



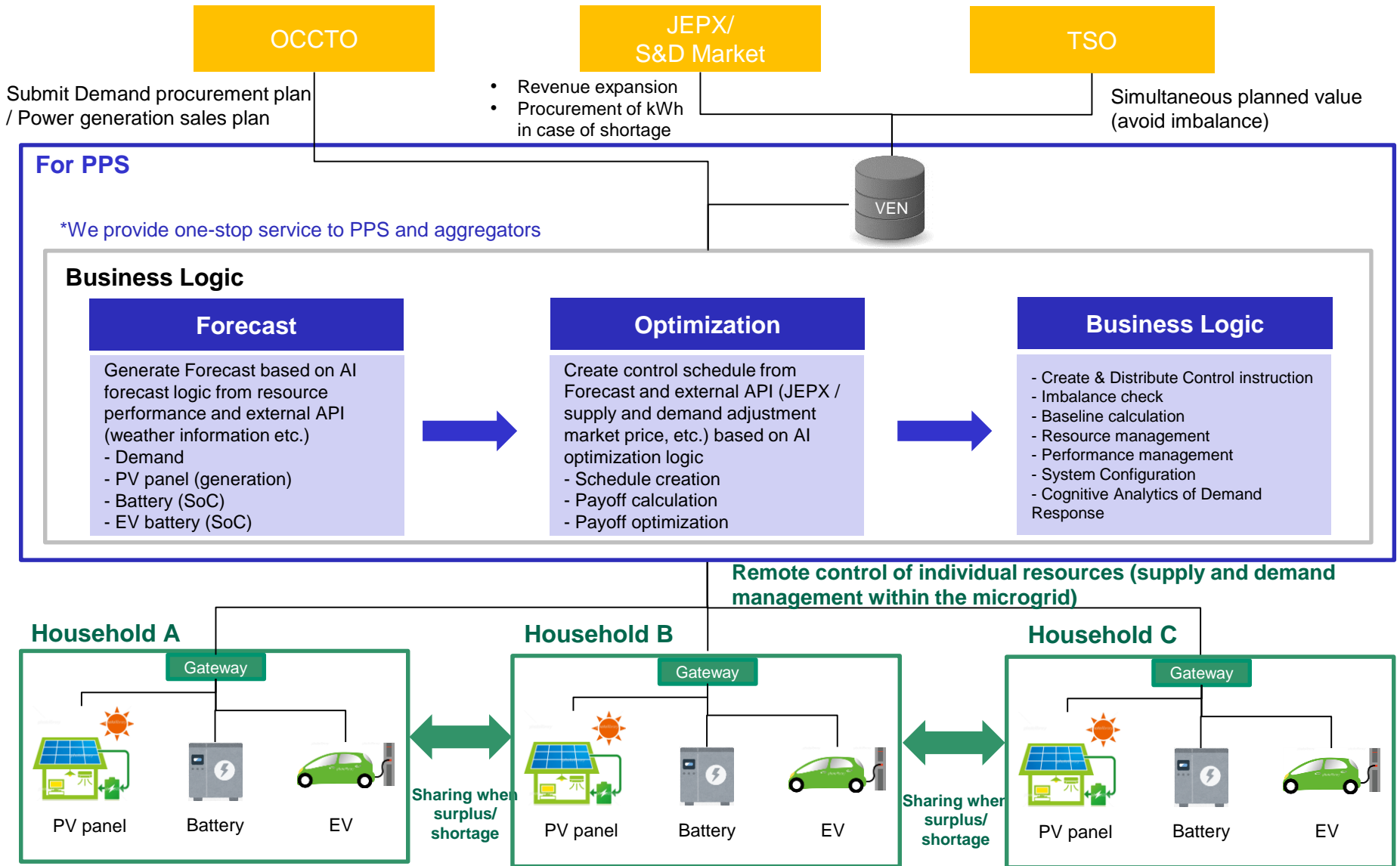
GRID SOLUTIONS

Microgrid Solutions

Grid Solutions, Inc.

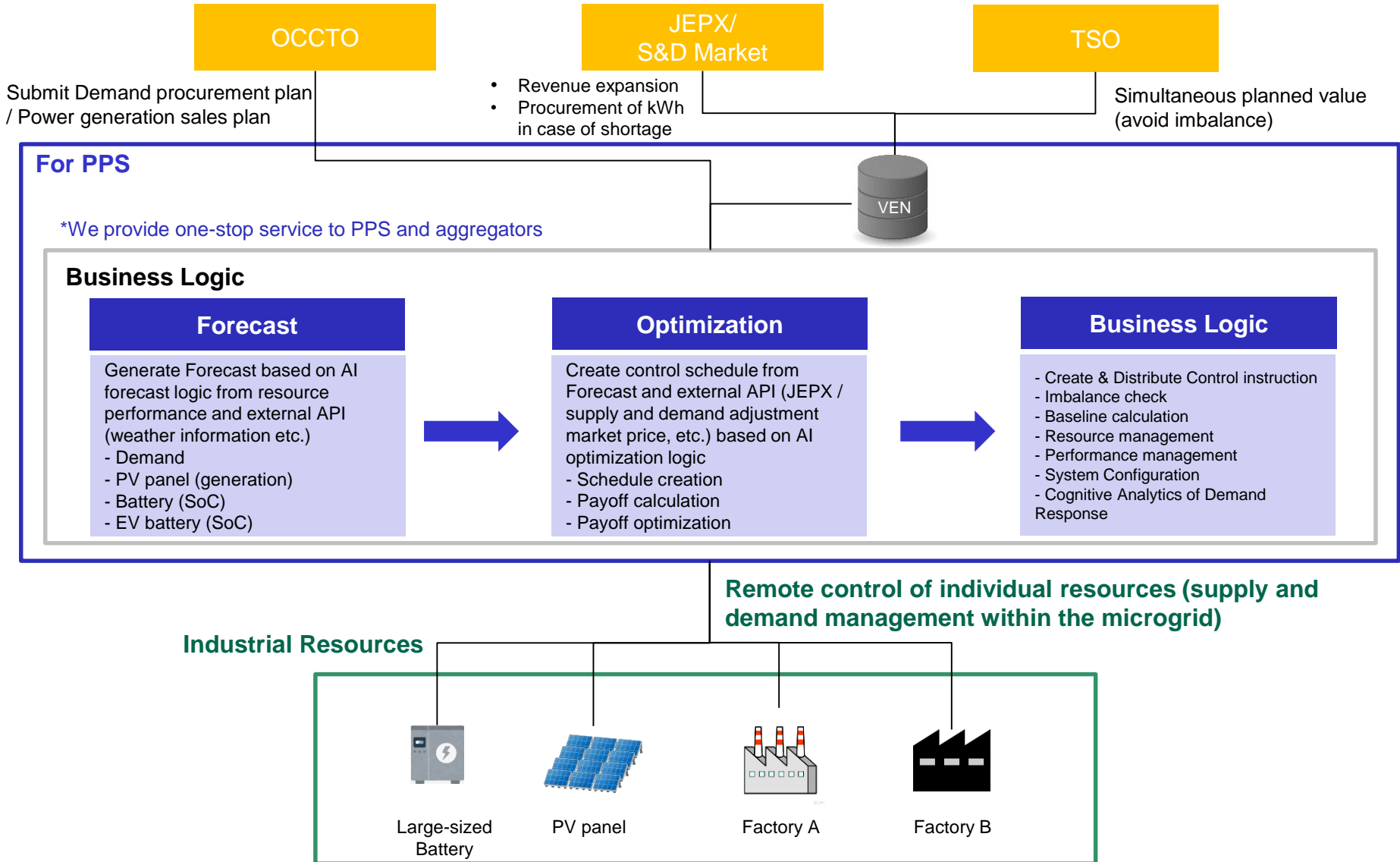


Overview of Microgrid Solution (Residential Facilities)





Overview of Microgrid Solution (Industrial Facilities)





Main functions provided by business logic (1/3)

Forecast

- Resource consumption forecast affects payoff optimization and needs to be more accurate. Our unique AI-based **forecasting engine** predicts **demand, PV panel's power generation, EV and storage battery SoC** through resource performance data, external weather data API, etc.
- Our Forecast Engine is a tool to automatically perform forecasts, based on time series, using **machine learning algorithms and deep learning**.
- Forecasting accurately is key to running an efficient VPP. For this end, we use weather data and solar irradiation data from external data sources to make more accurate predictions.
- Our forecast engine provides a **two day forecast with intervals required by customers** of the series (i.e. 30min interval).
- This algorithm trains a forecasting model, handling outlier and missing data set.

Optimization

- Optimal payoff based on **1) demand forecast value, 2) controllable amount, 3) DR event from TSO, 4) price information from JEPX and S&D market** linked from demand forecast engine generates a **24-hour (48 frames) supply and demand schedule**. The schedule is **updated every 30 minutes** as the forecast is updated.
- Based on a 24-hour schedule, it instructs the amount of electricity to procure in JEPX or S&D Market. Also, for the time of the successful bid, a control instruction schedule is created and the amount of the successful bid is distributed to each resource so that the payoff is optimal.



Main functions provided by business logic (2/3)

Event Management/Distribution

- It is a function to distribute control commands to consumer resources that can be controlled according to the schedule created by the optimization engine.
- After creating the control instruction, it responds through the following sequence.
 - 1) Calculate the baseline based on the control performance (power usage) of resources.
 - 2) Judge whether to participate in the event from the distribution result, and return a response to VEN.

Performance Management

- It is a function to acquire and manage the actual information from resources and a function to send it to the power transmission and distribution business operator. It is also used as information for optimal distribution of control instructions in conjunction with the forecast engine.
- Performance management is mainly 1) "Resource performance registration", 2) "Resource performance aggregation", 3) "Send Report" :
 - 1) "**Resource performance registration**": Receive performance from each resource and register them in the database.
 - 2) "**Resource achievement aggregation**": resource performance aggregation request (schedule base) is received and the performance is sent to VEN.
 - 3) "**Send report**": sends the aggregated resource results to VEN.
- Supports three reports: "baseline report", "control performance report", and "controllable amount report".



Main functions provided by business logic (3/3)

Baseline Calculation

- The baseline is an estimate of the amount of power demand without demand restraint. The amount of demand restraint at the DR event. It is calculated as the difference between this baseline and the actual power demand.
- Business logic calculates the baseline based on the results aggregated from each resource, and uses the averaging method (High 4 of 5: data for the 4 days with the highest power consumption in the last 5 days).

System Configuration

- It is a function to manage the load information of the resources owned by each consumer, the baseline, and other information about the consumer.



Company Overview

- ❑ Company Grid Solutions, Inc
- ❑ Location 4-6-16-1004 Shiba Minato-ku Tokyo 108-0014
- ❑ Founded April 2012
- ❑ CEO Yohei Takahashi
- ❑ Bank SMBC Kashiwa Branch
- ❑ Business Development of Smart grid, Demand Response, VPP solutions
 - ✓ OpenADR solutions
 - OpenADR2.0b certified (VTN, VEN)
 - ✓ VPP solutions
 - ✓ AI-based forecast engine
 - ✓ Participated in a number of national projects