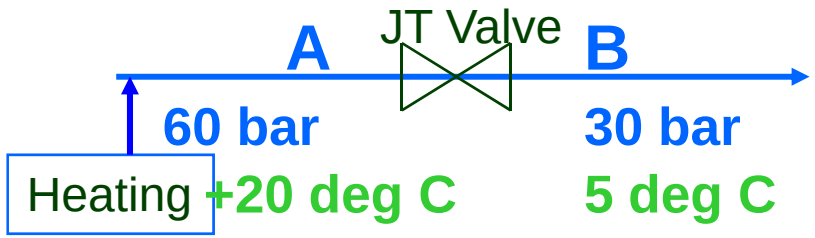
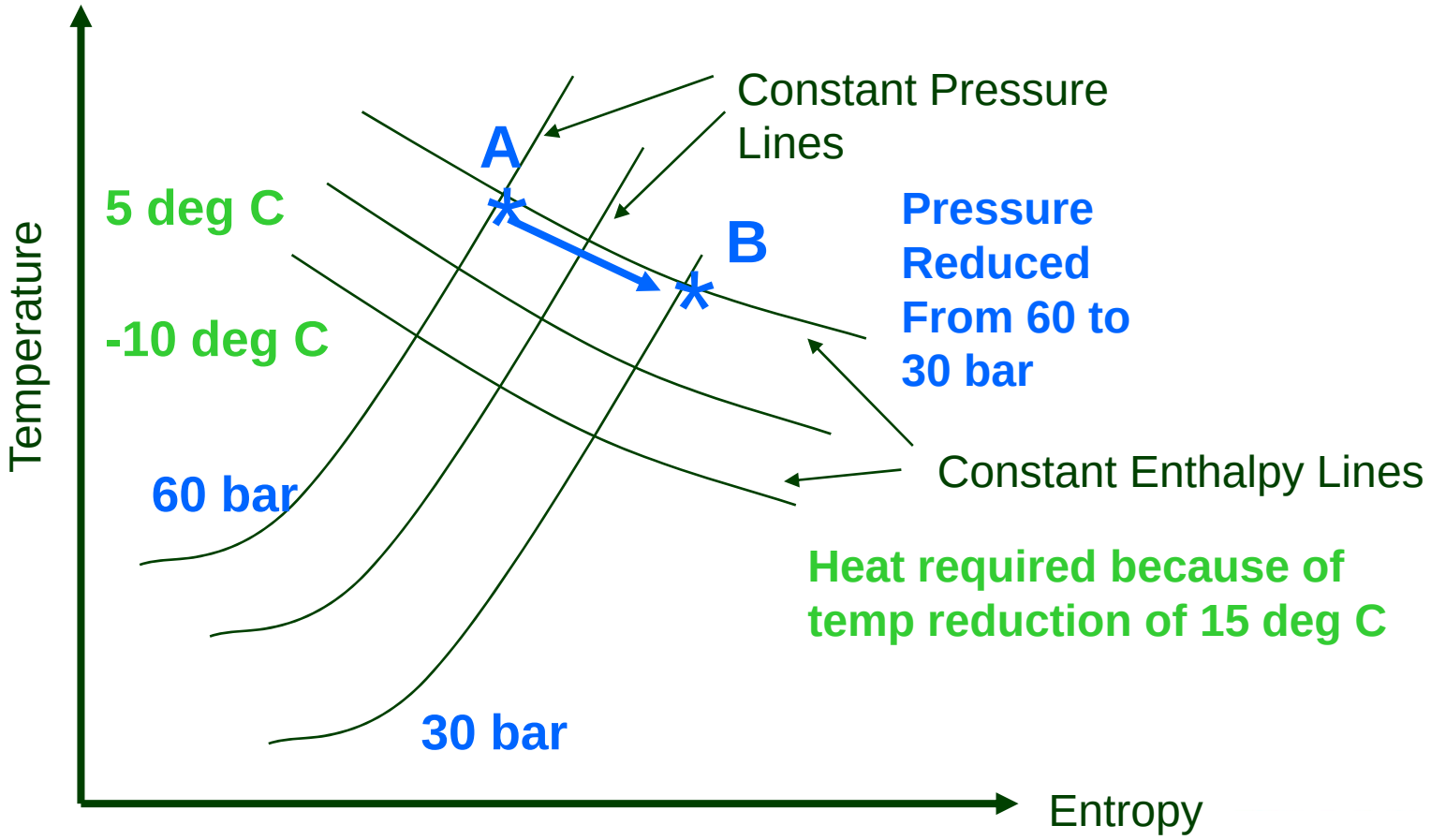
Blue-ng Consultation

Background briefing:

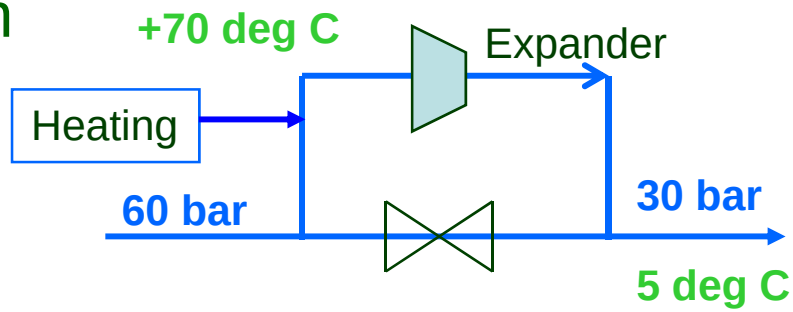
1. Basic thermodynamics
2. Technology Options for Pressure Reduction
3. Capex, fuel costs, income and CO2 savings

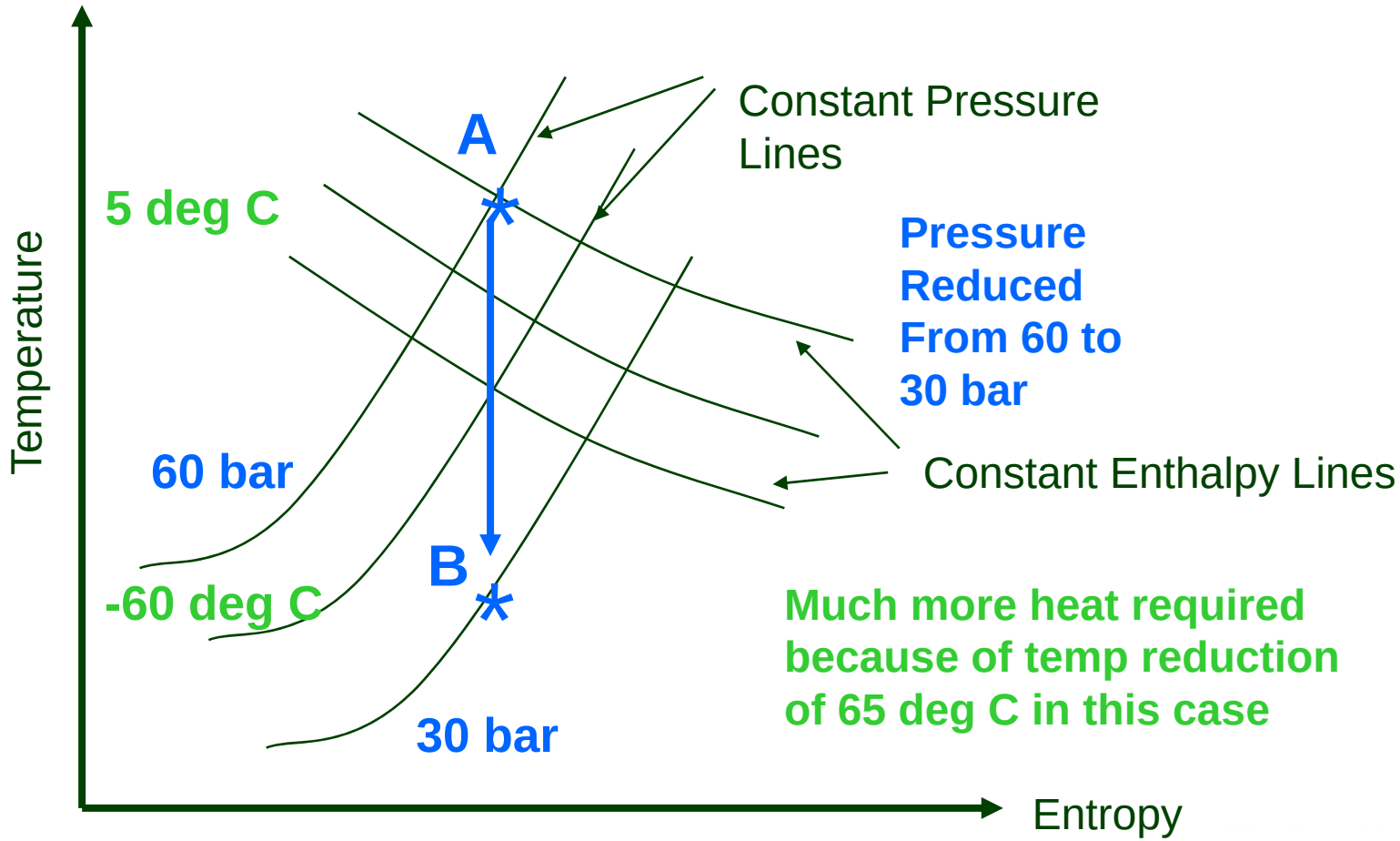
Base Case
Isenthalpic expansion





Expander-CHP Case
Isentropic expansion





Pressure Reduction Options

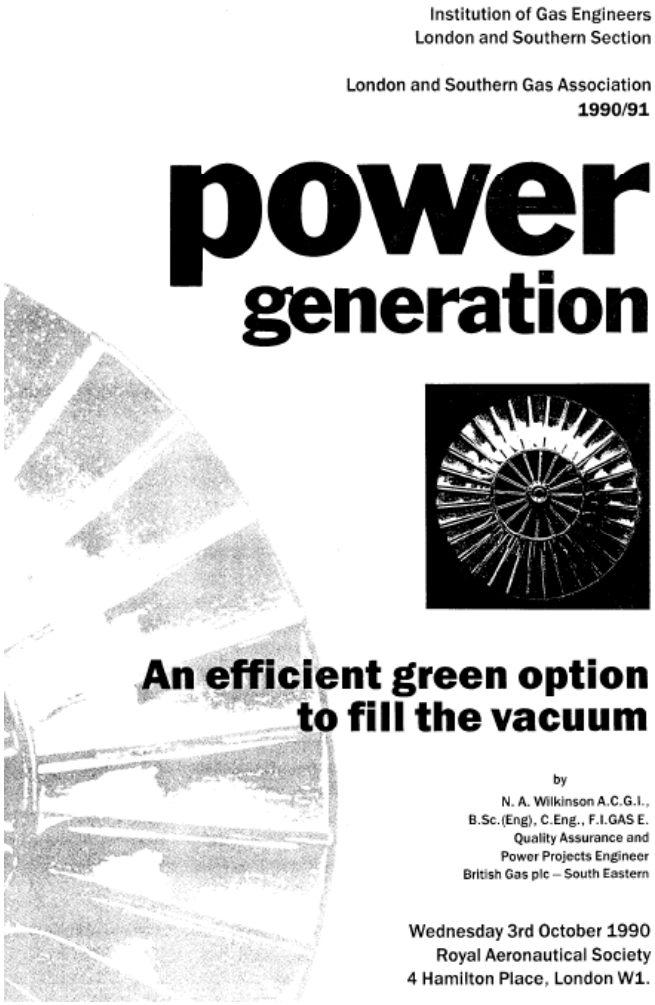
1. Isenthalpic expansion
   - No electricity, minimum heat required
     - Normal method adopted, use of a valve
2. Isentropic
   - Electricity produced, medium heat requirement, met by using boilers
     - Eg Transco St Mary Cray (1990)
3. Isentropic + CHP
   - Electricity produced, large heat requirement, met by using the waste heat from a CHP plant:
     - Natural gas CHP (eg Sibelga Brussels, 2001)
     - Biomass CHP (eg proposed by Blue ng)
4. Isentropic + utilize the cool
   - Electricity produced, large heat requirement met by utilisation of the ‘cold’ rather than pre-heating of the gas:
     - Produce district cooling (eg Osaka Gas 1996)
     - Provide refrigeration and/or make LNG

Expander only
British Gas South Eastern 1990
St Mary Cray, Kent

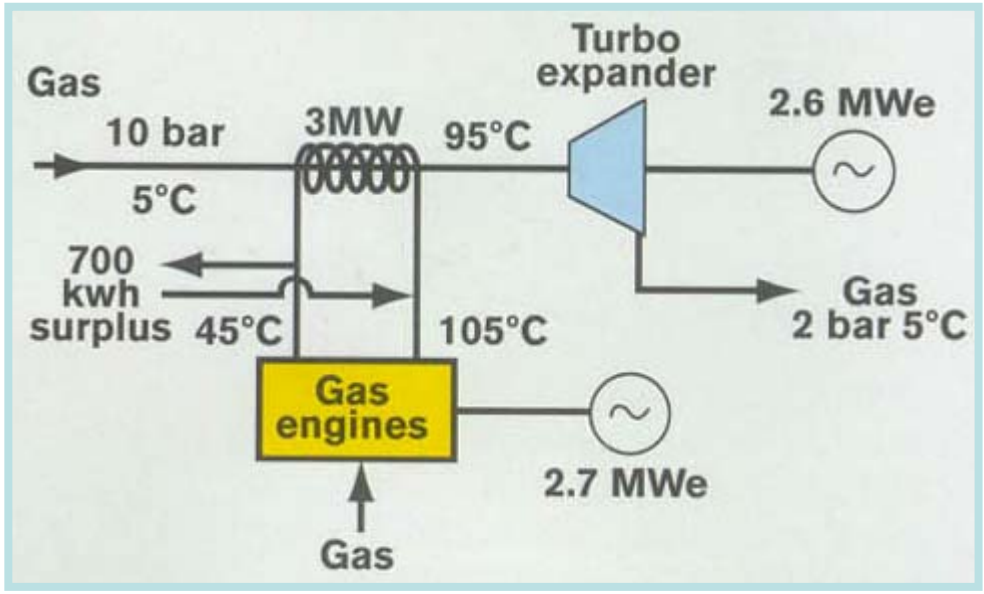
SUMMARY

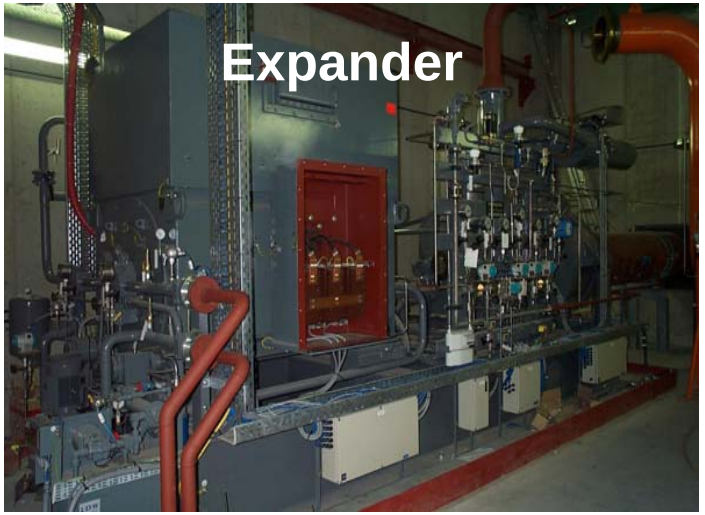
Government legalisation to privitise the electricity supply industry has brought about considerable discussion on the economic advantage of private generation of power. Power station projects producing many hundreds of megawatts have been proposed to supply the ever increasing demand. BGSE have taken one small step into this new area for the gas industry, by installing a turbo-expander at a pressure reducing station, producing 1070kW of electrical energy. The high efficiency of power generation using this installation makes not only a good economic case but is also environmentally acceptable. A growing awareness of the scarcity of all forms of energy, particularly natural gas and hydrocarbon products, has resulted in increased emphasis on energy conservation.

Note – a combined cycle version of this was envisaged for a site in Croydon with waste heat from a CCGT used as the pre-heat for the expander but this was not built



Expander – CHP
Sibelga Brussels 2001





Expander + Chilling
Osaka gas 1997

Summary

Osaka Gas Co. has introduced an electricity and chilled water cogeneration system which uses an expansion turbine to recover energy produced in the pressure reduction of town gas supplied to the Osaka Dome City District Heat Service. The system is the first of its kind in Japan for district heating and cooling. It is expected to produce 2,750 MWh of electricity and 1,900 MWh of chilled water annually, thereby reducing primary energy consumption by 9,420 MWh, CO_2 emissions by 2,000 tonnes and NO_x emissions by 790 tonnes. The simple payback period for the investments will be 5 years.

Highlights

- **Cogenerates power and chilled water**
- **Reduces energy consumption and CO_2/NO_x emissions**
- **Payback period of 5 years**

Aim of the Project

The aim of the Osaka Gas Co. was to introduce a power and chilled water cogeneration system which, via an expansion turbine, recovers energy produced in the pressure reduction of town gas supplied to the Osaka Dome City District Heat Service project. The system takes advantage of the fact that a regulator station for reducing town gas pressure is situated adjacent to the main district heat service energy plant. Although power generation using energy from gas pressure has already been used in liquefied natural gas (LNG) and other terminals, the Dome City system is the first application of the technology for district heating and cooling (DHC) in Japan.

Summary
Costs, electricity income and CO2 saving
all figures estimated