Offshore / FPSO project
ABB offshore solution

ABB Oil, Gas & Petrochemical: Portfolio

Technology | Expertise | Experience
---|---|---
- Electrical, Control, Instrumentation and Telecommunication (ECIT)
  - Electrification systems
  - Control & Automation systems
  - Instrument, Products and Analytical systems
  - Telecommunications systems
- Upstream and Midstream Plants on EPC basis
- Lifecycle services
ABB Oil & Gas Organisation Profile

- Oil, Gas & Petrochemical
- Four centers of excellence:
  - Oil & Gas related vessel (Norway)
  - Offshore Oil & Gas (Norway)
  - Cruise & ferries (Finland)
  - Crane and harbour systems (Sweden)
- Two centers of competences
  - Drilling application (Singapore)
  - Offshore FPSO Engineering Center (Singapore)
- Global Service
  - 19 Marine Service Centers (MSC)

ABB Open Offshore engineering centre in Singapore for the Oil & Gas Market.

- Business Times, 2nd Feb 2009
- Upstream, 6th Feb 2009

ABB expands
ZURICH-headquartered ABB plans to open an engineering centre in Singapore targeting the floating production, storage and offloading unit market. Building on its experience with marine and offshore systems and solutions, ABB chose Singapore because it “accounts for 40% of the global market for rig building. FPSO conversion, ship repair and related activities.”
What ABB can offer for your Offshore & Onshore requirements

Contents

- FPSOs & Platforms Deliveries
- Value of E-House Solutions
- References
- Global Services
Offshore Platforms / FPSO / FSO
ABB Offering (1)

- Electrical System & Power Management
- Automation & Safety System
- Instrumentation
- Telecom system
- E-House / CER
- Engineering / System studies & analysis
- Project Management
- Life Cycle Support & Service Environment

Offshore Platforms / FPSO / FSO
ABB Offering (2)

- Containerized Equipment Room, Class 1 Zone 2
  - Optional for Blast rated
  - Fire Rated E-House with Zone rated Battery Room & Transformer Room.
  - HVAC & ducting with Pressurize & optional Purging System
  - Fire & Gas Detection System
  - Fire Suppression System
- Electrical (E)
  - Power Generation & Distribution, Electric Motors & Drives
  - Power & Energy Management
  - AC/DC Drives
- Automation (C)
  - Integrated Safety & Control
  - Instrumentation & Process Analyzers
  - Flow Metering, Metering Skids & Tank Gauging
  - Enhanced Operations & Production
  - Information Management
- Telecom (T)
  - Satellite Systems
  - Radio Systems
  - Entertainment Systems
  - CCTV, PABX, PA&A
  - Meteorology
- Life Cycle Simulator
  - Operator Training
  - Modification Support
### Scope of Supply

Scope varies based on customization

<table>
<thead>
<tr>
<th>Package</th>
<th>Type</th>
<th>Discipline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Voltage Switchgear &amp; MCC</td>
<td>33kV Switchgear &amp; 11kV RMU</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>66kV</td>
<td></td>
</tr>
<tr>
<td>Low Voltage Switchgear &amp; MCC</td>
<td>400V</td>
<td>E</td>
</tr>
<tr>
<td>Bus Ducts</td>
<td>11kV, 6.6kV, 400V</td>
<td>E</td>
</tr>
<tr>
<td>Transformers &amp; NERs</td>
<td>Distribution/Power/Oil/Dry</td>
<td>E</td>
</tr>
<tr>
<td>UPS &amp; Batteries</td>
<td>AC &amp; DC</td>
<td>E</td>
</tr>
<tr>
<td>Motors &amp; Drives</td>
<td>MV/LV</td>
<td>E, (C)</td>
</tr>
<tr>
<td>Electrical Control System (ECS)</td>
<td>Power Management System(PMS)</td>
<td>E, C</td>
</tr>
<tr>
<td></td>
<td>Power Distribution Control System(PDCS)</td>
<td>E, C</td>
</tr>
<tr>
<td>Process Control System (PCS)</td>
<td>Process Control &amp; Shutdown</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Advance Applications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simulator</td>
<td></td>
</tr>
<tr>
<td>Safety Instrumented System (SIS)</td>
<td>Emergency Shutdown (ESD)</td>
<td>C, 1</td>
</tr>
<tr>
<td></td>
<td>High Integrity Safety System</td>
<td></td>
</tr>
<tr>
<td>Instrumentation</td>
<td>Process, Analytics, Metering</td>
<td>I</td>
</tr>
<tr>
<td>Telecommunication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>Power System Studies</td>
<td>E, C, I, T</td>
</tr>
<tr>
<td></td>
<td>Installation, Commissioning,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation, Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

### FPSO/FSO/Platforms

Integrated Power & ICSS System

[Diagram of FPSO/FSO/Platforms]

[Diagram of FPSO/FSO/Platforms]
Offshore Platforms / FPSO
Integrated Electrical System

- LV Distribution
- Industrial Ex
- 400/230V
- LV Motors
- UPS
- Battery
- Indoor AIS
- LV Distribution Transformers
- HV Drives
  - Compressors
  - ESP
  - Water injection
  - Etc

Offshore Platforms / FPSO
Typical Integrated Control & Safety System
Offshore Platforms / FPSO
Typical Telecom System

E-House for Petrobras Tupi Field
FPSO
E-House / LER

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

ABB as One Stop Solution!

- OIL
- CER
- TELECOMMUNICATION
- AUTOMATION
- ELECTRICAL
- GAS
- PETROCHEMICAL
Contents

- FPSOs & Platforms Deliveries
- Value of E-House Solutions
- References
- Global Services

Value for E-House solutions?

- 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
What is CER or E-House?

- Prefabricated steel structure building to house all Electrical & Control equipments in a safe area.
- Design to meet Offshore (or) onshore requirements.
- Integration of all components Switchgears, Transformers, VFDs, 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
- Close the gap between Systems and commodity products offering

Equipment Interconnecting & Pre-Commission
An MAV/MEV Project Organisation

Why CER / E-House?

- 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 disputes & stoppages
Salient of E-House

- **Why doesn’t Every Equipment vendor do it?**
  - Most focused on selling product not solutions. (Take an order; Not responsibility)
  - Most don’t have the product range to package.
  - Most lack the multiple technical disciplines needed e.g. Structural, Mechanical, Electrical.
  - Most lack true 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

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
Project Cost Control

- Significantly diminished potential for scope overlap or conflict
- Knowledge of local standards & conformance
  - 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

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
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

Value for E-House Solutions
Motivation - Hidden Cost

![Diagram showing hidden costs and known costs.](image-url)
## ABB Scope

### Modular Concept versus Conventional Concept

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Modular Design Approach</th>
<th>Integrated Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination</td>
<td>Single Vendor</td>
<td>Multiple Vendor</td>
</tr>
<tr>
<td>Product Knowledge</td>
<td>Good Product Knowledge and integration experience</td>
<td>Good product knowledge for its own discipline, problems arise from interfacing</td>
</tr>
<tr>
<td>System Knowledge</td>
<td>Good System Knowledge and integration experience</td>
<td>Good system knowledge for its own discipline, problem arises from interfacing to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other systems</td>
</tr>
<tr>
<td>Engineering Capability</td>
<td>Multiple discipline within one vendor</td>
<td>Multiple discipline from different vendor</td>
</tr>
<tr>
<td>Project Management</td>
<td>Single Point Contact for complete offering</td>
<td>Many Product Managers for individual product</td>
</tr>
<tr>
<td>Project Cost</td>
<td>Significant reduction, less variation order</td>
<td>May incurred cost over run if not properly managed by experienced engineer for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>various disciplines</td>
</tr>
<tr>
<td>Warranty</td>
<td>Warranty from single vendor</td>
<td>Warranty from multiple vendors and dispute on problem may arise</td>
</tr>
<tr>
<td>Delivery</td>
<td>Easier to expedite delivery and manageable</td>
<td>May cause other vendor to delay due to predecessor delayed</td>
</tr>
<tr>
<td>HSE / OHS</td>
<td>Less risk with single vendor manage the project within the same location</td>
<td>Possibilities of risk due to different working attitude and culture from multiple vendor</td>
</tr>
<tr>
<td>Quality Control</td>
<td>Easy for traceability and manageable from single vendor</td>
<td>May cause quality disputes among vendor; traceability need longer process from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>multiple vendor</td>
</tr>
</tbody>
</table>

### Contents

- FPSOs & Platforms Deliveries
- Value of E-House Solutions
- References
- Global Services
Petrobras Cidade de Angra dos Reis MV 22 (Tupi 1) (Loaded out on 20 Nov 09)

- Project background:

MODEC awarded the Main Electrical Vendor (MEV) contract to ABB in Feb 2009. It was a very challenging order for ABB because all the equipment and buildings, had to be delivered within 9 months, approx 700mTon

- FPSO Topsides: Module 8P
- Responsible for design, fabrication, integration and supply of main electrical equipment
- Main Equipment:
  - A-60 fire rated E-house
  - LV & MV Switchgear
  - Fire Alarm & CO2 Fire Suppression
  - HVAC
  - Interconnect Cabling within E-House
- 3m Truss support
- ABS certification

--BP Angola FPSO

- BP Angola – MODEC

- The FPSO will have production capacity of 157,000 barrels per day and first oil from the development is scheduled in 2011.

Deliveries – FPSO Topsides
- MV Switchgear
- LV Switchgear
- Power Management System
- Transformers
- FPSO Marine Hull
- LV Switchgear
Petrobras Cidade de SaoPaulo MV 23 (Tupi Field) (Project Ongoing)

- Project background:

MODEC awarded the Main Electrical Vendor (MEV) contract to ABB in Feb 2010. It was a very challenging order for ABB because all the equipment and buildings, had to be delivered within 12 months, approx 1000mTon with maximum Brazil content.

- FPSO Topsides : E-House Module
- Responsible for design, fabrication, integration and supply of main electrical equipment
- Main Equipment:
  - A-60 fire rated E-house
  - LV & MV Switchgear
  - Fire Alarm & CO2 Fire Suppression
  - HVAC
  - Interconnect Cabling within E-House
- 3m Truss support
- ABS certification

Hoan Vu JOC-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

- Equipment Room
  - E&I Building
  - Emergency Shelter
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 & CO₂ Fire Suppressant
  - Battery Charger
  - HVAC
- On-time project completion
- DNV certification

KODECO Poleng Process Platform C Development

- Fixed Platform: 1 nos. Elect Module & 1 nos. of Inst Module
- 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
  - MNS 380 LV Switchgear & MCC
  - 800xA ICSS System
  - Fire Alarm & CO₂ Fire Suppressant
  - UPS System
  - HVAC
  - Potable Water System
Peregrino FPSO & Wellhead
(Delivered in June 2009)

- Owner: Maersk
- Yard: Keppel Shipyard

Deliveries:
- FEED Studies for Electro and Automation
- Engineering services marine conversion
- Hullside Process and Safety Systems
- Topside Process and Safety Systems
- Power Management System
- Ex Remote I/O cabinets for PCS, PSD, ESD and F&G
- 3x24MVA Generators
- 13.8kV Switchgear & 6.6kV Switchgear
- 440V / 220V Process Switchboard
- UPS w/batteries
- Transformers (dry immersed)
- VSD for LV
- IS Limiters

Deliveries - Wellhead Platforms
- Integrated Process and Safety Systems
- Power Management System
- 13.8kV Switchgear
- 4.16kV Switchgear
- 380V LV
- VSD MV
- Transformers (oil immersed)

The FPSO and the two wellhead platforms will be installed on the Peregrino Field located offshore 85 km south-east of Rio de Janeiro, Brazil. The recoverable resources are estimated at between 300 million and 600 million barrels of heavy oil (API 14). There will be 30 horizontal production wells and 7 water injection wells. Production will commence in the first quarter of 2010.

Pioneer FPSO Cascade & Chinook
FPSO at field

- Owner: BW Offshore (BWO)
- Yard: Keppel Shipyard

Deliveries:
- Electrical System
  - MV Switchgears
  - Cargo pump VSD system
  - Compressor Soft Starters
- Integrated Process Automation System
  - EPC services for Automation
  - Topsides Process Control
  - Topsides Process Shutdown
  - Topsides Emergency Shutdown
  - Vessel Emergency Shutdown
  - Power Management System

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.
Knock Allan FPSO Project
Delivered 2008

- Owner: Fred Olsen & Co
- Yard: Dubai Dry-dock

- Deliveries:
  - E-House
  - topside Local Equipment Room
  - Electrical System
  - 6.6kV main Switchgear
  - 440V Process Switchboard
  - 22kVA UPS batteries
  - Soft starters for 5MW compressors
  - Transformers (city and oil immersed)
  - Integrated Process Automation System
  - EPC services for Electro and Automation
  - Topside Process Control
  - Topside Process Shutdown
  - Topside Emergency Shutdown
  - Vessel Emergency Shutdown
  - Power Management System

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, West Africa.

When completed in October 2008, the FPSO will have a production capacity of 35,000 barrels of oil, 85 mmstd 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.

FPSO Vincent
Delivered 2008

- Owner: Woodside
- Buyer: Maersk

- Deliveries:
  - Electrical Switchboard
    - Topside LV distribution boards and motor control centre
    - HV Switchgear
    - New Generators (Interface)
    - MV Soft starter.
  - Integrated Process Automation system
    - Topside Process Control
    - Topside Process Shutdown
    - Topside Local Equipment room
    - Vessel shut down Systems
    - F&G systems
    - Power Management.

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.
E-House Sub Station

Substations: SUT (Jurong Island)

- 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
Major customers

- Pulp and paper
  - PETRONAS
  - ExxonMobil
  - bp
  - MODEC

- Oil and gas
  - BP
  - Royal Dutch Shell
  - Total
  - ENI

- Marine
  - Aker
  - STX
  - DSME
  - Hudong

- Utilities
  - Iberdrola
  - E.ON

- Chemical and pharma
  - BASF
  - TITAN

- EPC
  - ALSTOM
  - Technip
  - HITACHI

Offshore & FPSO Project References (1)
### Offshore & FPSO Project References (2)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year</th>
<th>Country</th>
<th>Owner/Operator</th>
<th>EPC/Client</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Offshore & FPSO Project References (3)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year</th>
<th>Country</th>
<th>Owner/Operator</th>
<th>EPC/Client</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© ABB Group  
April 1, 2010 | Slide 54

© ABB Group  
April 1, 2010 | Slide 55

© ABB Group  
April 1, 2010 | Slide 56