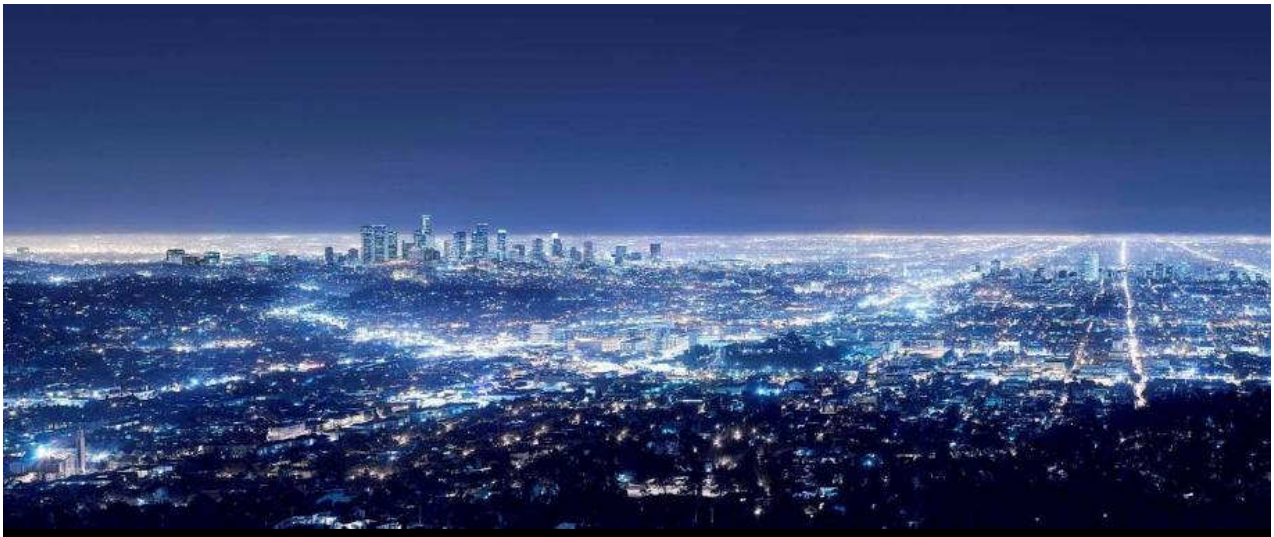

Khaleef Khan & Juraimi Jahya, Oil, Gas & Petrochemical, 19 Feb 2009

Trends towards pre-fabricated substation

© ABB Group

Power and productivity for a better world™

Agenda

- Organization & Resources
- Core Competency
- Our Commitment – ABB Centre of Engineering for FPSO
- Benefits of E-House (Interconnection & Pre- Commissioned)
- Typical Project Execution Model
- Slides on Past Successful Projects
- Project References

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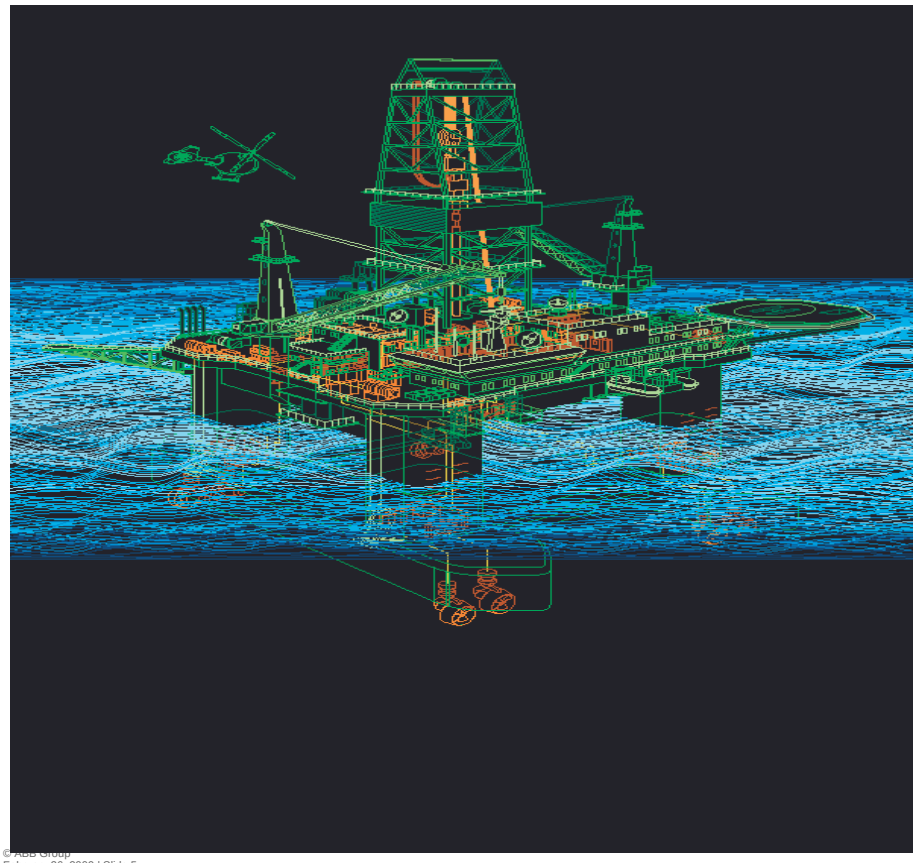
ABB Organization & Resources

- Experience & Support from global ABB units in the US, Norway, & Australia.
- Proven E-Packages for all Marine & Offshore E-Houses key customers.
- ABB Singapore has successfully delivered customized engineered Certified E-Houses for key projects in the Marine FPSO, Oil,Gas & Petrochemical industry.
- Market Driven Solutions.

Our Core Competency

- In-House Engineering Team (Structure, Architecture, E & I etc)
- Project Management, Engineering Management & Construction Management
- Capability to Assemble, Package, Test & Deliver solutions safely on-time in full to the right quality.
- ABB being one of integration leader for Switchgears, Transformers, Drives , Control Systems, SCADA, PMS etc

ABB opens FPSO Engineering Centre in Singapore



- Business Times, 2nd Feb 2009

ABB to hire more oil and gas engineers

POWER and automation technology company ABB Singapore intends to add to its 800 staff by hiring immediately 10 to 12 engineers for its floating production, storage and offloading (FPSO) vessel business.

The company, which is part of the ABB Group headquartered in Zurich, Switzerland, also intends to hire 50 engineers over the next year.

These new hires – mainly project managers and structural, electrical, design and project engineers – will complement some existing 100 engineers dedicated to the oil, gas and petrochemicals and marine sector.

An FPSO is a type of floating tank system designed to collect oil from a nearby platform, process it and store it until it is offloaded on to waiting tankers. It is used to transport oil in the offshore environment in cases where long pipelines are not a feasible option.

Currently, Singapore accounts for 70 per cent of the global market for FPSO conversions and is among the top three centres in the world for oil and gas manufacturing and engineering.

Manohar Khiatani, assistant managing director of the Economic Development Board, said: "This is a clear indication of ABB's confidence in Singapore and our leadership position in the marine and offshore industry. ABB's presence will further strengthen our offshore ecosystem and is in line with our desire to develop as an integrated marine and offshore hub."

Our Commitment?



ABB

Occupational Health & Safety Policy

ABB is committed to providing a safe and healthy work environment for all employees, subcontractors, customers and visitors.

We believe it is the responsibility of management and employees to create a safe work environment, and to ensure that our operations do not place our staff, our visitors or the local community at risk.

We recognize health and safety is an integral part of all our activities.

The Management of ABB Industry Pte Ltd will:

- Provide leadership on Occupational Health and Safety matters and seek continuous improvement in our Occupational Health and Safety performance.
- Identify and reduce the risk inherent in work activities that may result in personal injury or illness.
- Provide information on Occupational Health & Safety to improve staff understanding of workplace hazards.
- Involve our employees in our Occupational Health and Safety programmes.
- Expect all people engaged by ABB to comply with applicable laws and regulations.

Life is Precious - Think and Act Safely

ABB is committed to providing a **safe and healthy work environment** for all employees, subcontractors, customers and visitors.

The ABB Business Principles are encapsulated in three words - **Respect, Responsibility, and Determination**.

ABB	Group Directive Attachment Title:	ABB Code of Conduct Statement of Acknowledgment
	Group Directive Attachment Number:	GD/LC-40A01
	Group Directive Owner:	Head of GF-LC
	Related Group Directive:	GD/LC-40
	Approved By:	CEO
	Effective Date:	September 1, 2007

ABB Code of Conduct

ABB
CODE OF CONDUCT
STATEMENT OF ACKNOWLEDGMENT

I acknowledge that I have received and read the ABB Code of Conduct and understand the policies and standards contained therein. I acknowledge that as an employee of ABB, its subsidiaries or divisions it is my obligation to:

Never knowingly violate the policies and standards contained in the "Code of Conduct".

Seek advice where I have a question concerning the interpretation or application of the policies and standards contained in the "Code of Conduct".

Promptly report any matters that are known to or believed to present a violation of the Code of Conduct or law and comply with any action requested by the Company.

I understand that I should report any possible violation of the Code of Conduct and raise any question or concern I have relating to compliance with the code through discussion with my management or with my company's legal or human resource representative or through the ABB business ethics hotline.

I further understand that my failure to comply with the policies and standards contained in the Code of Conduct may lead to disciplinary action up to and including possible termination of my employment.

Signature:_____ Date:_____

Employee Name:_____
(Please Print)

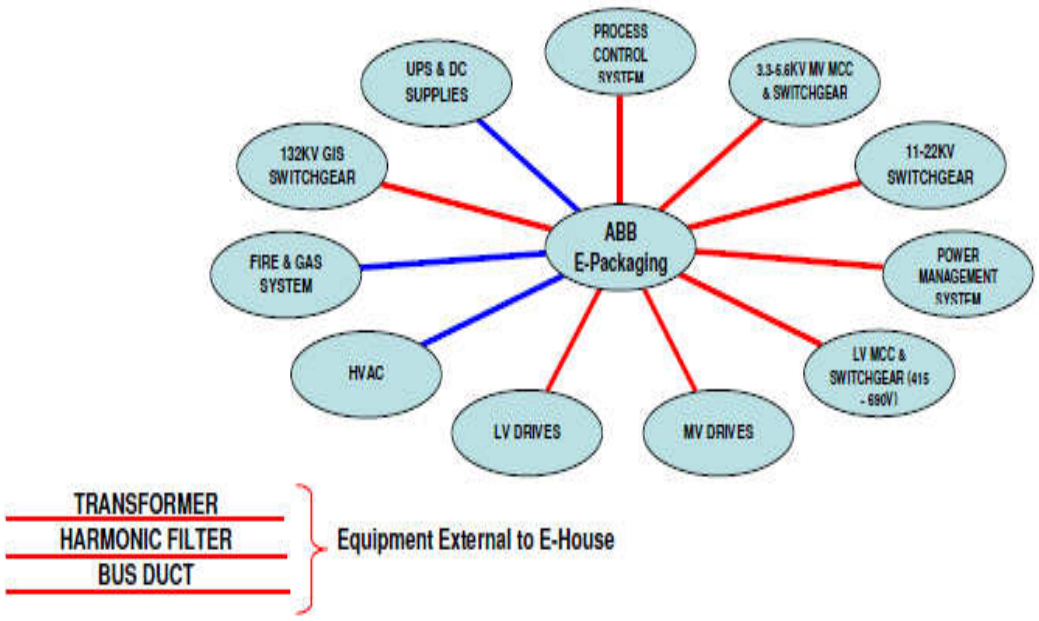
Company/Local Division:_____

Location:_____

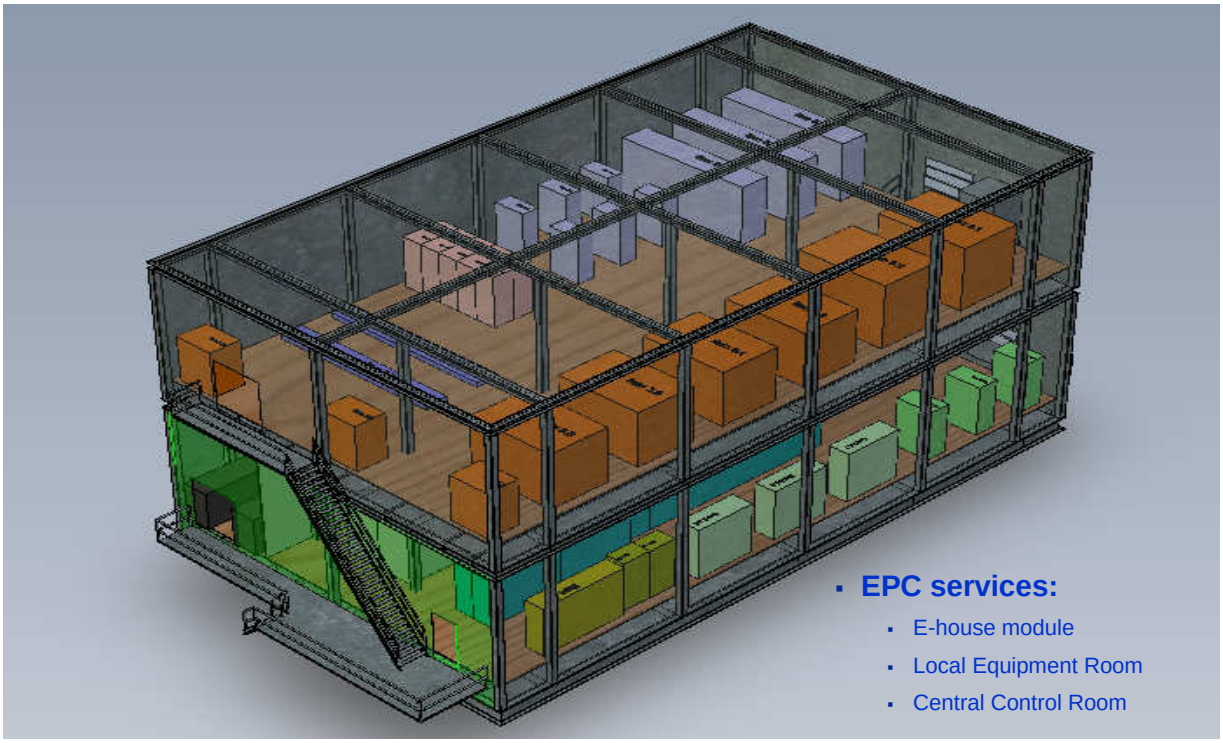
What is E-House?

- Prefabricated steel structure building to house all Electrical & Control equipments in a safe area.
- Design to meet Offshore / Onshore requirements.
- Integration of all components Switchgears, Transformers, VFD's, and Control Instruments like PCS , DCS etc.
- Fully tested and interconnected of HVAC, F&G system & Small power and lighting utilities (Building Services)
- Custom engineered modules complies to 3rd party certification-DNV, ABS, Lloyds etc
- E-Packaging is a smart way of offering, which minimizes competition and leads to profitable growth
- Close the gap between Systems and commodity products offering

Equipment Interconnecting & Pre-Commission



Typical – E-House / LER

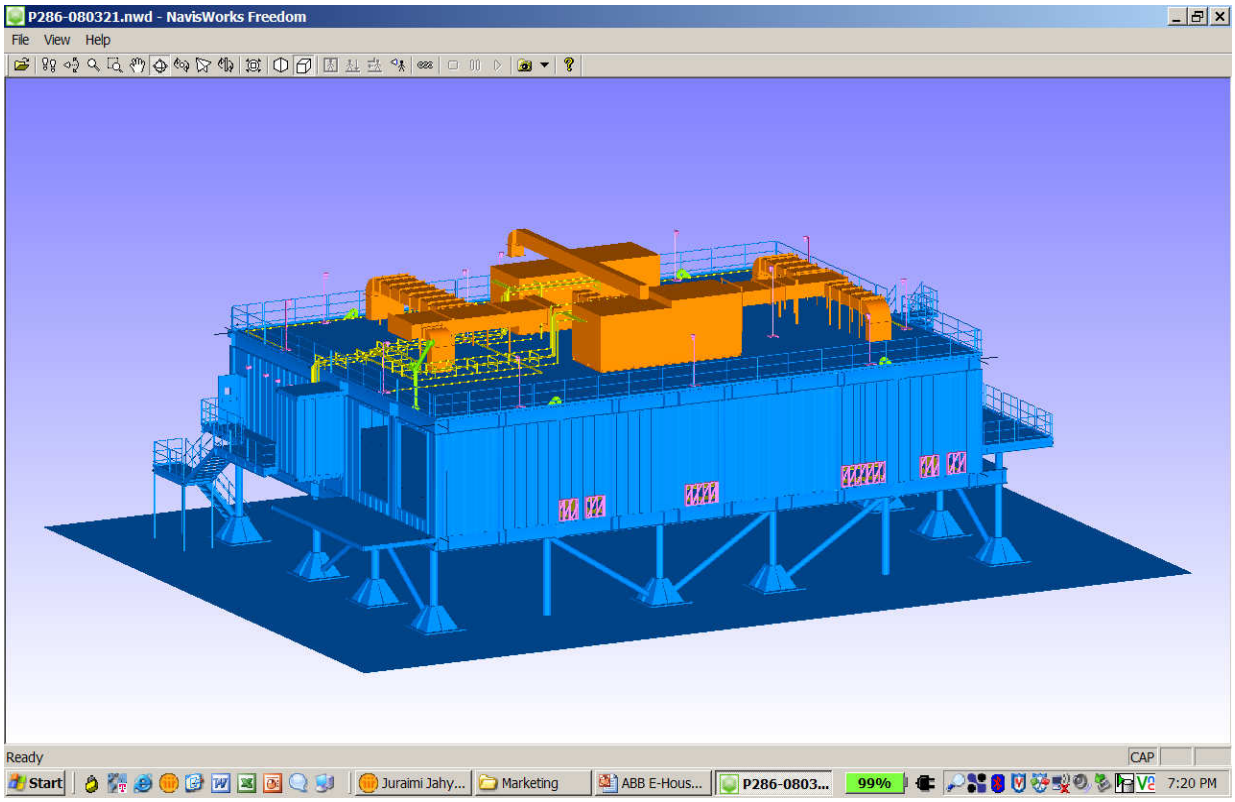


- **EPC services:**
  - E-house module
  - Local Equipment Room
  - Central Control Room

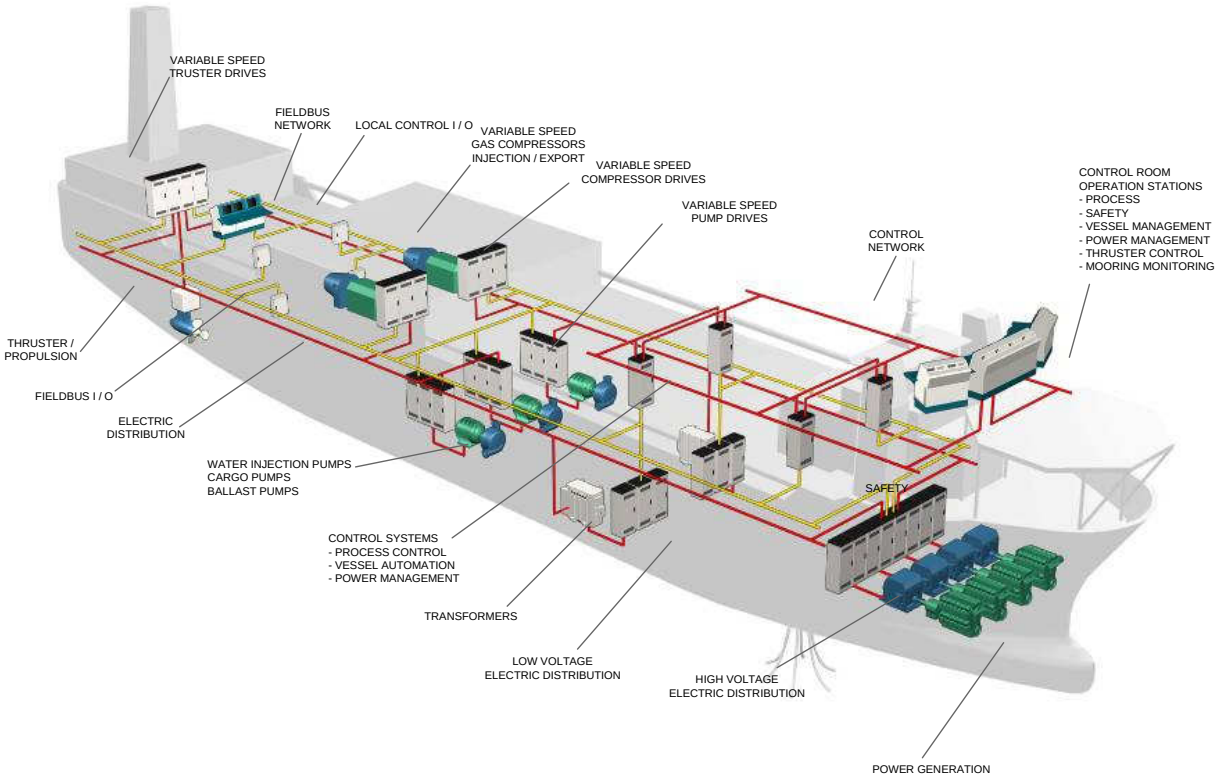
Control Room Design



Typical 3-D Model of E-House



FPSO –Module on Topsides



E-House on FPSO Topsides

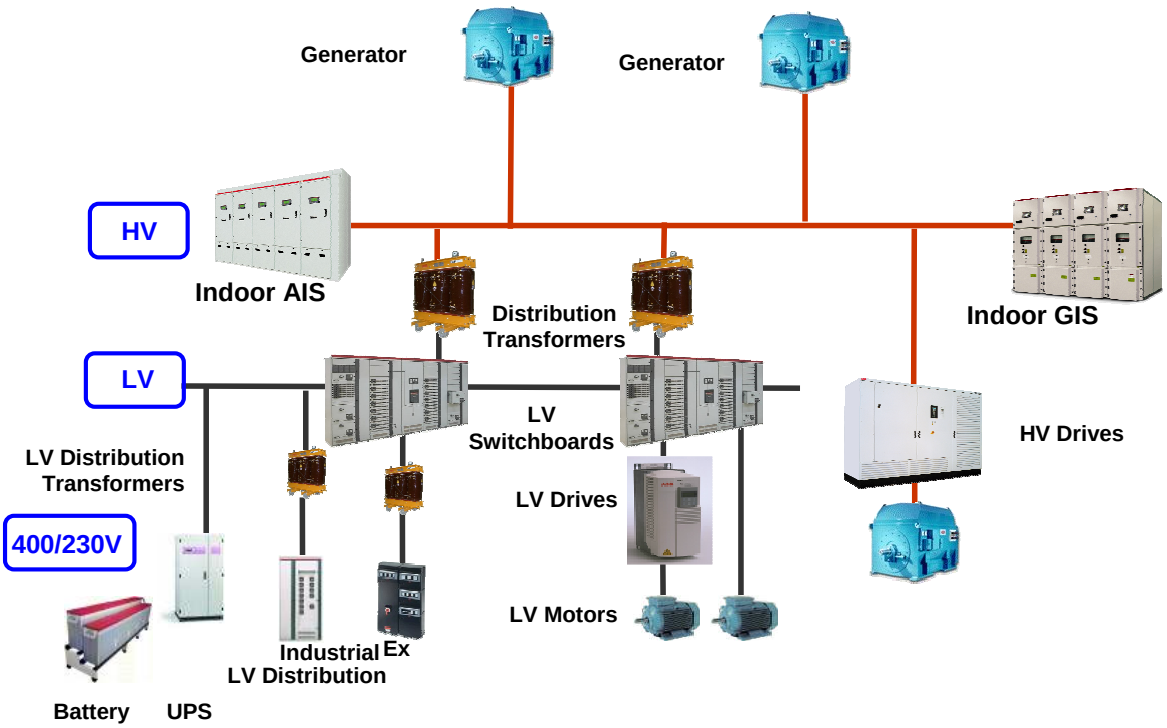






© ABB Group

Integrated Electrical System



© ABB Group

Value for E-Packaging?

- **Single Point Contact**

  ABB will take full accountability & responsibility from design management, project management & construction management.

- **Assembly**

  Integration of all equipments, eg. E&I, HVAC, F&G and other Building Services.

- **Package**

  Reduce the risk of schedule delay, easy coordination for integration process .

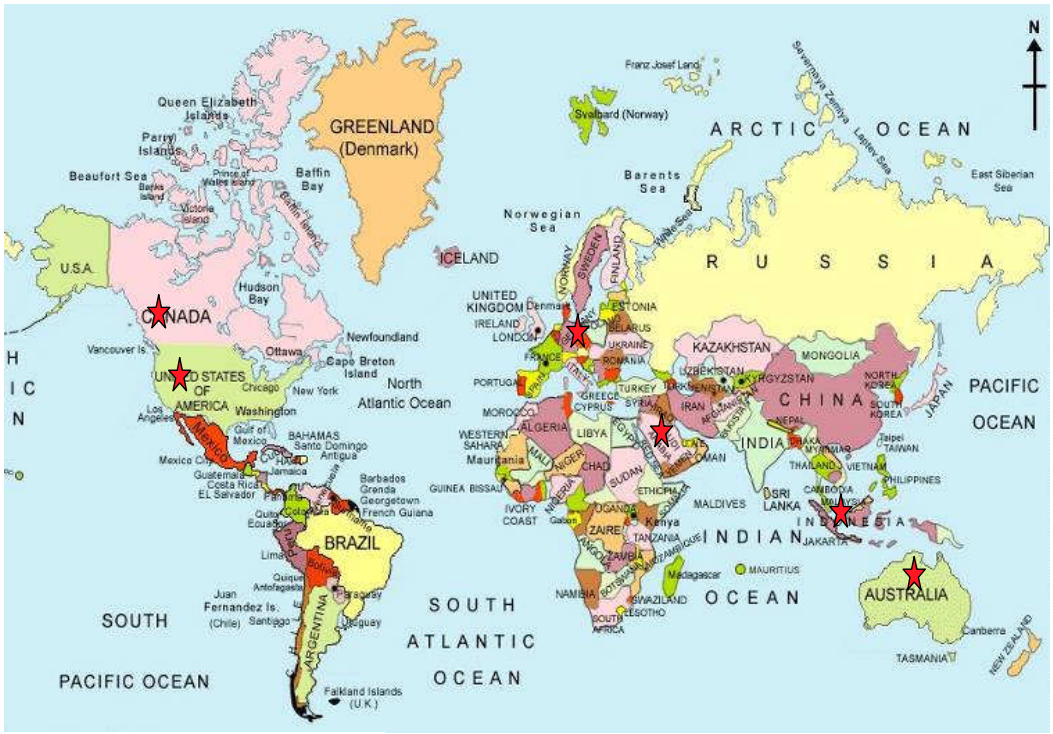
- **Tested**

  Arrive tested, complete & ready for installation thus minimizing commissioning workforce and duration.

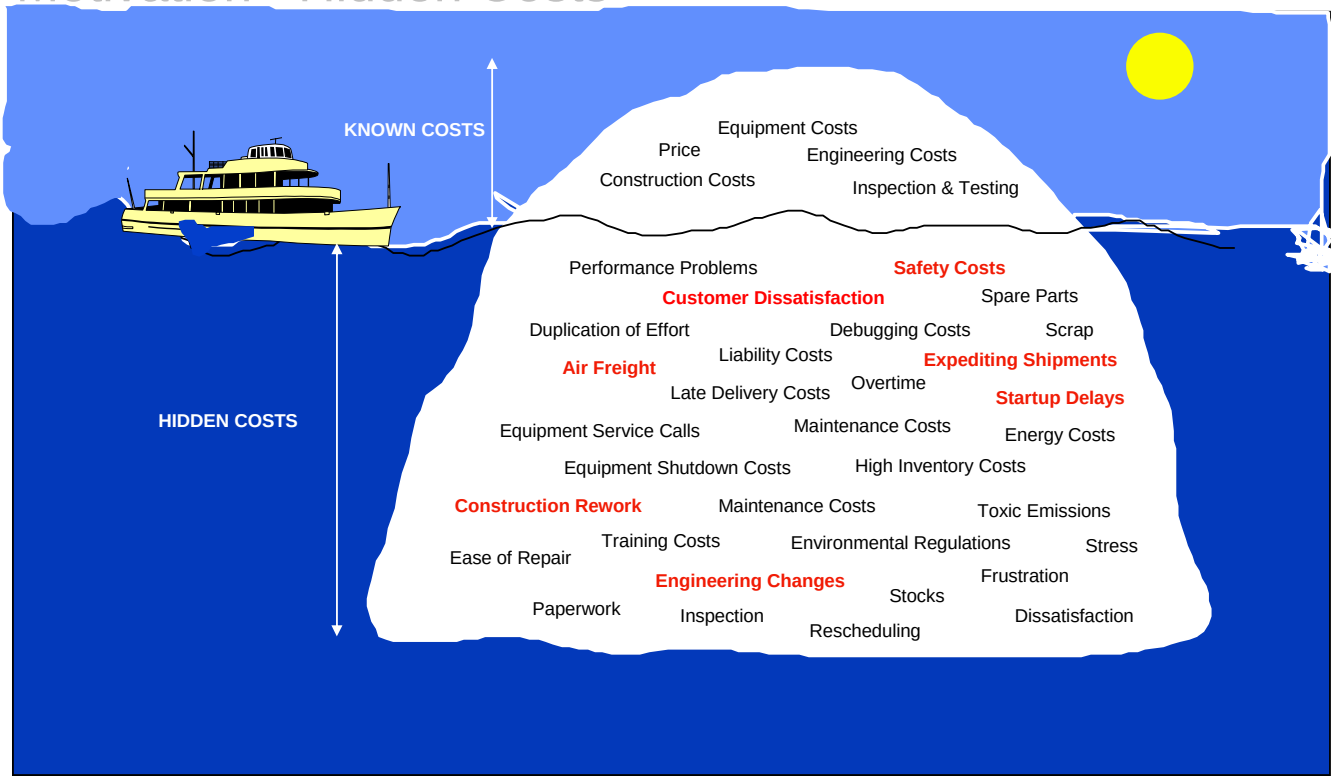
- **Delivery**

  Any size, Any service & Any environment

E-Packaging responsible units



Motivation - Hidden Costs



© ABB Group

Why Transportable Building?







- 70-80% of the detail to design a switchroom comes from the equipment manufacturer
- Off site installation of switchgear & interconnection
- Flawless Execution & Integration
- Expertise in design & Engineering
- Design in parallel with switchgear
- Very short site erection time (Less impact on critical path)
- OH&S compliance easier & lower cost
- Avoid project related industrial disputes & stoppages

© ABB Group

Home Truths







- **Why doesn't Every Equipment vendor do it?**
  - Most focused on selling product not solutions. (Take a product order; Not Engineering System)
  - Inadequate product range to package.
  - Inadequate multiple technical disciplines needed e.g. Structural, Mechanical, Electrical.
  - Insufficient project management expertise.
- **Why does ABB offer E-Packaging?**
  - ABB has proven internal expertise in the execution of this solutions.
  - Take advantage of ABB's broad product base.
  - ABB well developed and compact equipment solutions mean that they are vastly more competitive in footprint savings & optimization

E-Packaging Main Advantages

- Up front costs Saving
- Project Cost Control
- Compliance with local requirements
- Reduced project duration
- Reliability & maintenance

Up Front Costs Saving

- **Buildings sized and configured to suit ABB's more compact equipment**
- **Reduced shipping costs**
- **Packaged pricing incentives from ABB**
- **Reduced ABB Project Management costs**
- **Reduced client costs in: Project Management, Engineering & Procurement**
- **Reduced integration costs for the design & engineering associated with client Free Issue Materials**



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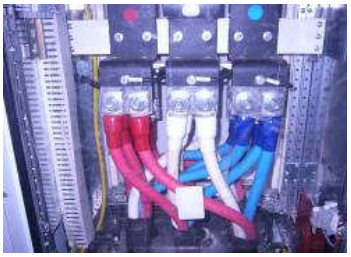
Project Cost Control







- **Significantly Diminished potential for scope overlap or conflict**
- **Knowledge of Local standards & conformances**
  - Significantly reduced potential for rework
- **Provision of skilled project managers**
  - Providing a single point contact
  - Fewer packages to integrate & coordinate
- **Identification, Collection & dissemination of critical equipment design data is ABB's responsibility.**
  - Reduces Scope conflict
  - Variation potential
  - Extensions of time

© ABB Group

Reduced Project Duration

- **Expert in Project Execution**
- **Single Contact Point**
- **Provision of skilled project manager / coordinators**
  - Initially located in your project office
  - Transferring to site during the delivery phase
  - Providing a single point contact for all ABB issues
  - Faster turn around on all approval processes
- **One complete ABB coordinated project plan**
  - Coordination with installation & commissioning teams
  - Quick resolution of all issues that arise until our equipment is operational
- **Maximize prospect of completing early**





© ABB Group

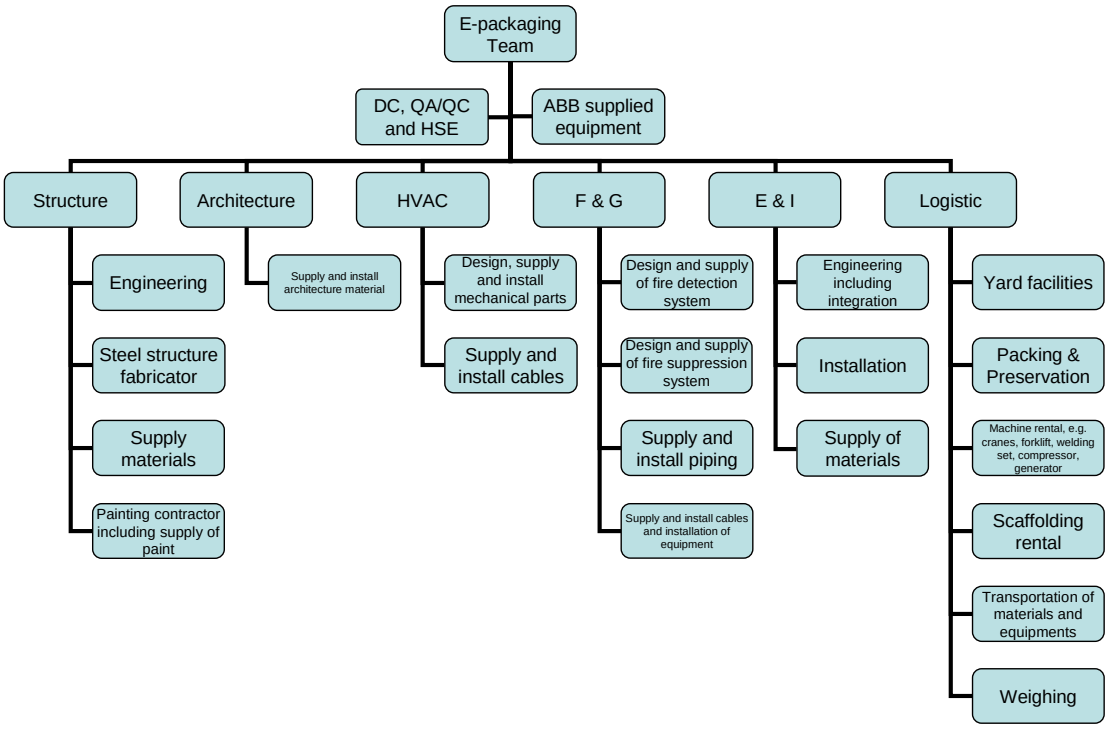
Reliability & Maintenance

- Access to trained ABB service technicians 24 hours per day 365 days per year
- Trained, skilled professional team will deliver service for all ABB products
- Spares availability.
- Warranty will deliver
  - Quick resolution to any warrantee issues
  - Gap-free, single responsibility coverage between different equipment (can not blame other equipment)
  - Easy coordinated administration



© ABB Group

Typical Project Execution Model



Our Experience

- E-House
- Telecommunication
- Automation
- Electrical

Hoan Vu Ca Ngu Vang Field Development

- **Fully Integrated Wellhead Production Platform Automation**
  - DCS, ESD, F&G Detection Systems
  - Wellhead Control Panel
  - Video, Audio and Data Telecommunications
  - CCTV
- **Power generation and distribution**
  - Twin Diesel Generators
  - Frequency Converter
  - Electrical Control Gear
  - Uninterruptible Power Supply
- **Building**
  - E&I Building
  - Emergency Shelter



Value : USD 4M

E&I Module for VietSovPetro - Vietnam

- Fixed Platform : MSP-1
- Responsible for design, integration and supply of main electrical equipment
- Implement power synchronisation solution between existing upstream & downstream systems
- Main Equipment :
  - A-60 fire rated container
  - LV & MV Switchgear
  - Transformer
  - Fire Alarm & CO_2 Fire Suppressant
  - Battery Charger
  - HVAC
- On-time project completion
- DNV certification



Value : USD 700k

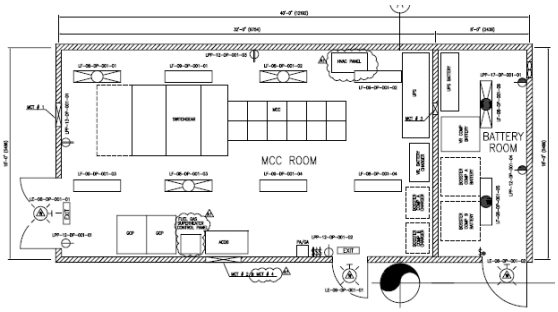
KODECO Poleng Process Platform C Development

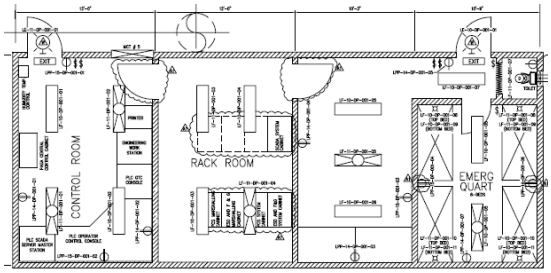
Fixed Production Platform

ABB's scope of supply includes integrated 800xA automation & safety systems, an ABB MNS LV System, 380VAC Generator Switchgears and MCC & AC Distribution Boards in two fully assembled E-houses, one control building (45 X 18 X 12 Feet; 30,000 kg), and one electrical building (40 X 18 X 12 feet; 23,000 kg).

Fire suppression systems, fire and gas detectors, potable water systems, HVAC, and UPS will also be supplied for the buildings.

In addition, ABB will provide engineering, supply, installation commissioning and start-up, as well as training of the integrated power and automation systems. The project is expected to be operational in March 2007.





© ABB Group

Kodeco Poleng Process Platform C Pictures





E-House Sub Station







Substations: SUT (Jurong Island)

Production unit: ABB Singapore

- 6.6kV Switchgear
- ABB Type tested equipment
- Customized made design
- Factory engineering & assembly
- Pre-wired, Pre-tested, plug & play
- Application: Utility Substation.

E-House Product Capabilities





- Install equipment up to 72kV GIS
- Total building size virtually unlimited
- Split into sections (33m x 7m x 7.5m) for shipping
  - Side by side building
  - Two story building
- Self-frame or rigid construction
  - R20 insulation or to spec
  - Fire-rated buildings, fire systems installed
  - Other systems integrated (safety)
- Structural and civil designed/stamped
- HVAC custom designed and built

More examples for E-Packaging













© ABB
Februar

More Example for E-Packaging



GORO PROJECT: New Caledonia





Port Warratah Coal Services :HV Sub-station

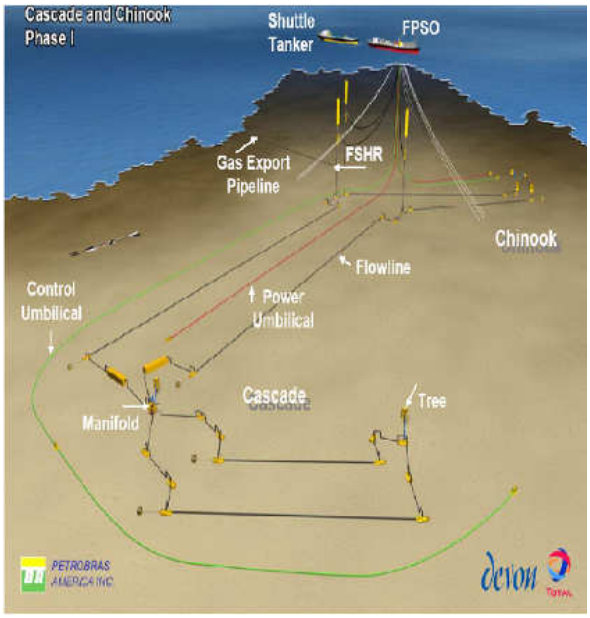


HiSmelt Project

© ABB Group
February 26, 2009 | Slide 34

FPSO - Latest Project

- **Pioneer FPSO Cascade & Chinook - BW Offshore (BWO)**
  - The FPSO will be installed on the Chinook Cascade fields, located in the Walker Ridge block, situated over 300 km south of the Louisiana coast in the beginning of 2010. Production will commence in the first quarter of 2010. The FPSO will have a storage capacity of about 600,000 barrels of oil, a process capacity of 80,000 bopd and gas export facilities of 16 mmscfd. The FPSO will be installed on the field with a water depth of 2,600 meters, probably the deepest water depth an FPSO ever has been installed on.



- **Deliveries:**
  - EPC services for Automation
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Emergency Shutdown
  - Vessel Emergency Shutdown
  - Power Management System

FPSO Project in development

- **Olowi – Fred Olsen Production**
  - The 145,000 dwt tanker Knock Allen to be converted at Dubai Dry Dock to a FPSO for operation for CNR International (Olowi) Limited offshore Gabon, Vest Africa.
  - When completed in October 2008, the FPSO will have a production capacity of 35,000 barrels of oil, 85 mmdcf gas per day and a power gen capacity of 2x27MW. The storage facilities of the vessel will hold 1.04 million barrels of oil equivalent.



- **Deliveries:**
  - EPC services for Electro and Automation
  - E-house module
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Emergency Shutdown
  - Vessel Emergency Shutdown
  - Power Management System
  - 6,6kV main Switchgear
  - 440V Process Switchboard
  - 20kVA UPS w/batteries
  - Soft starters for 5MW compressors
  - Transformers (dry and oil immersed)

FPSO Project in development

- **Maersk Woodside Vincent**
- The 380,000 dwt tanker Ellen Maersk to be converted to a FPSO at Keppel Shipyard in Singapore in 2007 and renamed Vincent.
- When completed in 2008, the FPSO will have a production capacity of 120,000 barrels of oil and 100 million standard cubic feet of gas per day. The storage facilities of the vessel will hold 1.9 million barrels of oil equivalent.



- **Deliveries:**
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Local Equipment room
  - Emergency Shut Down Systems
  - F&G systems
  - Ex Remote I/O cabinets for PCS, PSD, ESD and F&G
  - Power Management
  - Topside LV distribution boards and motor control centre
  - HV Switchgear
  - Generators Interface
  - MV Soft starter.
  - UPS
  - Trafo
  - Ex. Distribution Boards

FPSO Project in development

- **Cidade de Vitoria (Golfinho II)**
  - Vitoria, is a project where an oil tanker will be converted into an FPSO vessel with a storage capacity of 1,600,000 barrels and an oil production capacity of 100,000 barrels of oil per day. The FPSO will be used on the Petrobras field called Golfinho.



ABB Scope of Supply:

- Topside Process Control
- Topside Process Shutdown
- Topside Instrumentation
- Topside Local Equipment room
- Ship Automation System (refurbishment)
- Emergency Shut Down Systems
- F&G systems
- Topside LV distribution boards and motor control centre
- HV Switchgear
- Power Management.
- Telecom

Low Cost Fast track FPSO projects (sample)

- **Sendje Ceiba**
- The 275,000 dwt tanker Berge Hus was converted into an FPSO at Jurong shipyard in Singapore and renamed Sendje Ceiba.
- FPSO Sendje Ceiba was delivered with a production capacity of 160,000 barrels of liquids per day (bpd) and water injection capacity of 135,000 bpd. The storage capacity is two million barrels of oil. ABB (Vetco Aibel) has provided the process plant. The design life is 15 years with ten years on the field without dry docking.
- **Deliveries:**
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Instrumentation
  - Topside Local Equipment room
  - Ship Automation System (refurbishment)
  - Emergency Shut Down Systems
  - F&G systems
  - Topside LV distribution boards and motor control centre
  - HV Switchgear
  - New Generator
  - Power Management.
  - MV Soft starter.



Low Cost Fast track FPSO projects (sample)

- **Sendje Berge Upgrade**
  - Sendje Berge was upgraded in 2004 at Jurong Shipyard in Singapore after been awarded a contract with ADDAX.



Deliveries upgrade scope:

- Extension of topside Process Control
- Extension of topside Process Shutdown
- Extension of topside Instrumentation
- Extension of topside Local Equipment Room
- Extension of Ship Automation System (refurbishment)
- Extension of Emergency Shut Down Systems
- Extension of F&G systems
- Extension of Topside LV distribution boards and motor control centre
- Extension of HV Switchgear. New panels in existing switchboard.
- New Generator
- Extension of Power Management
- Delivery of Medium Voltage soft starters for Gas Injection pumps. 4,7MW.

Low Cost Fast track FPSO projects (sample)

- **Berge Helene Generic**

- The conversion of the 275,000 dwt tanker Berge Helene was completed 2003 at Jurong shipyard in Singapore. Berge Helene is a generic FPSO with a production capacity of 60,000 barrels of liquids per day (bpd) and a storage capacity of two million barrels of crude oil. The vessel is designed for extended at-sea service and to support incremental, on-location expansion of up to 240,000 bpd.



- **Deliveries generic:**
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Instrumentation
  - Ship Automation System (refurbishment)
  - Emergency Shut Down Systems
  - Topside F&G systems
  - HV Switchgear
  - Power Management

Low Cost Fast track FPSO projects

- **Berge Helene Upgrade**

- The upgrade of Berge Helene in production at Chinguetti field outside Mauritania, West Africa.



- **Deliveries for upgrade:**
  - Extension of Topside Process Control
  - Extension of Topside Process Shutdown
  - Extension of Topside Instrumentation
  - Extension of Ship Automation System (refurbishment)
  - Extension of Emergency Shut Down Systems
  - Extension of Topside F&G systems
  - Extension of existing HV Switchgear.
  - Delivery of 2 pc. 30MVA turbine generators.
  - Delivery of “new” 11kV switchboard.
  - Delivery of 6,6 kV emergency switchboard.
  - Extension of Power Management.
  - Delivery of transformers with bus-duct connection.
  - Delivery of 11 kV soft starters for Water Injection and Gas Injection pumps.
  - Delivery of 6,6kV Soft Starters for emergency switchboard.

Major customers

Pulp and paper	APP, April Group
Oil and gas	ExxonMobil, bp, Shell, ConocoPhillips, bhpbilliton, Air Products
Marine	Keppel Corporation, JSL Jurong Shipyard, NOL, MODEC
Utilities	Marubeni Business Machines (America) Inc., SP PowerAssets, Lilama, Public Utilities Board, Ministry of the Environment and Water Resources, Hydro
Chemical and pharma	Schering-Plough, Lucite International, Lonza, Huntsman, DuPont
EPC	Chiyoda, Kawasaki, Mecomb, JGC, Hamworthy Fluid Innovation

Latest Reference projects

Utilities:
SEC Saudi
Enmax Power
Enmax Energy
ATCO
TransAlta
Epcor
Fortis Inc.
Canadian Hydro Developers
Canadian Gas and Electric
BC Hydro
AltaLink
NRG Gladstone Power Station
Power & Water Darwin
SUT Jurong Island (Singapore)
NRG Gladstone Power Station
Yallourn Origin Energy,
Dampier Port Upgrade Sakhalin
Island (Russia)
11kV Darwin LNG (Cogen)

Oil and Gas Related:
Shell (Canada)
Kumtor (Kyrgyzstan)
AEC Pipelines
Westcoast Energy
Imperial Resources
BP
Gulf Midstream
Irving Oil
EnCana Oil and Gas
Exxon Mobil
PetroCanada
Union Carbide
Express Pipelines
Nexen Petroleum
PetroKazakstan
LNG (Angola)
Ambatovy (Madaghasker)
Co. Minera Zaldivar (South America)
Zhungeer Coal (China)
City Investing (South America)
MHI (Australia)
Cummins (Saudi Arabia & Australia)
Newcrest Telfer
Bechtel Darwin LNG
Bass GasProject (Australia

Oil and Gas Related:
Continued
PetroSov Vietnam (Singapore)
Kodeco PPP Indonesia (Singapore)
Hoan Vu- Ca Ngu Vang (Singapore)

Latest Reference projects

Tar Sands Area:

Syncrude Canada
Suncor Energy
Albian Oil Sands
Canadian Natural ResourcesLtd.

Mines:

Luscar Coal
Cardinal River Coal
Highland Valley Copper
Elk Valley Coal
Wabush Mines
Iron Ore Co. of Canada
Western Energy
Sakallin Island – Russia
Port Warratah Coal Services-
Australia

Industries:

Crown Industries
Patton and Cooke
Bechtel- Suez Ammonia –Egypt
ALINTA Wagerup GT

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Power and productivity
for a better world™