Technology trends that will shape Digital transformation

Gas & Power
Jaktarta 31st October 2019
Adopt digital solutions
The data challenge

The Internet of Things
75 billion connected devices by 2025

New ways to keep up
Up to 20% lower capital expenditures through digitalization
**Adopt digital solutions**
What’s needed: analytics, not analog

| Optimize asset performance with digitalization | Improve supply chain with Additive Manufacturing |
| Protect assets with comprehensive cybersecurity | Improve decisions through increased collaboration |
Power Diagnostics® - Global Fleet under Monitoring

Monitoring experience: More than 30 million operating hours and counting ...

**Monitored Units:**
- Gas turbines including generators: 607
- Steam turbines: 143

**Total site rated Power:**
- 163.6 GW

* Source: Fleet Data Management
Performance Monitoring
Monitoring of asset performance and operational KPIs

• Continuous insight into the production using KPIs to trace asset performance
• Simplifies management tasks through mgmt. and operational tools

Asset Diagnostics
Centralized Asset Diagnostic Services

• Condition monitoring
• Increases availability by enabling predictive maintenance
• Centralizes experience and know-how

Operation Optimization
Automated operations and maintenance management

• Digitalization of workflows and maintenance processes
• Transparency increase through central plant data, spare part and shift management

Generation Management
Asset integration for optimal resource use and dispatch

• Includes economic dispatch, generation scheduling and pooling
• Helps to fulfill commitments at min. resource consumption

Better decisions  Increase availability  Improve operations  Optimal dispatch
Digital focus – now on entire power plant!

1. Gas turbines
2. Steam turbines
3. Generators
4. Transformers
5. GT-Compressors
6. Condensate pumps
7. Ventilation
8. Pump motors
9. Cooling water pumps
10. Feed-water pumps
11. HRSG + ....

November 2018
What is the condition of ALL my assets right now?

How to extend the lifetime of my assets?

When should I replace my assets?

Am I making optimal use of available industry knowledge?

Am I doing optimized maintenance for the power plant or even my fleet?

How will the condition of my assets develop in the future?

Which long term resources do I need to manage replacement waves?
Customizable dashboards provide insights into KPIs, Health Index, States and Alarms.
Asset Performance Management for Power Plants

At a glance

Asset Performance Management delivering significant cost savings and higher availability

<table>
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<tr>
<th>Forcéd outages</th>
<th>Operation &amp; Maintenance</th>
<th>Availability</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 25%</td>
<td>-10%</td>
<td>+10%</td>
<td>ISO55000</td>
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<tr>
<td>Less forced outages</td>
<td>Timely planning enables</td>
<td>On average we achieve 10% higher availability</td>
<td>designed to help you manage risk and realize the value of your organization’s assets</td>
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<td>due to real-time asset health diagnostics</td>
<td>enormous savings for operation and maintenance</td>
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Customer value across all assets of the entire power plant

- Decreasing Investments in Maintenance and Service
- Increasing Availability and Reliability
- Extending Life Time of all components
Introduction
First Gen Corporation, through its subsidiaries, operates as an independent power producer in the Philippines. The company operates natural gas-fired power plant and hydroelectric power plant, as well as generates power through geothermal, wind, and solar power.

First Gen’s wholly-owned First NatGas Power Corp. (FNPC) owns the 414-MW rated San Gabriel Power Plant. San Gabriel started commercial operations on November 7, 2016.

San Gabriel utilizes Siemens SCC6-8000H combined-cycle gas turbine, which is designed to have a combined-cycle efficiency rating greater than 60 percent and offers operational flexibility.

Project
Siemens is the facility O&M provider. Siemens has provided operations from the start up of the facility through today.

APM was implemented as the first Siemens APM for Power Plants pilot for the complete implementation of the Siemens Bentley co-developed solution. The APM program is populated with Siemens proprietary models developed specifically for the San Gabriel Station. The experience and lessons learned from this installation will be incorporated in Siemens roll out of the world wide deployment of APM to both Siemens technology as well as any OEM based facility. We are utilizing our engineering and service experience for operating and maintaining entire facilities, as well as the millions of manhours of work done on plants worldwide.