

Energy Research Institute @ NTU

ENGAGING CONSUMERS FOR SMARTER GRIDS

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CONTENTS

- 1.** Energy Transition in Singapore
- 2.** Consumer-Assisted Green and Flexible Energy
- 3.** Efforts and Ideas on Engaging Consumers
- 4.** Discussions

Energy Transition in Singapore

The Four Switches

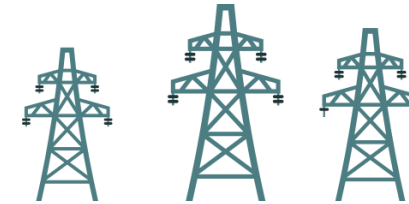
(Courtesy: EMA, SG)



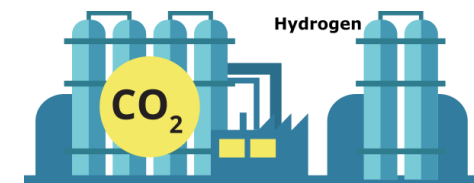
Natural Gas



Solar

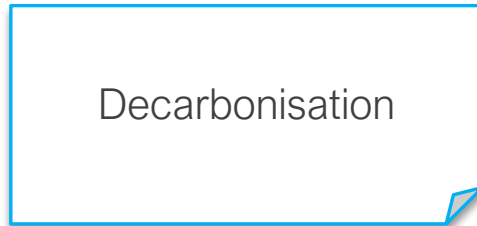


Regional
Power Grids

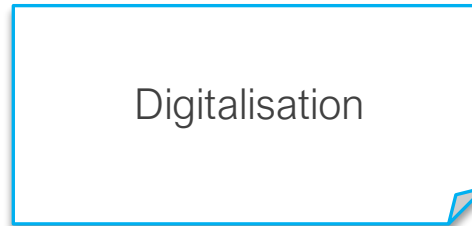


Low-Carbon
Alternatives

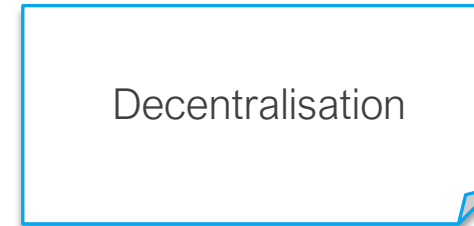
The Many Ds



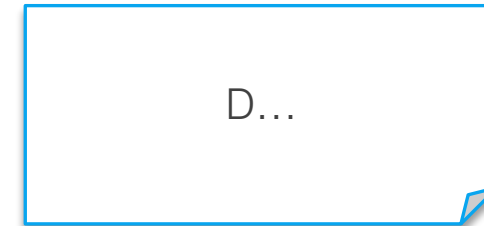
Decarbonisation



Digitalisation



Decentralisation



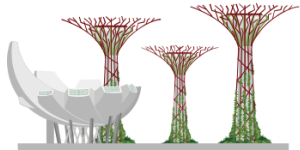
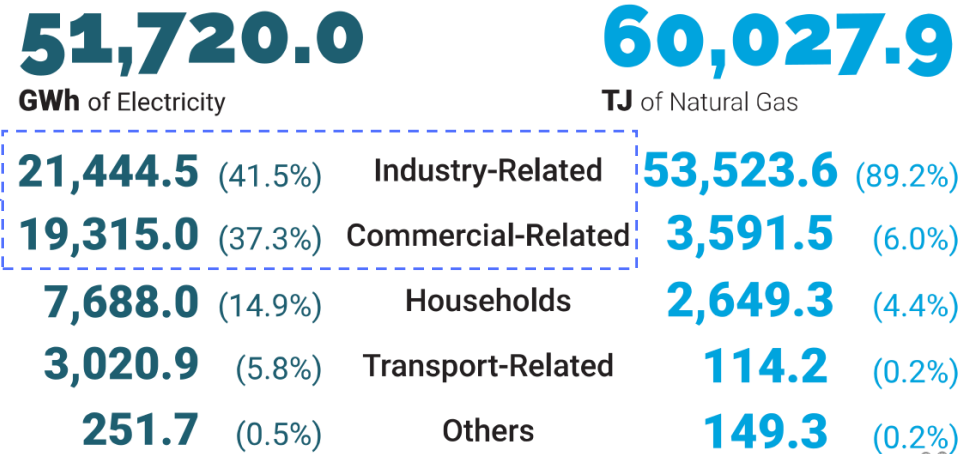
D...

What about the consumers?
How do they feature in the energy transition?



Singapore – Facts and Considerations

Energy Consumption in 2019

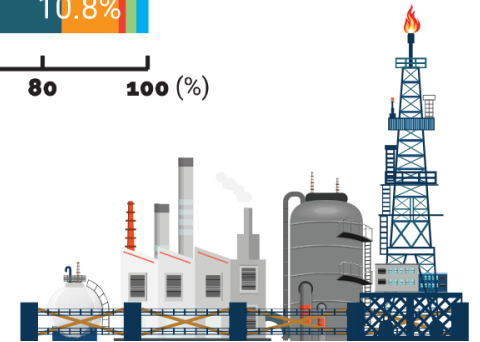
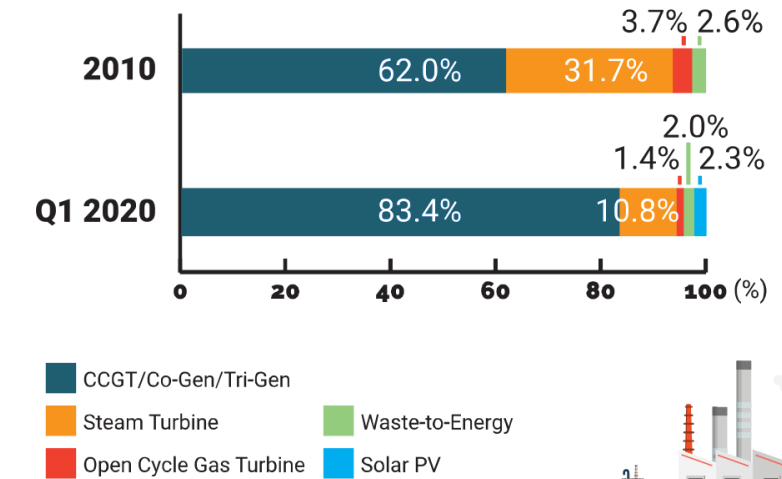


Major consumers of electricity (~79%)

- >50 billion units (kWh) of yearly energy consumption
- >95% of fuel mix is natural gas since Y2014
- Carbon emissions are mainly due to demand
- ~7.7 GW peak system demand (till date)

Electricity Generation Capacity by Technology Type

by Technology Type



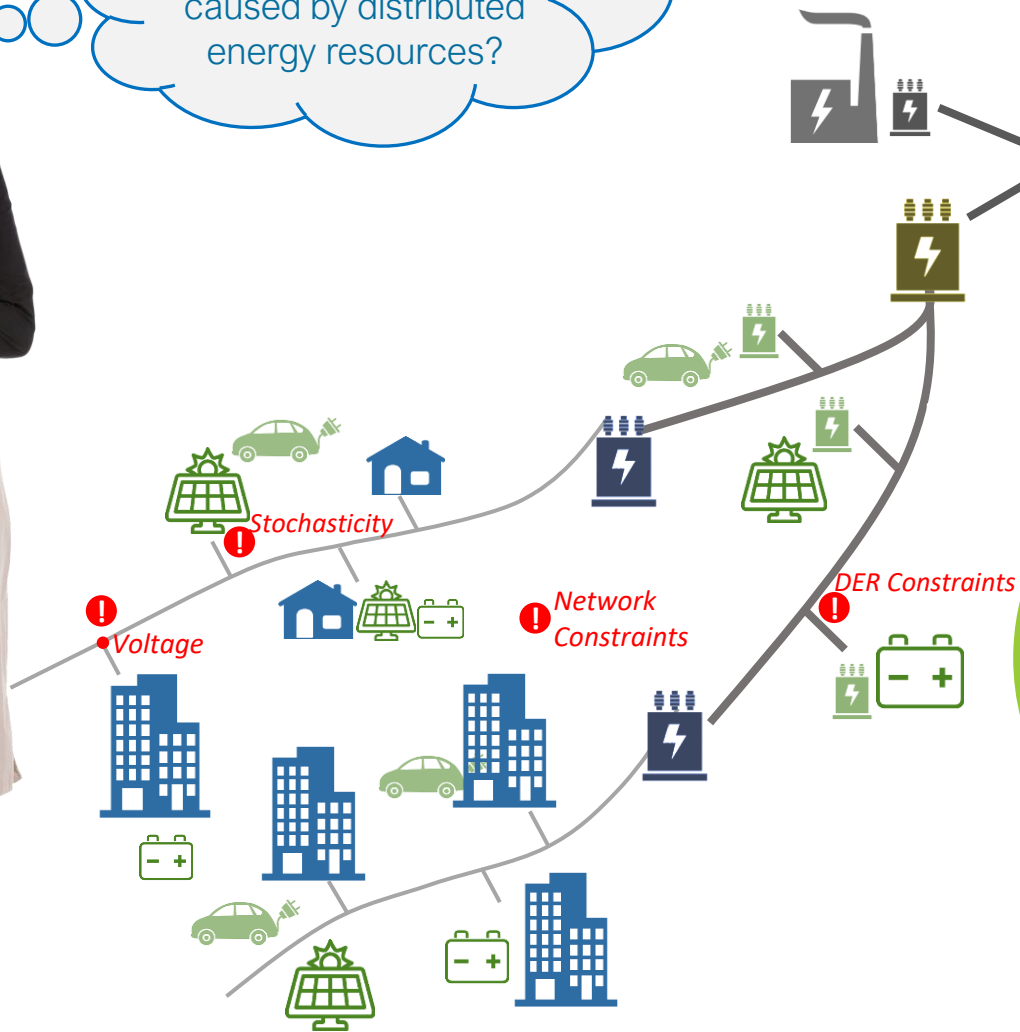
Courtesy: Singapore Energy Statistics 2020, Energy Market Authority (EMA) Singapore, URL: <https://www.ema.gov.sg/cmsmedia/SES2020/Infographics.pdf>

Courtesy: Energy Market Authority (EMA) Singapore, URL: <https://www.ema.gov.sg/Statistics.aspx>, URL: <https://www.ema.gov.sg/ourenergystory>

- Target of ≥200 MW of energy storage systems beyond Y2025
- Target of deploying 2 GWp of solar by Y2030
- Target of 60,000 EV charging points by Y2030



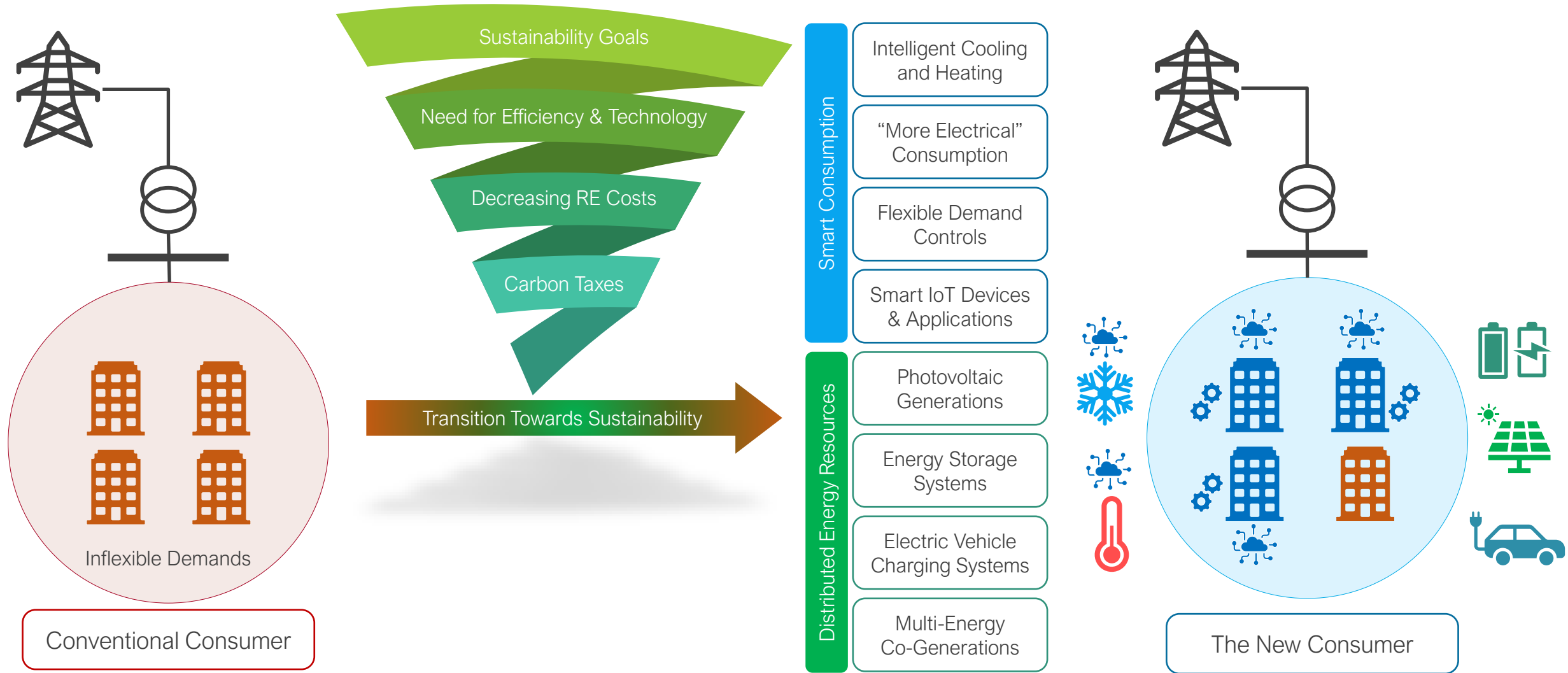
How to manage the power variability caused by distributed energy resources?



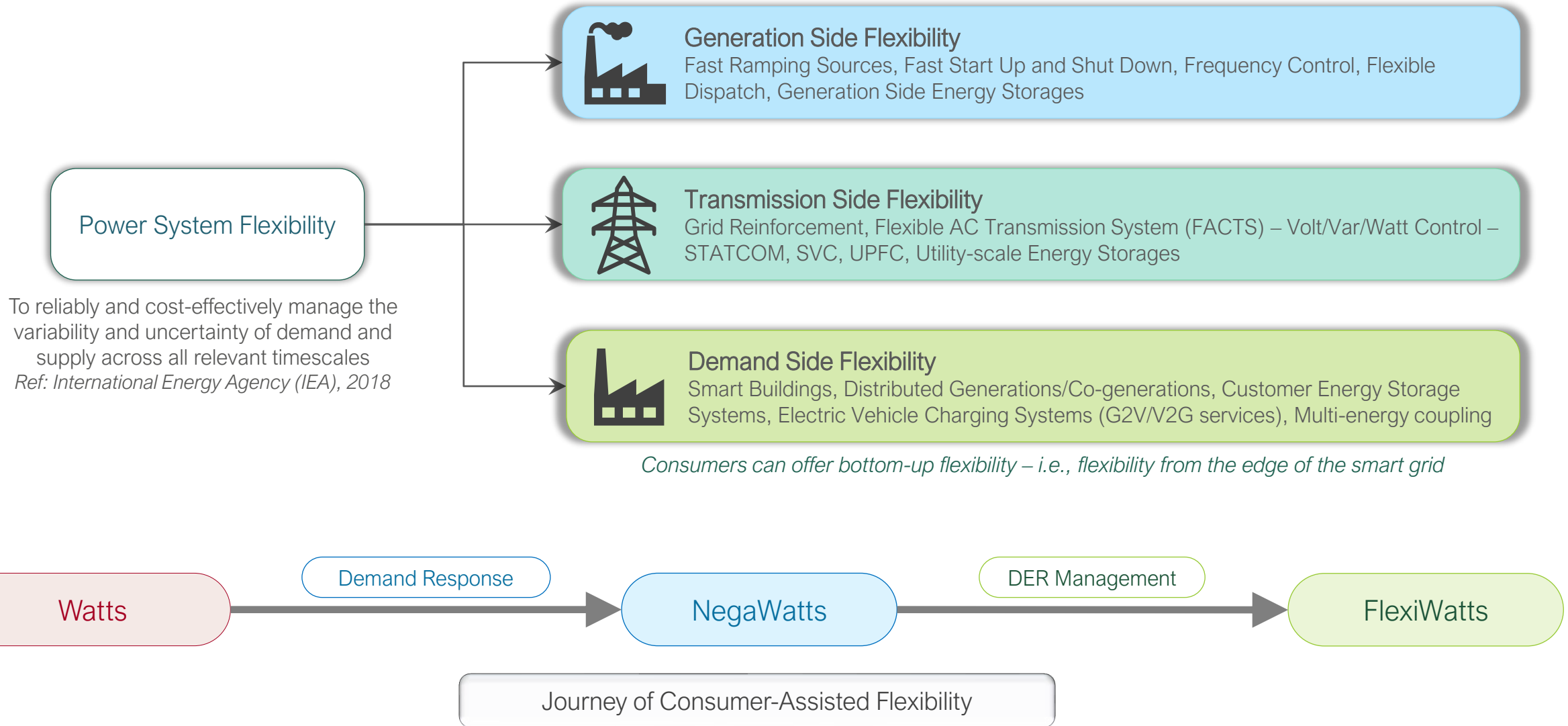
How to support the sustainability targets without heavy investments?



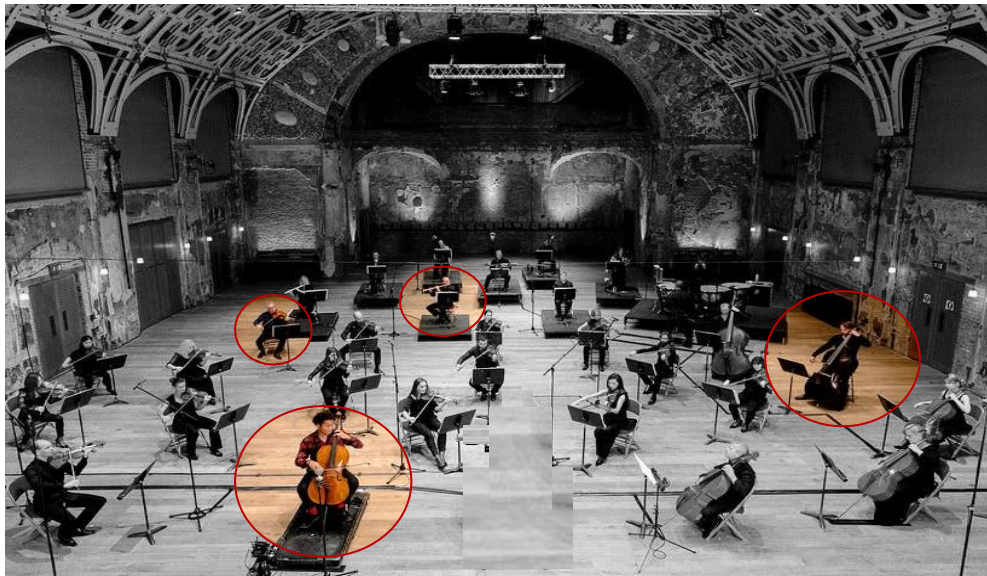
Consumers Reimagined



Consumer-Assisted Flexible Energy & Power for Smarter Grids



Consumer-Assisted Flexibility – Interesting Challenges (non-exhaustive)



Siloed



Orchestrated

Single-user
operating system



Single-user
car ride



Single-user
battery



“Sharing” or Access Model

Digitalised “Access Economy” where multiple parties access services from the same asset, sometimes at the same time, using digital technologies.

Multi-user
operating system



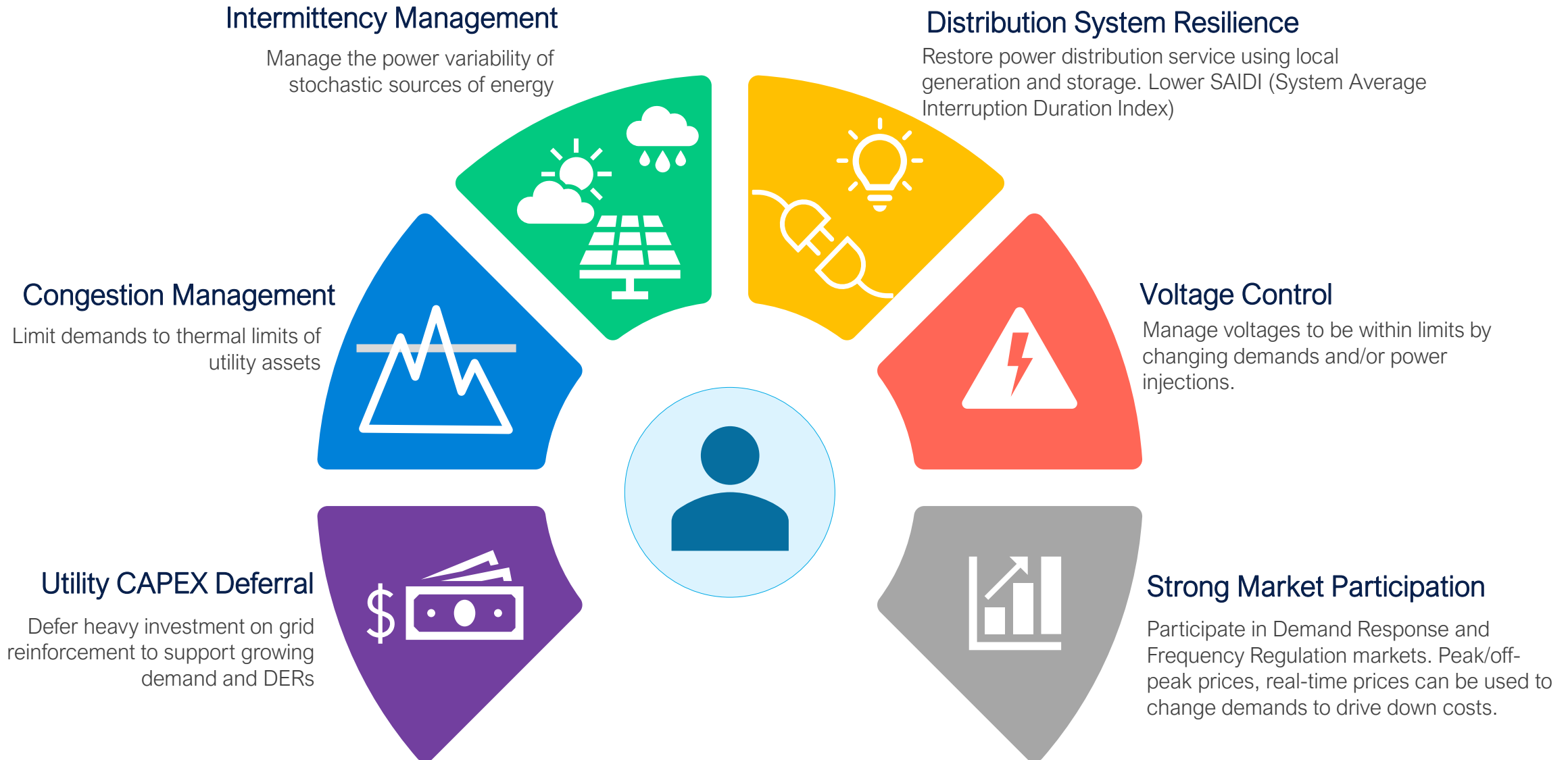
Multi-user
car ride



Multi-user
battery



Consumer-Assisted Flexibility – Values to Offer (non-exhaustive)



Solutions from ERI@N for Singapore & Beyond



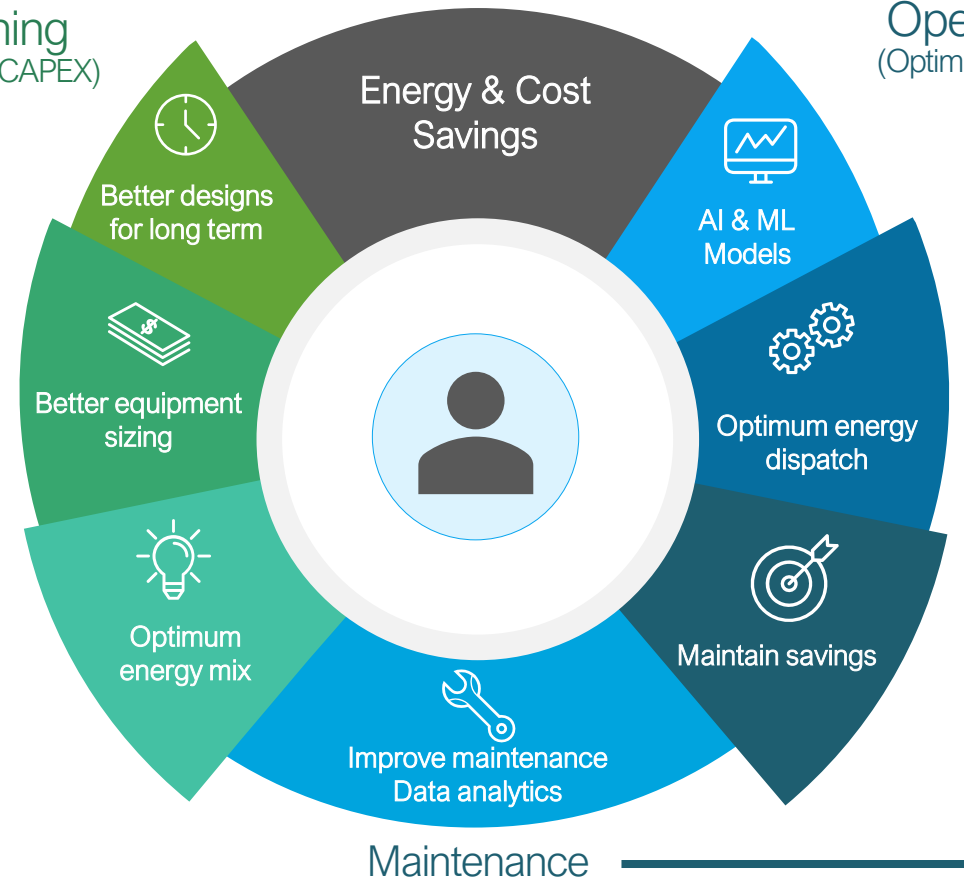
Smart Multi-Energy System

Funded by National Research Foundation (NRF), Singapore

Optimal Design,
Optimal Operation,
Maintenance & Analytics
of
**Multi-Energy Demand Nodes of
Consumers**

Outcome: More Efficient & Greener
Industrial Consumers

Planning
(Optimize CAPEX)



Added efforts on IoT & data-fusion for
engagement of smart homes

Operation
(Optimize OPEX)



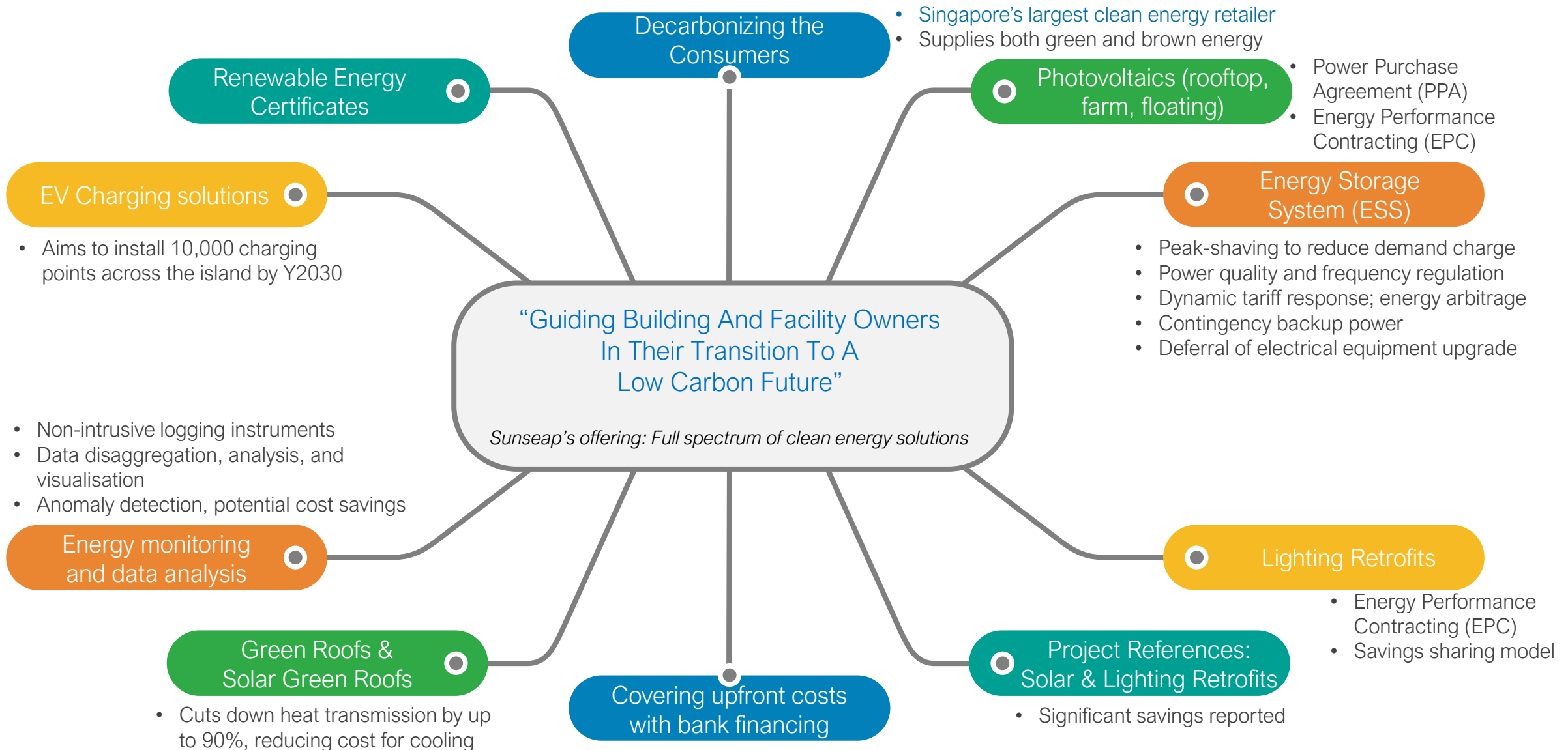
Distributed Energy Resource Management System

Funded by National Research Foundation (NRF), Singapore

Grid-inclusive, Grid-edge,
Decentralised Operation,
Management & Analytics
of
**Multi-DER Flexible Demand
Nodes of Consumers and the
Utility**

Outcome: More Reliable & Greener
Consumer-assisted Distribution Grid

Speaker-1: Peter Goh, Vice President, Sunseap Group



Speaker-2: Jean-Philippe El Khoury, Head of Sales, Smart Grid, East Asia and Japan, Schneider Electric

Uplight – An illustration of engaging consumer

- Consumers may experience disconnect due to complexity of signing up for utility's schemes.
- Uplight company bridges the gap between energy providers and their customers.
- Software-as-a-service (SaaS) model is used.

Easy Consumer Engagement

- Patented instant rebate engine for bundling smart thermostat offers.
- Instant enrollment in energy saving scheme (*"Digital Customer Activation"*)
- Optimise and control thereafter.
- Provides energy disaggregation analytics.

HVAC/Temperature Control

- Consumers get a better rate of electricity in exchange of letting utility control more.
- Optimal HVAC control is performed to reduce high-priced consumption.
- Co-optimization considers PV & ESS too.

Plus App from Uplight (pilot)

- Plus bundles multiple utility programs into simple, personalized offers in a consumer-friendly digital experience.
- Customer pays the same amount every month i.e., predictable bills during the pilot study.

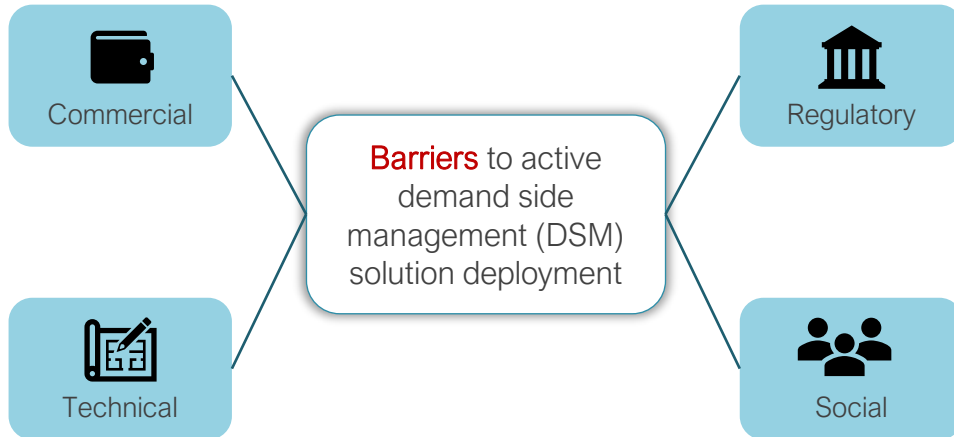
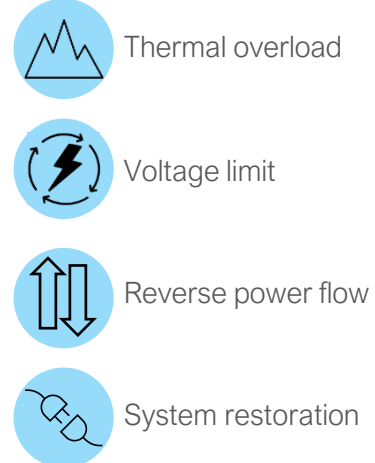
Speaker-3: Anne-Soizic Ranchere, Principal, Enea Consulting, Singapore

Power system needs

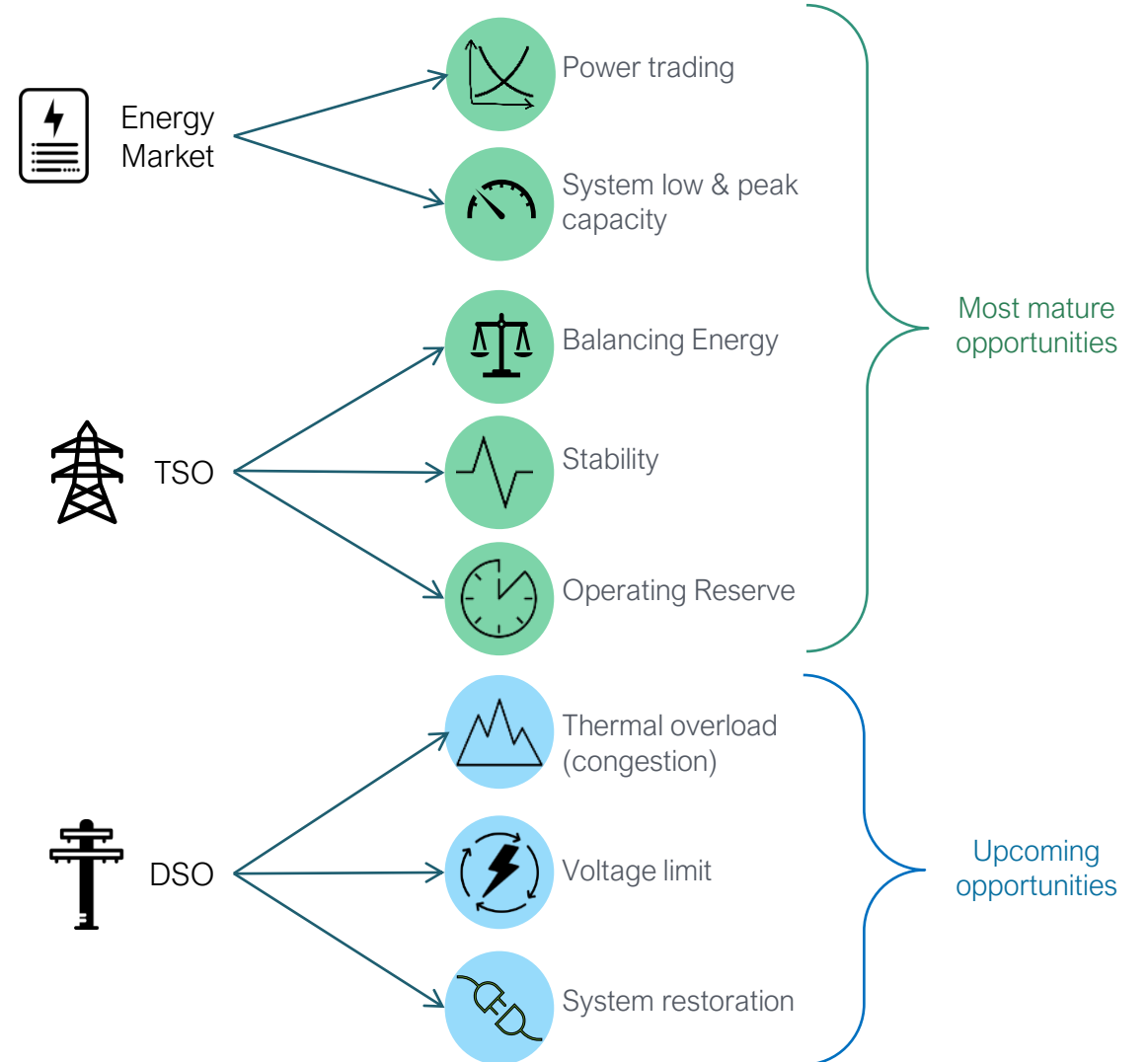
Whole of System



Distribution System



Service / Revenue Streams



Discussions

Engaging consumers is the key to Demand Side Flexibility and to achieve decarbonisation through allowing further renewable energy integration, while deferring investments on distribution grid reinforcement.

Multi-energy and distributed generation inclusive demand side management is crucial for Singapore. ERI@N-SMES and ERI@N-DERMS projects are focused on multi-energy consumers and flexibility from consumers, respectively.

Sunseap engages consumers who require clean energy, retrofits on building lighting, energy storage systems, solar green roofs, energy disaggregation, and targets installation of many EV charging points by Y2030.

Uplight achieves easy consumer engagement and participation in utility's schemes. Currently, a fixed amount as monthly bill in return of HVAC control is being piloted.

Enea would provide the perspective on energy transition, the grid perspective, the consumer perspective, and the revenue streams, barriers and opportunities in a consumer-centric grid.

For engaging consumers to be successful, both human elements and technological elements must come together.

An aerial architectural rendering of a modern urban development. The scene shows a cluster of buildings with green roofs and blue accents, situated next to a body of water. The buildings are surrounded by lush greenery and trees. In the background, a city skyline is visible. The overall atmosphere is bright and modern.

THANK YOU