



SIEMENS



# Smart solutions for fleets of all types & sizes of power generation

Marcus König, E F IE SGS / September 2013

# The Siemens structure: Four Sectors close to the customer

Energy	Healthcare	Industry	Infrastructure & Cities
<p><b>Divisions</b></p> <ul style="list-style-type: none"> <li>Fossil Power Generation</li> <li>Wind Power</li> <li>Oil &amp; Gas</li> <li>Energy Service</li> <li>Power Transmission</li> </ul>	<p><b>Divisions</b></p> <ul style="list-style-type: none"> <li>Imaging &amp; Therapy Systems</li> <li>Clinical Products</li> <li>Diagnostics</li> <li>Customer Solutions</li> </ul>	<p><b>Divisions</b></p> <ul style="list-style-type: none"> <li>Industry Automation</li> <li>Drive Technologies</li> <li>Customer Services</li> </ul>	<p><b>Divisions</b></p> <ul style="list-style-type: none"> <li>Rail Systems</li> <li>Mobility and Logistics</li> <li>Low and Medium Voltage</li> <li>Smart Grid</li> <li>Building Technologies</li> <li>OSRAM <sup>1)</sup></li> </ul>



1) In fiscal 2011, Siemens announced its intention to publicly list OSRAM and retain a minority stake as anchor shareholder in OSRAM AG for the long term.

# Siemens Energy Sector – Clean electricity for the world

## Top performance in five Divisions

Fossil Power Generation (E F)	Wind Power (E W)	Oil & Gas (E O)	Energy Service (E S)	Power Transmission (E T)
 <p>World record <b>60.75%</b> efficiency for combined cycle power plants</p>	 <p>New performance dimensions <b>6 MW</b> for wind turbines</p>	 <p>Deep-sea capable <b>36 kV</b> Seabed power distribution at depths of up to 3,000 m</p>	 <p>Additional <b>200 MW</b> through modernization in 2011</p>	 <p>World record <b>800 kV</b> for direct current transmission</p>



# Energy Sector – Fossil Power Generation Division



## Product Business Unit (E F PR)

- **Gas turbines**  
(112 MW to 375 MW)
- **Steam turbines**  
(90 MW to 1,900 MW)
- **Generators**  
(25 MVA to 2,235 MVA)
- **Fuel gasifier**
- **System integration**



## Energy Solutions Business Unit (E F ES)

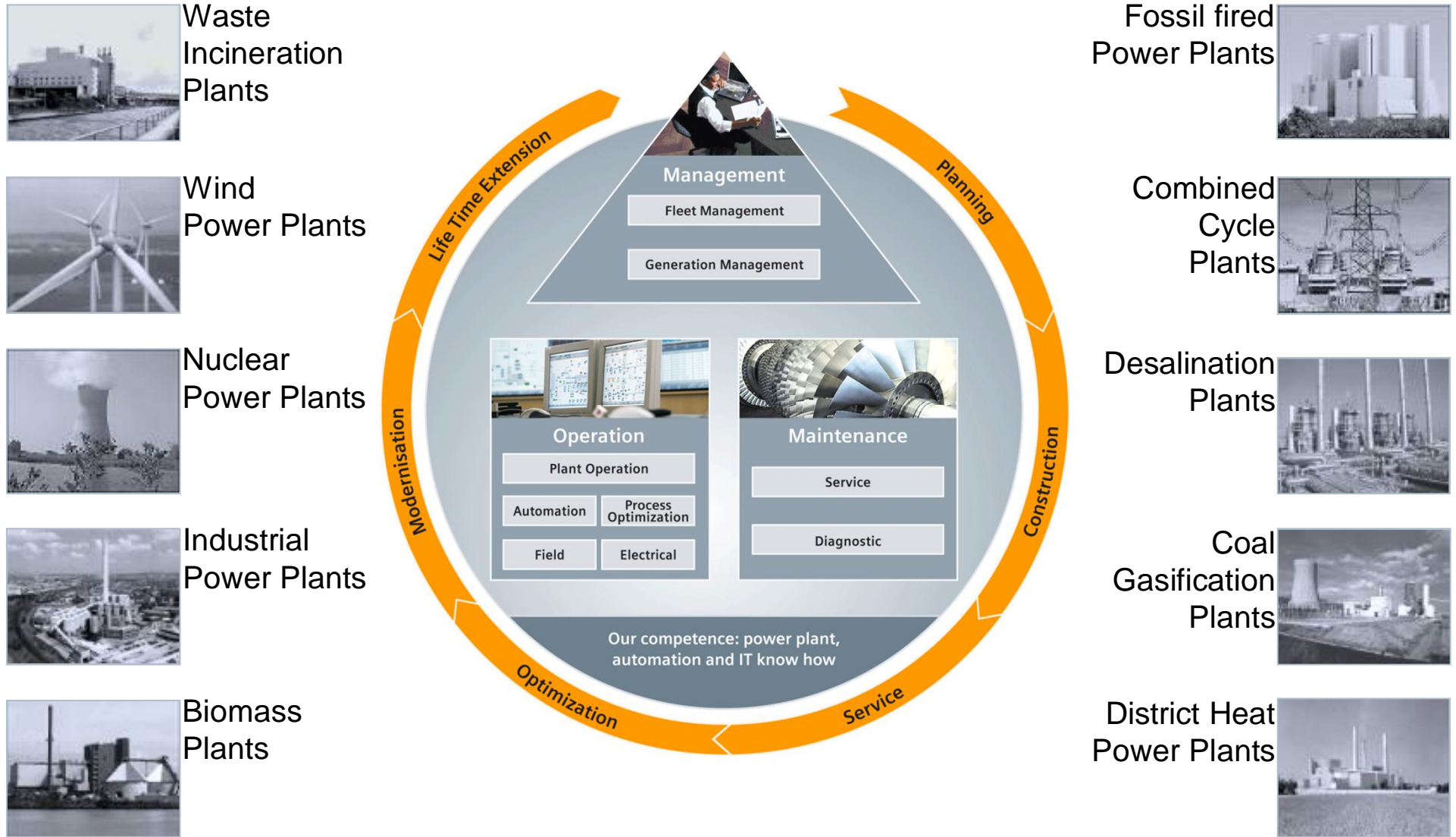
- **Gas turbine power plants**
- **Combined cycle power plants**
- single-/multi-shaft configuration
- **Integrated solar combined cycle power plants**
- **Steam power plants**
- **The comprehensive range of offerings extends to complete turnkey solutions.**



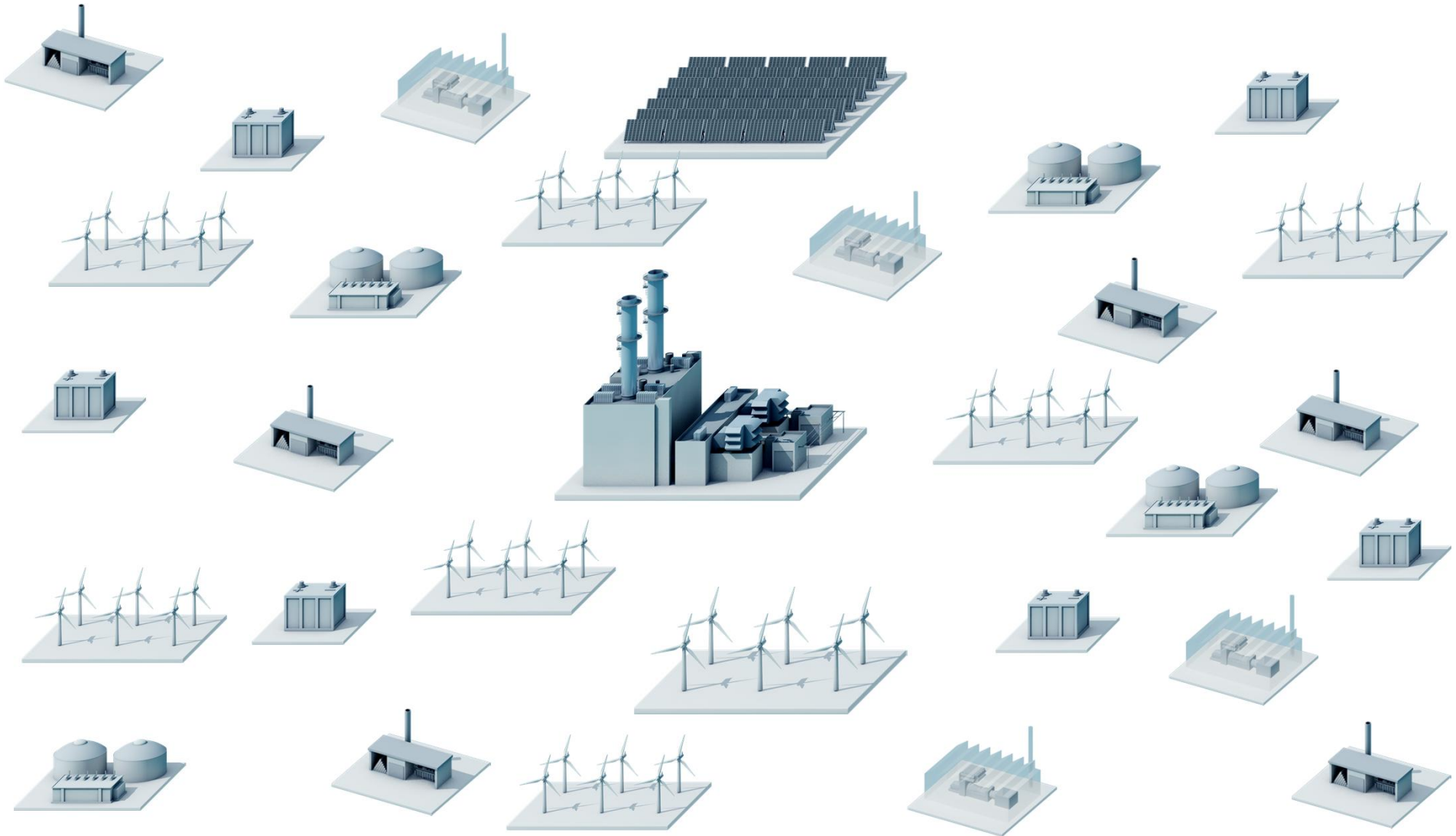
## Instrumentation & Electrical Business Unit (E F IE)

- **Highest availability** – proven SPPA-T3000 in over 380 units
- **World record conversion time** for a full I&C modernization
- **Immense savings** – at least one complete I&C system less during a plant's lifecycle
- **Smart Generation Solutions** – to manage decentralized energy generation and optimization

# Siemens E F IE: The leading global solution provider for enterprise-wide power generation management



# Power supply becomes increasingly decentralized, volatile and complex





# Economics, weak-grids and market liberalization are predominant factors – with clear requirements



## New Energy Mix

- Shifts in the energy mix with significant regional differences



## Changing Economics

- Rising OPEX for fossil energy, falling CAPEX for wind and PV



## Liberalization of energy markets

- Fluctuating prices and market integration of renewables



## Weak / overloaded grids

- Little investment & high volatility through renewables

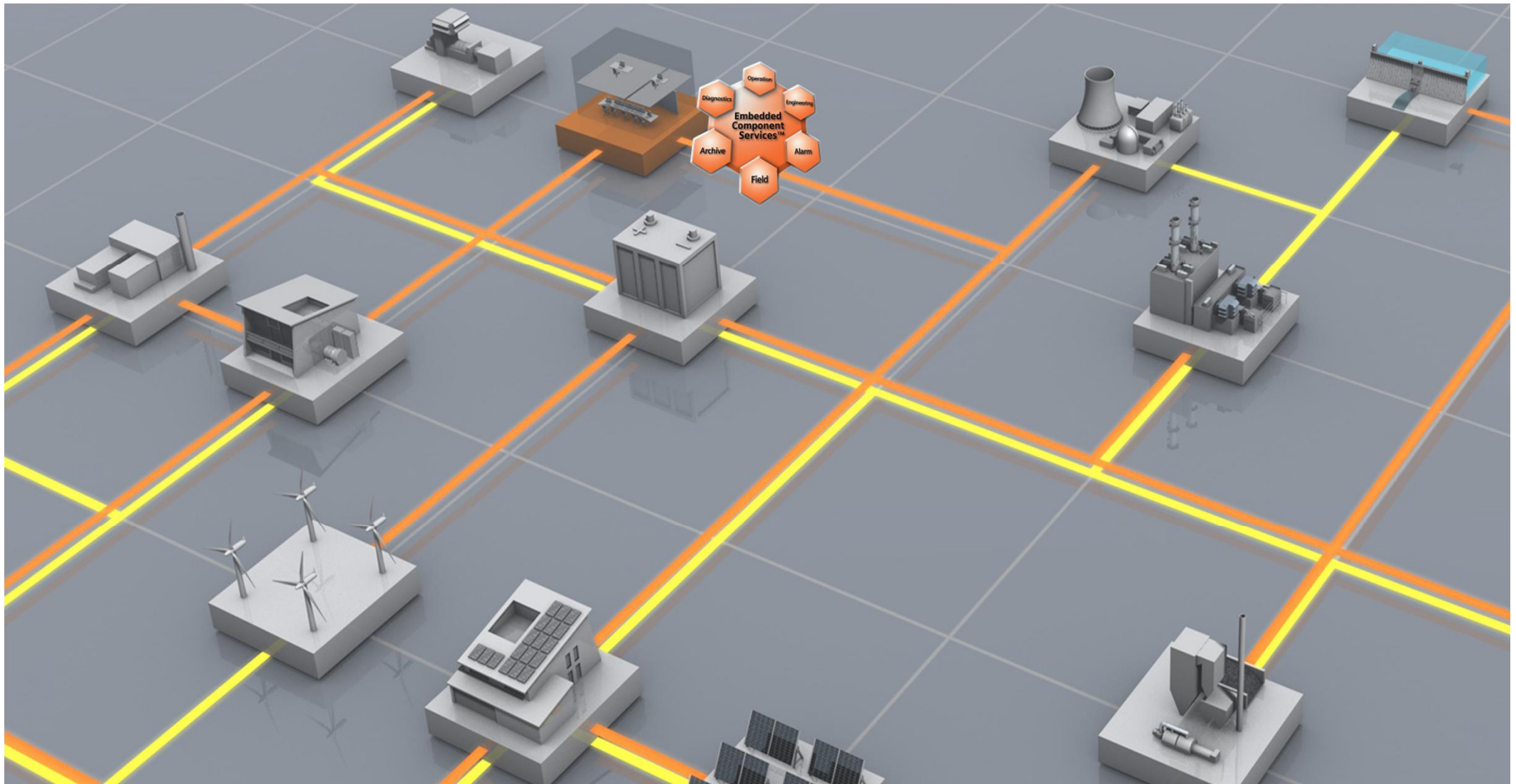


## Environmental aspects

- Ramp-up of renewables accepted goal in all societies

- 1 Increased Flexibility of Fossil Plants
- 2 Smooth integration of Renewables
- 3 Fleet Optimization (Economic Dispatch)
- 4 Hybridization Fossil + Renewables
- 5 Sizing the right mix of generation types
- 6 Services for Operations & Maintenance

# Centralized and distributed power generation units have to interact – in real-time

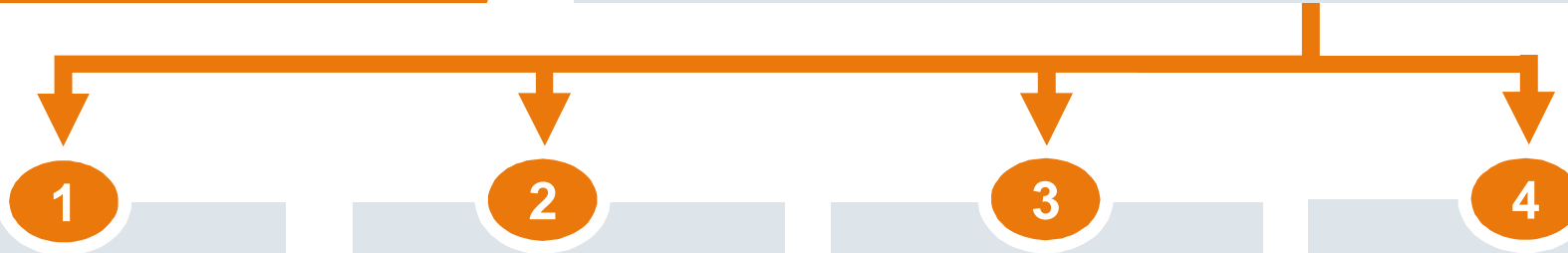




# Siemens provides solutions for highest efficiency, reliable power supply and reduced emissions

## Smart Generation Solutions

- Flexibility improvements of thermal power plants
- Smooth integration of volatile renewables
- Off-Grid power solutions with minimized cost of energy
- Fleet optimization for best profitability in liberalized energy markets



**1**

### Performance Monitoring

Overview

Overall portfolio

Annual revenue: 12,345,678 €

Monthly revenue: 12,345 €

Energy yield 24h: 45 kWh

Avoided CO<sub>2</sub>: 1,345,678 MWh

**2**

### “Flex Power Plant Solutions”

**3**

### Hybrid Power Solutions

**4**

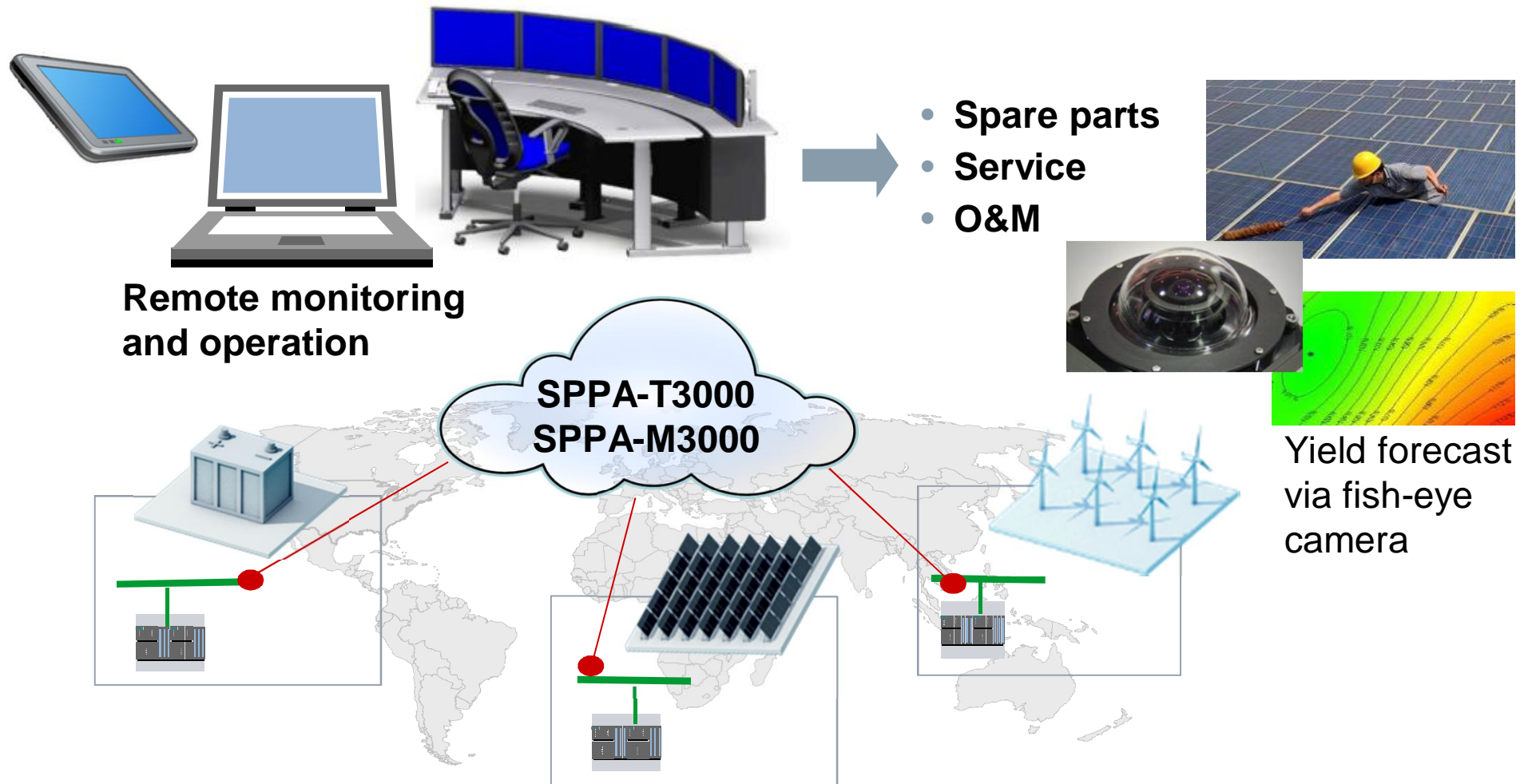
### “Modular Power Plant Solutions”

**SIEMENS**



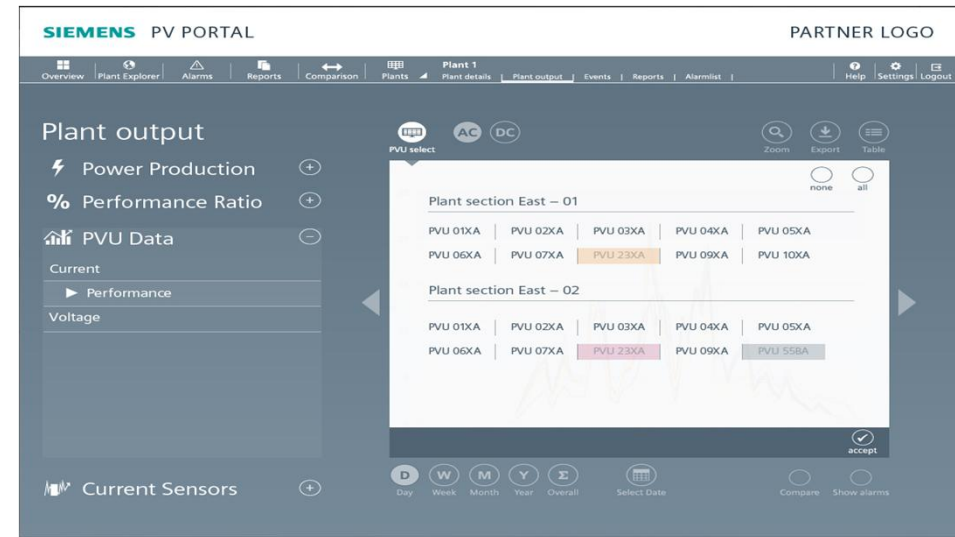
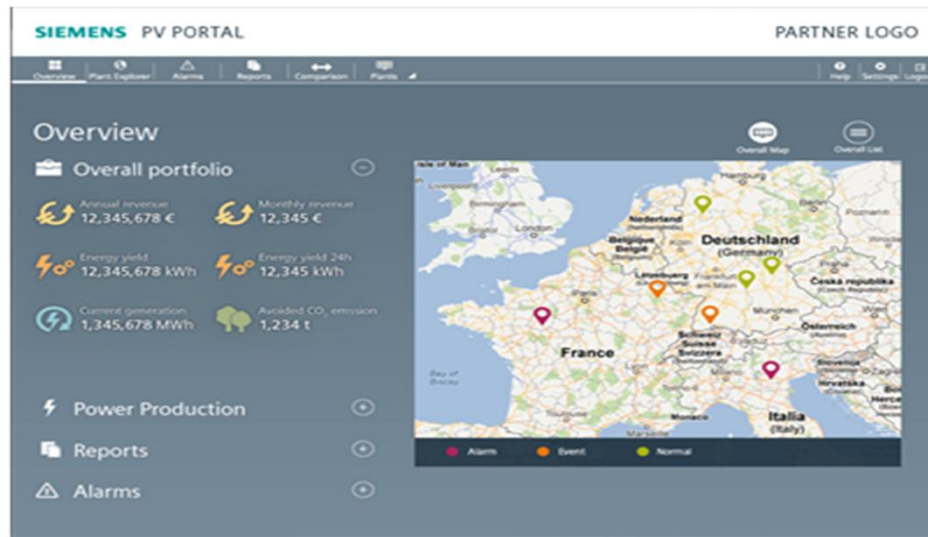
# Performance Monitoring Solutions

# Remote Performance Monitoring of distributed renewable generation units and fleets





# The Monitoring Portal provides all key performance indicators at the click of a button



# Performance Monitoring Solutions: from planning to service solutions for maximum yield

## Our solution:

- Monitoring solution for renewables incl. yield forecasting, real-time diagnosis
- Remote control of all electric devices, remote diagnostics and remote operation
- Data processing and evaluation via Energy Asset Management software
- Information platform for plant data
- Selection, configuration and integration of battery storage
- Customer-specific service packages that range from remote monitoring and operation through to maintenance and complete plant operation

## Customer Benefit:

- **Proven technology for reliable generation**
- **Worldwide remote monitoring and control**
- **Dependable forecasts for optimal marketing**
- **Individual service for maximum revenue**
- **Data security that meets the strictest standards**
- **Expandability and scalability for maximum future-proofing**

# Performance Monitoring Solutions – successfully implemented in large PV plants



## Ketura Solar Park, Israel

- Arava Power Company
- 5 MW PV plant
- Scope: full EPC incl. EBOP
- Advanced service package
- Performance ratio guarantee



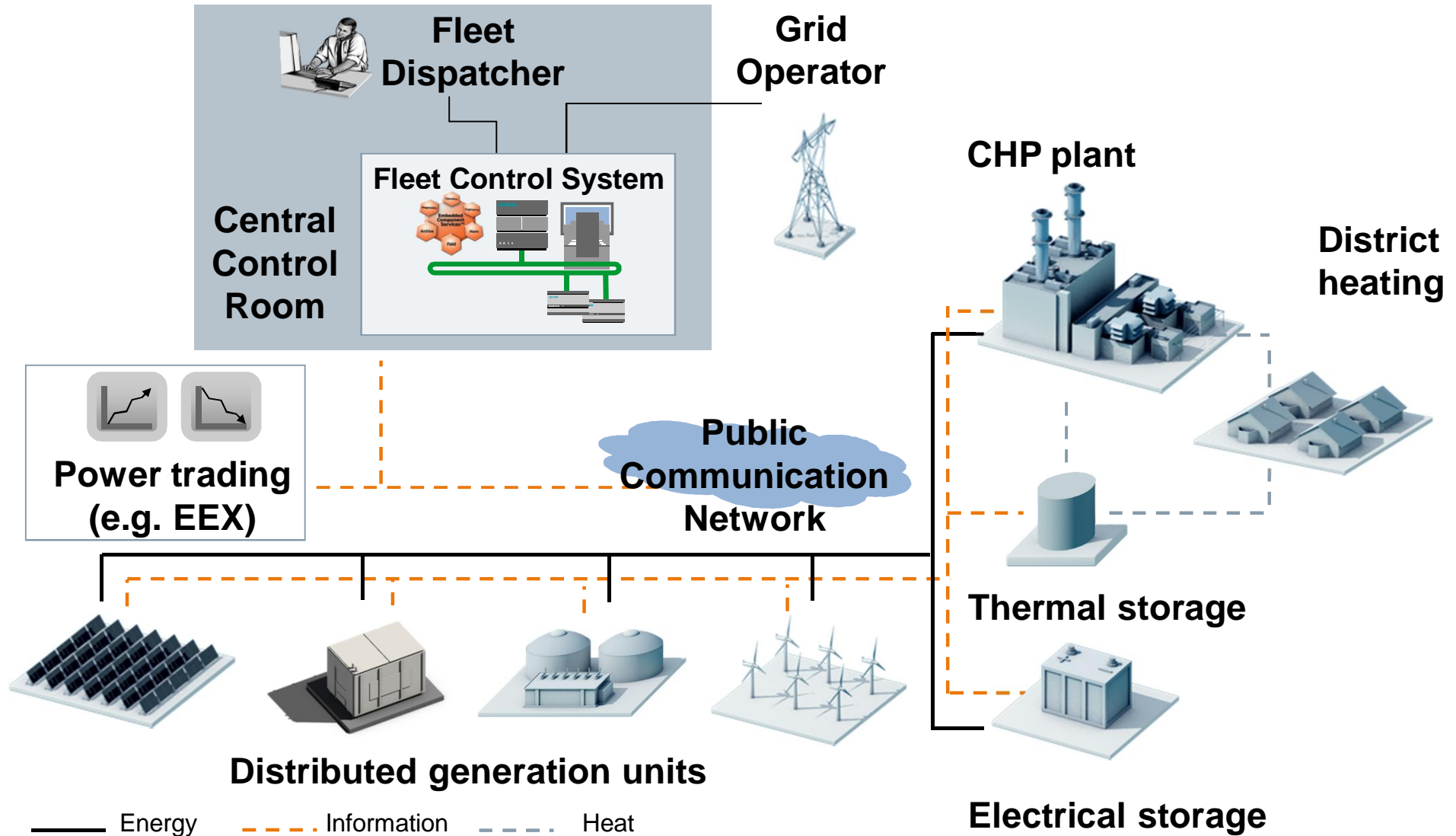
## Droogfontein & De Aar, South Africa

- Mainstream Renewable Power
- 2 x 50 MW PV plant
- Scope: full EPC incl. EBOP
- Advanced service package
- Performance ratio guarantee

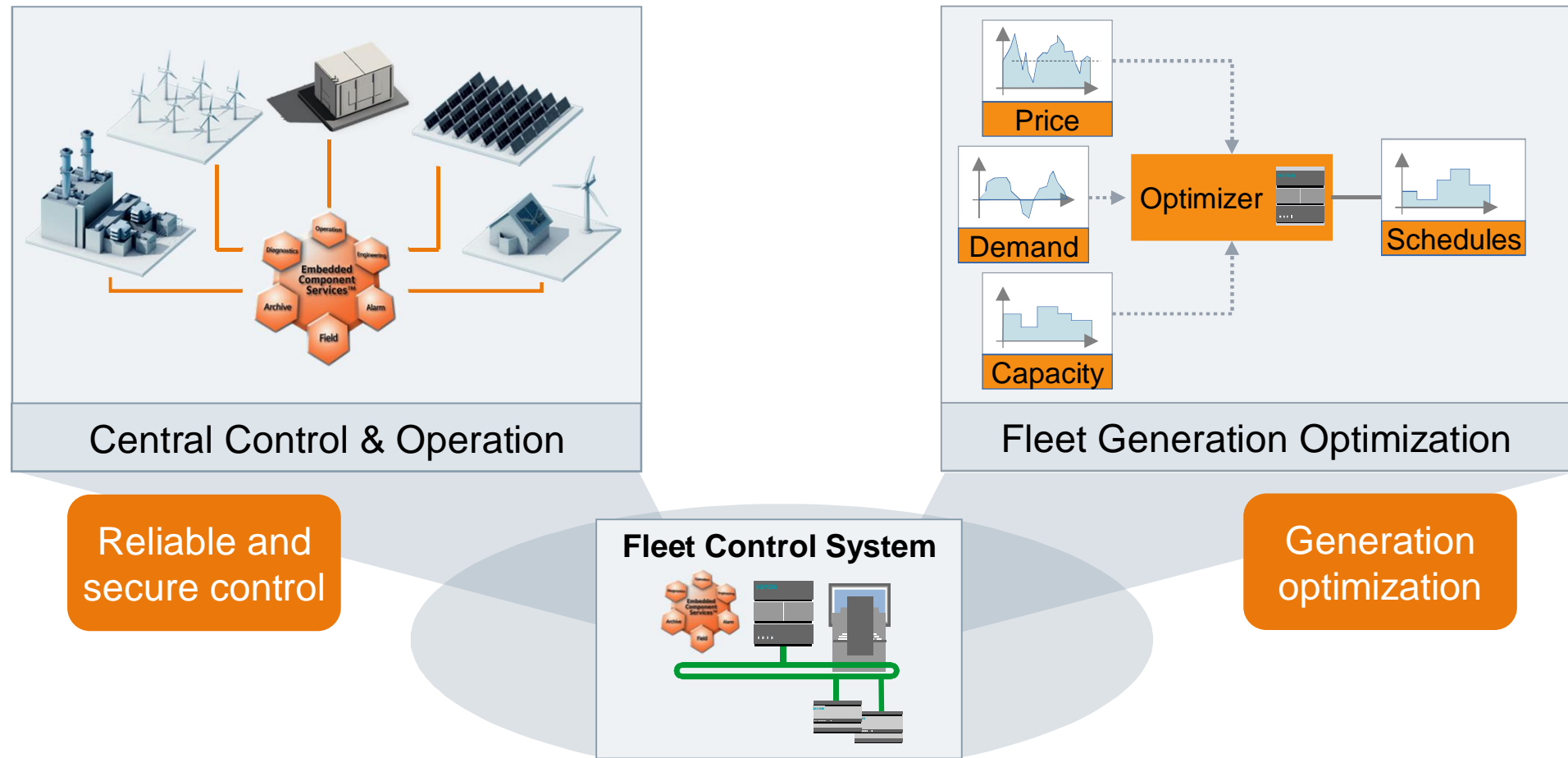


# “Flex Power Plant Solutions”

# „Flex Power Plant Solutions”: more flexibility for existing conventional plants and fleets



# Fleet Control System – basis for an optimized and solid system



→ **Combined solution** provides highest availability, lowest OPEX and maximum earnings



# “Flex Power Plant Solutions”: from planning to service solutions for maximum yield

## Our solution:

- For single plants:
  - Usage of thermal storage for decoupling of power and heat generation
  - Integration of boilers and heat pumps for active usage of price advantages caused by excess supply of renewable power
- For fleets:
  - Optimal fleet monitoring and control, and resource optimization out of one central control room
  - Automated dispatch and optimization of distributed, heterogeneous generation units

## Customer Benefit:

- **Increased flexibility**
- **Minimized third-party supply**
- **Participation in energy markets (incl. reserve power) also for smaller plants**
- **Increased transparency of plant status and costs all over the entire fleet**
- **Increased profitability through automated fleet optimization**
- **Cost reduction through centralized operation**

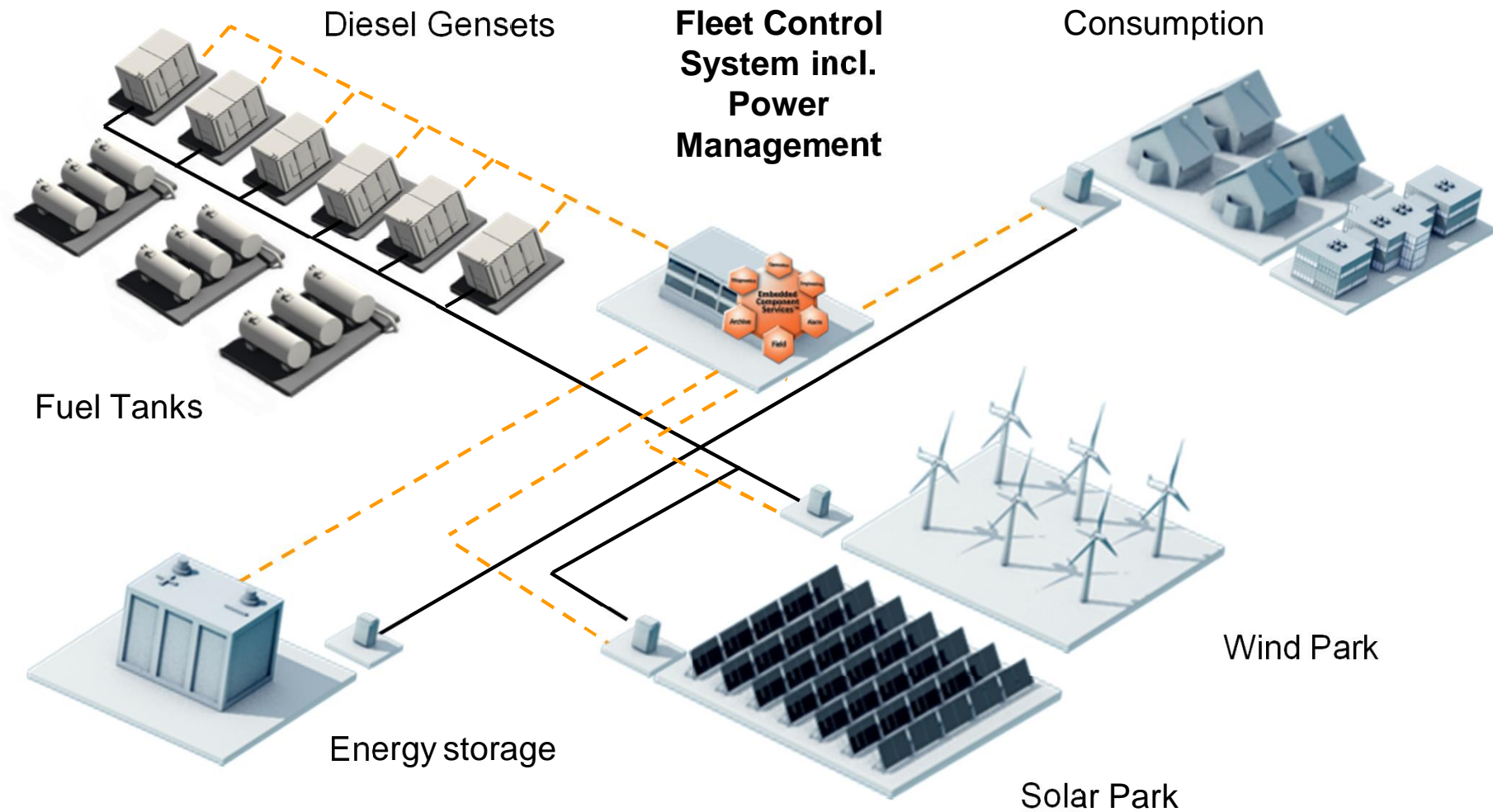
# Centralized control and optimization of fleets: Origin Energy, Australia



**Integration of 13 power stations  
(gas, wind, coal, hydro): total 2,6 GW**

# Hybrid Power Solutions

# Hybrid Power Solutions integrate renewables efficiently into diesel plants



—— Energy    - - - - Information



# Hybrid Power Solutions – reliable power supply for islands or remote installations

## Our solution:

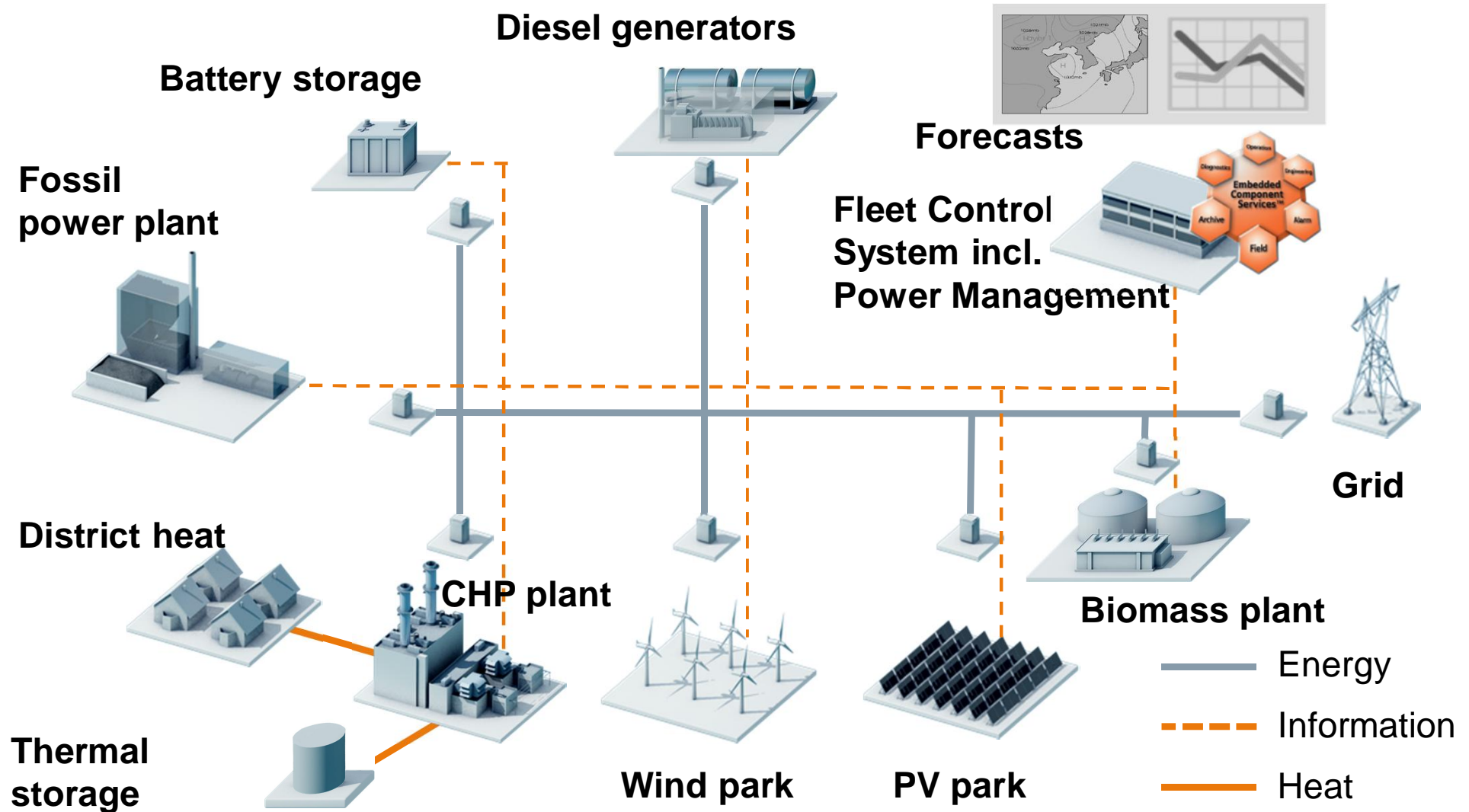
- One-stop turnkey solutions including planning, engineering, installation & commissioning, and service
- Integration with existing diesel generators or delivery of new diesel power plants
- Delivery of wind and/or solar parks
- Technology selection, sizing and delivery of energy storage (e.g. batteries)
- Siemens Fleet Control System with power management for economically optimized, automated operation
- Complete electrical package including electrical balance of plant and grid integration

## Customer Benefit:

- **Reliable power supply with high grid stability and power quality**
- **Fuel savings of up to 60 %**
- **Reduced logistic/ transportation costs**
- **Emission reduction of up to 60 %**
- **Up to 100 % peak penetration of renewables**

# “Modular Power Plant Solutions”

# “Modular Power Plant solutions”: Bundling fossil and renewable generation units and storage



# “Modular Power Plant Solutions“ – the answer for new power plant projects

## Our solution:

- Intelligent combination of fossil and renewable generation units
- Integration of battery and thermal storage as well as boilers and heat pumps for optimized operation
- Fleet Control System for control and optimization of the entire fleet from one central control room
- Participation in energy markets
- Flexible expandability by distributed generation modules

## Customer Benefit:

- **Reduced complexity by combining distributed generation units**
- **Optimized power and heat generation based on availability, forecasts and costs**
- **Maximum flexibility by intelligent integration and control of the pooled generation modules**
- **Reduced operation and maintenance costs of the whole fleet**



# Smart solutions for highest efficiency, reliable power supply and reduced emissions



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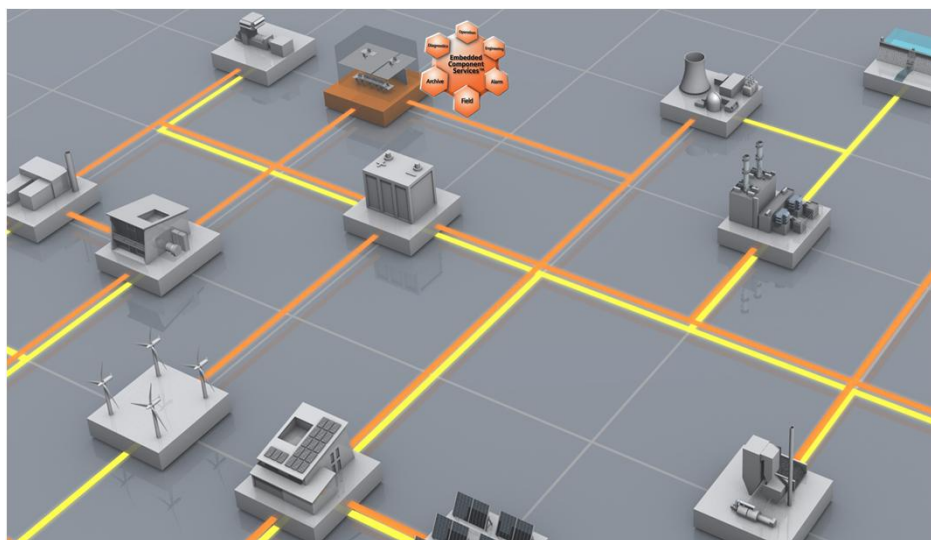
## “Flex Power Plant Solutions”

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## “Modular Power Plant Solutions”



To obtain further information, please contact:  
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Smart Generation Solutions

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