



## Load Management System and HMI Monitoring

### TYPE OF PLANT

#### Vessel

- Two boilers
- 1 x Steam turbine for propulsion on single screw
- 3 x Steam turbine gensets.
- 2 x Auxiliary diesel engines for mixed function either:
  - Power generation
  - Auxiliary propulsion
- Speed; 20knots
- Launched; 1953

### PRIME MOVER

#### 3 x Condensing Turbine Generators

- GE 3600rpm
- 2000kW
- 450V delta wired

#### 2 x Diesel Engine mixed function

- CAT 3412, 1800rpm
- 1600kW or 700hp Water jet
- 4160V delta wired

### CONTROL TECHNOLOGIES

#### Woodward Atlas

Redundant Load sharing (KW/KVar), bus-tie logic, genset synchronizing, monitoring and overspeed detection.

#### Woodward SPM-D

Bus tie synchronisation.

#### Woodward 723+

Diesel genset startup and speed control.

#### HMI / SCADA System

Touch-screen terminal in the ECR (Engine Control Room) for control, monitoring, alarming, trending and event logging.

### PROJECT OVERVIEW

A military surveillance vessel with two boilers providing steam for the main propulsion turbine and the three condensing steam turbine generators. Each steam turbine generator can provide 2000Kw of electrical power. Additionally there are two auxiliary Diesel generators of 1600Kw each. The auxiliary engines have a dual function and can be used to provide additional propulsion power should the main turbine fail.



A split bus arrangement allows the turbines to supply power to the 450V mission distribution bus with the auxiliary generators supplying a 4KV bus. These two busses can be connected through a transformer and another bus tie. Synchronization of this bus tie (BT4KV) is done

through a SPM-D that adjusts the auxiliary gensets with reference to the 450V bus. SPM-D's are also used to synchronize the other bus ties with the adjusted and reference buses dependent upon which switchboard is used to initiate the synchronization process.

Speed is controlled on the steam turbines by an old GE mechanical governor while on the diesel gensets a 723 speed control and actuator are employed. For all gensets the Atlas control is used to synchronize the generator to the bus as well as for all the required loading/unloading and loadshare functions.

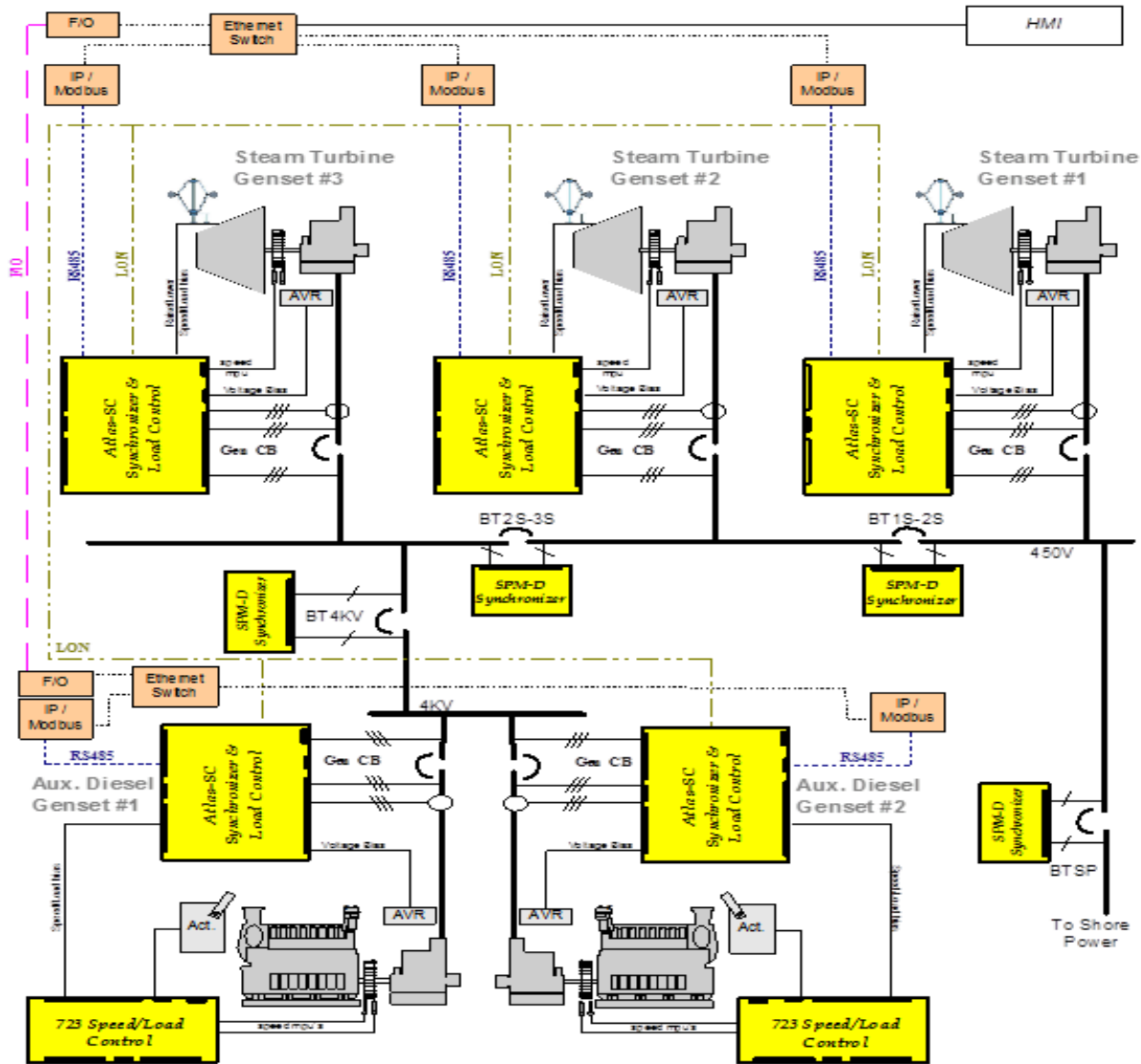
The AVR's on the turbines are Basler D400 and on the diesel engines are Basler VR3/VR6 Voltage matching and power factor control are achieved through a bias signal from the Atlas control.

Control and transfer to and from the shore power is also a function of the Atlas controls.

There is an HMI in the control room that is used to view all alarm and trending data from these units to aid in troubleshooting or reporting.



# PROJECT OVERVIEW : MILITARY VESSEL, STEAM TURBINE & DIESEL ENGINE GENSETS



## Standard EGCP3-LS functionality Utilized:

- Start & Stop Control Functions including:
  - Dead Bus or Live Bus synchronizing
  - Automatic or manual synchronizing
- Fuel Scheduling Functions including:
  - Isochronous Load sharing (Kw/PF)
  - Auto unload and trip GCB
  - Fuel Limiting Functions for engine/ gen. Protection
  - Softloading/unloading

## Additional functionality Incorporated:

- Start & Stop Control Functions including:
  - AVR enable logic
  - AVR suppression logic
  - Reverse bus tie synchronization
  - Shore power synchronization over LON
- Fuel Scheduling Functions including:
  - Auto load and trip BTSP
- Safety & Alarm Functions
- Modbus for HMI Monitoring
- OPC server access for SCADA system

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