Power and Gas
Division
## Key figures for FY 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Orders*</td>
<td>14.0</td>
</tr>
<tr>
<td>Revenue*</td>
<td>12.7</td>
</tr>
<tr>
<td>Division Profit*</td>
<td>2.2</td>
</tr>
<tr>
<td>Employees*</td>
<td>41,525</td>
</tr>
</tbody>
</table>

* Incl. Service

(in billions of €)
Power and Gas Division
Organizational structure as of October 1st, 2014

Large Gas Turbines, Generators (PG GT)
- Gas turbines from 100 to 400 MW
- Electrical generators from 25 up to 2,235 MVA
- Fuel gasifiers

Distributed Generation (PG DG)
- Industrial gas Turbines from 5 to 50 MW
- Aero derivative gas turbines from 4 to 64 MW

Steam Turbines (PG SU)
- Steam turbines from 45 kW to 1,900 MW
- Steam turbines for industrial applications & power generation

Compressors (PG CP)
- Turbo compressors for
  - Oil & Gas
  - Industrial applications
- Compressor packages incl. drives

Energy Solutions (PG ES)
- 50 Hz and 60 Hz Gas turbine power plant solutions
- CHP*
- IGCC**
- Repowering
- Integrated solar combined cycle
- HRSG

Instrumentation and Electrical (PG IE)
- Control solutions
- Electrical solutions
- Energy management solutions
- Solutions for distributed and hybrid power generation

* Combined heat and power
** Integrated gasification combined cycle

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Power and Gas locations underline our global footprint

Locations
- Gas Turbines / Generators
- Steam Turbines
- Compression
- Energy Solutions
- Instrumentation & Electrical

** Under construction

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Power and Gas Division
BU Large Gas Turbines, Generators (PG GT)

Portfolio

- **Gas turbines**
  (100 MW to 400 MW)

- **Generators**
  (25 MVA to 2,235 MVA)

- **Fuel gasifiers**
  (Syngas output from 50,000 Nm$^3$/h to 210,000 Nm$^3$/h)

- **System integration**

Innovation highlight

**SGT-8000H gas turbine series**

- Low investment costs per kW
- Low lifecycle costs
- High reliability and availability
- Fast start-up and high operational flexibility
- High efficiency: > 60 % in combined cycle operation

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BU Large Gas Turbines, Generators (PG GT)
Reference: SGT6-8000H

Customer: Florida Power & Light
Location: Cape Canaveral Florida U.S.A.
Date: 2013

Market requirements
- Brownfield re-powering project
- Converting a conventional power plant into a modern, efficient combined-cycle power plant

Solution
- 3×SGT6-8000H, in combined-cycle multi-shaft configuration
- Generator type SGen6-2000H
- Total power output > 1260 MW net
- Plant efficiency > 60.0 % net

Customer benefit
- One third less fuel consumption per megawatt-hour compared to the site's previous plant
- Fuel cost savings of nearly $1 billion over the turbines’ entire lifecycle by upgrading the power plants
Power and Gas Division
Business Unit Distributed Generation (PG DG)

Portfolio

- **Industrial gas turbines**
  (5 MW to 50 MW)

- **Aero derivative gas turbines***
  (4 MW to 64 MW)

Innovation highlight

Dry Low Emission (DLE) Combustion System

Customer Benefits:

- Achieve legislative and permit requirements for low NO\(_x\) (mostly <15 ppm NO\(_x\)) emissions without driving up the emissions of CO

- No additional operational limitations on engine operation – e.g. maintaining stable engine operation through load shed and load acceptance

- High reliability to minimize maintenance requirements

* After closing of Rolls-Royce Energy acquisition. Regulatory approval pending.
Business Unit Distributed Generation
Reference: SGT-750

<table>
<thead>
<tr>
<th>Customer:</th>
<th>Industriekraftwerk Greifswald GmbH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Lubmin, Germany</td>
</tr>
<tr>
<td>Date:</td>
<td>2013</td>
</tr>
</tbody>
</table>

**Market requirements**
- Nord Stream offshore pipeline connects Russia with Central Europe to deliver natural gas from the natural gas fields in Siberia
- At Portovaya, Russia, the gas is compressed to enable it to flow through the Baltic Sea, upon landfall pressure and temperature drop
- In Lubmin, the gas is further expanded, and when expanded, the gas cools
- Gas needs to be heated for further transport

**Solution**
- A SGT-750 gas turbine for cogeneration (38 MWe, 47 MWth)
- Automation and control for the landfall station

**Customer benefit**
- Cogeneration solution: Heat from the GT warms up the gas, while the electric power generated by the turbine is fed into the grid
- Highest efficiency: Total efficiency of ~ 90 %
- Short start-up times: From 0 to full load in 10 minutes
- Highest availability due to low maintenance requirements
Power and Gas Division
Business Unit Steam Turbines (PG SU)

Portfolio

- **Steam turbines**
  (45 kW to 1900 MW)
  - **Small steam turbines**
    (45 kW to 250 MW)
  - **Large steam turbines**
    (90 MW to 1900 MW)

Innovation highlight

**Enhanced Platform Design**

- Higher steam parameter
- High reliability
- Reduced start-up time
- Faster load changes
- Improved efficiency
- Long life cycle – increased life time

Enhancement Platform Design
### Customer

- **Customer:** Shenergy/ SEC  
  Wai Gao Qiao III

### Location

- **Location:** China

### Date

- **Date:** 2008

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### Market requirements

- Highest efficiency requirement
- CAPEX-driven customer
- Joint manufacturing by Siemens and SEC

### Solution

SST5-6000 steam turbine package consisting of:

- SST5-6000 Steam turbine and generator, partly by SEC
- SCon-6000 Condenser and auxiliary by SEC under Siemens license

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### Customer benefit

- State-of-the-art plant in China – 46% efficiency world record
- Max. proven power output: 1,112 MW
- Experienced design
- Low maintenance costs due to long maintenance intervals
Portfolio

- Turbo compressors for oil & gas and industrial applications
- Compressor trains
- Compressor automation

Innovation highlight

Siemens standardized integrally geared turbo compressor for air separation:
- Introduction of a highly standardized compressor series STC-GC (165–400)
- Pre-engineered for main air applications
- Extended range of integrally geared compressors comprises approx. 80 % pre-engineered components whilst 20 % are customized

Innovation highlight

Customer Benefits:
- Best-in-class efficiency through use of well proven flow components
- Maximum cost savings through standardization
- Short delivery time
- Highest flexibility to meet individual project requirements
- Integrated smart protection system

Siemens offering:
- Extension of existing compressor portfolio to achieve the same efficiency as customized integrally geared turbo compressor
- Up to 400,000 m³/h air intake
## Business Unit Compressors

Reference: IGCC – Air Separation

### Customer: Reliance

### Location: Jamnagar, India

### Date: 2013

### Requirements

- Jamnagar IGCC is the world’s largest IGCC plant with power output of 1,000 MW electrical power. Oxygen plays a key role for power gas operation; Siemens compressor trains are part of the oxygen production within five air separation units with a capacity of 5,250 tpd oxygen.

### Products

- 10 x compressor trains for air separation, each consisting of a main air compressor (STC-GV), booster air compressor (STC-GV high pressure), SST-600 steam turbine drive
- Three air compressors, two nitrogen compressors (STC-GV)
- Cross selling: Three compressors for refining STC-GV (38-2-K)

### Customer benefits

- Highest efficiency / optimum TCO
- Highest reliability / production efficiency
- Lowest operator / maintainer manning levels
- Best HSE performance due to extended maintenance intervals
- Lowest environmental impact:
  - Noise / air emissions / steam turbine drive
Portfolio

**Energy Solutions** is an OEM-EPC solution provider and the most trusted local partner for integrated fossil power plant solutions of highest quality:

- **Gas turbine power plant solutions for 50 Hz and 60 Hz**
- **Combined cycle power plants (CCPP)** single-shaft and multi-shaft configuration
- **Integrated solar combined cycle power plants**
- **Integrated gasification combined cycle**
- **Combined heat and power**

Know-how of more than 130 years of experience in realizing turnkey power plant solutions

Innovation highlight

**Siemens FACY technology for faster startup times and flexible operation**

- Maximum load ramp-up after starting power plant
- Maximized plant lifecycle with daily start-ups and shut-downs
- Highest start-up reliability
Customer: GS EPS Co. Ltd.
Location: Dangjin, Korea Republic
Date: 2013

Requirements
- High efficiency for profitability and environmental compatibility
- High availability in start-ups and operation
- High flexibility to compensate for fluctuating renewable feed-ins

Solution
- Most efficient combined cycle power plant (CCPP) in Asia with Siemens core components (e.g. SGT6-8000H gas turbine, hydrogen-cooled generator, I&C system, BENSON® HRSG)

Customer benefits
- For the first time in Asia a 60 % net efficiency was successfully achieved
- Excellent project management: handover 12 days ahead schedule
- Benchmark reliability, flexibility and availability
- Lower life cycle costs, reduced CO₂ emissions
Power and Gas Division
BU Instrumentation and Electrical (PG IE)

Portfolio

- SPPA-T3000 Control system of the 4th generation:
  Maximum efficiency, reliability and ease of use
- Siemens Power & Process Automation (SPPA) Family
- Service
- Solutions for distributed and hybrid power generation

Innovation highlight

SPPA-T3000 Control System:
Never goes obsolete

- Allows for avoidance of at least one complete control system replacement during the power plant's lifecycle
- Hardware-independent software architecture
- Highest availability for power plants – SPPA-T3000 has been proven in over 780 power plants
- World record conversion time for a complete modernization of instrumentation & controls
Business Unit Instrumentation and Electrical
Reference: SPPA-T3000 / SPPA-R3000

Customer: Svanemølle Power Station, Dong Energy
Location: Svanemølle-varket, Denmark
Date: 2010

Market requirements
- Modernization of a 55 years old combined cycle power plant with a 60 MW Siemens gas turbine and a 33 MW Skoda steam turbine for simple and harmonized control of all power plant components incl. remote operation from a control room, 15 km away from the plant
- Increase flexibility according to fluctuating demand and enhance availability

Solution
- Replacement of the existing control system with SPPA-T3000 Control System to centralize control and monitoring of all processes
- Integration of SPPA-R3000 Turbine Controls

Customer benefit
- Improved availability thanks to powerful data management with simple remote monitoring and diagnosis and rapid trouble-shooting
- Enhanced versatility thanks to integrated engineering with fast online adjustments
- Lower cost thanks to reduced operating and maintenance effort