



# Virtual Power Plant

## Development Status, Hurdles and Outlook in Singapore

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Sembcorp Industries Ltd.



# Introduction to Sembcorp



# Overview

## Leading **energy** and **urban development** player

Operating across multiple markets worldwide

### Key Businesses

#### Energy

- Integrated energy player
- Gas & Power, Renewables & Environment, Merchant & Retail

#### Urban

- Leading Asian Developer
- Transforms raw land into sustainable urban developments
- Economic engine to support growth





# Virtual Power Plant in Singapore



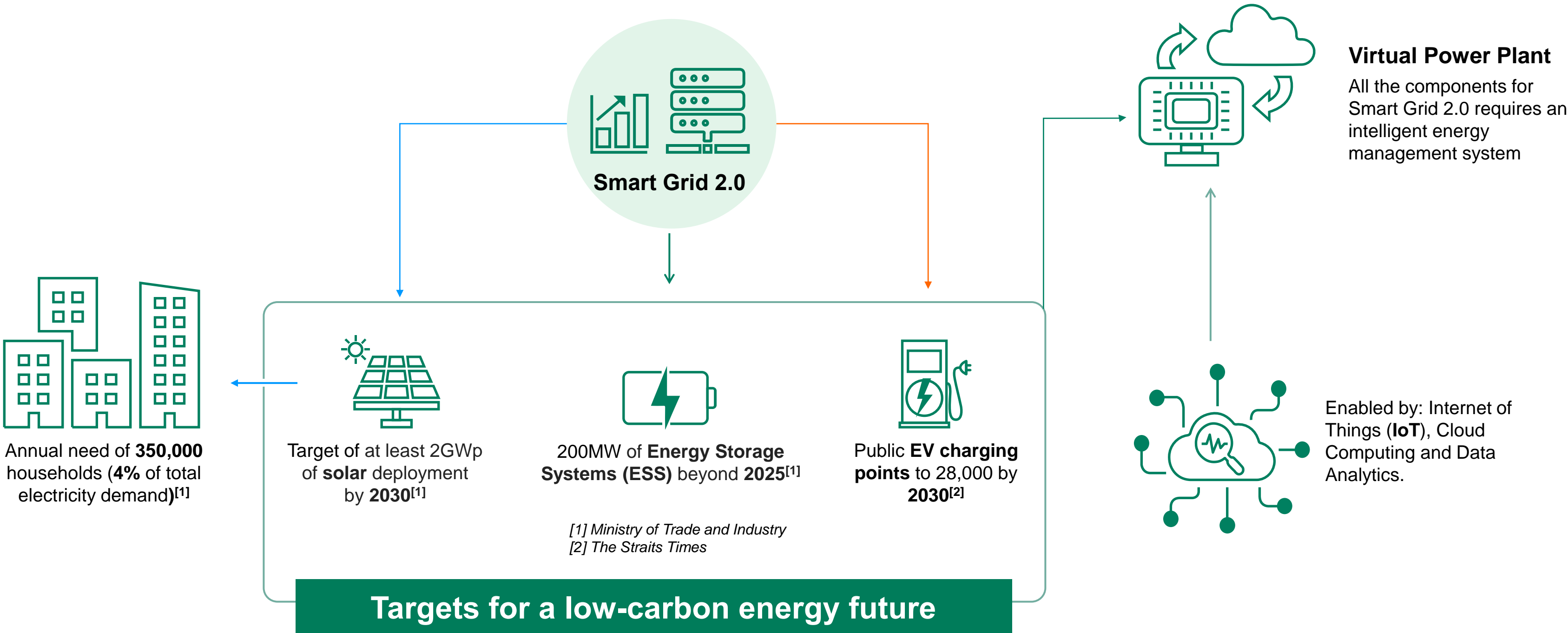
# Energy & Utilities Industry

Major trends in the industry today



# Smart Grid 2.0

## Singapore's progress to the next generation



# What is a Virtual Power Plant (VPP)?

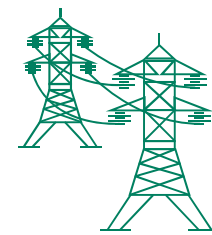
## A Sembcorp Definition



### Distributed Generation

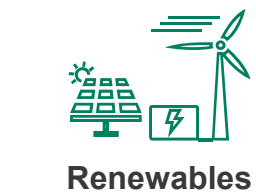
- Commercial & Industrial
- Residential

### Power Grid



### Distributed Load

- Commercial & Industrial
- Residential



Renewables



Energy Storage



Diesel Generator



Other Distributed Generators



### Virtual Power Plant

- Aggregation
- Forecast
- Optimisation



EV Charger



Lighting



Machinery



HVAC



Demand Forecast



Production Forecast



Power Price Forecast



Weather Forecast

## Virtual Power Plant

- Emerges when many spare capacity of distributed energy resources (DERs) left unused and too small for trading.
- Is **essentially a software platform** that aggregates and control many DERs.
- Focus **on DER optimisation and monetisation**



# Applications of VPP

## Enable multiple value streams



### Behind-The-Meter

- Manage demand charge without load shedding
- Optimise time-of-use
- Reduce energy purchase from retailer
- Act as an intelligent Uninterrupted Power Supply (UPS)
- Additional revenue streams
- EV Charger Integration

### Energy Trading & Retail

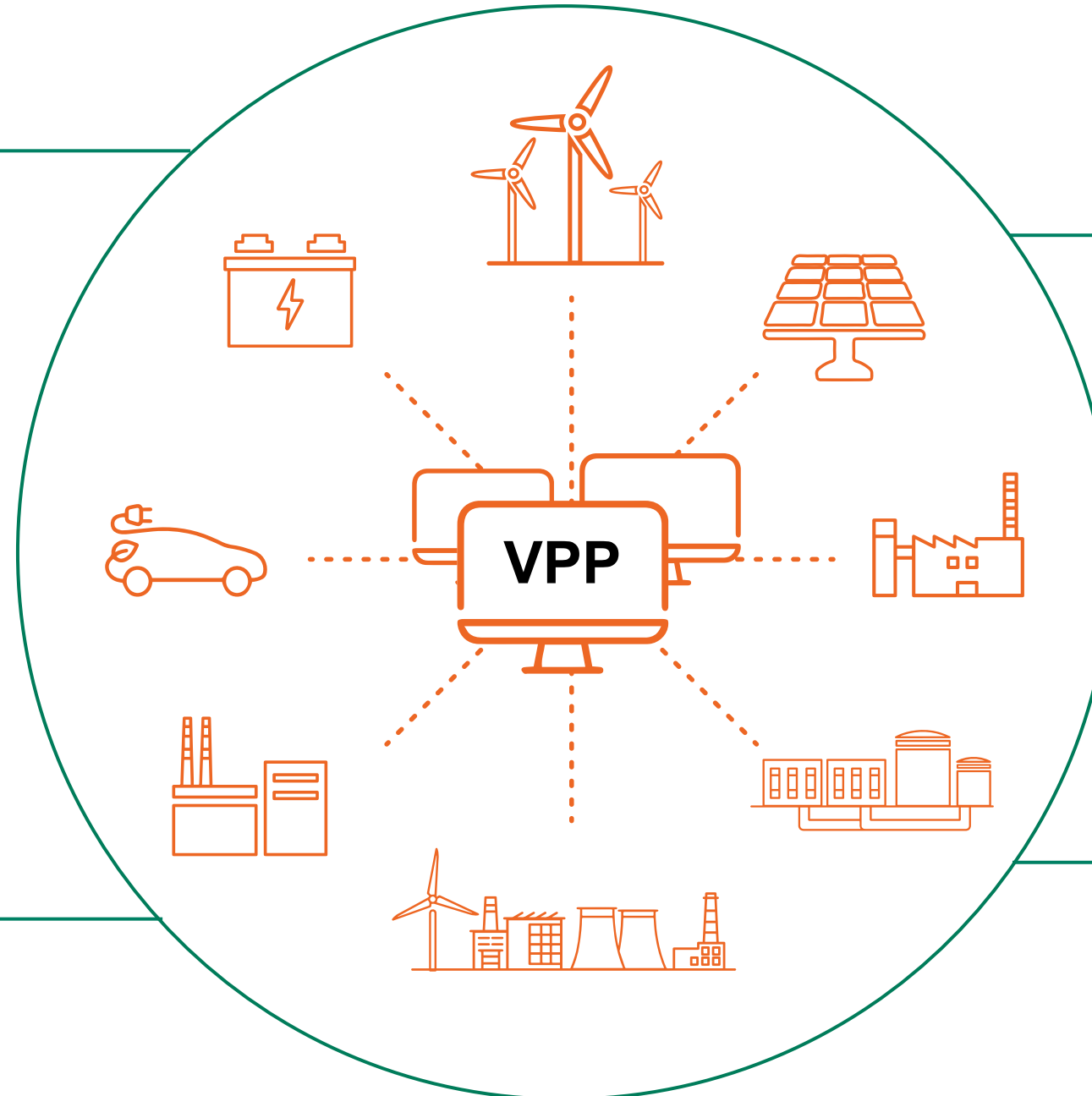
- Aggregate low cost energy from residential and commercial consumers
- Generation, system imbalance forecast
- Energy price forecast
- Optimum trading and scheduling advisory

### Grid Ancillary Services

- Frequency regulation
- Primary and contingency reserves
- Reactive support and voltage control service
- Demand response

### Renewables

- PV and wind generation forecast
- Renewables + Energy Storage
- Intermittency mitigation
- Multiple revenue streams
- Renewable energy certificates



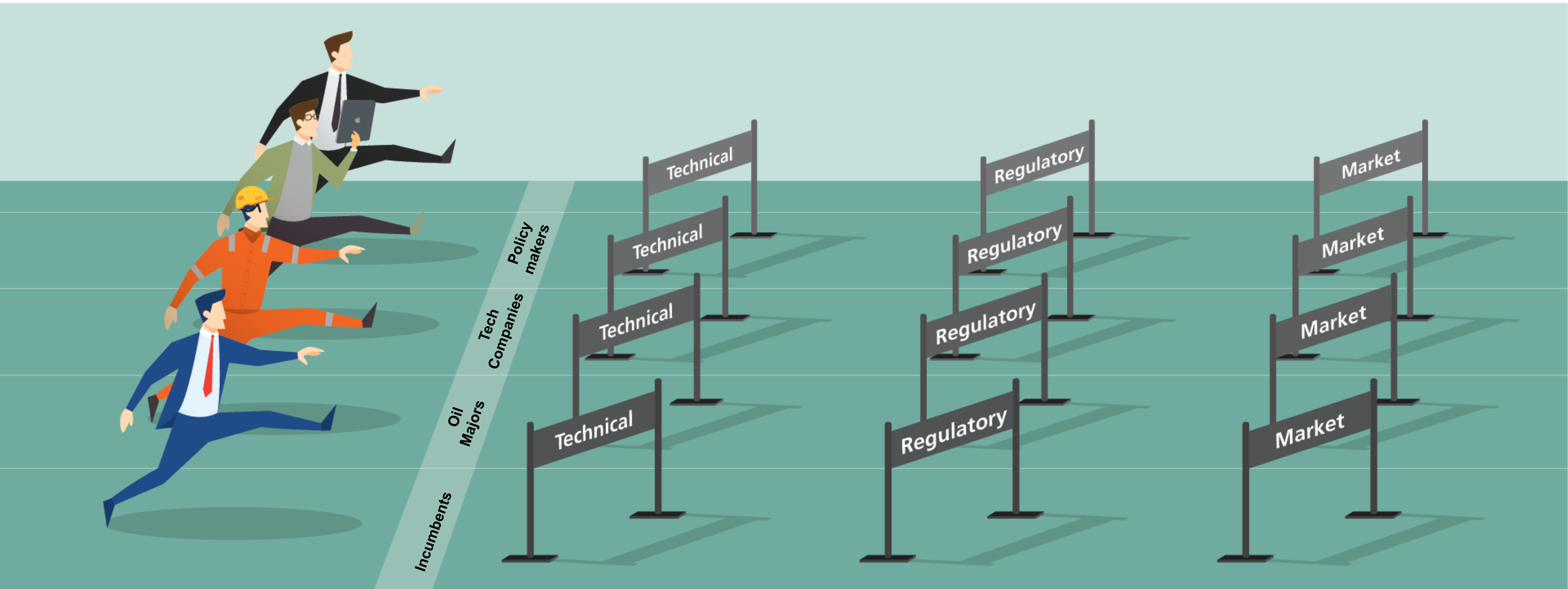
Source: Energy Market Authority



# Working on VPP in Singapore



We are seeing encouraging traction among various stakeholders but challenges exist in the eco system...



**Sembcorp** welcomes collaborations  
to build up the **DER** and **VPP** ecosystem  
in Singapore



# Thank you

