

ALSTOM GRID

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Area Sales Director

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*We are shaping the future**

ALSTOM

Alstom Grid : Within the Alstom group

Alstom Grid : Product Lines and Solutions

Alstom Grid : SMART Grid

Alstom Grid : References in Thailand

Alstom Grid : Solutions in Thailand

Three main activities in 4 sectors*

Equipment & services for power generation

Alstom Thermal Power



Alstom Renewable Power



Equipment & services for rail transport

Alstom Transport



Equipment & services for power transmission

Alstom Grid



Alstom Grid : Key Figures

Ready to address the market needs

New growth potential for the Group

A global leader in electrical transmission with a 12% global market share

- 19,000 employees in 70 countries
- Over €4 billion annual sales
- Over 90 manufacturing and engineering sites worldwide
- 4 main business : HV Products, Turnkey Solutions, Automation and Services



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Alstom Grid : Global Leadership

•No. 1 in

- Network Management Solutions
- Market Management Systems
 - Disconnectors
- Digital Instrument Transformers
- Rectifier-based power solutions for aluminium electrolysis processes

•Leadership in

- Air-insulated substations & gas-insulated substations
 - HVDC
 - FACTS
- Smart Grid technologies
- Substations for offshore wind farms in Europe



Alstom Grid : Organised in 10 main Product Lines



• POWER TRANSFORMERS

- More than 130,000 MVA
- 1,000 transformers per year
- World's largest electric arc furnace transformer



• INSTRUMENT TRANSFORMERS

- More than 200,000 equipments
- Compact Optical Sensor Intelligence



• CIRCUIT BREAKERS

- Over 80,000 equipments
- 8,000 solutions per year
- Top three suppliers with Live Tank, Dead Tank and compact modules



• GAS-INSULATED SUBSTATIONS

& LINES (GIS & GIL)

- 2,000 substations GIS
- Over 150 km single-phase GIL
- Fivefold size decrease
- SF₆ reduction



• DISCONNECTORS

- N° 1 manufacturer
- Over 140,000 units in more than 130 countries

Alstom Grid : Organised in 10 main Product Lines



•POWER ELECTRONICS ACTIVITIES

- One of the leaders in HVDC (high voltage direct current) to transmit large quantities of electricity over very long distances
- Specialist in Flexible AC Transmission Systems (FACTS)



•AC SUBSTATIONS (up to 1200 kV)

- Air/Gas-insulated switchgear
- Offshore and onshore wind farms
- Turnkey high voltage substations
- Grid interconnection for all types of generation



•NETWORK MANAGEMENT SOLUTIONS

- Worldwide leader in Energy Management Systems (EMS)
- Market Management Systems (MMS)
- Distributed Management Systems (DMS)



•SUBSTATION AUTOMATION SOLUTIONS

- MiCOM IED (Intelligent Electric Device)
- Conventional and Digital Control Systems (PACiS)

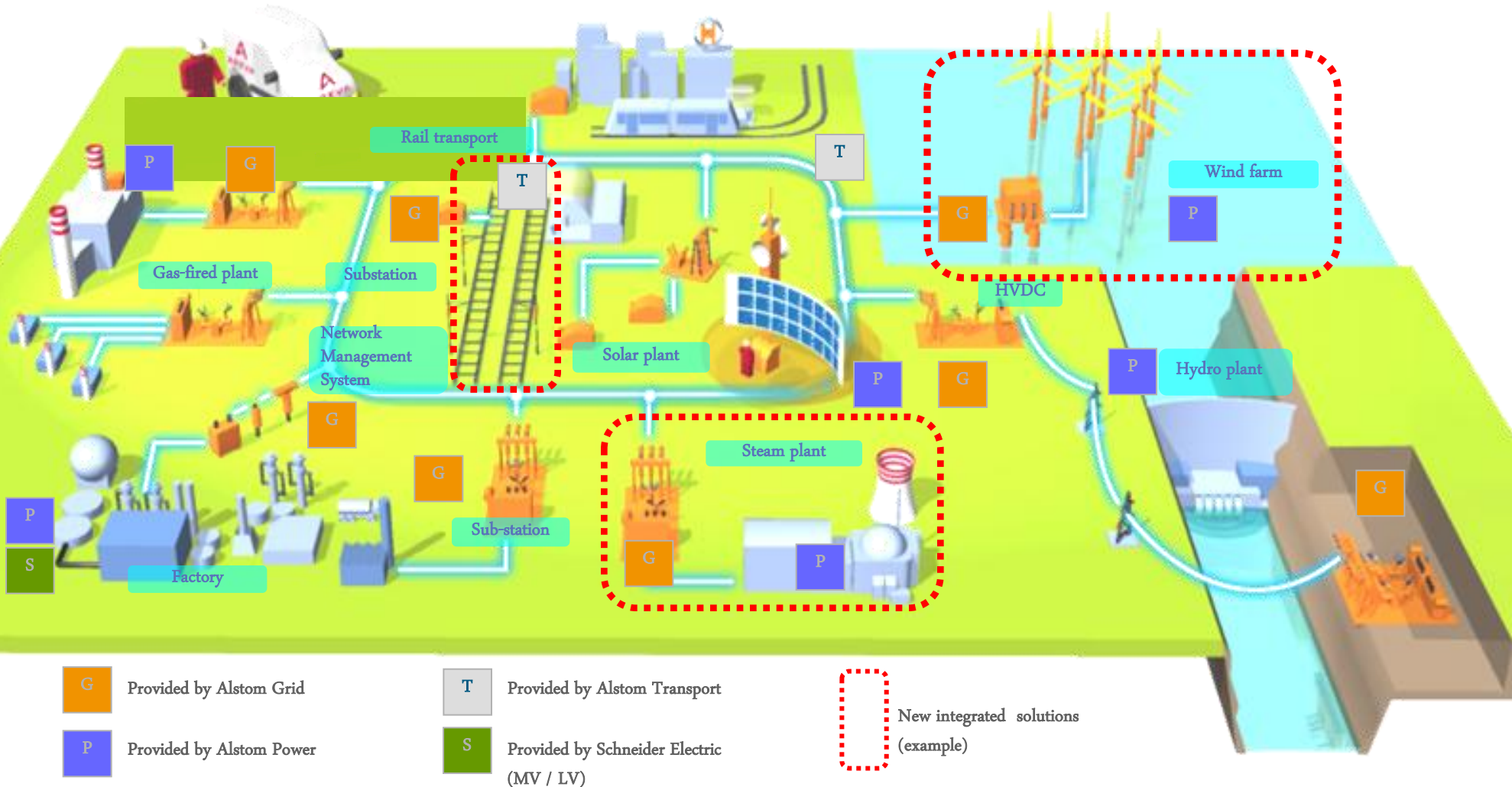


•SERVICES

- From network design to asset evolution
- From project to long-term partnerships
- From emergency to predictive maintenance

Alstom Grid

From products to integrated solutions (a partnership approach)



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Alstom Grid : Experiences in Thailand

Alstom Grid : Solutions in Thailand

Alstom Grid : Increasing energy challenges Leading to the need for Smart Grid solutions

1



Fast growing energy needs, especially electricity

- ◆ Energy world consumption 2007-2035: ~+50%
- ◆ Share of electricity in total energy consumption : from 9% in 1973, 16% in 2004 to more than 20% in 2030

2



Race for a low carbon energy mix

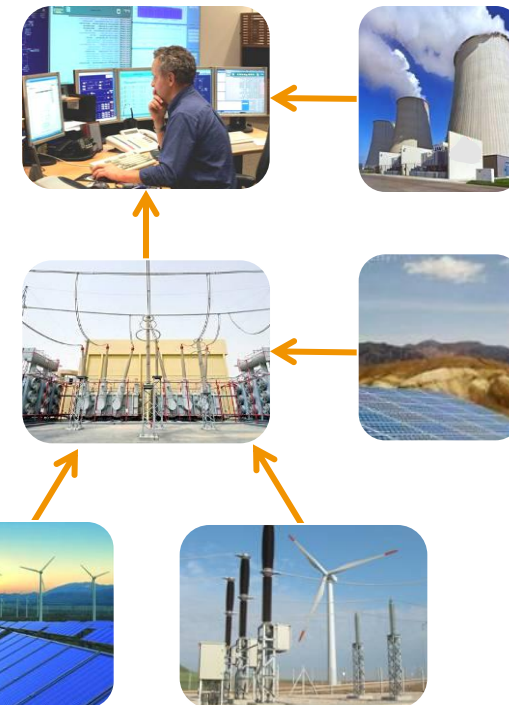
- ◆ Ex : Objectives 20/20/20 of the European Union : -20% of CO₂ emissions, -20% of energy consumption, 20% of energy coming from Renewable Energy Sources

3



Strong constraints on primary resources

- ◆ Ex : Europe dependency on fossil fuels imports: 70% in 2030



Network increasing complexity

Need for energy efficiency

Alstom Grid : The full energy value chain will be impacted

New elements of the value chain



Energy management MUST be smarter at all levels
- with new technologies and new solutions

Alstom Grid : Delivering advanced technologies and solutions

Some examples of technologies and solutions...



Digital Instrument Transformers



UHV up to 1,200 kV



Distributed generation grid connections



Green Transformers



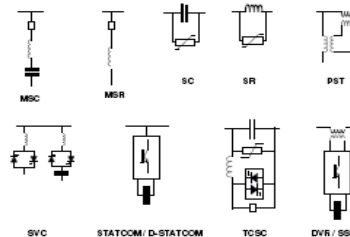
HVDC Interconnections



Turnkey substations



Static Var Compensators



MSC = Switched Capacitor
 MSR = Switched Resistor
 SC = Series Capacitor
 SR = Series Reactor
 PST = Phase Shifting Transformer
 SVC = Static Var Compensator
 STATCOM = Static Synchronous Compensator
 D-STATCOM = Distribution STATCOM
 TCSC = Thyristor Controlled Series Capacitor
 DVR = Dynamic Voltage Restorer
 SSSC = Static Synchronous Series Compensator

Flexible AC Transmission Systems (FACTS)



Network and generation management systems

...to address customer needs

V



Reliability and Quality



Stability



Environmental concerns



Energy efficiency



Market efficiency

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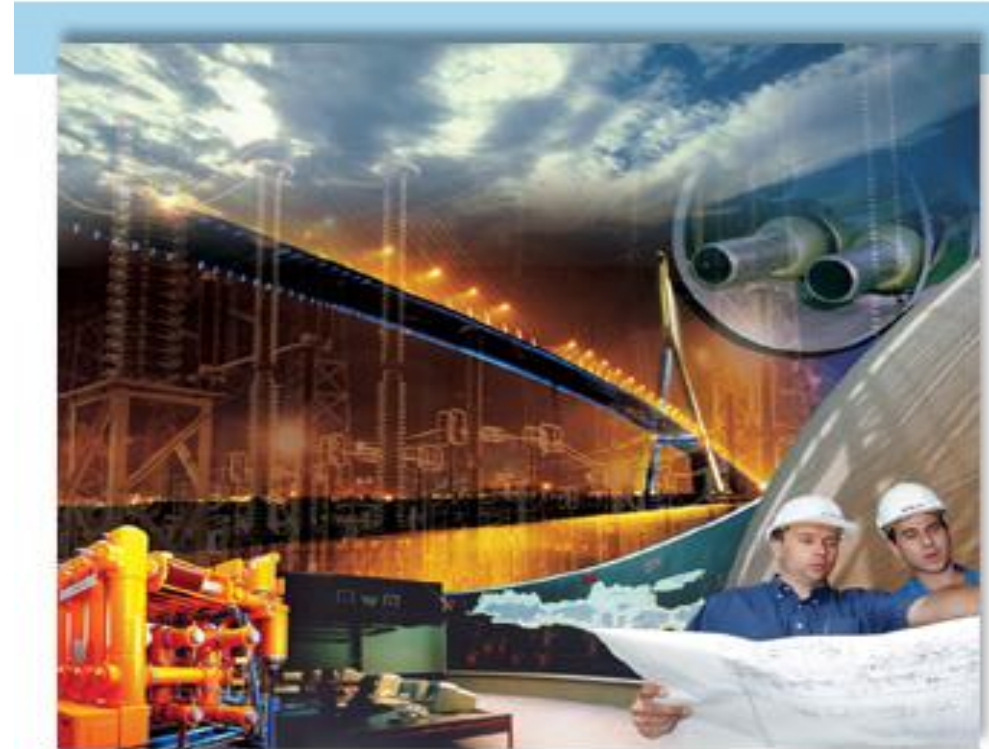
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Alstom Grid : A Confirmed Experience in Thailand

Over 30-year presence in Thailand

- Supply of HV equipments
 - Turnkey solutions
 - Project Execution
 - Services
-
- Utilities (EGAT, MEA, PEA)
 - IPPs & SPPs
 - Industries (Oil & Gas, Cement, Petrochemical, etc.)
 - Infrastructures



Alstom Grid : A Significant Installed Base

A few examples of equipments & systems installed in Thailand

- Over 2,000 outdoor HV circuit-breakers (from 69kV to 500kV)
- More than 200 bays of HV GIS (from 69kV to 230kV)
- Power Transformers (mostly above 230kV, 200MVA)
- All types of relays & control systems
- SCADA / EMS control centers (EGAT and MEA)



Alstom Grid : Success Stories in Thailand

- **EGAT**

230kV GIS Lat Phrao Substation

230/115kV GIS Navanakorn Substation

500kV GIS On-Nuch Substation

230kV GIS Samut Sakhon Substation

230kV GIS Samphran Substation with Supervision

Power Transformer 300MVA 230/500kV

SCADA/EMS Upgrade

- **MEA**

SCADA/EMS

Protection & Relays

230/115/69kV Vibhavadi Terminal Station

230/115kV Tanontok Terminal Station

- **PEA**

AIS/GIS product supplied through local contractors

Turnkey Substations:

PEA 115/22kV GIS Substations Pattaya Tai, Rangsit, Om Yai

PEA 115/22kV Substation V-Shape Projects

PEA 115/22kV Substation PRASAE

- **IPP: BANGBO & BOWIN 230kV Switchyards**



ALSTOM GRID

Pongsak Attavanich

Solutions Group Manager

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Alstom Grid : Turnkey Solutions

We Serve the Following Markets



•Utility



Alstom Grid : Turnkey Solutions (Supply, Engineering & Construction)

What we have offered

SOLUTIONS FOR HV SUBSTATIONS

GIS Substations & Conventional Substations up to 500kV



SOLUTIONS FOR POWER PLANT

Exit Substations

eBOP (Generator Step Transformer, IPB connection to UAT, Excitation Transformer, Aux Transformer, Generator Circuit Breaker, MV & LV, Cabling and Cable Tray System, CCTV, Communication System, Diesel Generator, PA System, Erection, Testing & Commissioning)

Alstom Grid : Services



- CONSULTING
 - Network design and consulting
 - Oil analysis
 - Condition monitoring



- RENOVATION, MODERNISATION, EXTENSION
 - Condition assessment of substation
 - Life extension and performance improvement
 - Equipments upgrade, modernisation and extension



- LONG TERM MAINTENANCE & PARTNERSHIP
- 3 levels of incremental services: Expertise, Performance & Serenity
 - Equipment assessment and time based maintenance
 - On-line condition monitoring with condition based maintenances
 - Corrective actions with guaranteed response time
 - Strategic spare parts inventory management
 - Operations on non-Alstom equipment up to facilities management such as in offshore platform.



• PRODUCTS LIFE CYCLE SERVICES

- Erection, testing and commissioning
- Inspections and maintenance
- Condition, life assessment and on-line monitoring
- Emergency support, diagnosis and repair
- Life extension, renovations, modernisation and upgrades
- Spare part strategic inventory management and supply
- Decommissioning & Recycling



• SPARE PARTS

- Online catalogue
- Spare part identification with technical maintenance manual
- Personalised quotation



• TRAINING

- 15 Technical Institutes
- Over 200 training courses
- Standard and customised training
- eLearning & Distance education
- Competence Development Training

Alstom Grid : Services

Installed Base Maintenance

- GLOW SPP2&3 Mid Life Overhaul GCB
- GECCO ONE Spare Parts 230kV GIS, GIL, GCB, BWatch
- NTS TATA Steel Arc Furnace Transformer
- Various AIS Substations i.e. EGAT. Thai Oil, IPT, etc.



Alstom Grid : Services

E&C, Trouble-shooting & On-site Services

- LAOS-Nam Ngum2 230kV GIS
- SCSC TATA Steel Replacement of OLTC Arc Furnace Transformer
- GECCO ONE 230kV GIL
- EGAT Supervision 500/230kV GIS Substations
- PEA Supervision 115kV Compact Substation HYPACT
- E&C Various Substations



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