

**ESB**

Bord Soláthair an Leictreachais

# **NORTH WALL GENERATING STATION**

## INTRODUCTION

The North Wall Generating Station is located at Alexandra Road, near Alexandra Basin on the North side of the River Liffey.

North Wall was the first thermal generating station to be built by the E.S.B. Following extensive conversion and redevelopment, the station was given a new lease of life in 1982. At this stage it became the first major user of natural gas in the Dublin area, and quickly attained its position as the most efficient thermal unit on the system.

Generated power is fed to the National Grid at 220kV and directly into the local city network at 38kV. Station output is now 270 MW.

The first development of the station comprised four 40,000 lb/hr natural circulation, oil fired Babcock and Wilcox boilers and one 12.5 MW Stal turbo alternator. The boilers were erected as part of an oil refinery project and were purchased by the E.S.B. in 1947. The turbo alternator was originally purchased for a station at Portarlinton but was erected at North Wall.

The second development comprised two 75 ton/hr. oil fired Velox boilers and two 17 MW Brown Boveri steam turbo alternators. These units were commissioned in 1953. An additional unit was erected and commissioned in 1963. At this stage the Stal turbine was re-located in Portarlinton and the Babcock and Wilcox boilers were subsequently retired.

North Wall ran with its capacity of 51 MW from then until 1980 when it was taken out of service.



## THE PRESENT DEVELOPMENT:

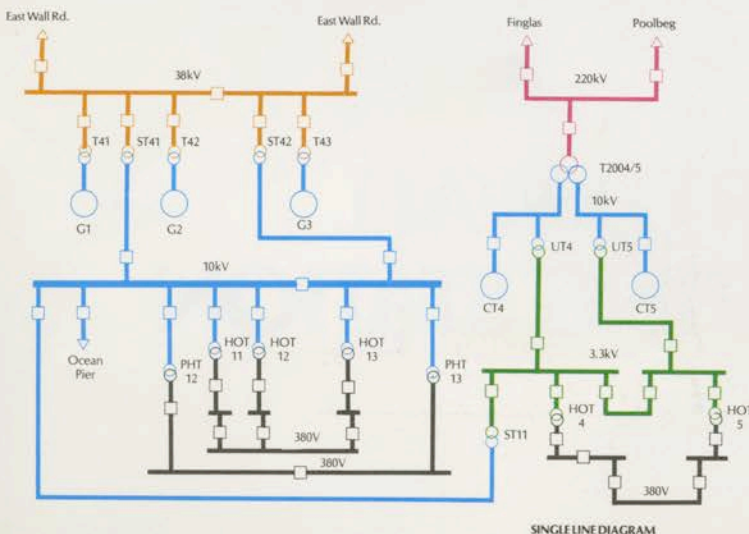
The steam plant is repowered as a combined cycle from a General Electric gas turbine. A second gas turbine is designed to operate in simple cycle. The steam turbines are rerated at 16 MW.

Gas from the Natural Gas Grid **1** (see Schematic diagram) is taken into the Station and compressed to 20 bar in the compressor house **2**. Alternatively, distillate from the fuel storage tanks **3** can be used to fuel the gas turbines.

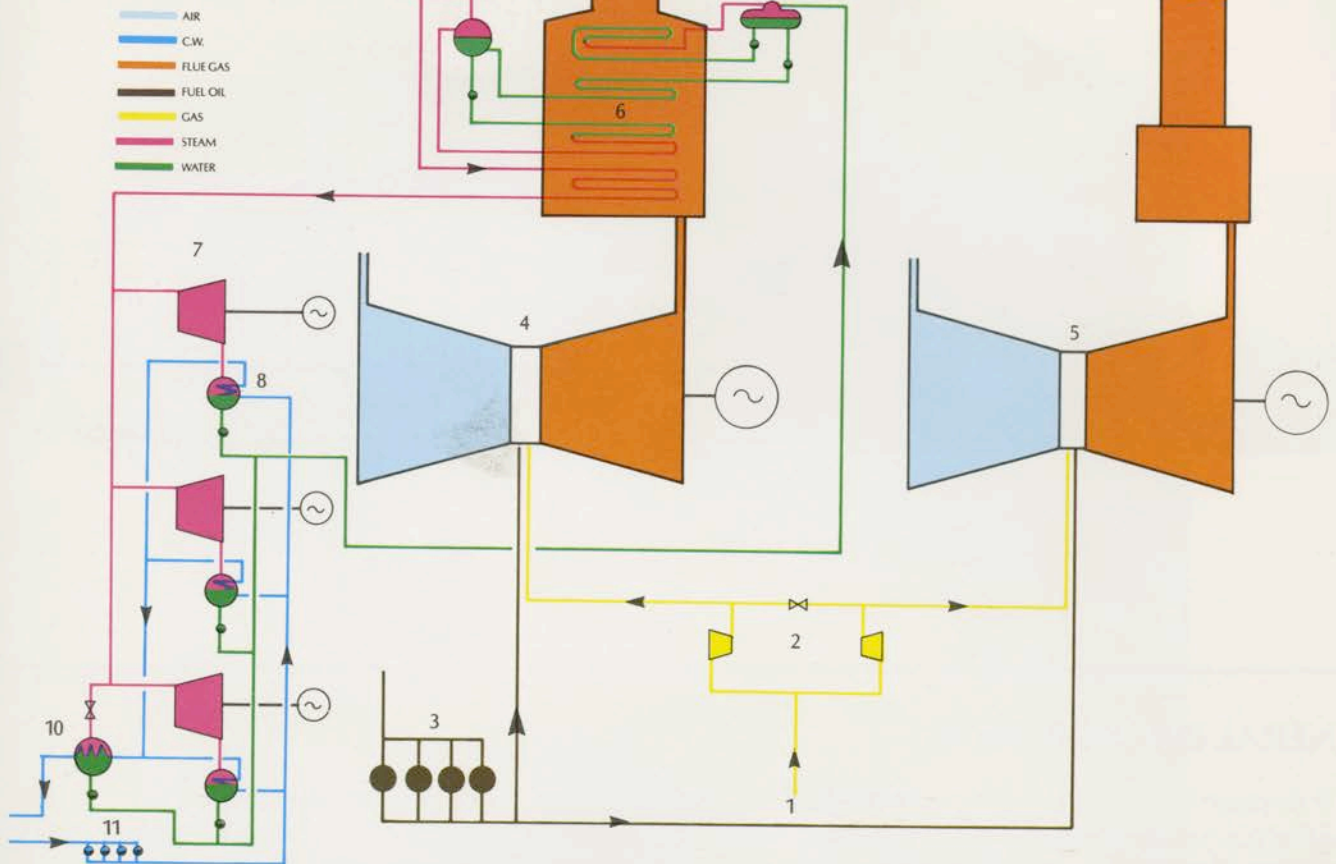
Fuel enters the fourteen combustion chambers of the combined cycle gas turbine **4** and/or the open cycle gas turbine **5**. Fuel mixes with compressed air from the gas turbine compressor and combustion takes place at about 10 bar pressure and temperatures over 2000°C. The hot gases produced are cooled with compressed air and pass through the turbine blades. The energy of the hot gases is converted in the turbine section, driving the air compressor and the gas turbine alternator.

In the case of the combined cycle, the exhaust gases from the gas turbine enter the Waste Heat Recovery Boiler **6** where the residual heat is transferred to a closed, water and steam cycle. Steam from this boiler supplies the three steam turbo-alternators **7** and is condensed **8** before returning through the deaerator **9** to the boiler. The deaerator is heated via a low pressure steam circuit from the waste heat recovery boiler.

During start-up and shut-down excess steam is routed through the dump condenser **10**. The cooling water for the condensers is estuarine water from the C.W. Pumps **11**.



### General Station Schematic



## TECHNICAL DATA

### Gas Turbines

2 x General Electric Frame 9001E 104/110 MW Industrial Gas Turbines.  
 2 x Alsthom Atlantique 124 MVA Alternators.  
 Firing Temperature : 2000°C/3630°F  
 Turbine Inlet Temperature : 1085°C/1985°F  
 Turbine Exhaust Temperature : 520°C/ 970°F  
 Compressor Discharge Pressure : 11 bar

### Boiler

1 x Cockerill Waste Heat Recovery Boiler (Assisted Circulation).  
 High and Low Pressure Circuits.  
 Steam Flow : 48 kg/s  
 Steam Pressure : 22 to 28 bar  
 Steam Temperature : 435°C/815°F  
 Exhaust Outlet Temperature : 200°C/395°F

### Steam Turbines

3 x Brown Boveri 17 MW Single Cylinder Turbines.  
 3 x Brown Boveri 20 MVA Alternators.

### Electrical

Generated Voltage : 10.5 kV  
 Auxiliary Supply Voltages : 3.3 kV and 380 V  
 Transformers : 1 x 300 MVA 10.5/10.5/220 kV main output from Gas Turbines (A.C.E.C.)  
 3 x 20 MVA 10.5/38 kV output from Steam Turbines (A.E.G., B.B.C.)

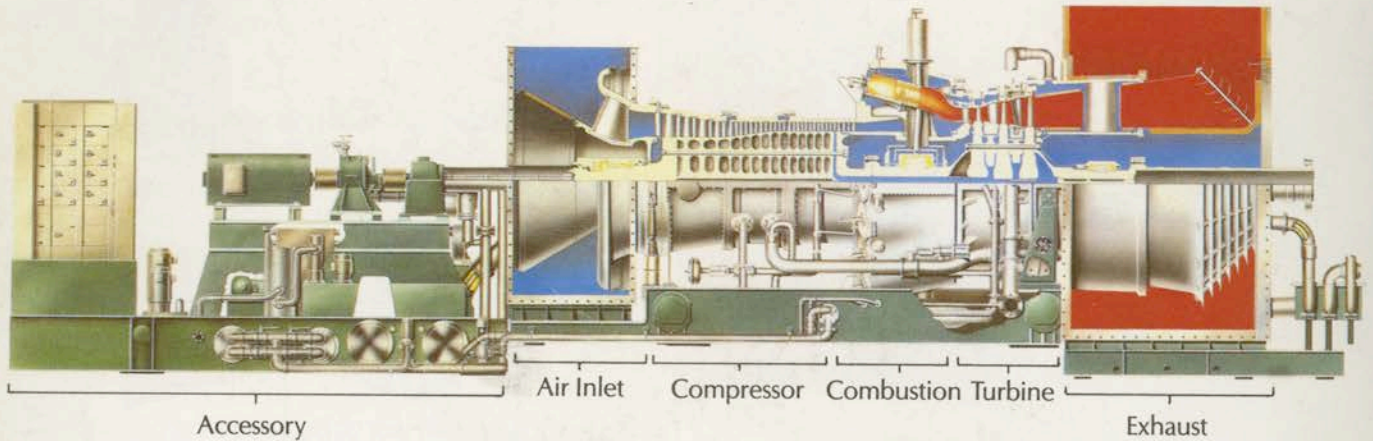
### Fuel

Natural Gas or Distillate.  
 Gas Consumption : 12 scf/kWh per Gas Turbine.  
 2 x 1500 kW Aerzen Gas Compressors.  
 Gas Pressure as supplied : 10-18 bar.  
 After Compression : 20 bar  
 Maximum Compression Ratio : 2/1  
 Oil Consumption : 0.3 kg/kWh per Gas Turbine  
 Oil Storage : 4 x 4000 tonnes storage tanks  
 Fuel Conversion Efficiency : Combined Cycle — 43%  
 Open Cycle — 33%

### Circulating Water

Pumps : 4 x Sulzer CW Pumps.  
 CW Flow : 15,400 gpm  
 Condensers : 3 BBC Condensers and Bye-pass in parallel supplying dump condenser in series.  
 Chlorination : Englehard Electrochlorination System.

## Frame 9001E Gas Turbine



### GENERAL INFORMATION

The Frame 9001E Gas Turbines were the largest industrial gas turbines available at the time of their installation. Their facilities for burning heavy fuel oil, L.P.G., natural gas or distillate determined their selection for North Wall. Since the extension of the natural gas grid from Cork to Dublin the heavy fuel oil and L.P.G. capabilities have not been required to date.

The gas turbines are very flexible for rapid loading and unloading and in simple cycle mode are ideally suited as peaking units. Provision exists for future conversion of C.T.5 to combined cycle operation.

The gas turbines are each equipped with the General Electric Speedtronic Mk2 control system. In the case of the combined cycle, this control system is integrated with the BBC Turboturn and Decontic control systems for the steam turbines, and with the Hartmann & Braun Contronic 3 system for the boiler. All the plant is remotely operated from a new control room alongside the original turbine hall.

ESB Project Design personnel were responsible for all the engineering involved in the station redevelopment.

