

Green Engineering Technology Day

24-03-2010, Scandic Hotel Kolding

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A photograph of an offshore wind farm with several wind turbines in a line across a blue sea under a clear sky. The water is dark blue with white foam from a boat's wake in the foreground.

Siemens Wind Power

Hardware In Loop Software Test System

Agenda

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About Siemens

- Siemens Energy Sector
- Siemens Wind Power

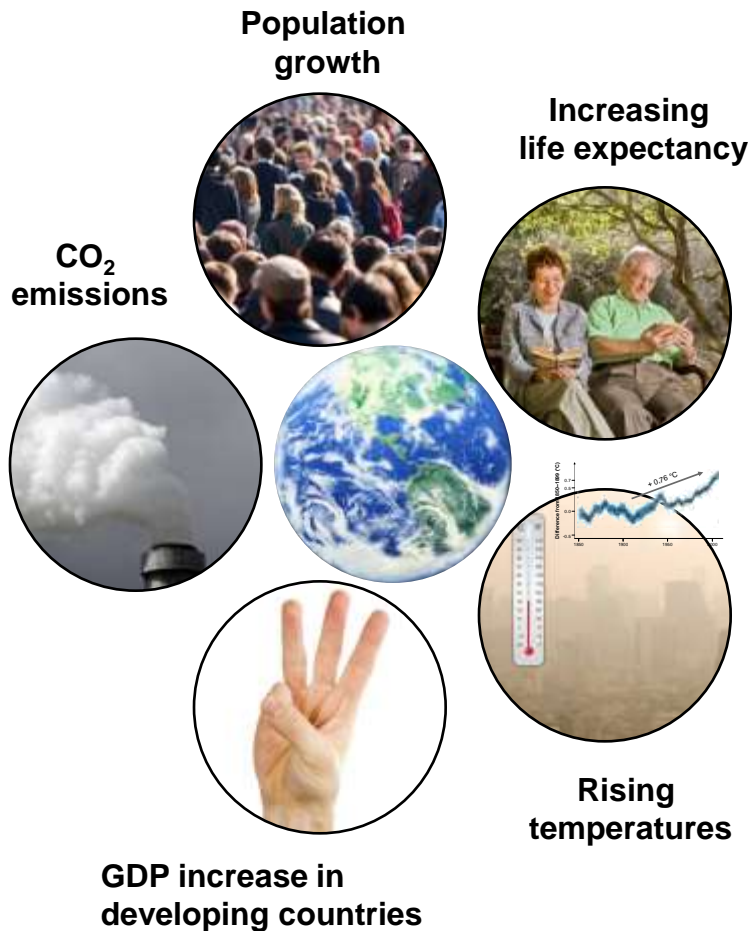
Hardware In Loop Test System

- System Design
- Architecture

Closing

The world is changing – Siemens has answers to these burning questions

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Industry



We solve the challenges of a booming population

Healthcare



We supply better and affordable healthcare

Energy



We lower CO₂ emissions with our energy solutions

Siemens Energy Sector – Answers for energy supply

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Energy products and solutions – in 6 Divisions

Oil & Gas



**Fossil Power
Generation**



**Renewable
Energy**



**Energy
Service**



**Power
Transmission**



**Power
Distribution**



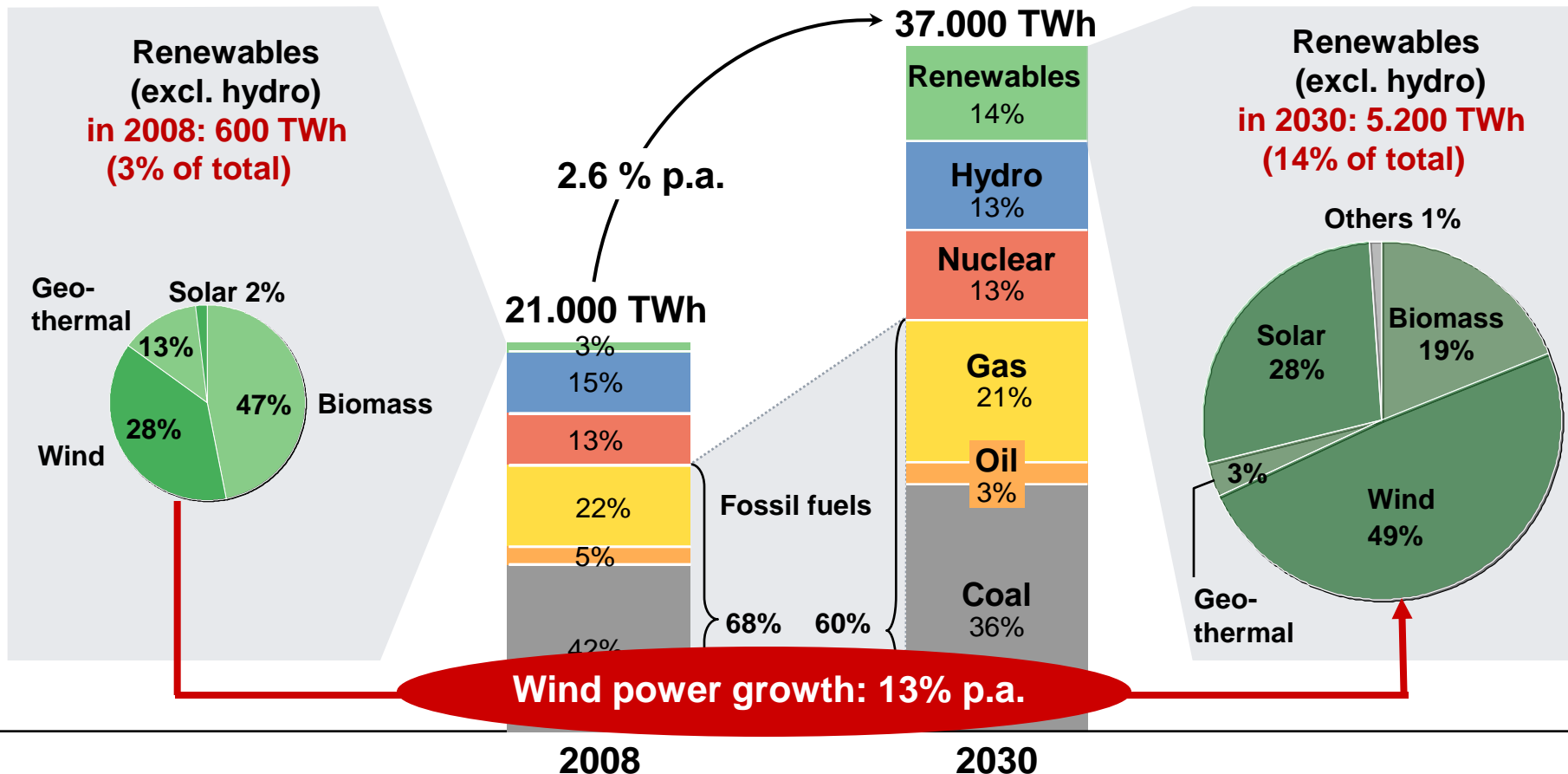
Innovation fields along the entire energy conversion chain

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Energy outlook

Power Generation (in 1000 TWh¹)



Siemens Wind Power Facts at a glance



Currently 5,800 employees globally (850 in 2004)

Deliveries: 2,500 MW in 2009 (600 MW in 2004)

Capacity: Growing with a solid double digit rate

Installed Base: > 8,700 turbines with > 11,000 MW capacity

Record Order Entry in FY 2009

No. 1 in new offshore orders in 2007, 2008 and 2009

Target: To become Top 3 supplier in 2012

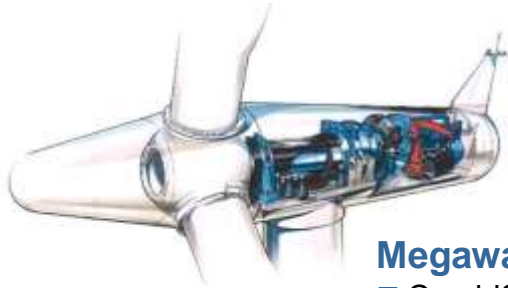
We have long experience in offshore and onshore wind farms



- 2010** Rødsand II offshore wind farm, Denmark: 207 MW
- 2010** World's largest offshore wind farm Greater Gabbard, UK: 504 MW
- 2009** Horns Rev II offshore wind farm, Denmark: 209.3 MW
- 2009** Whitelee onshore wind farm, Scotland: 322 MW
- 2008** Lillgrund offshore wind farm, Sweden: 110 MW
- 2007** Burbo Banks offshore wind farm, UK: 90 MW
- 2006** Horse Hollow II onshore wind farm, USA: 300 MW
- 2005** Smøla I+II onshore wind farm, Norway: 150 MW
- 2003** Nysted offshore wind farm, Denmark: 166 MW
- 2001** King Mountain onshore wind farm, USA: 278 MW
- 2000** Middelgrunden offshore wind farm, Denmark: 40 MW
- 1991** World's first offshore wind farm Vindeby, Denmark: 5 MW

Our portfolio: Based on 30 years of experience in the wind industry

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Megawatt class

- CombiStall technology
 - SWT-1.0-54: 356 WTG
 - SWT-1.3-62: 1,520 WTG
 - SWT-2.0-76: 165 WTG
 - SWT-2.3-82: 506 WTG

Multi-Megawatt class

- Pitch technology with variable speed
 - SWT-2.3-82 VS and SWT-2.3-93: 1,501 WTG
 - SWT-3.6-107: 101 WTG

Kilowatt class

- Stall technology
 - SWT-0.6-44: 1,316 WTG
 - < 600 kW: 2,330 WTG

Direct Drive Technology

- Compact Direct Drive
 - SWT-3.0-101 DD



SWT-0.6-44

SWT-1.0-54

SWT-1.3-62

SWT-2.0-76

SWT-2.3-82

SWT-2.3-82 VS

SWT-2.3-93

SWT-2.3-101

SWT-3.0-101 DD

SWT-3.6-107

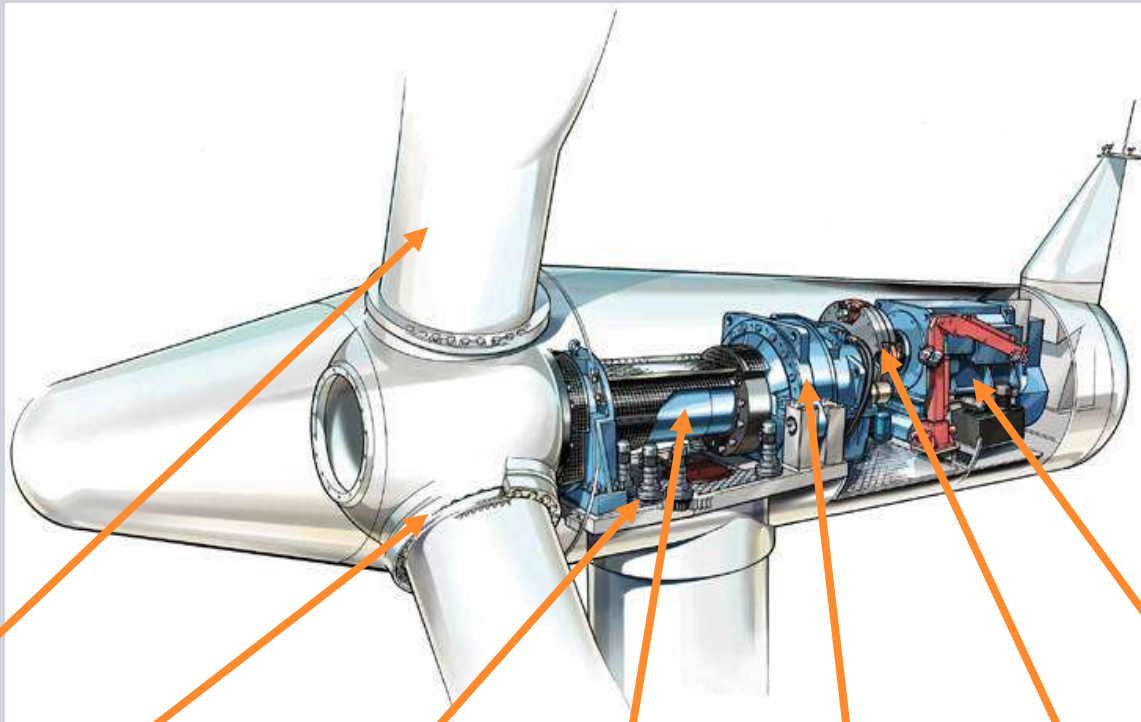
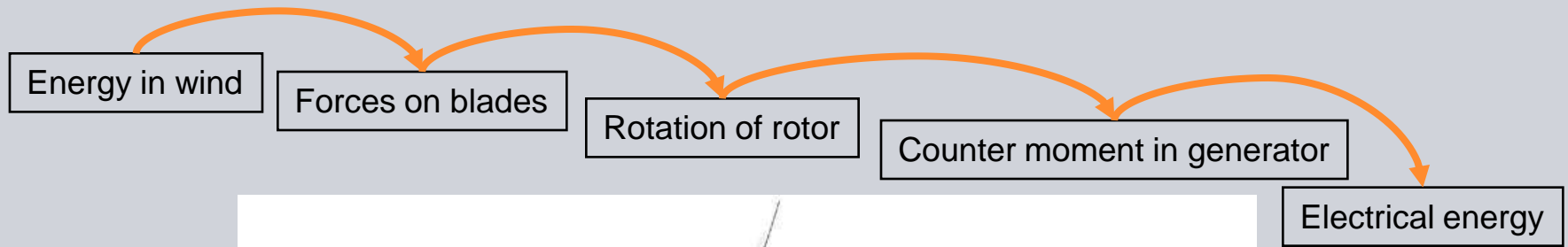
SWT-3.6-120

- Former product portfolio
- Existing product portfolio
- Expansion to product portfolio - New Technology

Installed base worldwide: > 8,700 turbines with > 11,000 MW capacity

Main principles of a wind turbine

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blades

pitch bearings

yaw motor

main shaft

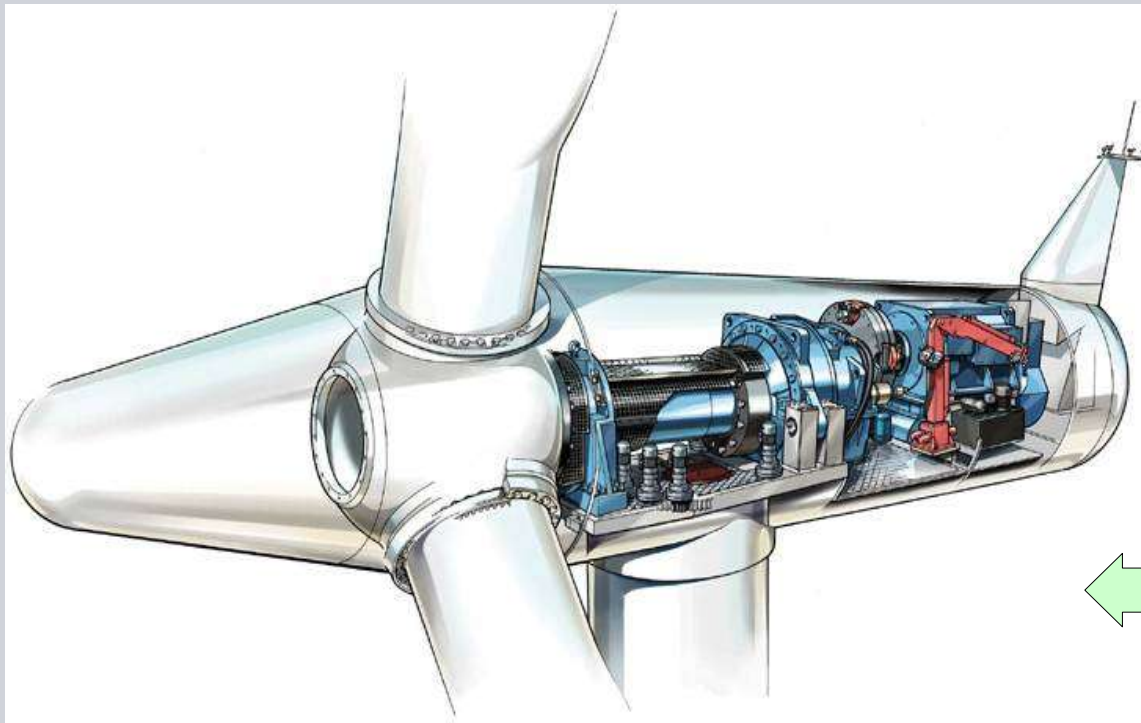
gear box

brake

generator

Main principles of a wind turbine

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Wind Turbine
Control Computer

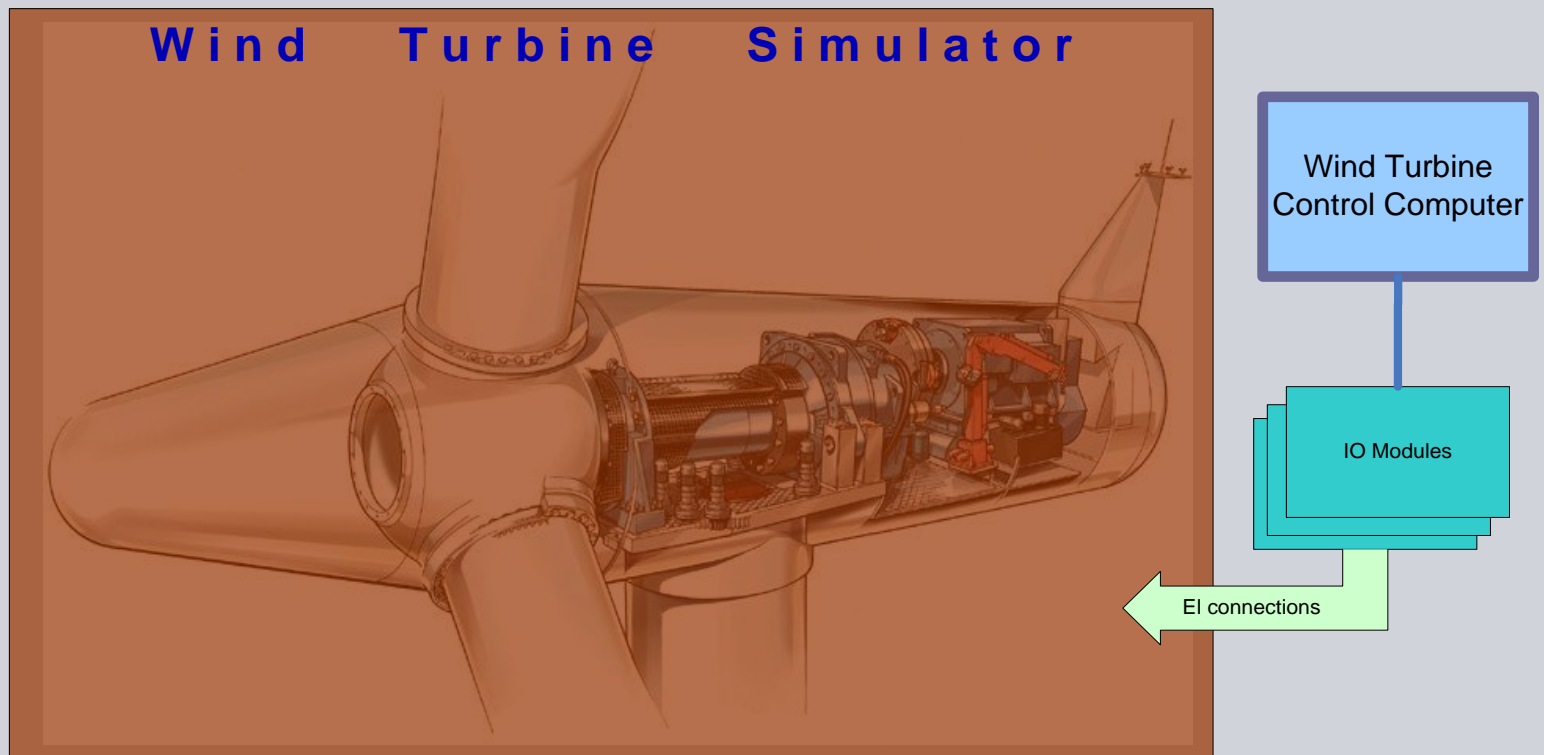
IO Modules

← EI connections

Siemens Wind Power Test System

System Design

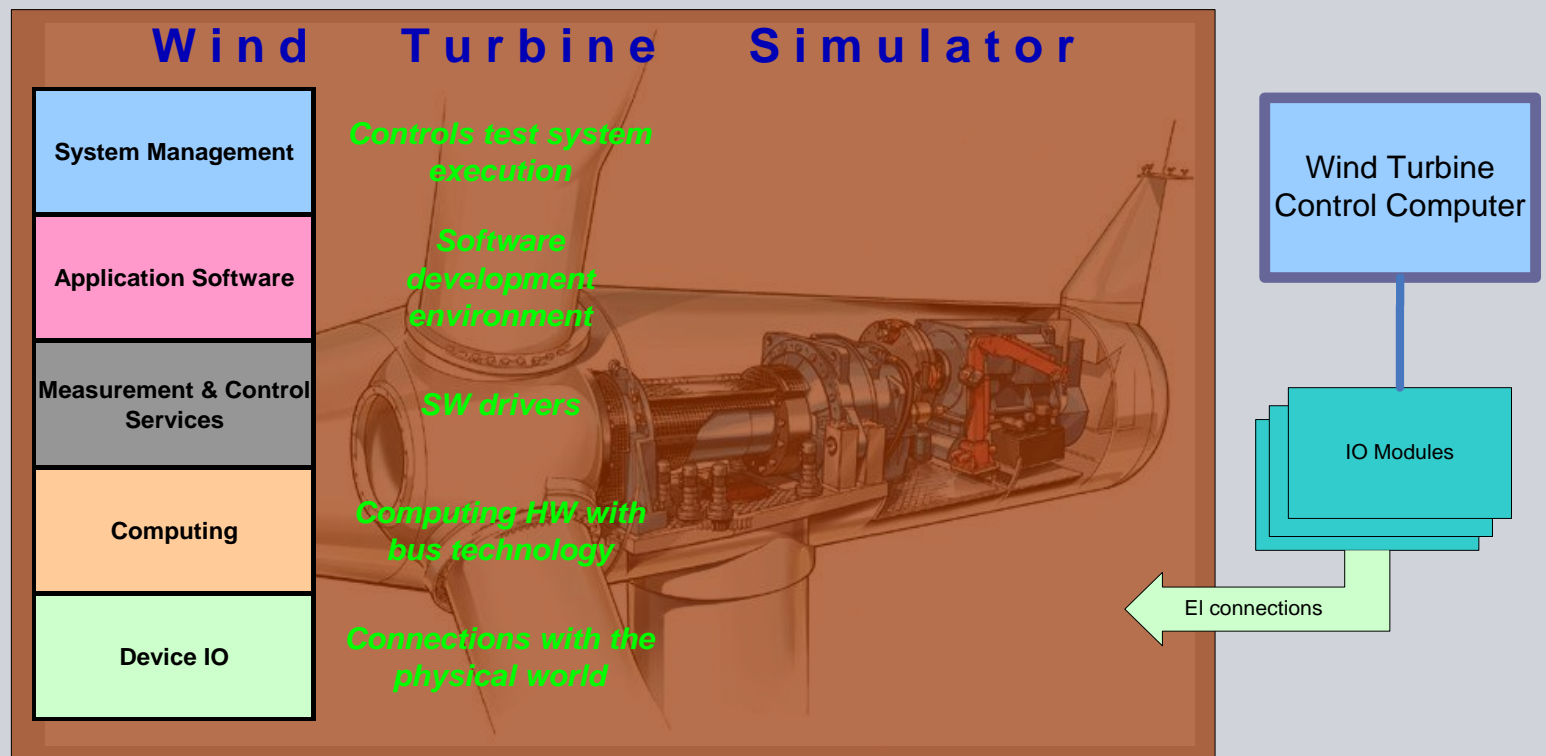
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System Design

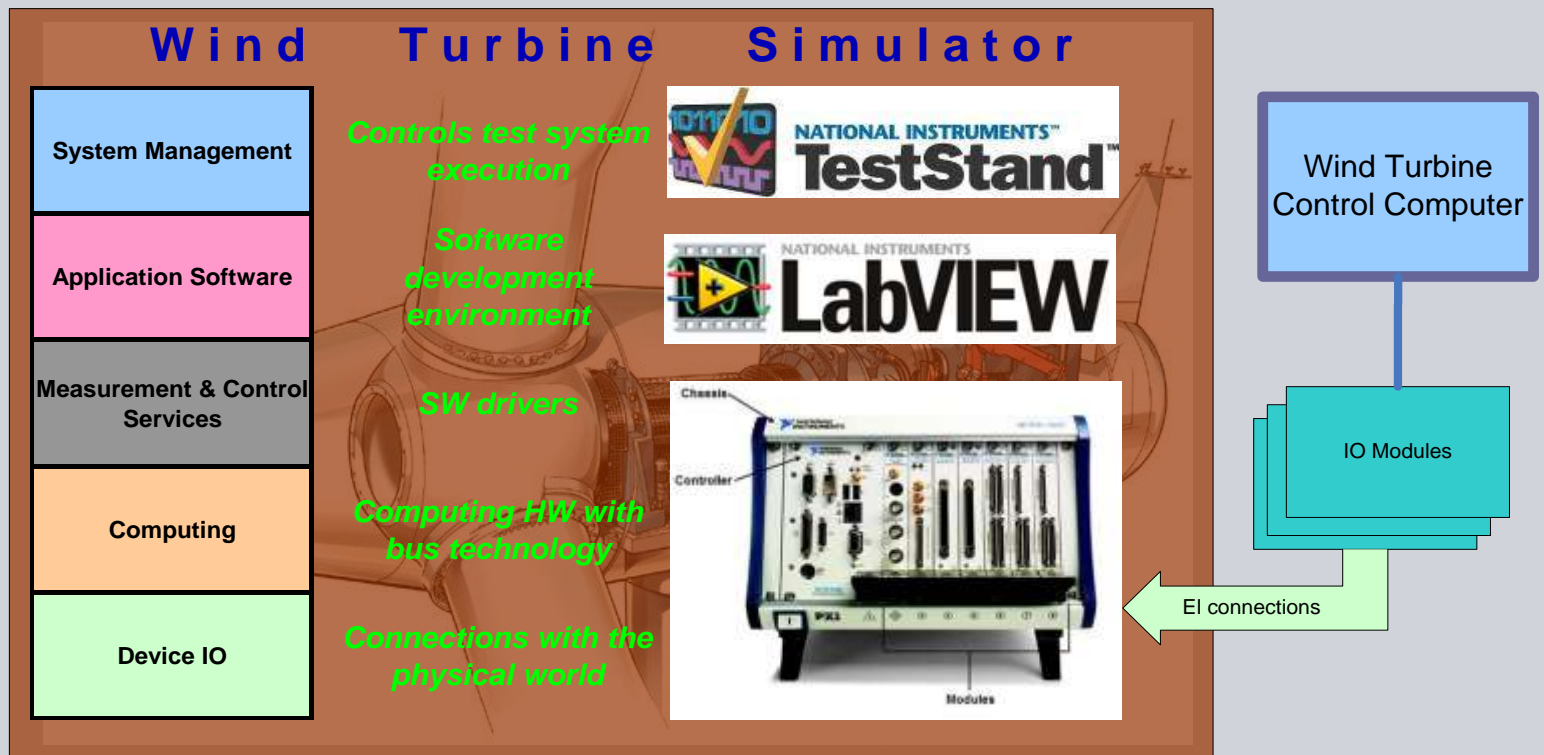
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Siemens Wind Power Test System

System Design

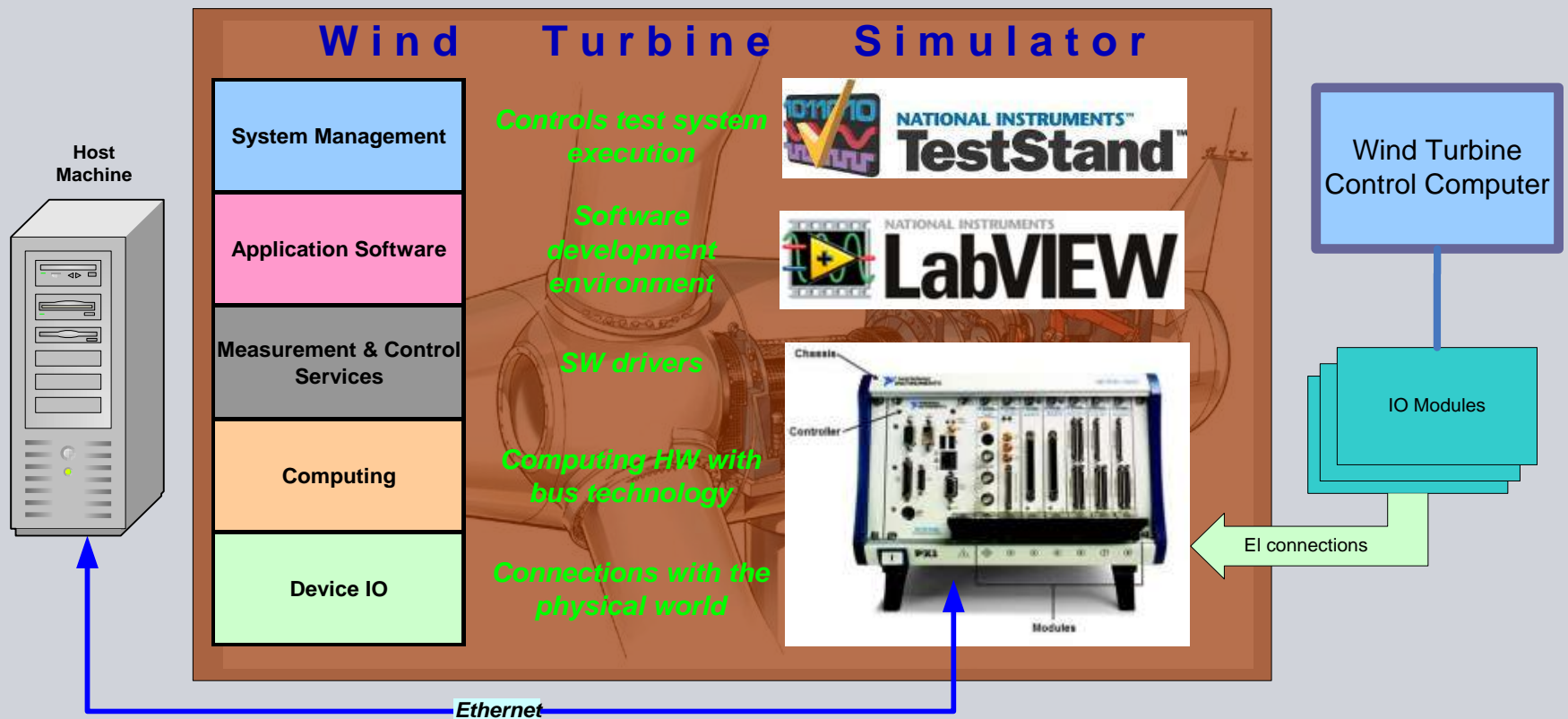
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Siemens Wind Power Test System

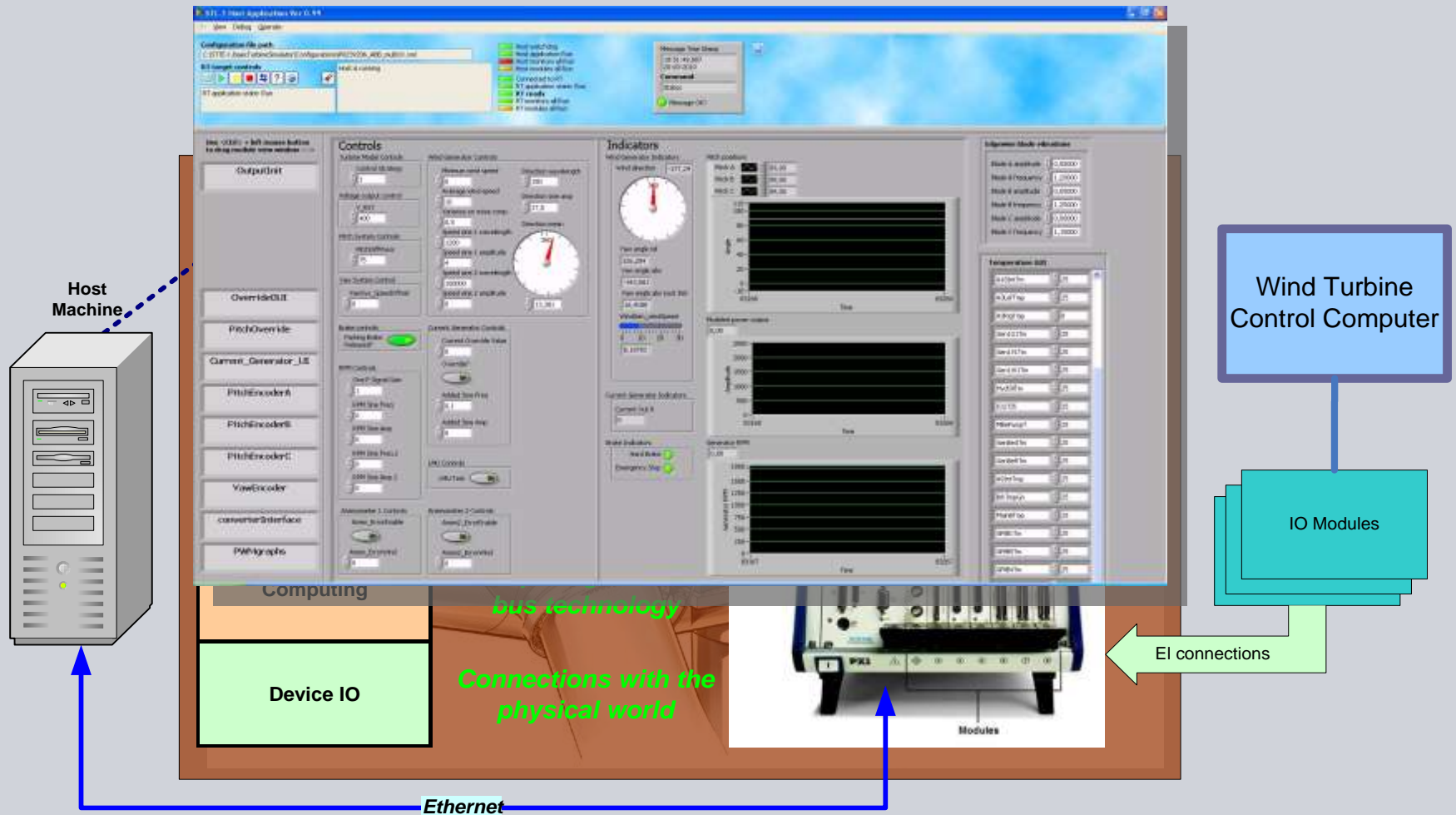
System Design

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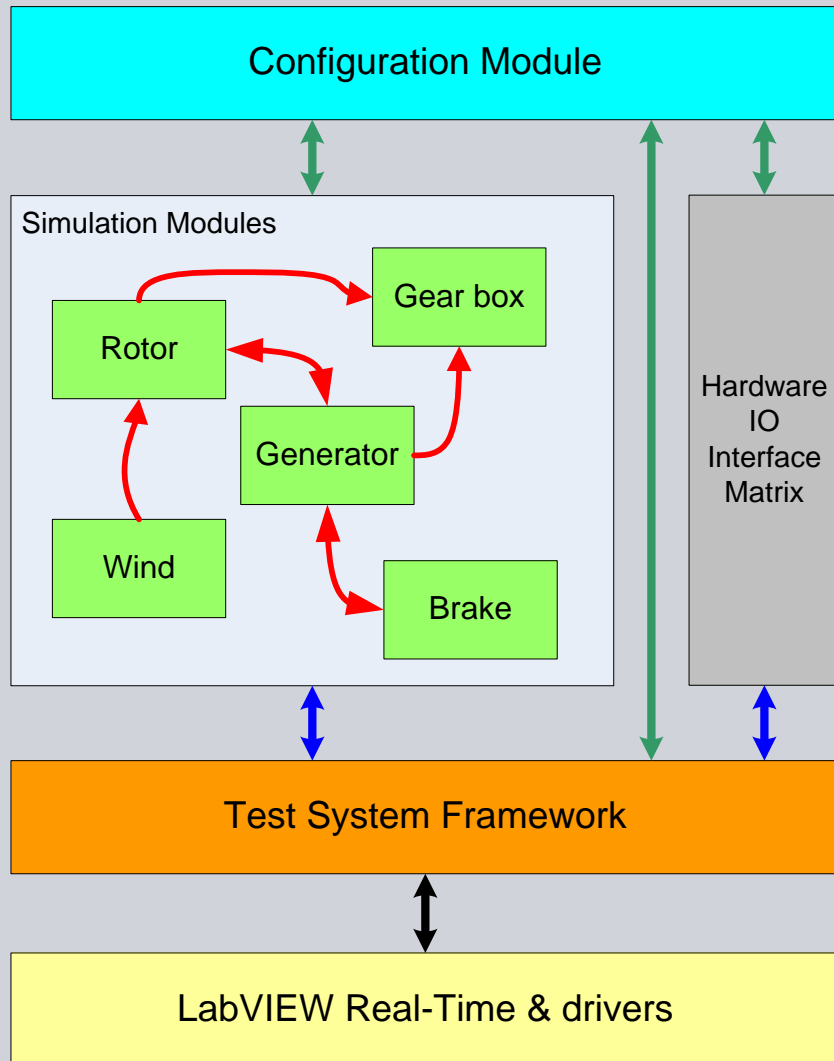
Siemens Wind Power Test System System Design

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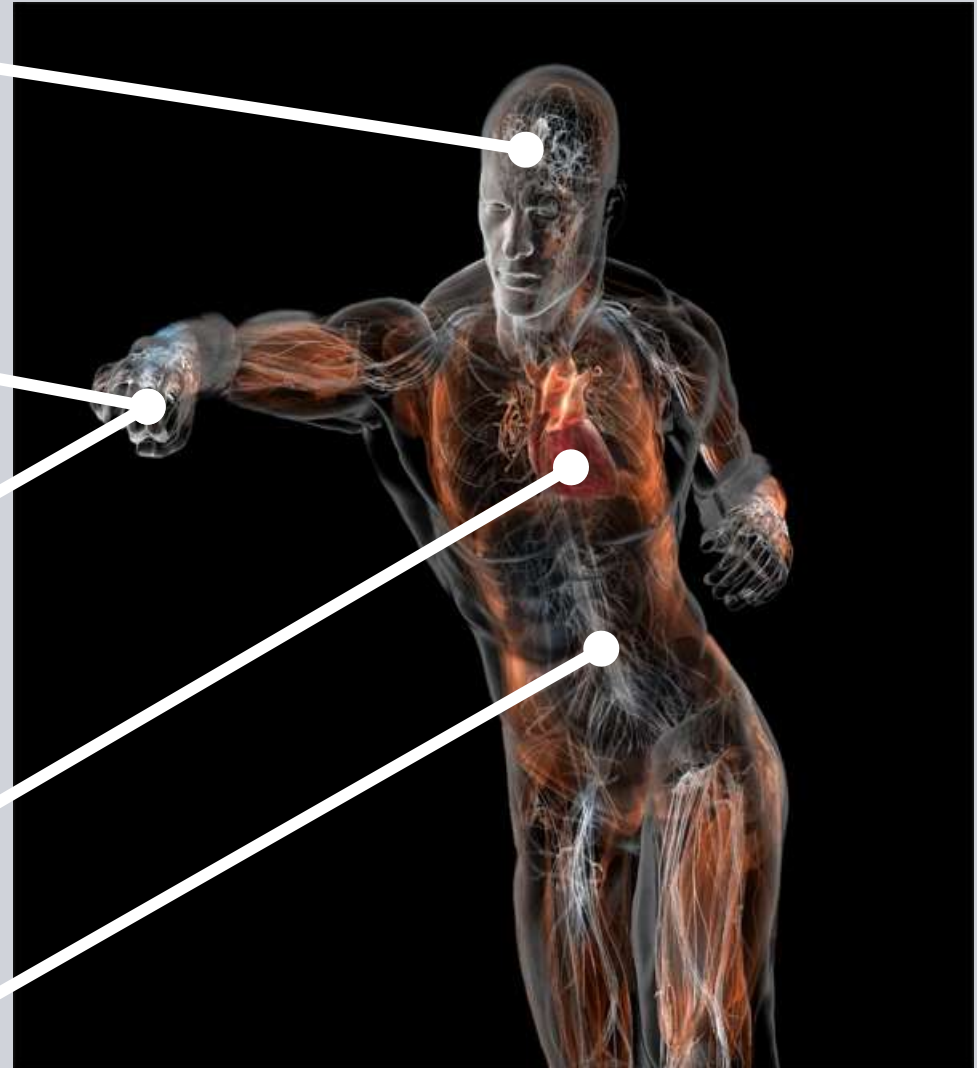
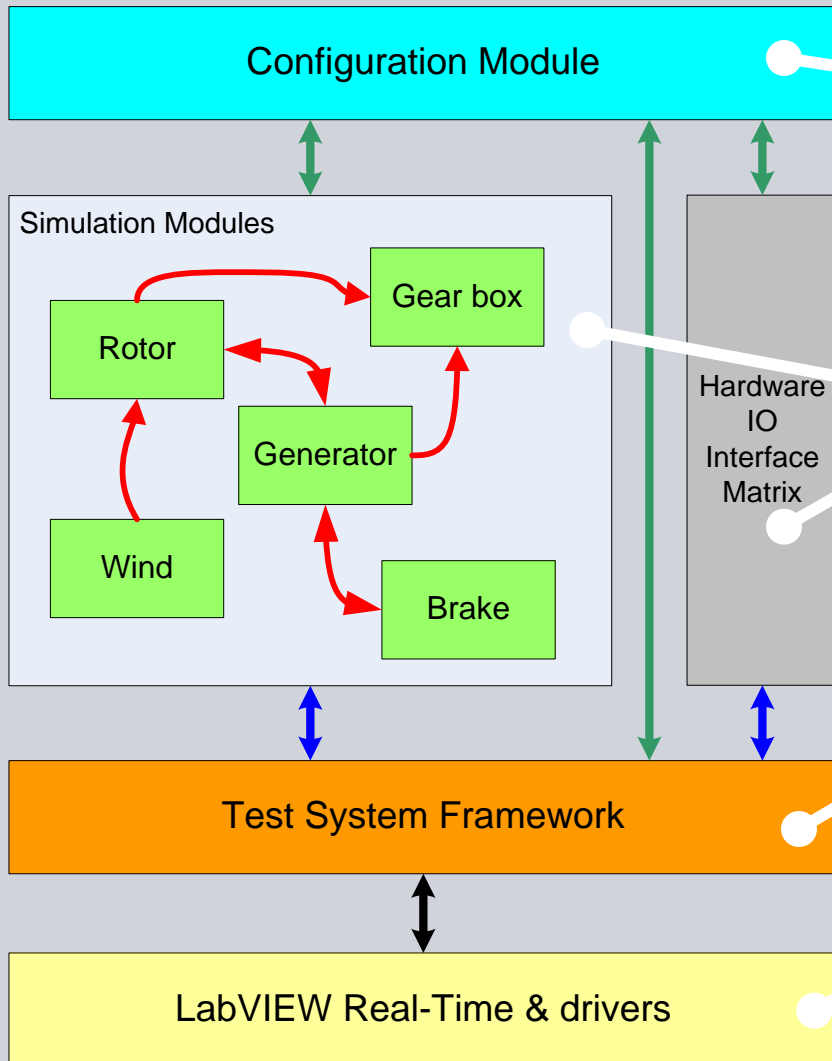
Siemens Wind Power Test System Architecture

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Siemens Wind Power Test System Architecture

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Closing

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Thanks to



Med venlig hilsen/Best Regards,

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