

INTRODUCTION

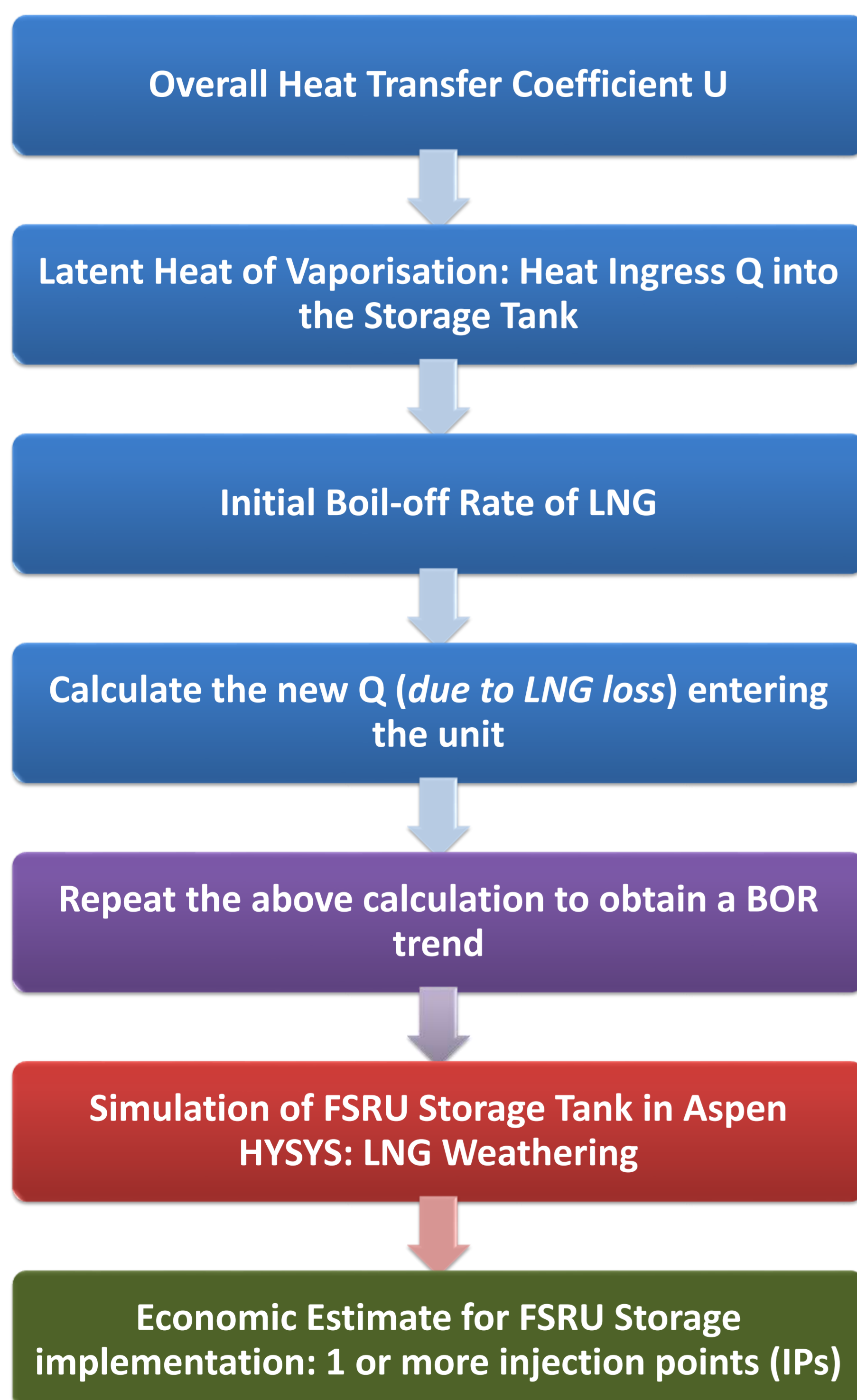
Ireland has a small gas network (13,400 kms) with increasing demand for natural gas (5 bcm, 2017). Recent Floating Storage and Regasification Unit (FSRU) vessels have a capacity of 170,000 m³ and a gas send out rate of 600 mmscfd which could supply the nation's demand (averaging 400 mmscfd in July, 2018). Establishment of LNG terminal with FSRU offers flexibility in relocation and investment.

Objectives

- To investigate the implications of *Long-term storage* in FSRUs, thereby to determine the change in boil-off rate (BOR) and analyze the LNG weathering.
- To identify the possibility of handling the Boil-off Gas (BOG) generated by operating the regasification unit at a minimum capacity.
- To investigate the implications of continuous operation of the FSRU regasification unit and *handling the excess supply*.
- To provide an economic estimate of the FSRU deployment.

METHODOLOGY

A model is developed to determine the BOG generated^[1].



RESULTS

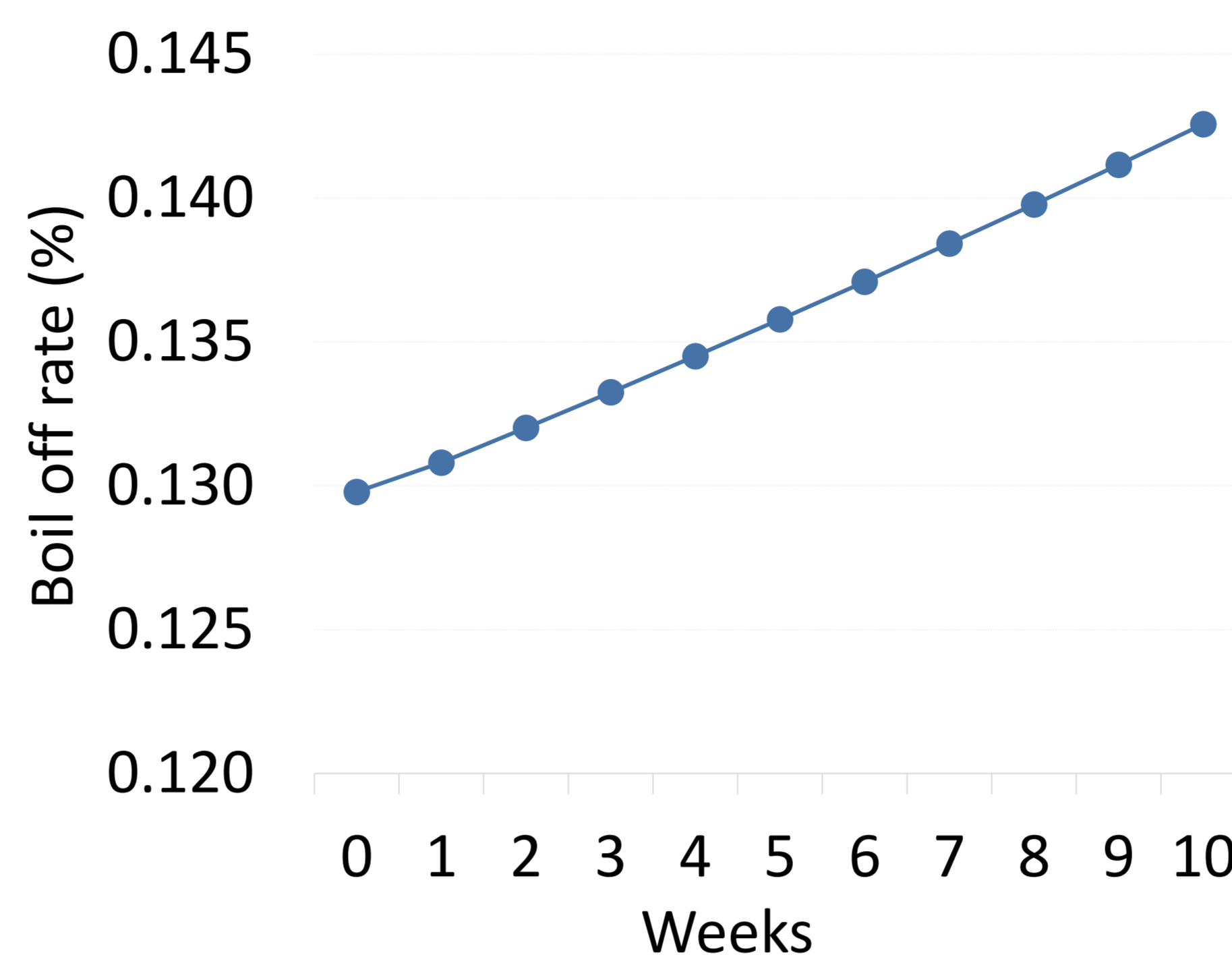


Fig 1 – Boil-off rate in FSRU storage unit over 10 weeks

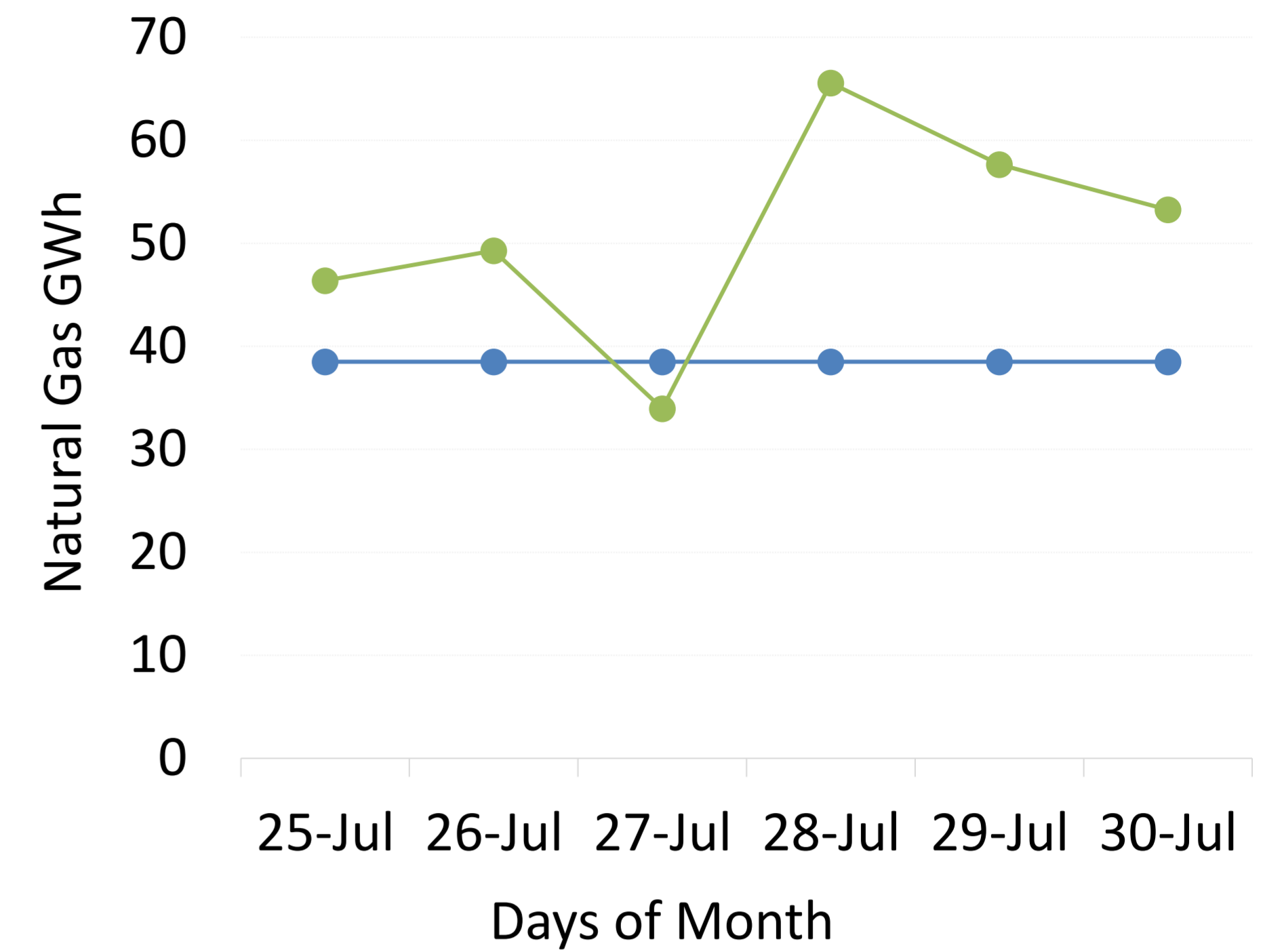


Fig 2 – Availability of gas for reverse flow at Moffat

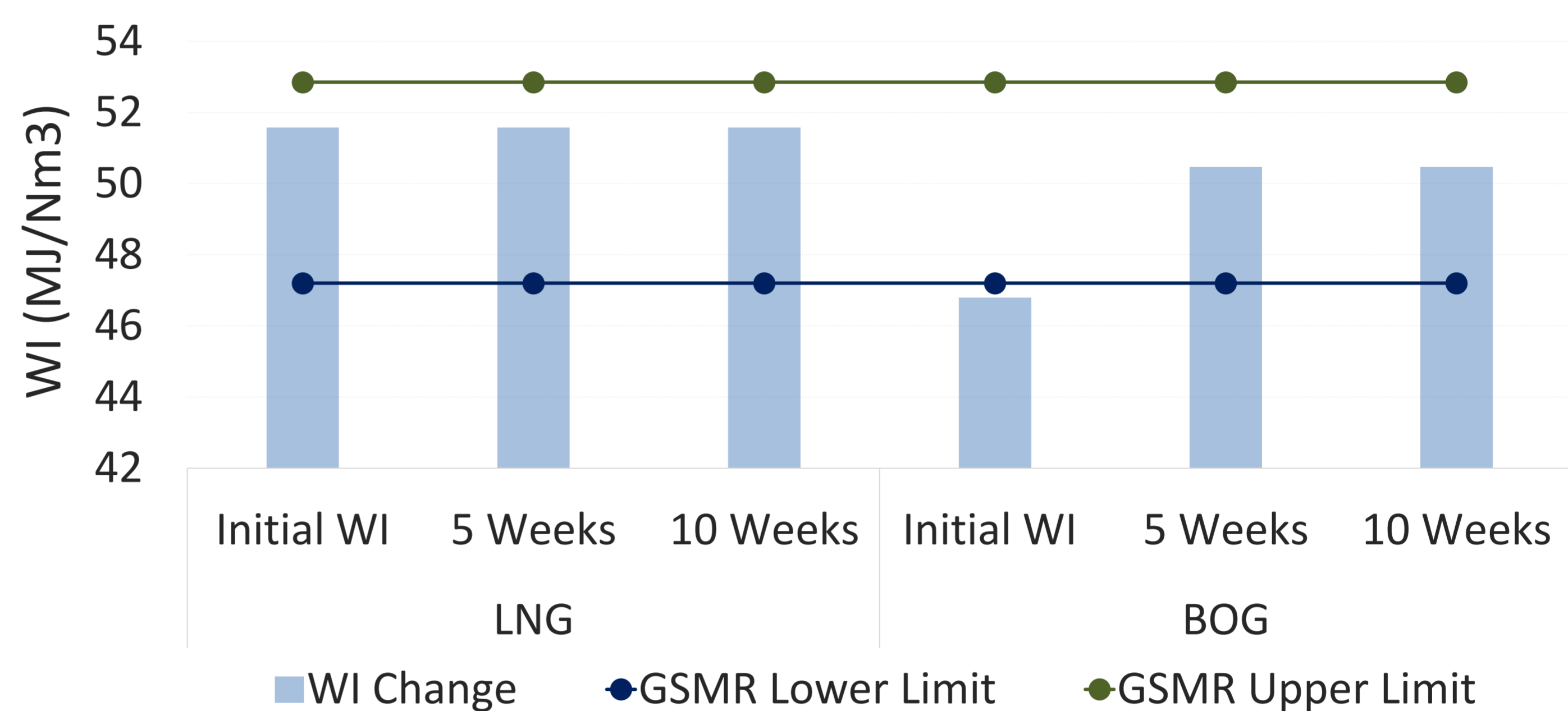


Fig 3 – Change in Wobbe Index of LNG & BOG over the storage period

Scenario	Total Production Cost (€mm/year)	Final Cost per Unit (cent/kWh)
Every 5 Weeks	120.50	1.1931
Every 10 weeks	115.55	2.2881
Every 5 Weeks - 2 IPs	191.98	0.9052
Every 10 Weeks - 2 IPs	181.10	1.7931

Table 1 – FSRU Storage implementation: Overall Production Cost & Unit Price of Gas

- Increase in BOR throughout storage period (up to 0.143% per day) is observed.
- In general, Wobbe Index of LNG and BOG are within the operational limits (except the BOG from LNG with high N₂).
- Storage up to 5 weeks is identified as the economically attractive option.

CONCLUSIONS

- LNG supply via FSRU will increase the gas flows in the networks.
- Development of small scale LNG networks (ssLNG).
- Reduction in carbon neutrality can be achieved by implementing more greener fuels like biomethane with LNG in the energy mix.

REFERENCES

- [1] Velisa Vesovic Calogero Migliore Cristina Tubilleja. "Weathering prediction model for stored liqueed natural gas (LNG)". In: Journal of Natural Gas Science and Engineering (2015).
- [2] Det Norske Veritas George G. Dimopoulos. "A Dynamic Model for Liqueed Natural Gas Evaporation during Marine Transportation". In: International Journal of Thermodynamics (2008).
- [3] Brian Songhurst. "The Outlook for Floating Storage and Regasication Units (FSRUs)". In: (2017).

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