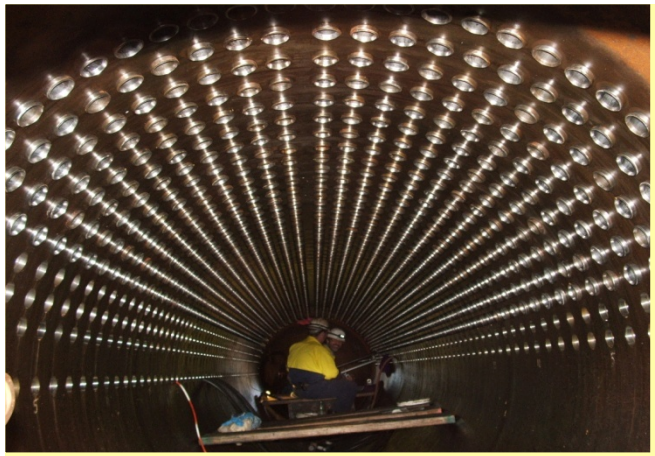




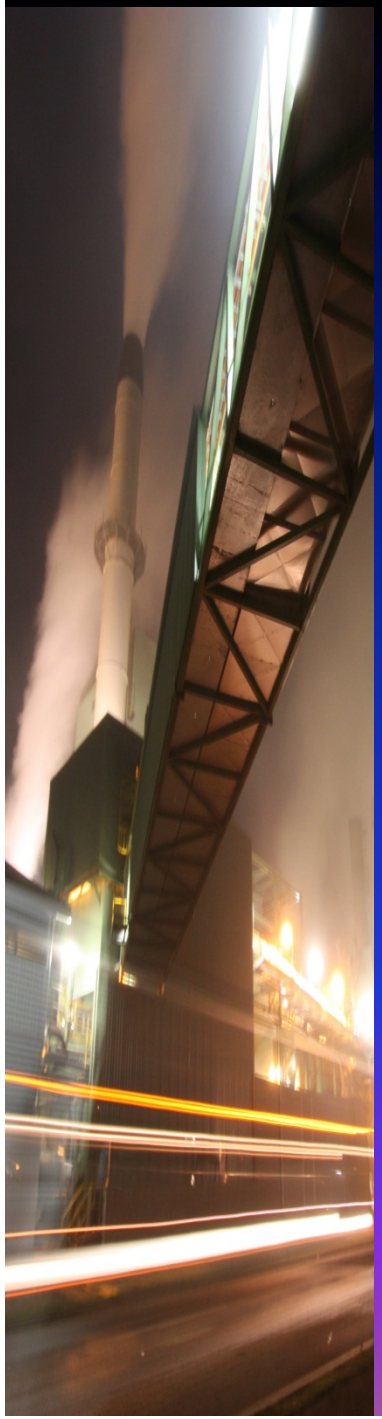




# DESIGN CONSIDERATIONS FOR A COGENERATION PLANT







# FACTORS INFLUENCING DESIGN

- Plant capacity
- Fuel Types/quality
- Fuel handling & storage
- Water sources
- Cooling method



# ADDITIONAL FACTORS INFLUENCING DESIGN

- Type of Contract
- Development Approval conditions
- Method of Finance

# PLANT DESIGN

- Feasibility Study is a guide to the expected size of plant based on the economics of the concept.
- In NSW Sugar case the feasibility study lead to a “concept design”.
- The concept design was provided for use by local Council and Government Agencies for Development Approval (DA).

# PLANT DESIGN – TYPE OF CONTRACT

**Some common types of construction contracts:-**

- Lump Sum Contract
- Unit Price Contract
- Cost Plus Contract
- Incentive Contract
- Percentage of Construction Fee Contract
- Project Alliance Contract

# PLANT DESIGN – TYPE OF CONTRACT

- Engineer, Procure, Construct (EPC) or Turnkey Contract
- Sunshine Electricity used an EPC Contract
  - Fixed and firm lump sum price
  - Liquidated damages for late delivery and non performance
  - Single point responsibility for the project

# PLANT DESIGN – TYPE OF CONTRACT

- An EPC Contract is a performance based contract whereby the plant output (electrical and steam) is specified and the contractor provided a design that met the output requirements.
- The kit of plant is the contractors design and technical risk.
- Guaranteed performance is provided under the contract with Liquidated Damages for non conformance.

# PLANT DESIGN - SPECIFICATION

- The design requirements in the specification are general because of the nature of the EPC Contract.
- Reference to Australian and International Standards.
- Reference to DA consent conditions which included the general terms of approval from Government Agencies, e.g. EPA, Main Roads, Office of Water, Fire Brigade.

# Development Approval Influences

- Environmental Issues
  - Site Specific Meteorological Data File
  - Air Dispersion Model
  - Ground Level Concentrations of Pollutants
  - Dust/Odour Transmission
  - Noise Model
- Local Government conditions, e.g. road and infrastructure (water, sewerage)

# WHAT DOES THIS MEAN FOR PLANT DESIGN

- The plant design will be influenced by "general Terms of Approval" from Government Agencies:-
  - Air emission limits
  - Noise limits
  - Lighting
  - Water emission limits
  - Visual Impact

# Meteorological Data File

- 12 Months of data collection required.
- If not available review agencies, e.g. DECCW will use “default” conditions in their model.
- Lead to the inclusion of an inversion layer in the Broadwater model with implications for noise and air emission calculations.
- Conservative/costly  design.

# Development Approval Influences Cont'd

- A Fire Safety Study
  A fire safety study for the proposed development. This study shall cover all aspects detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No. 2 "Fire Safety Study Guidelines" and the New South Wales Government's "Best Practice Guidelines for Contaminated Water Retention and Treatment Systems".

# Fire Safety Study Implications

- Specialist Work
- Firs Safety Study includes:-
  - Fire Risk Assessment
  - Assessment of fuel types and storage
  - Water available for fire fighting
  - Plant operating conditions
  - People
  - Property
  - Environment

# Fire Safety Implications

- Fire Study to be reviewed and approved by the NSW Fire Brigade.
- Contractor then designs plant based on approved FSS.
- Another contractor will likely install plant.
- Fire Brigade will the inspect and witness commissioning tests.
- Before an Occupation Certificate can be issued a Fire Safety Certificate must be issued by a qualified party.

# Fire Safety Implications

- Addition of property & environmental protection in the development approval meant larger water storage and more fire protection.
- Automatic shutdown of plant in the event of an alarm activation.
- Direct connection of the Fire Indicator Panel to the Fire Brigade.

# FINANCING

- Sunshine Electricity used Project Finance to build the Condong and Broadwater Plants.
- The Financiers carry the risk on construction.
- Contracts supporting the project are the financiers security, e.g. Power Purchase , Energy Transfer, Fuel Supply, Construction Contract.

# FINANCING INFLUENCE ON DESIGN

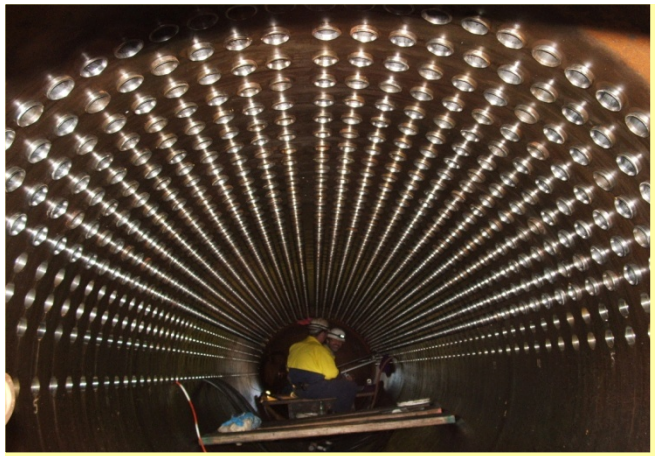
- If the financiers are carrying construction risk, they want proven design.
- Will insist on inserting additional protection into commercial conditions of the contract, e.g. insurance provisions.
- Will inhibit innovative design.
- Will not be cutting edge technology.

# WHAT DOES THE TYPE OF CONTRACT MEAN FOR PLANT DESIGN

- Type of Contract will influence the detail in the plant specification .
- In an EPC Contract the over-riding principal is performance, therefore the contractor will decide the kit of plant to be provided.
- Any direction given to the contractor with respect to plant design could relieve the contractor of design risk.

# WHAT DOES THE TYPE OF FINANCE PACKAGE MEAN FOR PLANT DESIGN

- Financier is carrying construction risk.
- Will review all aspects of the plant through an independent engineer.
- Project Finance requires proven design with reference to operating history.
- Does not encourage innovation.









# DESIGN CONSIDERATIONS FOR A COGENERATION PLANT



