



Virtual Power Plant

Development Status, Hurdles and Outlook in Singapore

SIEW 2020 Roundtable

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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

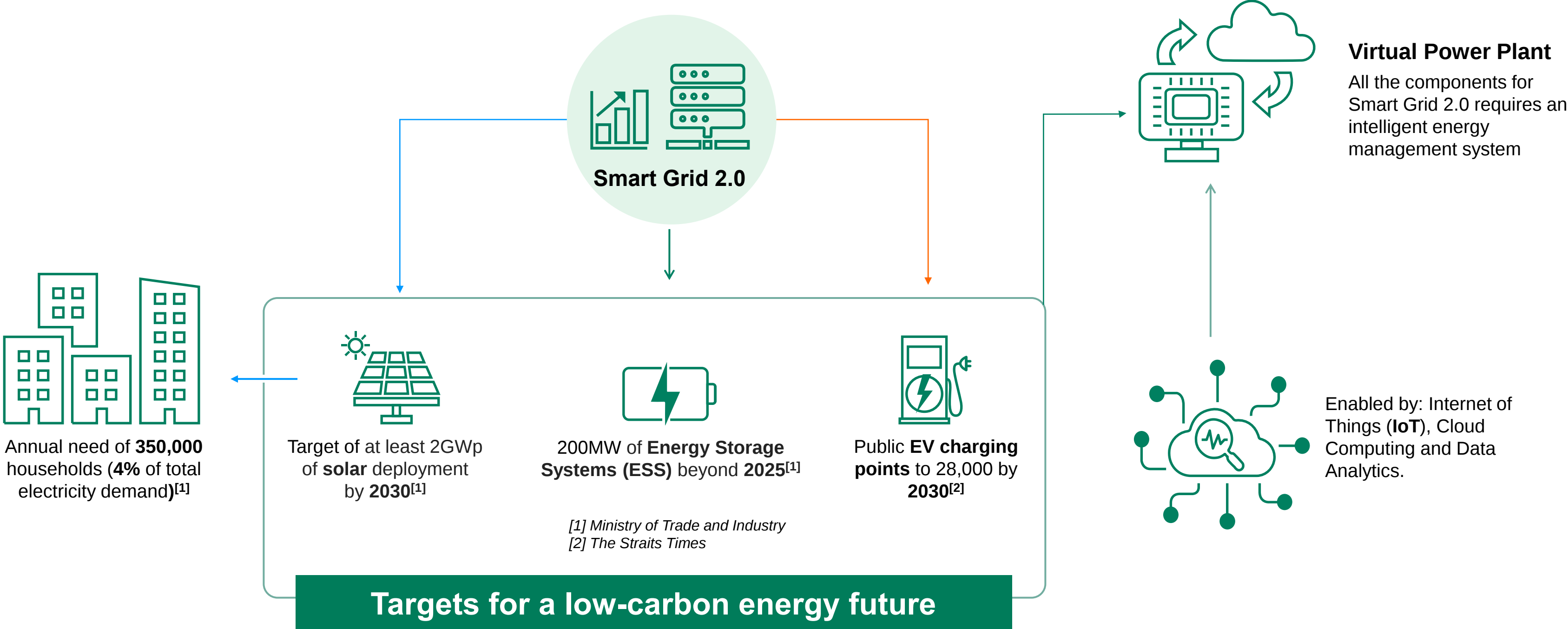
Energy & Utilities Industry

Major trends in the industry today



Smart Grid 2.0

Singapore's progress to the next generation



What is a Virtual Power Plant (VPP)?

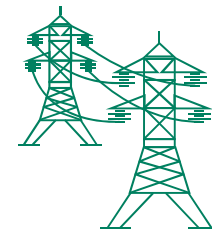
A Sembcorp Definition



Distributed Generation

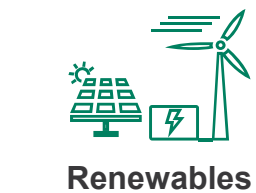
- Commercial & Industrial
- Residential

Power Grid



Distributed Load

- Commercial & Industrial
- Residential



Renewables



Energy Storage



Diesel Generator



Other Distributed Generators



Virtual Power Plant

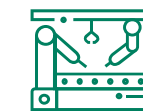
- Aggregation
- Forecast
- Optimisation



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

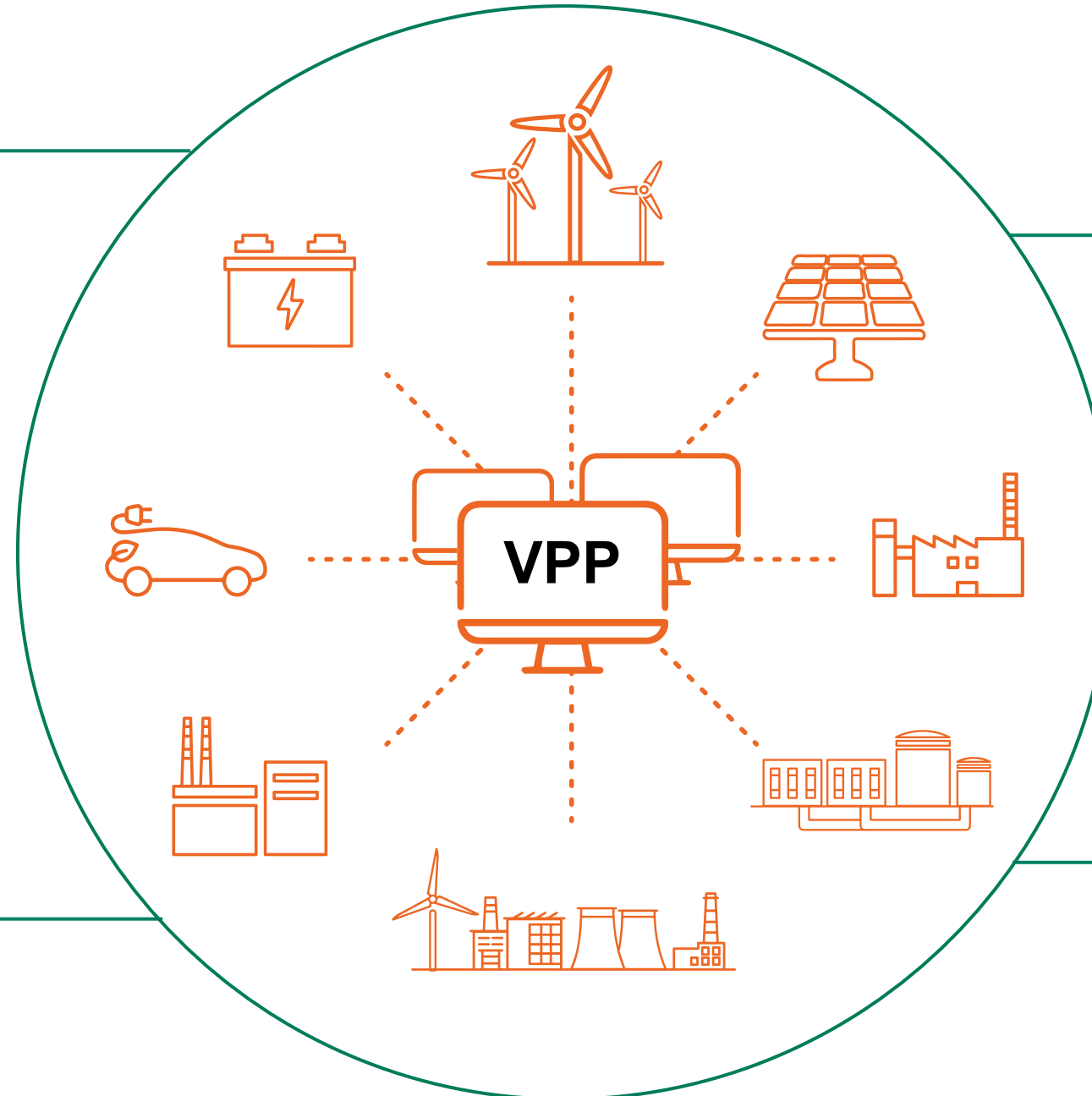
- Aggregate low cost energy from residential and commercial consumers
- Generation, system imbalance forecast
- Energy price forecast
- Optimum trading and scheduling advisory

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

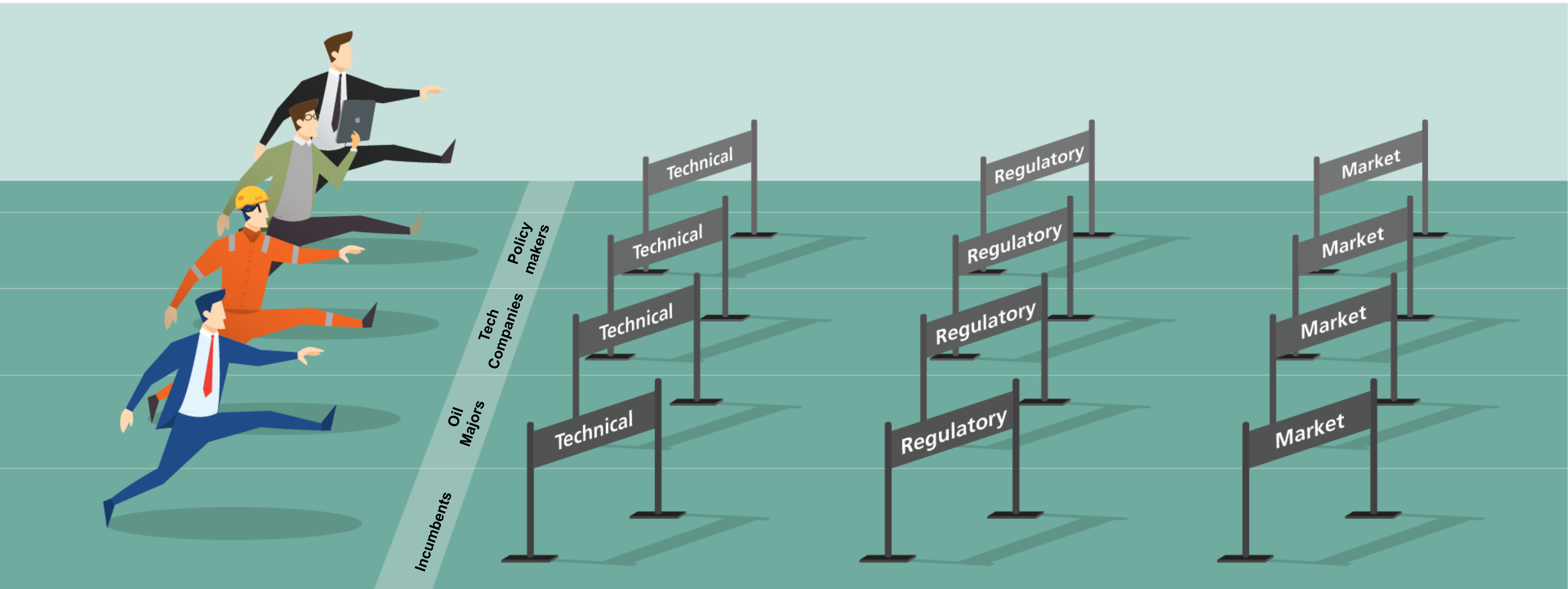


Source: Energy Market Authority

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

