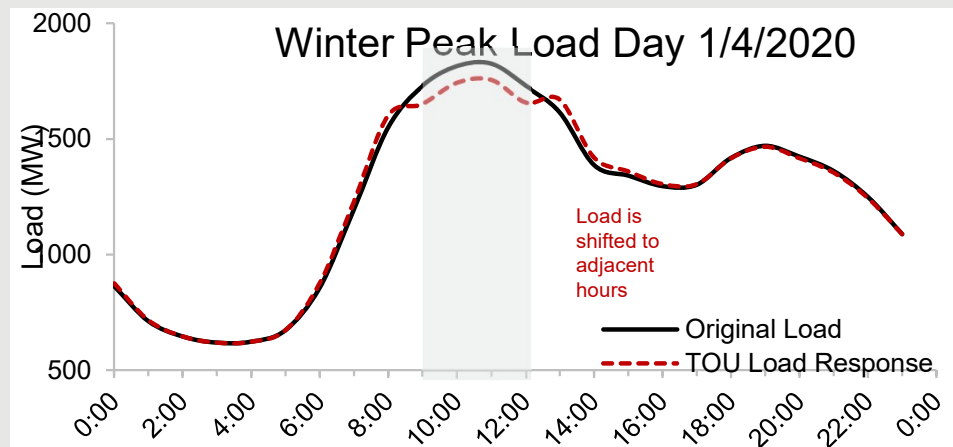
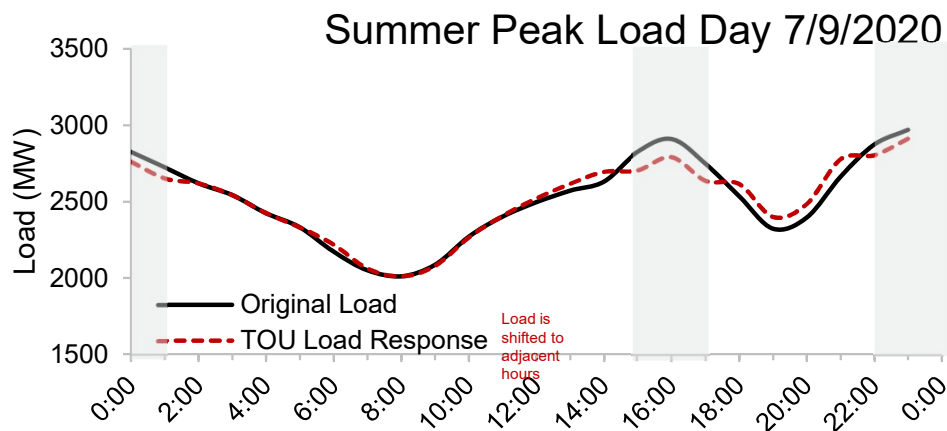
Level of incentive

Return on investment

Market readiness with smart equipment

Seasonal TOU Impact – USAID GtG RISE study

Metric	Summer (Apr.-Oct.)	Winter (Nov-Mar)
Peak reduction	2%	3.8%
On-peak/off-peak price ratio	1.11	1.12
Savings (Rs.)	1.24%	2.5%
On-peak hours	15:00-17:00 and 22:00-01:00	09:00-12:00



High self elasticity and Medium window

How to continue making grid resilient from consumer side?

- **Energy Efficiency:** Motivate customers to reduce their energy consumption and purchase energy efficient loads
- **Demand Reduction and Load Leveling:** Motivate customers to shift some of their energy consumption to off peak
- **DER Generation:** Motivate customers to purchase DER generation (e.g. solar PV) and reduce reliance on bulk system generation
- **DER Storage:** Motivate customers to use their DER generation to supply demand locally

Make resilience add value to DERs: Rate structures, DSOs, and policies needs revisions to make resilience economically viable



THANK YOU