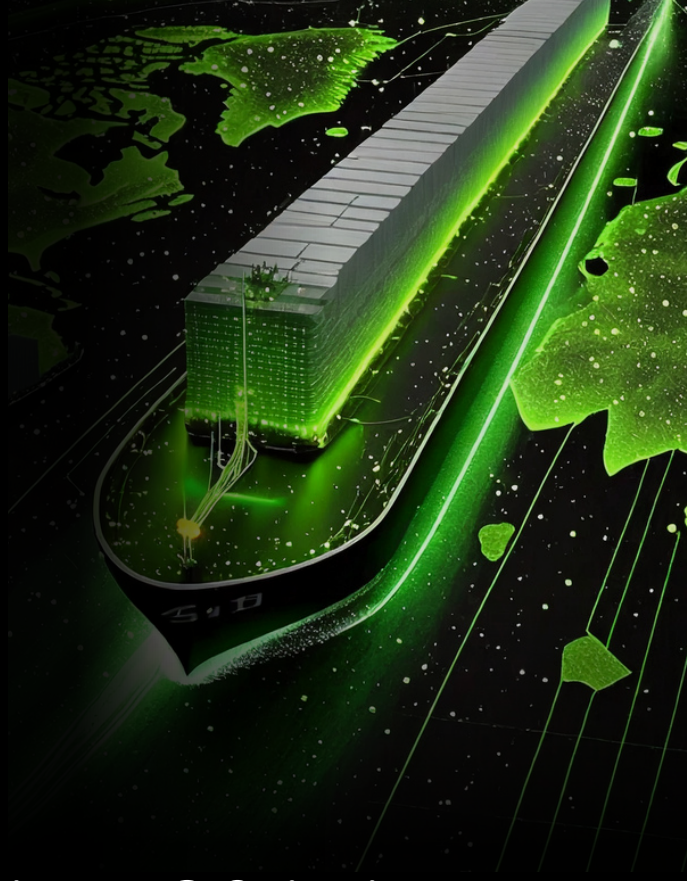


From research
to business value



Optimizing LNG Shipping Routes and Logistics with Hybrid Quantum Computing

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CASE STUDY



From research to business value



CASE STUDY

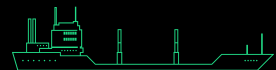


Optimizing LNG Shipping Routes and Logistics with Hybrid Quantum Computing

In the dynamic and demanding realm of LNG logistics, efficient routing stands as the cornerstone of operational excellence. Uniper - at the forefront of the global energy market, operating complex supply chains spanning over 40 countries, seeking to enhance the efficiency of its complex LNG shipping and scheduling as part of its sustainability strategy. Amidst a landscape increasingly affected by intense geopolitical shifts and volatile demand patterns, and where adapting to rapid market changes is crucial, this posed an intricate constrained optimization problem, challenging to solve with traditional methods.

Exploring new paths for maintaining and enhancing their competitive edge, Uniper turned to Terra Quantum. This partnership marked the beginning of an innovative journey to apply Hybrid Quantum Optimisation, aiming to build on existing practices to take Uniper's complex logistical network performance to the next level. The collaboration was not just about streamlining routes; it was a strategic move to significantly bolster Uniper's market position by navigating the constantly evolving global energy landscape with unmatched efficiency and foresight.

Key Takeaway



Employing a cutting-edge Hybrid Quantum Optimisation method, Terra Quantum co-designed an innovative multi-stage optimization algorithm with Uniper, enabling the energy leader to optimize its LNG transportation and exceed previous planning methods. The solution outperformed previous heuristics in under 7 minutes, unlocking an expected increase in annual value of over 30% through optimal contract selection, timing and integrated propulsion mode decisions.

By incorporating advanced computational techniques to optimise route selection and scheduling, our solution markedly improved Uniper's capacity to capitalise on high-value shipping opportunities. This strategic advantage highlights the prowess of quantum-enhanced algorithms in transforming logistical efficiencies and boosting financial outcomes in the dynamic world of global LNG distribution.

Uniper's Challenge: Precision in LNG Shipping & Logistics Optimisation



Global LNG shipping, characterised by vessels without fixed schedules, faces complex challenges. With volatile prices and operations spanning globally, optimally scheduling numerous contracts and ships poses an intricately constrained optimization problem. This strains traditional logistics models, impacting efficiency and profitability in a commodity business sensitive to external factors.

Results

34%

Reduction in runtime versus traditional methods

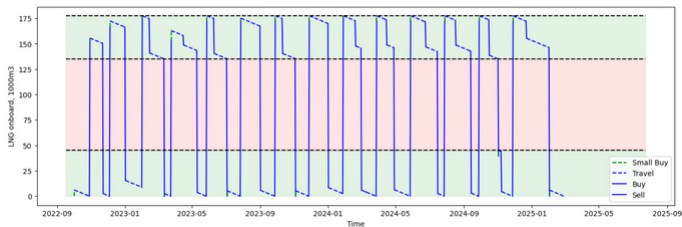


Significant value unlocked for Uniper's LNG operations by enhancing scheduling efficiency

The Approach

To optimize Uniper's flexible LNG transport strategy, Terra Quantum leveraged its Hybrid Quantum Optimization solving a staged model balancing big and small contract assignments per vessel. Tuning parameters linking the phases through quantum-inspired computation, the algorithm delivered a significant uplift within minutes.

Our approach harnessed the power of TetraOpt, a cutting-edge tool designed to navigate through solution space with extremely high numbers of variables and constraints. The algorithm's robust performance, completing calculations within 7 minutes, delivered a significant improvement in efficiency and depth—offering a nuanced understanding of the global shipping complexity that Uniper faced.



Simulated LNG Volume Onboard Under Different Scheduling Scenarios

The TetraOpt solution delivered a dual benefit: a significant increase in profitability and an operational model that could swiftly adapt to market changes and logistical demands. This technological leap, grounded in quantum-inspired computation, positions Uniper to navigate the future of LNG logistics with confidence and precision.

Conclusion

By setting new standards in shipping optimization to unlock substantial value, Terra Quantum's enhanced routing solution not only promises considerable cost savings but also enables Uniper to navigate the future with increased agility. As quantum computing matures, such advancements will further propel operational efficiency and market adaptability in the energy sector.