UNIVERSITY of HOUSTON
CULLEN COLLEGE OF ENGINEERING

Global LNG supply under Shamal (شمال) disruptions

Jaeyoung Cho[1], Gino J. Lim, Taofeek Biobaku[1], Selim Bora[2], Hamid Parsaei[2].
[1]University of Houston, [2]Texas A&M University at Qatar

LNG Supply Chain

Exploration & Production | Liquefaction | Transportation | Regasification

The impact

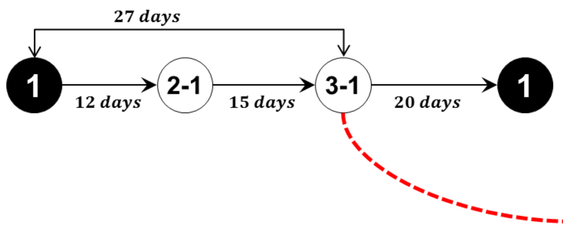
Delays in cargo loading (days to weeks)

Changes the pre-planned vessel routing schedule

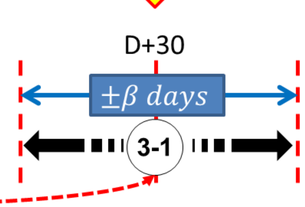
Costs penalty for delay, additional inventory and boiled-off gas (BOG) ≈ 0.2%/day)

Conceptual approach

1) No Shamal disruption ➔ deterministic model



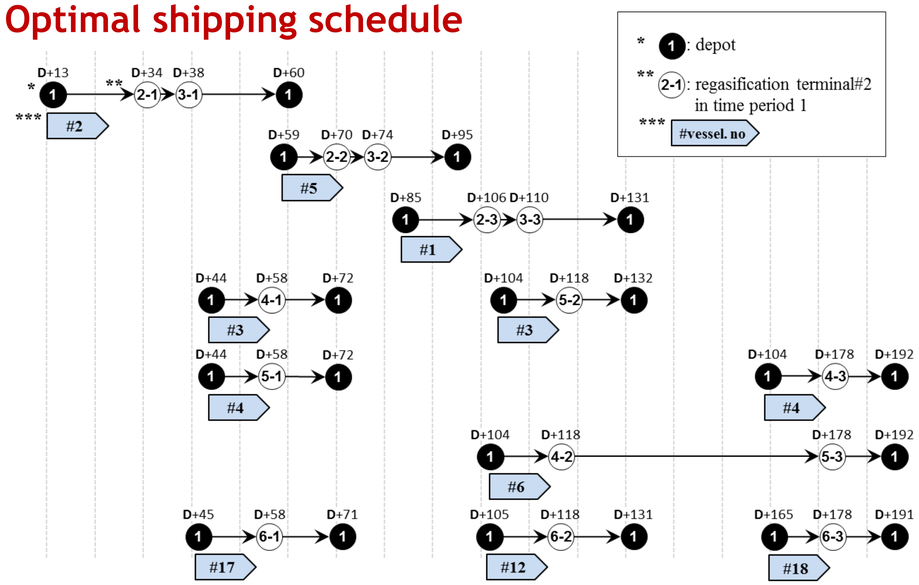
Expected time on target



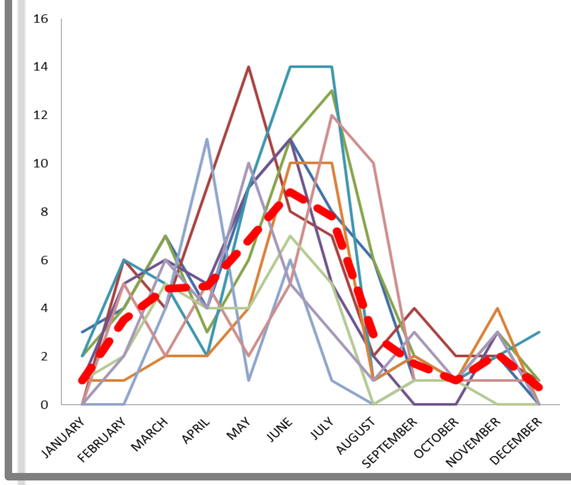
2) Shamal disruption (ξ) ➔ stochastic model

Shamal#1 scenarios : 30 BOG#1 scenarios : 30 BOG#2 scenarios : 30

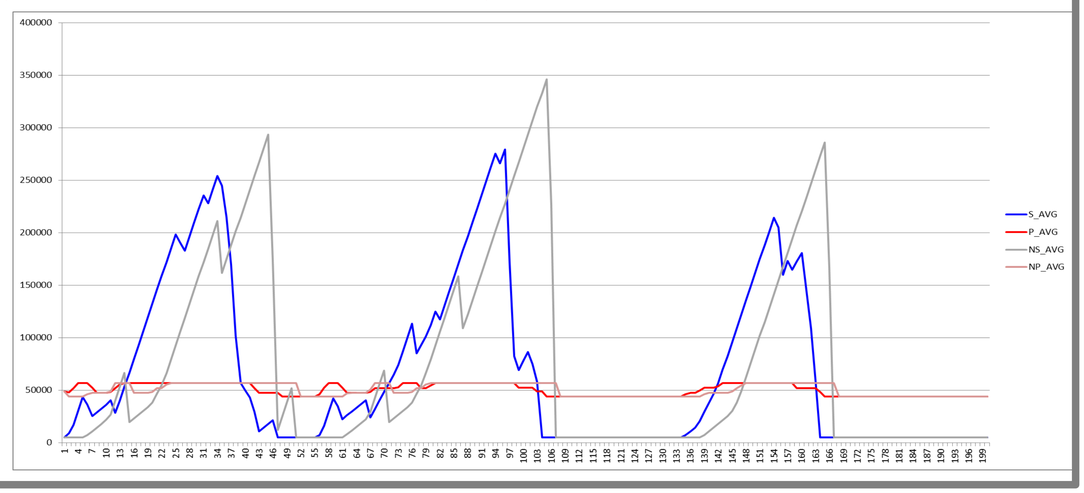
Optimal shipping schedule



Historical data on Shamal
*(1990-1999)



Inventory and Production schedule
('with Shamal' vs 'without Shamal')



Conclusions

- **Minimizes** expected delays of LNG cargo loading
- **No changes** on pre-planned vessel routing schedule
- **Minimizes** expected penalty cost for shipping delay
- **Ensures** stable expected profit and production level

References

1. Halvorsen-Weare, E. E., Fagerholt, K., & Rönnqvist, M. (2012). Vessel routing and scheduling under uncertainty in the liquefied natural gas business.*Computers & Industrial Engineering*.
2. Hamedi, M., Zanjirani Farahani, R., Husseini, M. M., & Esmaeilian, G. R. (2009). A distribution planning model for natural gas supply chain: A case study. *Energy Policy*, *37*(3), 799-812.