Siemens Energy Sector
Power Transmission Division (E T)
Power Transmission Division –
Our Mission

We are the preferred supplier of products, systems and solutions for efficient power transmission infrastructures. We innovate for our customers: we design, develop and provide valuable products, systems and solutions for power utilities and power intensive industries. Our leadership is recognized by the competitiveness of products and solutions supplied, the extended global footprint we are building up. We attract talents worldwide with challenging issues and we believe in passion to solve them.
## Power Transmission Division – Organizational structure

**Division**
- E T TR Transformers
- E T HP High Voltage Products
- E T HS High Voltage Substations
- E T PS Power Transmission Solutions

**Portfolio**
- Power Transformers
- Distribution Transformers
- Special Purpose Transformers
- Traction Transformers
- TLM™
- Transformer Components
- Circuit Breakers
- Disconnectors
- Earthing Switches
- Hybrid Switchgear
- Instrument Transformers
- Surge Arresters
- Bushings
- Air Core Reactors & Coils
- Air-Insulated Substations (AIS)
- Gas-Insulated Switchgear and Substations (GIS)
- Gas-Insulated Transmission Lines (GIL)
- HVDC Transmission
- Reactive Power Compensation / FACTS
- Turnkey Grid Access Solutions

**Market position**
- #2
- #1
- #1
- #2

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Energy Sector – E T
## Power Transmission Division – Key figures

### Key figures – fiscal 2008

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>5,497</td>
</tr>
<tr>
<td>New orders</td>
<td>7,290</td>
</tr>
<tr>
<td>Division profit</td>
<td>565</td>
</tr>
</tbody>
</table>

*(in millions of euros)*

### Employees

18,090

### Revenue by region

- **Asia, Australia, Near Middle East**: 44% of 5,497 million €
- **Europe, Africa, CIS**: 37% of 5,497 million €
- **Americas**: 19% of 5,497 million €
Power Transmission Division – Important partner in the energy chain
Power Transmission Division –
The link between power generation and distribution
## Power Transmission Division – Organizational structure

<table>
<thead>
<tr>
<th>Division</th>
<th>Business Unit</th>
<th>Portfolio</th>
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<tbody>
<tr>
<td>E T Power Transmission</td>
<td>E T TR Transformers</td>
<td><strong>E T HS</strong> High Voltage Substations</td>
</tr>
<tr>
<td>E T HP High Voltage Products</td>
<td>E T HS High Voltage Substations</td>
<td><strong>E T PS</strong> Power Transmission Solutions</td>
</tr>
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</table>

### Portfolio
- **Power Transformers**
- **Distribution Transformers**
- **Special Purpose Transformers**
- **Traction Transformers**
- **TLM™**
- **Transformer Components**
- **Circuit Breakers**
- **Disconnectors**
- **Earth Switches**
- **Hybrid Switchgear**
- **Instrument Transformers**
- **Surge Arresters**
- **Bushings**
- **Air Core Reactors & Coils**
- **Air-Insulated Substations (AIS)**
- **Gas-Insulated Switchgear and Substations (GIS)**
- **Gas-Insulated Transmission Lines (GIL)**
- **HVDC Transmission**
- **Reactive Power Compensation / FACTS**
- **Turnkey Grid Access Solutions**

### Market position
- **E T TR Transformers** #2
- **E T HP High Voltage Products** #1
- **E T HS High Voltage Substations** #1
- **E T PS Power Transmission Solutions** #2
Transformers Business Unit (E T TR)

**Portfolio**
- **Power Transformers**
  - Generator-Step-Up Transformers
  - System / Grid / Network Transformers
  - Phase Shifter Transformers
  - HVDC-Transformers
  - Oil Immersed Reactors
- **Distribution Transformers**
  - Oil Immersed
  - GEAFOL cast-resin Transformers
  - Voltage Regulators
- **Special Purpose Transformers**
  - Transformers for Industrial Applications:
    - Arc Furnace Transformers / Rectifier Transformers
  - Line Feeders
- **Traction Transformers**
- **TLM™**
- **Transformer Components**

**Key figures**
- ~ 20 manufacturing locations globally

**Market**
- The market for transformers is currently growing by 7% p.a.
Large distances between primary energy resources and load centers require HVDC systems with ultra high voltages to be efficient in investment and operation.

800 kV Ultra High Voltage (UHV) direct-current technology is used to transfer 5,000 MW bulk power transmission over 1,500 km and allows a saving of 33 million tones of CO$_2$ compared to a 500 kV HVDC line.

Up to 7200 MW transmission capacity over more than 2,000 km are being designed currently.

60 percent operating voltage increase compared to established 500 kV technology and mainly unchanged transport capabilities require new high voltage design solutions for most of the parts including new design methodology and tools.
Transformers Business Unit
Reference: GEAFOL transformers for Wind Turbines

Customer: Wind turbine manufacturer
Country: Globally
Date: Continuous delivery

Requirements
- Extreme reliability
- Flame-retardant
- Short-circuit proof

Products
- Typical size for GEAFOL-applications in wind energy up to 6 MVA
- Transformer is top mounted
- Transforming generator voltage < 1 kV to < 36 kV

Customer’s benefit
- Low weight
- High efficiency and reliability
- Environmental protection
- Global availability
# Power Transmission Division – Organizational structure

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<td>Power Transmission Solutions</td>
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<td>Gas-Insulated Switchgear and Substations (GIS)</td>
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</tbody>
</table>

Market position:

- E T TR: #2
- E T HP: #1
- E T HS: #1
- E T PS: #2

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### Portfolio
- Circuit Breakers
  - Live-tank Breakers
  - Dead-tank Breakers
- Disconnectors
- Earthing Switches
- Hybrid Switchgear: Dead Tank Compact
- Instrument Transformers
- Surge Arresters
- Bushings
- Air Core Reactors & Coils

### Key figures
- 23 manufacturing locations in 14 countries

### Market
- The market for high voltage products is currently growing by 6 percent p.a.
### High Voltage Products Business Unit –
Innovation Highlight: Full range of 800 kV DC products

<table>
<thead>
<tr>
<th><strong>Circuit Breaker 800 kV DC</strong></th>
<th>Worldwide first bypass circuit breaker for high-end HVDC power transmission over long distances with high energy efficiency.</th>
</tr>
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<td><strong>Surge Arrester 800 kV DC</strong></td>
<td>Worldwide first surge arrester for high-end HVDC power transmission over long distances with high energy efficiency.</td>
</tr>
<tr>
<td><strong>Transformer &amp; Wall Bushings</strong></td>
<td>Worldwide first and yet only pure epoxy-resin insulated 800 kV DC transformer and wall bushings for high-end HVDC power transmission.</td>
</tr>
<tr>
<td><strong>Disconnector 800 kV DC</strong></td>
<td>Worldwide first double side break disconnector with built-on earthing switch for high-end HVDC power transmission.</td>
</tr>
<tr>
<td><strong>DC Divider &amp; Filter Capacitors</strong></td>
<td>DC Divider and PLC Filter Capacitor for 800 kV DC power transmission for long distances with high energy efficiency.</td>
</tr>
<tr>
<td><strong>Smoothing Reactor 800 kV DC</strong></td>
<td>Air-core smoothing reactor for high-end HVDC power transmission over long distances with high energy efficiency.</td>
</tr>
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</table>
High Voltage Products Business Unit – Reference: 800 kV DC

Customer: Southern Grid  
Country: China  
Date: 2008/2009

Requirements

- Reliable and efficient high voltage products for HVDC transmission in China over more than 1400 km
- 5000 MW transmission capacity, 800 kV DC

Products

Full scale range of high voltage products: bypass circuit breakers, disconnectors, surge arresters, transformer and wall bushings, smoothing reactors, DC divider & PLC filter capacitors for HVDC converter stations

Customer’s benefit

Reliable and efficient Ultra High Voltage Products are fundamental for efficient and reliable energy transmission systems. Customers in China, India, Africa, America and Russia will save energy with efficient UHV solutions & products.
### Power Transmission Division – Organizational structure

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- **E T TR** Transformers
  - Power Transformers
  - Distribution Transformers
  - Special Purpose Transformers
  - Traction Transformers
  - TLM™
  - Transformer Components

- **E T HP** High Voltage Products
  - Circuit Breakers
  - Disconnectors
  - Earthing Switches
  - Hybrid Switchgear
  - Instrument Transformers
  - Surge Arresters
  - Bushings
  - Air Core Reactors & Coils

- **E T HS** High Voltage Substations
  - Air-Insulated Substations (AIS)
  - Gas-Insulated Switchgear and Substations (GIS)
  - Gas-Insulated Transmission Lines (GIL)

- **E T PS** Power Transmission Solutions
  - HVDC Transmission
  - Reactive Power Compensation / FACTS
  - Turnkey Grid Access Solutions
High Voltage Substations Business Unit (E T HS)

**Portfolio**
- Air-Insulated Substations (AIS)
- Gas-Insulated Switchgear and Substations (GIS)
- Gas-Insulated Transmission Lines (GIL)

**Key figures**
- 4 manufacturing locations and 19 CoC\(^1\)

**Market**
The market for high voltage substations is currently growing by 5 percent p.a.

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\(^1\) CoC = Center of Competence for project management & engineering
A new dimension in compactness
High-voltage gas-insulated switchgear – 8DN8 72.5 kV

- With a bay width of only 650 mm the 8DN8 72.5 kV switchgear provides a most compact solution for rated voltages up to 72.5 kV.
- The solution is based on proven 145 kV components. Its three-phase encapsulated construction makes it possible to achieve extremely low component dimensions.
- Thanks to its highly compact design it can be installed wherever space is an issue, e.g. in densely populated cities.
Customer: Kahramaa
Country: Qatar
Date: 2007

Requirements
Highly reliable and sustainable power supply for upcoming 180 high-rise buildings in Westbay area, combined with special architectural design

Products
High-voltage gas-insulated switchgears, power transformers, medium-voltage gas-insulated switchgears, shunt reactors, control and protection systems, sophisticated security and fire fighting systems

Customer’s benefit
The project improves the power supply to Kahramaa’s customers. The buildings are fully integrated in the architectural style of the neighborhood.
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**Market position**

- E T TR Transformers: #2
- E T HP High Voltage Products: #1
- E T HS High Voltage Substations: #1
- E T PS Power Transmission Solutions: #2

**Portfolio Market position**

- E T TR Transformers
- E T HP High Voltage Products
- E T HS High Voltage Substations
- E T PS Power Transmission Solutions
# Power Transmission Solutions Business Unit (E T PS)

## Portfolio
- HVDC Transmission
- Reactive Power Compensation / FACTS
- Turnkey Grid Access Solutions

## Key figures
1 manufacturing location in Germany and 3 CoC ¹ in Brazil, India and Germany

## Market
The market for power transmission solutions is currently growing by >20% p.a.

¹ CoC = Center of Competence for project management & engineering
Economic and reliable electrical power transmission over great distances of more than 1000km.

High transmission capacity, lowest energy losses and corresponding CO$_2$ emissions.

Enhanced grid integration for renewable energy sources.

With HVDC technology asynchronous power systems can be linked and long-distance transmission implemented using both overhead transmission lines and submarine cable.
Neptune RTS is able to provide a highly reliable energy transmission system which connects the Long Island Power Authority to the competitive PJM market. This HVDC System transmits power to a fast growing and difficult to reach urban load center on Long Island.

**Requirements**

- Highly reliable and sustainable power supply for New York (Long Island)
- 660 MW transmission capacity

**Products**

HVDC Converter Stations including power converter valves, converter transformer, smoothing reactors, high voltage switchgear, control and protection systems

**Customer’s benefit**

Neptune RTS is able to provide a highly reliable energy transmission system which connects the Long Island Power Authority to the competitive PJM market. This HVDC System transmits power to a fast growing and difficult to reach urban load center on Long Island.