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IGU

The Calculation of the Optimized Capacity of Turbo Expander Power Generator and the Process in the Depressurized Gas Station of KOGAS

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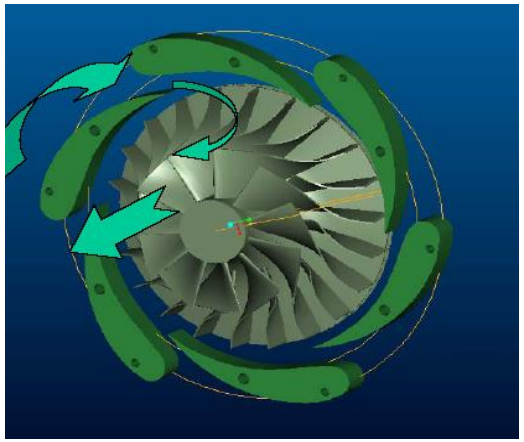
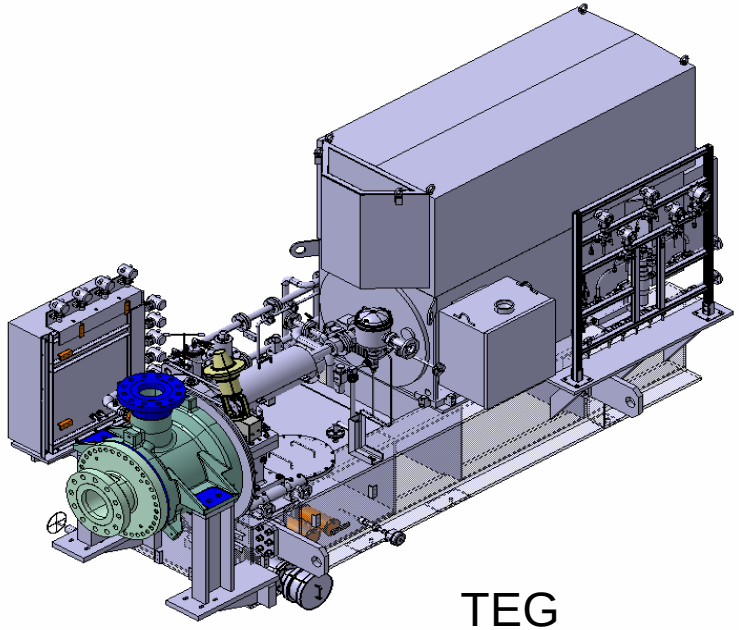
What is TEG(turbo expander generator) ?

- Functions
  - 1st function : pressure regulation
  - 2nd function : power generation



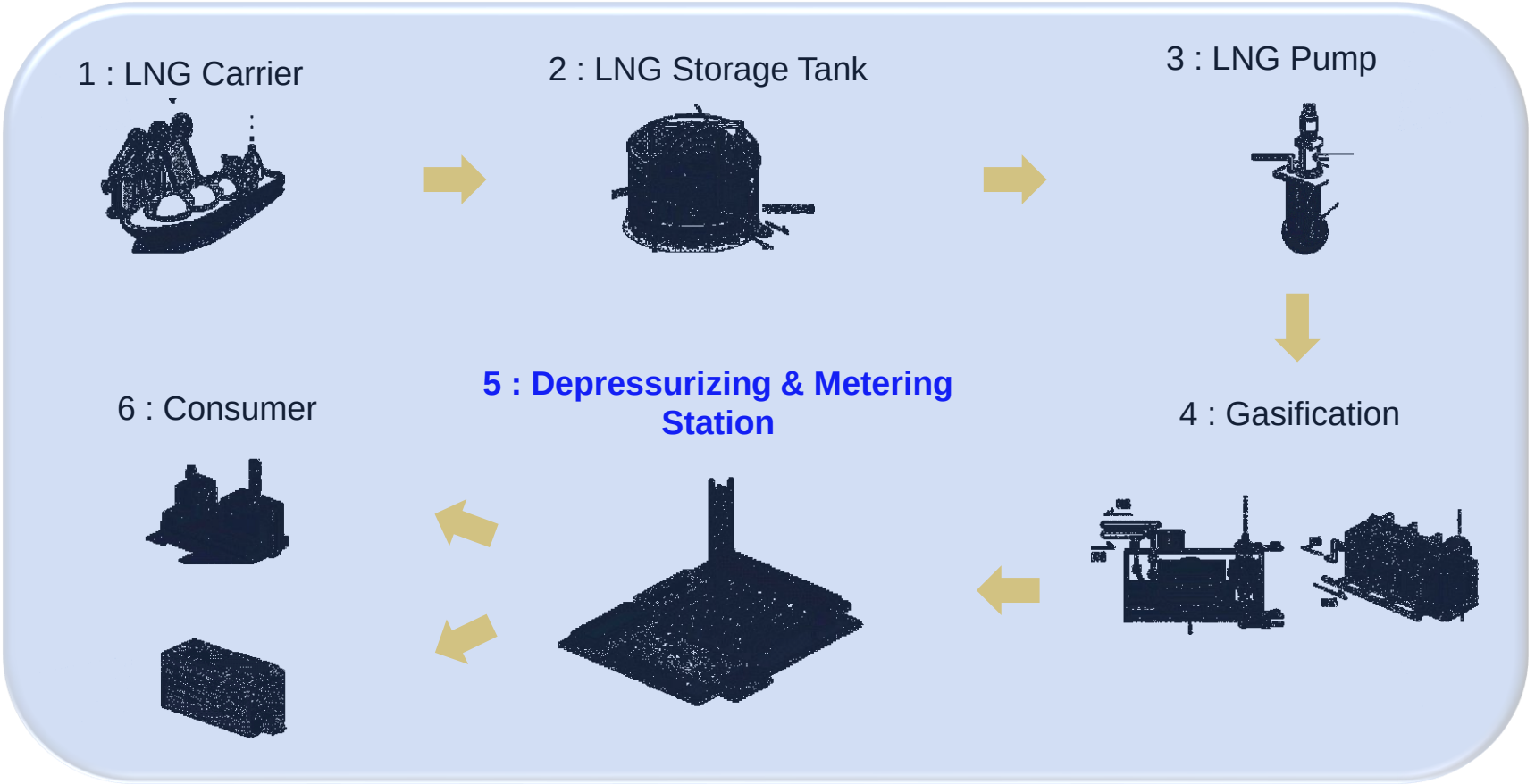
Turbo Expander



TEG

Background in KOGAS TEG

Supply chain of natural gas in Korea



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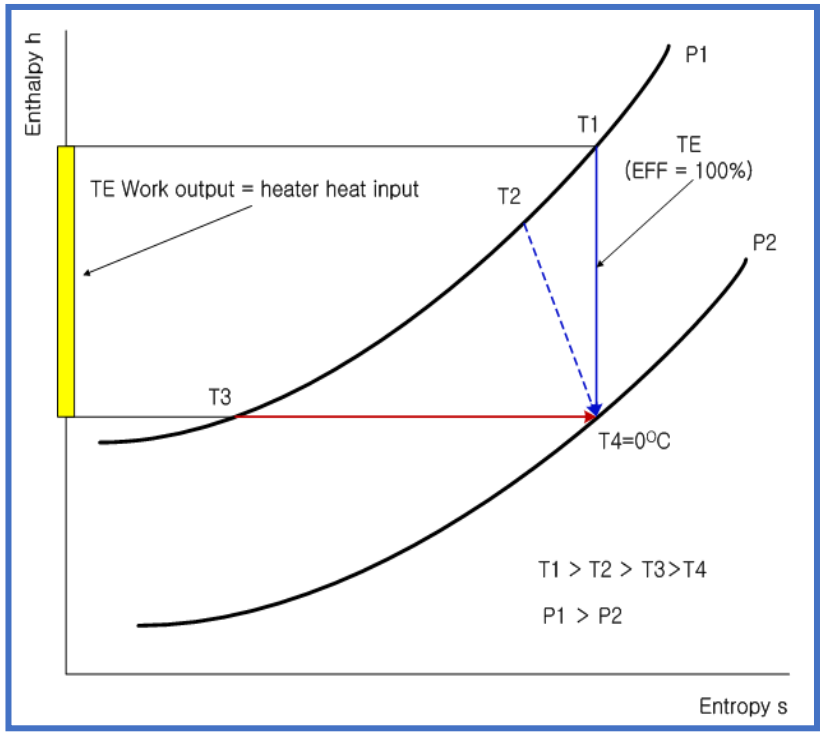
Theoretical Review of NG Flow in TEG

- Isentropic process in turbo expander flow

- Amount of power generation of TEG

$$Power = \eta \frac{k}{k-1} \dot{m} R T_{input} \left[1 - \left(\frac{P_{output}}{P_{input}} \right)^{\frac{k-1}{k}} \right]$$



Enthalpy-entropy diagram of gas flow

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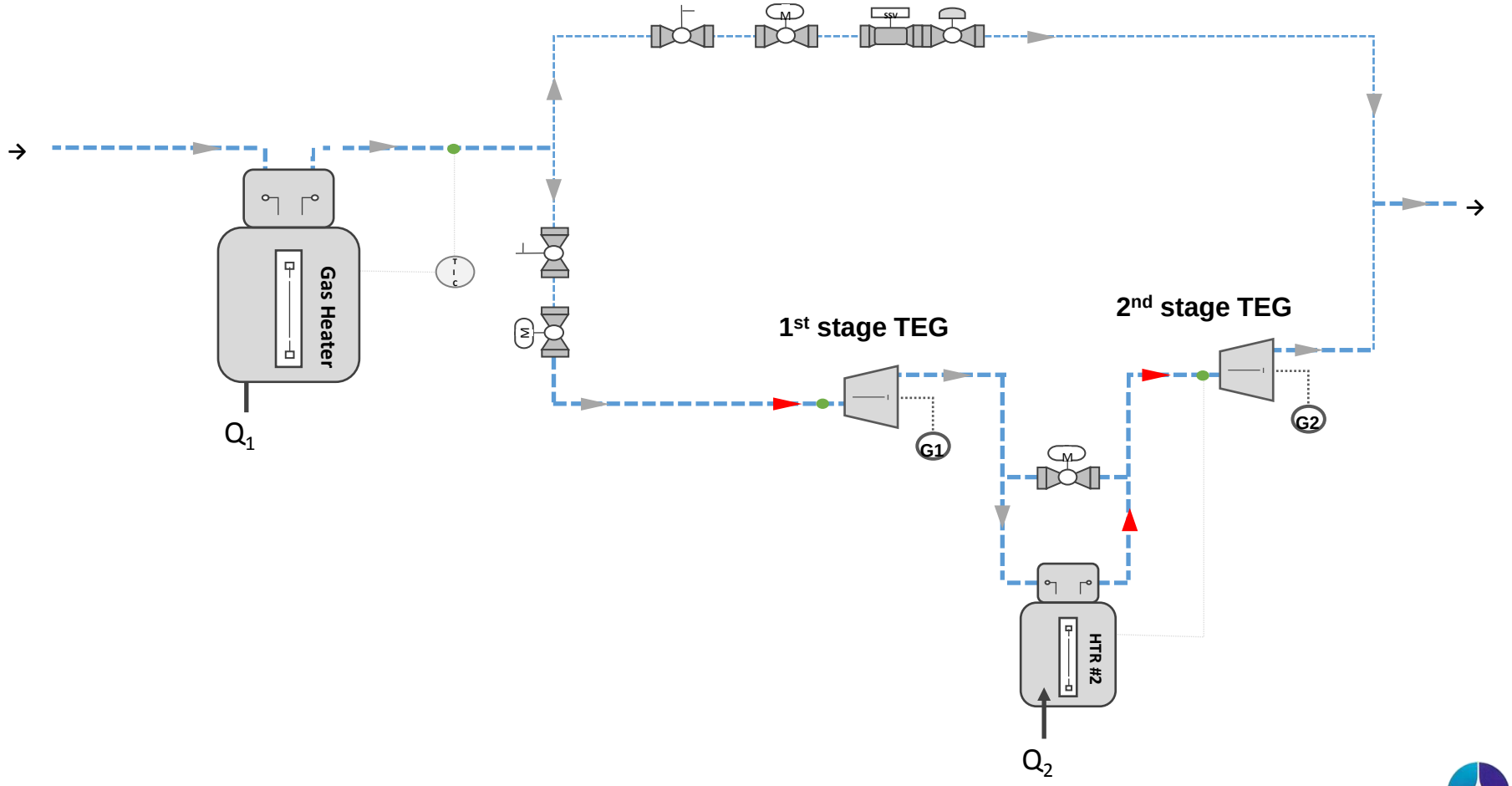
Process of TEG in Depressurizing Station



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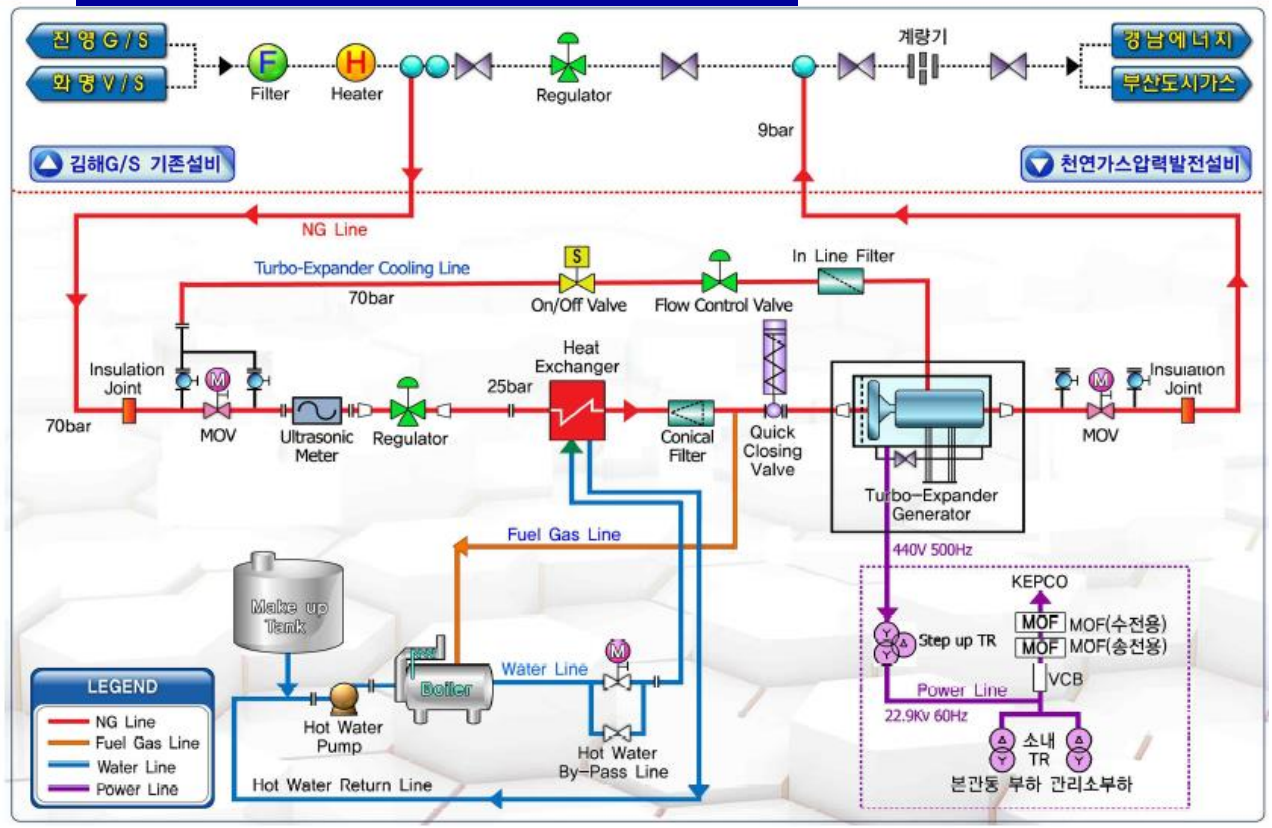
300kW Inpipe type TEG in Kimhae Station

Systematic diagram of TEG process



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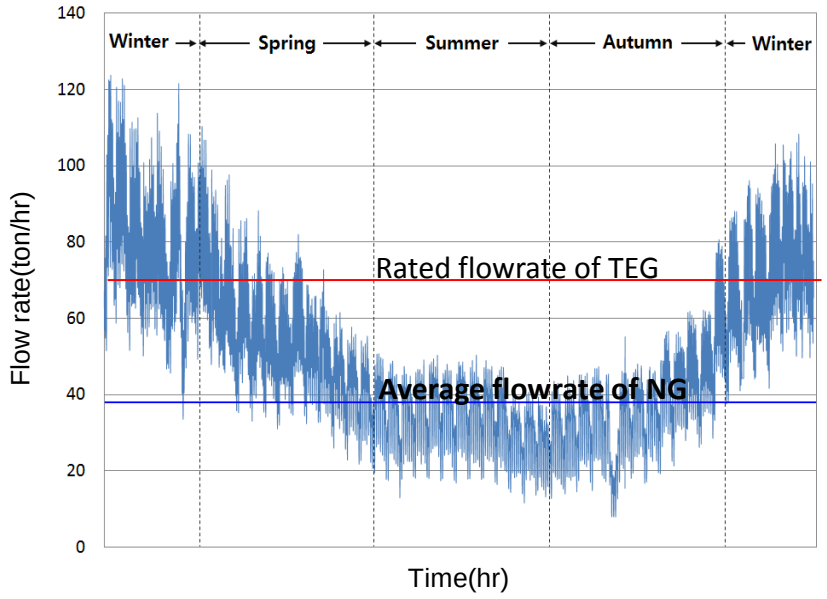
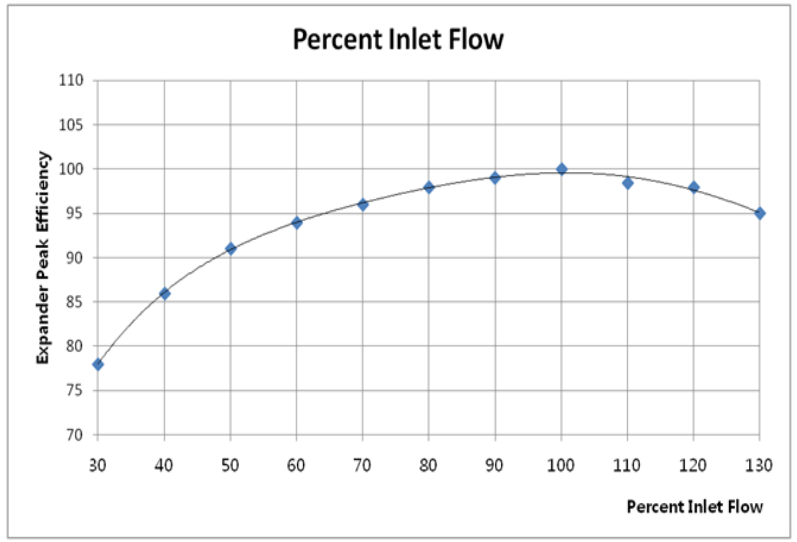
Factor for Selecting Optimized Capacity of TEG

- Various TDR(top down ratio) of NG supply in depressurizing stations
- Efficiency curve of TEG
- Operating range of TEG





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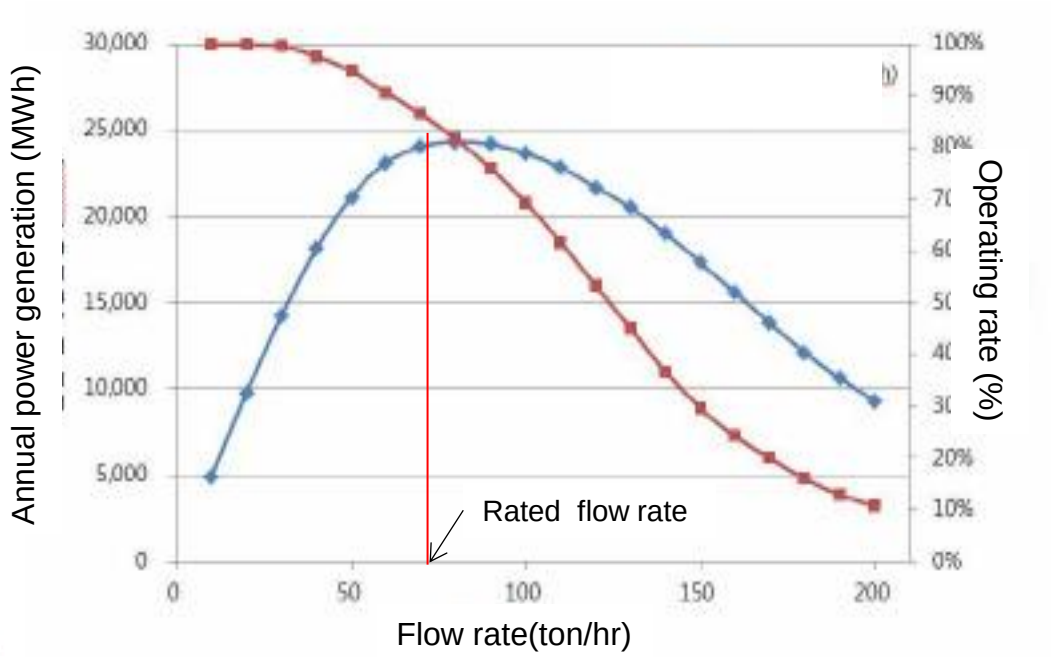
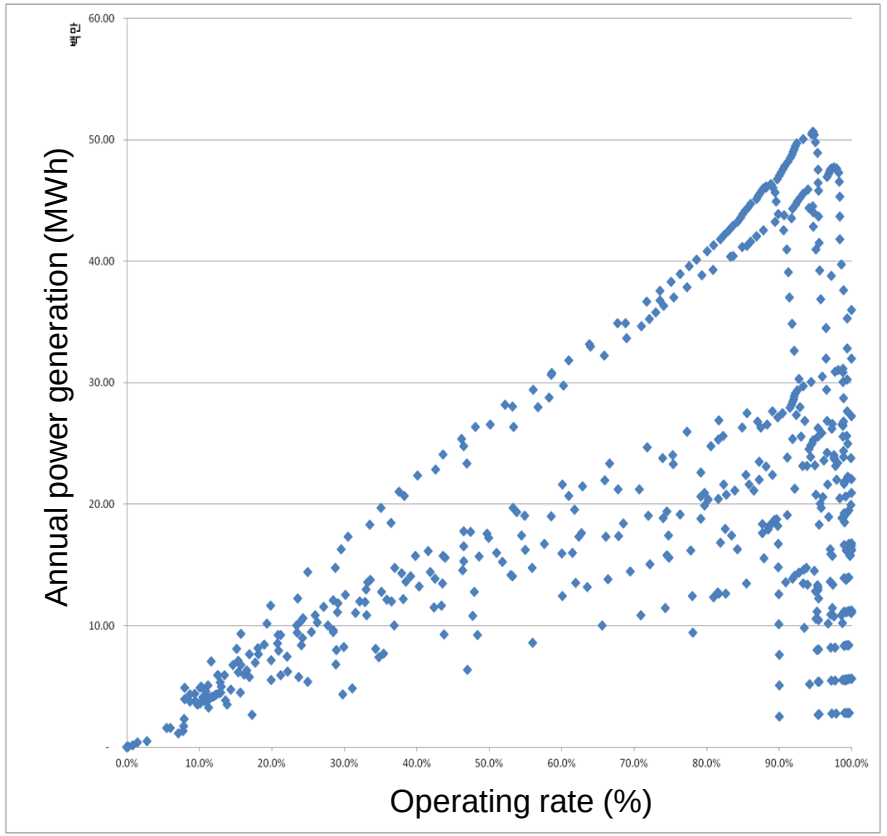
How to calculate optimized capacity ?

- Selecting the flowrate at which annual cumulative power generation (ACPG) is maximized





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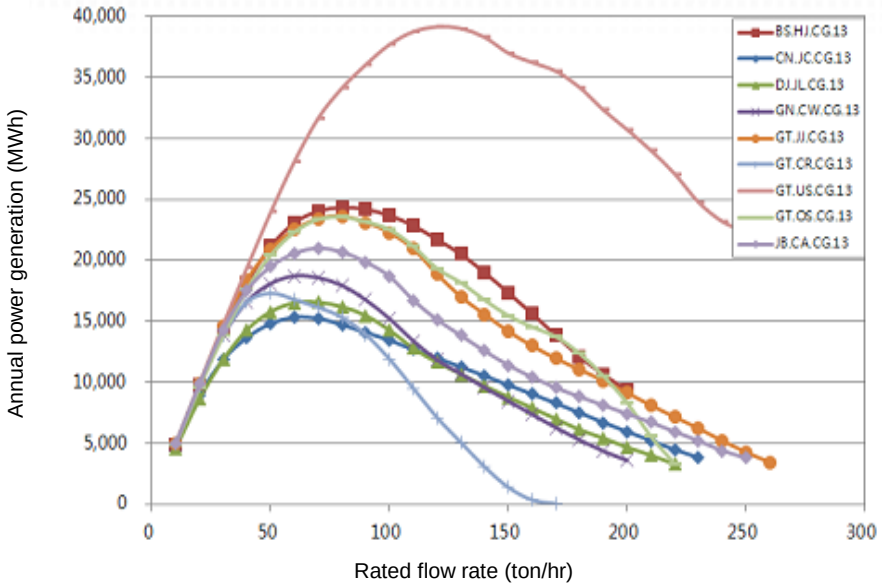
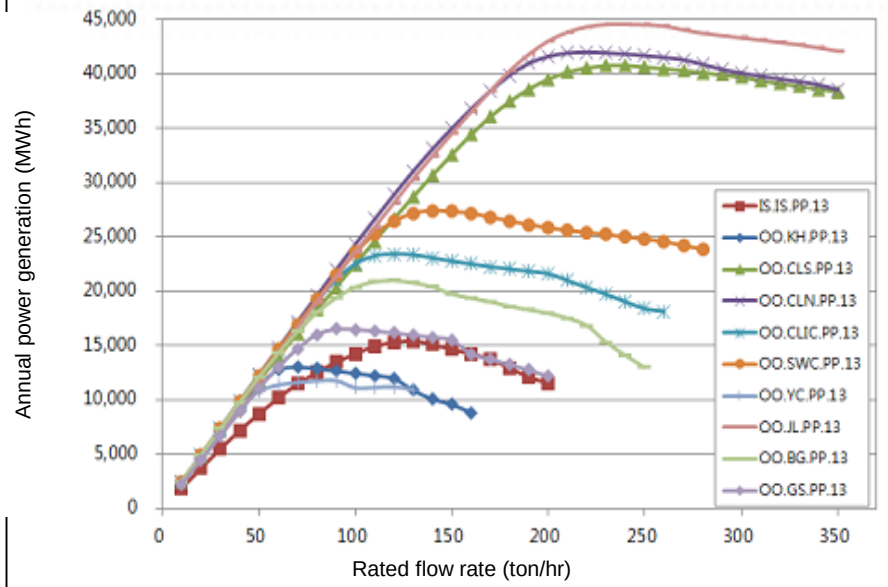
ACPG profiles in Regulating Stations

City gas (household/commercial/industrial)



Power generation



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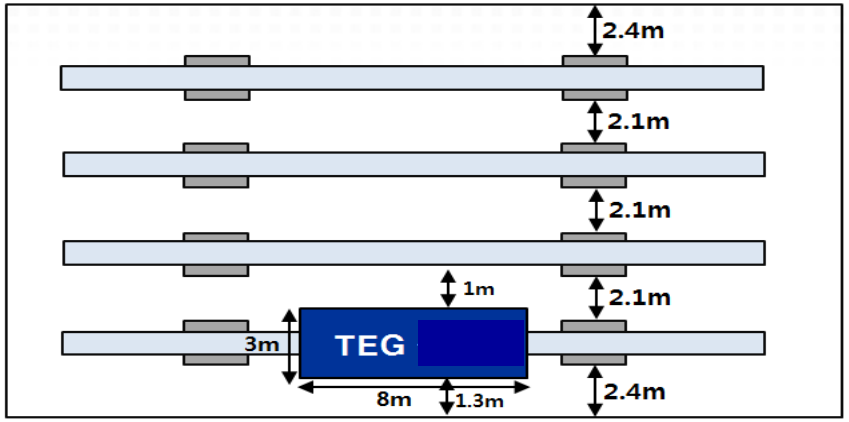
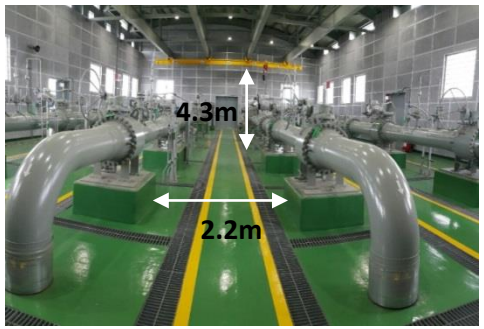
Installability of TEG in Depressurizing Building

- Standard layout of TEG installation in depressurizing building

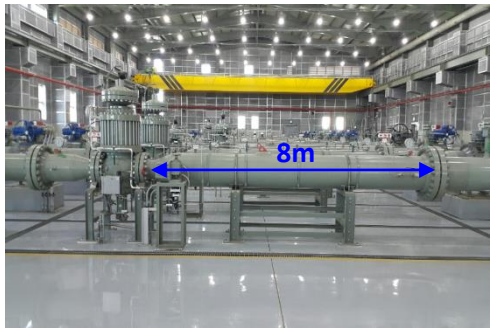


- Pipe layout and space in depressurizing building

Type 1



Type 2



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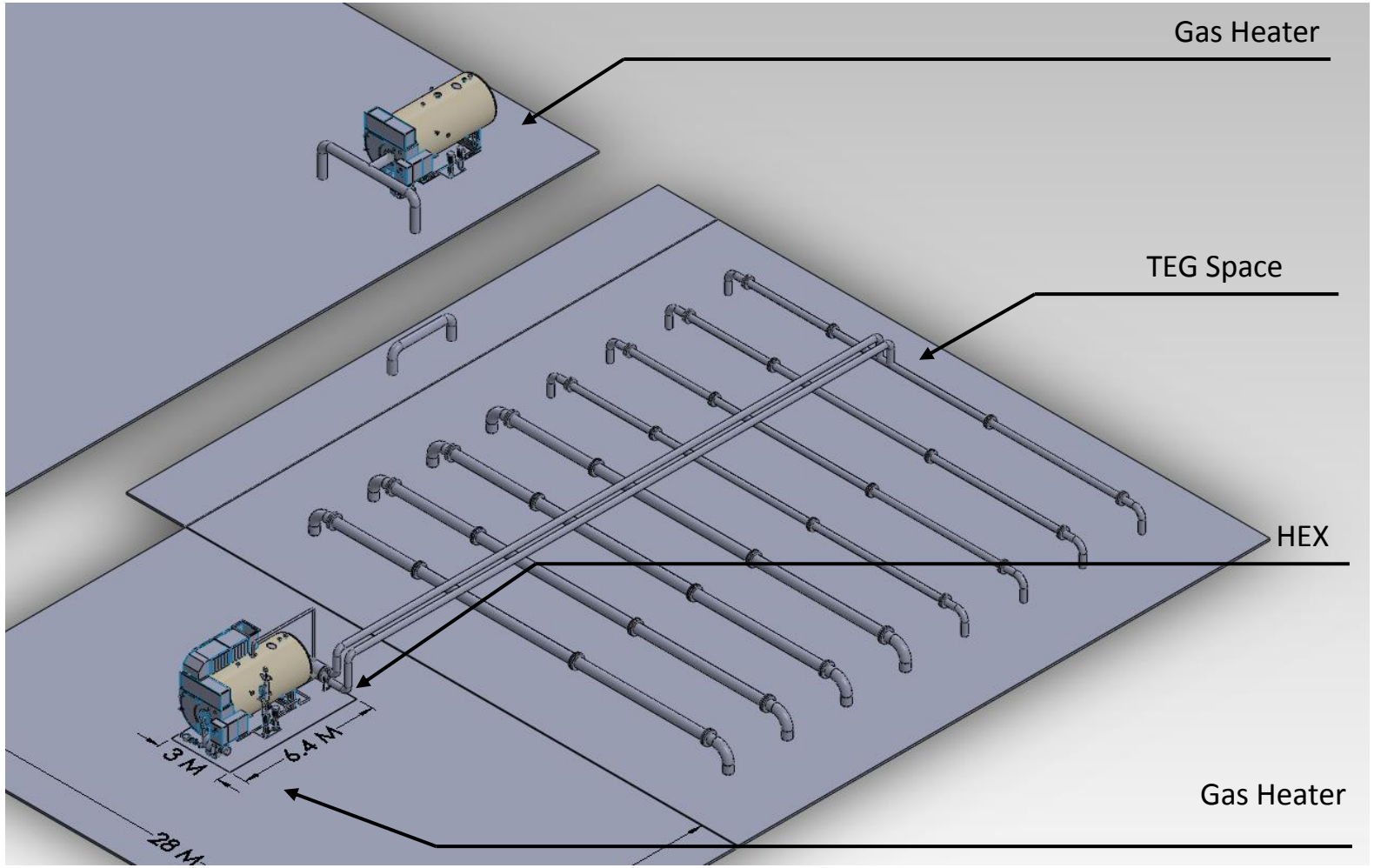
TEG Process Layout with Gas Heater



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Conclusion

- Understanding thermodynamics in TEG flow
- Feasibility of energy conversion from expansion energy to power generation from Kimhae station
- Methodology of selecting the rated capacity of TEG
- TEG installability in depressurizing stations
- TEG expandability to depressurizing stations


Thank you for your attention