Renovation and Modernization of Ageing Power Plants
India has a large Installed base of Older Power Stations
Almost 40GW of Coal Fired capacity more than 15 years old

- India has 200 Units of 100MW to 300MW Coal Fired which are more than 15 years old.
  - Several of these units are owned by State Owned Utilities or State Electricity Boards.
  - Most of the Machines are 110MW of 210MW BHEL Siemens KWU design
  - For Example, Mahgenco MSEB has around 24 Units of similar range with a installed capacity of 4.5 GW
  - These older units present operational and maintenance hazards due to dated mechanical and Electronics in the Control and Instrumentation systems
  - Need to address the Obsolescence issues from the Controls and Instrumentation is higher than ever.
    - Inefficient Operations
    - Loss of ignition
    - Environmental Pollution
    - Wastage of Fuel
    - Safety
    - Cyber Security
Upgradation or Modernization of Older Power Station Control System to the latest System Advantages

**Reduced Maintenance Costs**
- Aging technology has limited maintenance ability
- Spares are rare and expensive
  - Increased thermal stresses and plant equipment degradation resulting from unstable unit control
  - Upgrade eliminates the above
- Moreover a single integrated Unit for complete plant control system removes multiple disparate control systems in the unit thereby unifying the plant controls under one system.

**Improved Unit Heat Rate**
By eliminating analog system drift and hysteresis, a new DCS system provides operational savings through tighter set point control. Higher Control strategies result in

- Fuel savings from reduced start up time
- Holding SH and RH temperatures and throttle pressure closer to design values
Upgradation or Modernization of Older Power Station Control System to the latest System Advantages

**Improved Unit and Plant Availability**
- With new improved latest control systems, the failure rate is reduced by more than half.
- We expect the unscheduled outages to be reduced by 30% for a plant which adapts a complete control and instrumentation upgrade at the units.

**Asset Management**
- With new instruments and Asset Management the Plant owners can realized the complete values for the new improved hart and intelligent field devices thereby improving the overall efficiency of the power plant.

**Cyber Security**
- With our offerings around Cyber Security, we can work with the Customers to deliver an upgraded Power station control system with cyber hardened workstations and foolproof firewall operations
RRVUNL KOTA Unit 3 & 4 Renovation and Modernisation Project 2014

Rajasthan Rajya Vidyut Utpadan Nigam Limited - RRVUNL
Department Of Energy Government Of Rajasthan
Current installed capacity: 5957MW

1. Suratgarh STPS, 1500 MW
2. Kota STPS, Kota, 1240 MW
3. Chhabra lower Station, 1000 MW
4. Kalisindh Thermal Power Station, 1200 MW
5. Dholpur CCPS, Dholpur, 330 MW
6. Giral Lignite TPS, Giral, Distt. Barmer, 250 MW
7. Ramgarh Power Station, 273.50 MW
8. Mahi Hydel Power Station, 140 MW
9. Mini Micro Hydel, 23.85MW
Client: RRVUNL - Generation wing of Rajasthan State Government

Project: KOTA Units 3 & 4 DCS R&M
- **Unit 3** - Commissioned 25th September 1988
  - Pe - 210MW
- **Unit 4** - Commissioned 1st May 1989
  - Pe - 210MW

Objective: Upgrade CONTRONICS Control System

Overall Project CapEx: $5 MUSD including SG/TG C&I
RRVUNL KOTA Unit 3 & 4 Renovation and Modernisation Project 2014

Building The Business Case For RRVUNL

- RRVUNL completed their first R&M project using private sector resources.
- RRVUNL Initial R&M projects engaged Government sector resources on a nomination basis.
- RRVUNL was motivated and dissatisfied with the performance of their current automation suppliers.
- RRVUNL was a new client to Schneider Electric with no installed product base.
- RRVUNL had engaged with Schneider Electric at several strategic project entry levels

- Managing Director: Business and Financial Planning and Project Funding approvals.
- Engineering Design team: Aligning and Engaging technologies to ensure resolution of project objectives.
- Site installation team: Planning and Realization of project objectives to ensure plant requirements are met.
Critical Project Success Factors

- Early Engagement with customer project identification and needs analysis
  - Identification as a supplier with expert subject matter knowledge
  - Validated as engaging certified project engineering management processes and COP’s.
  - Verified as completing R&M projects to agreed schedules meeting critical path milestones.
  - Certified EVO engineers
  - Validated large project delivery
    - NTPC 6 x 500MW
    - TATA POWER 5 X 800MW.

- Development of key relationships between Key Decision Makers
  - Identification and realization of effective project communication channels.
- Project Scoping and Definition.
- Development and ownership of key tasks and deliverables (Who does What and When)
- Development and agreement on project standards, EDCS.....
Control System Refurbishment Castle Peak ‘B’ Power Station by SE PA Team in 2001-2005
Introduction to CLP Hongkong

- Location: Hong Kong
- Joint venture between China Light & Power Co. Ltd. and Exxon Mobil Energy Ltd.
- Hong Kong largest power station and one of the largest coal fired stations in the world
- Project Investment: US$12M
- Generating capacity 4X350MW (A Station) and 4X680MW (B Station)
Control System Refurbishment Castle Peak ‘B’ Power Station in 2001-2005

• Objectives of Refurbishment

  • To provide long term solution to mitigate spare obsolescence problem
  • To enhance plant operation and monitoring
  • To reduce maintenance efforts
  • To provide potential increase in unit thermal efficiency
  • To provide energy saving in unit start up
Control System Refurbishment Castle Peak ‘B’ Power Station in 2001-2005

• MAV Scope of Supply (Equipment)
  – I/A Series DCS System
  – Unit Control Desk (UCD)
  – Unit Control Panel (UCP)
  – Large Screen Display Unit (LDU)
  – Global Positioning System (GPS)
  – Uninterruptible Power Supply (UPS)
  – Intelligent Positioner’s
  – Electric Actuators

• MAV Scope of Supply (Services)
  – Project Management & Engineering
  – 3rd Party Equipment Procurement
  – Internal Testing & Factory Acceptance Test
  – Commissioning & Start Up
  – 2 Years Warranty Upon Issued Certificate Of Provisional Acceptance
Control System Refurbishment Castle Peak ‘B’ Power Station in 2001-2005

- With 30,000 I/Os, 36 Pairs CP60, 20 OWS, 4 EWS, and 4 HWS
- With 336 Intelligent Positioner and 32 Electric Actuator
- From Contract Award To FAT of 1st Unit – 6 Months
- From Contract Award To Completion of 1st Unit – 12 Months
- From Contract Award To Completion of 4 Units – 36 Months
Control System Refurbishment Castle Peak ‘B’ Power Station in 2001-2005

Key success factors are:

• Committed project teams in both CLP Power and Invensys
• Provision of accurate plant information
• Sound and proven design of controls
• User developed process graphics
• Experienced and professional installation team
• Effective operator training
New Emission Control (EC) Projects Engaged SE PA - 2008 to 2012

• The new FGD, BOFA/SCR Control systems are to integrate seamlessly with the existing four retrofitting 680 MW generating units. E.C. project is CLP’s commitment to enhance their environment performance of its coal fired (Incl. Gas + Oil fired) power plant
  • Total value : USD 5.3 Mil
  • Total I/O: nearly 10,000
  • Portfolio offering :
    • Foxobro I/A DCS
    • Triconex for Boiler Protection
    • Integration Consulting Services

Emission Control Projects
Boosted Over Fire Air (BOFA)
Selective Catalytic Reactor (SCR)
Flue Gas Desulphurisation (FGD) with booster fan and bypass damper
Boiler Protection System Extension Upgrade (BPSEU)
Existing Power Generation Units’ Boiler Control DCS Upgrade
Vattenfall Europe Berlin
Requisition for DCS-Revamp
CHP Reuter West: Two identical Units
Overview each Unit

Boiler Once Through Benson Type, w LowLoad System
Life Steam: 1000 t/h, 540 °C, 196 bar
Single Reheating: 540 °C, 49 bar

Firing Hard Coal, 4 Mills, 16 Burners, LowNox
Support Firing by Bunker C Heavy Oil

Turbine KWU 3-Stage PassOut-Cond-Turbine, 300 MW
 Eight Stage Feedwater Heating
3000 r/min, 353 MVA, 22 kV, H2 Cooling

Heat PassOut via 2 Heatcondensers and
1 Heatexchanger, max. 360 MW th

Scrubber DeNox, DeDust, FGD
Legacy Control System..Obsolete Instrumentation
..Inflexible Operation..& Service Problems
Requirement of Retrofit

The following requisition for a new control system concept has to be guaranteed by the control system supplier:

- Increment of Plant-availability
- Early recognition and fast remove of plant-alarms and -errors
- More flexible operation of Units (D and E)
- Better navigation of both Units (D and E)
- Reduced Plant downtime and improved Asset Management
- Reduced maintenance cost by carefully plant-operation
- Time-optimized startup- and synchronization procedures
Objectives for Plant Operation

- Operation of both Units and BOP by one Operator (First level) via Large Projection Screens
- Solving abnormal Situations handed over to other Personal on (Second Level) Operator Stations
- Fully automatic unit warm and hot start-up
- Secure Load Run Backs for Plant Disturbances
- Rapid Load Ramping, Supporting Primary and Secondary Grid Control
- Automatic Synchronisation of both Units to the Grid
## Existing Measuring, Control Systems and Safety Systems

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitters</td>
<td>0 - 20mA, 4 - wire</td>
</tr>
<tr>
<td></td>
<td>4 - 20mA, 4 - wire</td>
</tr>
<tr>
<td></td>
<td>4 - 20mA, 2 - wire</td>
</tr>
<tr>
<td>Control System</td>
<td>Siemens Teleperm C</td>
</tr>
<tr>
<td></td>
<td>Simadyn (Turbine)</td>
</tr>
<tr>
<td>PLC</td>
<td>Iskamatik B</td>
</tr>
<tr>
<td></td>
<td>Iskamatik K</td>
</tr>
<tr>
<td></td>
<td>Siemens S5</td>
</tr>
<tr>
<td>Safety System</td>
<td>Siemens HSS31</td>
</tr>
<tr>
<td>Process Computer</td>
<td>Krupp Atlas</td>
</tr>
</tbody>
</table>
Project Scope Schneider Electric Process Automation

- Exchange Control system, Safety system and Process Computer System for Unit D and E and auxiliary units by a new modern digital Control system.
- Exchange of the Controlsystem for Turbine and the Turbine of the Feedwater-Pump (KSPT) with all necessary mechanical adaptations.
- Centralization of local Control rooms for Unit D and E and all auxiliary units incl. reconstruction of the existing main Control room, during plant operation.
- Monitoring and visualization of FGD (Flue Gas Desulfurization) will be part of the new CR. Existing controlsystem for the FGD Unit will not be changed.
- Renewal of plant equipment to eliminate weak points and to increase the level of automation.
### Criteria for Decision

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Status</th>
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<tbody>
<tr>
<td>Quotation Concept</td>
<td>✔️</td>
</tr>
<tr>
<td>Open DCS System, Long Life Architectur</td>
<td>✔️</td>
</tr>
<tr>
<td>Comprehensive Engineering System with Productivity Tools</td>
<td>✔️</td>
</tr>
<tr>
<td>Highest Available Burner Management, ESD &amp; Turbine Control</td>
<td>✔️</td>
</tr>
<tr>
<td>System Features guaranteed</td>
<td>✔️</td>
</tr>
<tr>
<td>References and Engineering Competence</td>
<td>✔️</td>
</tr>
</tbody>
</table>
Central Control Room & HMI
Central Controlroom

Controlroom

- 1. Level: 1 off Operator and Large Screen (4 Cubes/Unit)
- 2. Level: 3 off 18” TFT Monitors per Operator console
- Tables for all Operator consoles adjustable for height
- New Operator-HMI-concept for optimal Operation with flexible use of personal on shift
- Elimination of all local controlrooms
Example 1st Level Operatorconsole

- One Keyboard and Mouse for simultaneous operating of four 50” screens
- Separate Unit Operation possible.
- Both consoles with equal rights and can operate both Units with one console (Redundancy)
- Operator is normally not responsible for removing Processalarms

Focus on Monitoring of both Units D & E und all auxiliary Units with one Operator, for „straight on“-production control
Renunciation on local controlrooms

Central controlroom with modern & ergonomic Design and with a new operator HMI concept
If you answer YES or your plant MEETS any of the following criteria please speak to a Schneider Consultant for the right solution for your plant.

• Statistic: 50% of the DCS (distributed control system) platforms running process plants today are at least 20 years old.
• There are two main drivers for control system upgrades: obsolescence and functionality needs.
• If part of a system goes down and there are no replacements, a whole process unit can grind to a halt.
• If you are experiencing downtime, the ROI is easy to calculate. But it’s hard to calculate it based on no downtime.
• Operational excellence Solutions like
  • asset management
  • information management
  • data mining
  can really give you a competitive advantage if used properly. A traditional control system has to be enhanced with these capabilities.
• Customers are migrating not because of obsolescence, but because of lack of performance from their systems.
  It doesn’t necessarily mean it isn’t controlling the process. It means that they aren’t able to get data that they need out of the system to be able to make better decisions.
Closing Thoughts

• Useful questions to ask yourself early in the process:
  
  • What’s your cost of doing nothing?
  
  • What are the expected benefits of doing the migration?
  
  • How much is that unplanned shutdown costing you?
  
  • What is the cost of inadequate response?
  
  • What is your actual cost of maintenance for this older system?
  
  • How much are you paying for replacement hardware at the parts recycler.
THANK YOU.