

ENERGY SYSTEM MODELLING AND OPTIMIZATION

ENGINEERING EXCELLENCE.



CONSULTING
ENGINEERS

ILF ESMO – ENERGY SYSTEM MODELLING & OPTIMIZATION

As the uptake of renewable energy accelerates, energy systems are shifting from stable supply to variable generation. Furthermore, green and low carbon infrastructure projects face regulatory complexity and uncertain business models; making holistic modeling and optimization essential. ILF combines decades of engineering expertise with advanced optimization techniques to deliver robust insights that guide strategic and technical decisions across the energy sector.



ITALY – POWER-TO-METHANE, FOOD INDUSTRY
Business Case and Concept Study for multi-MW power to gas system.



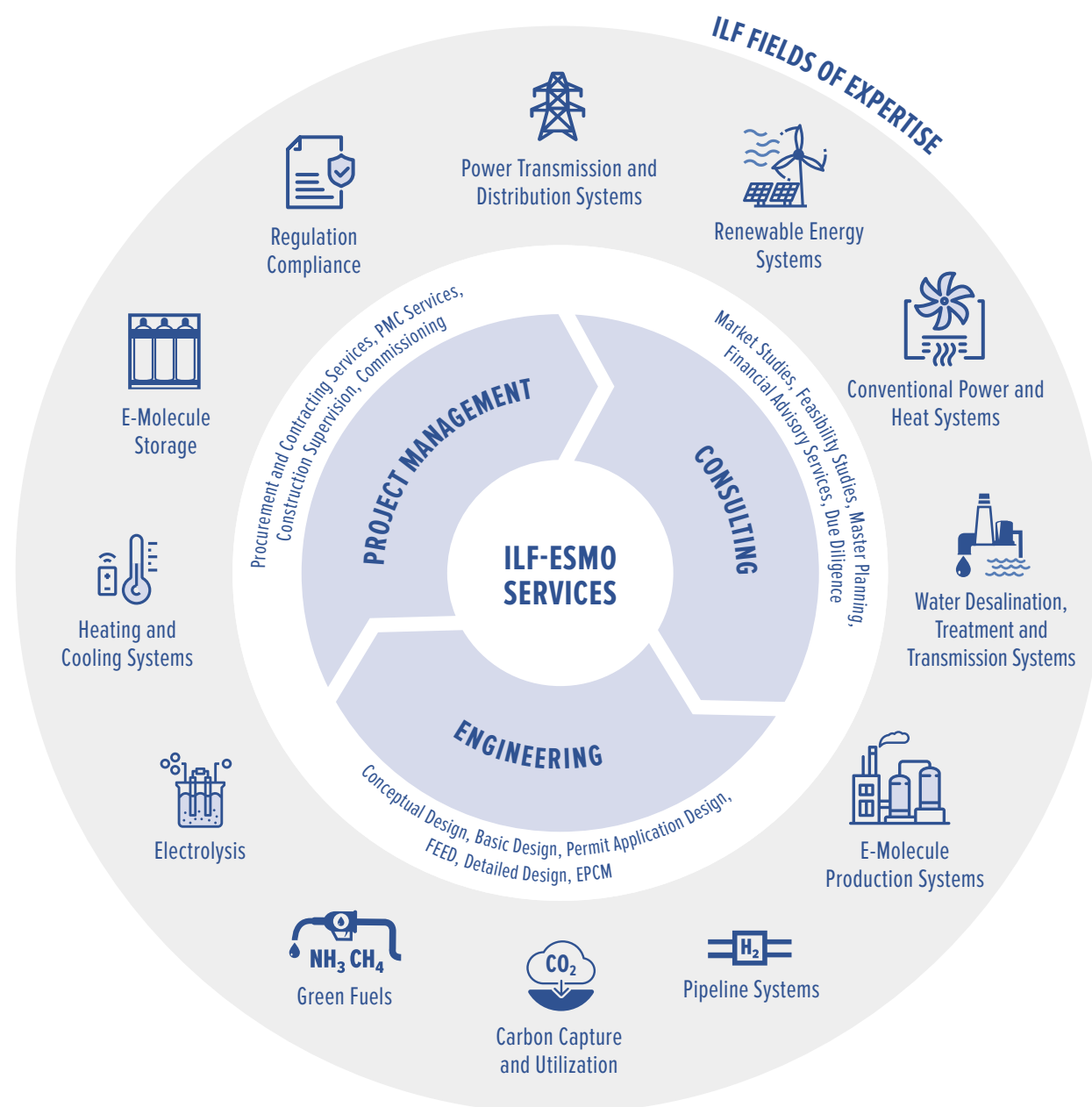
CANADA – EVERWIND FUELS
Owners Engineer and PMC
Concept Endorsement Study for 200,000 MTPA of green ammonia



OMAN – PROJECT DEVELOPER
Main Engineering Contractor
Concept Study for multi-GW green hydrogen and ammonia production.



GERMANY – NOVEL H₂ FUELING & EV CHARGING STATION CONCEPT
Business Case Study for concept that integrates renewables with ammonia cracking and fuel cell technology.

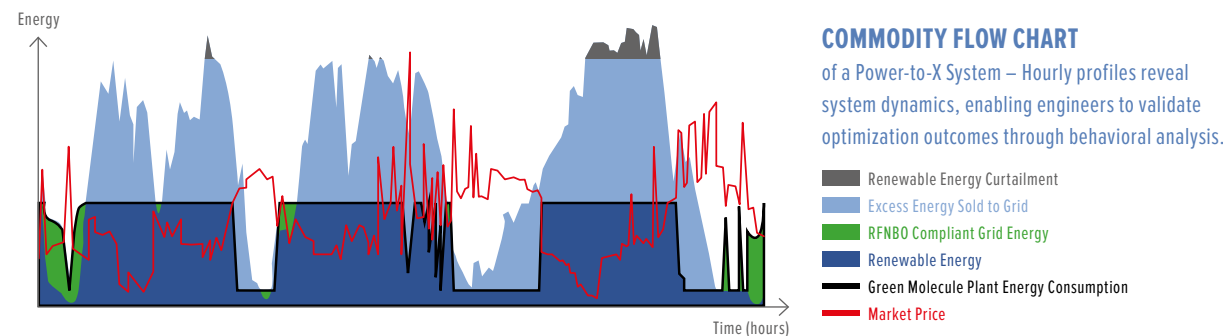


ILF Energy System Modelling and Optimization (ESMO) provides early identification of technically sound and economically viable projects through:

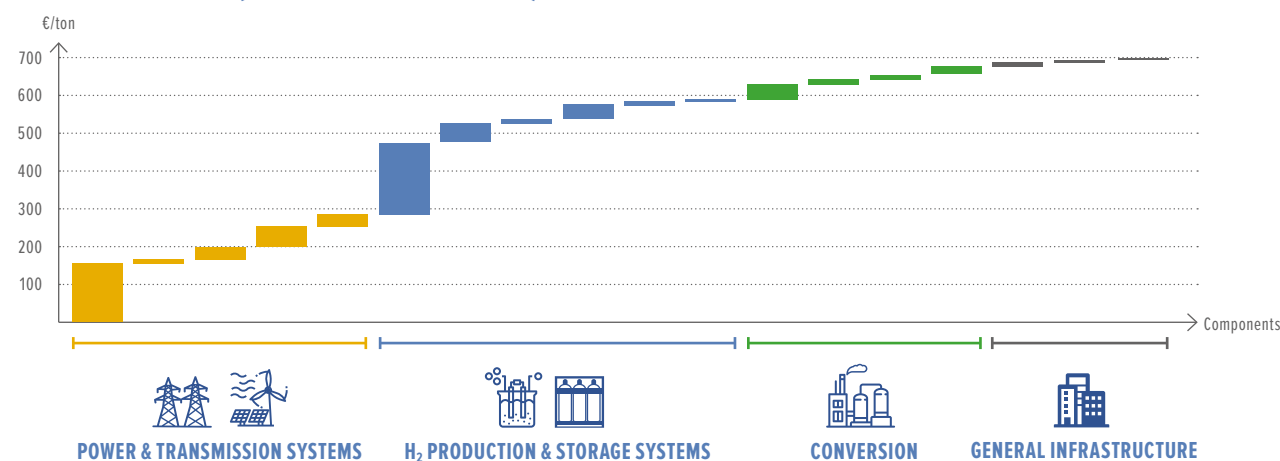
- » **Infrastructure sized for lowest lifecycle cost** for defined production/output targets.
- » **Quantified and validated outcomes** based on proven engineering expertise.
- » **Clear KPIs and deliverables** aligned with project gate criteria, ready for financial review and investor engagement.

ESMO SERVICES

By integrating system modelling and optimization methodologies from the outset, ILF establishes a solid foundation for efficient resource allocation and builds confidence at critical project decision gates. This approach ensures that complex ideas are translated into clear, quantifiable insights that support robust, data-driven decision-making.



LCOX BREAKDOWN (COMPONENT CONTRIBUTORS)



BUSINESS CASE STUDY, INDUSTRY – SERBIA

PROJECT OVERVIEW

To address the dual challenge of CO₂ reduction and energy independence, a Serbian chemical company engaged ILF for a pre-feasibility study. Using ESMO, ILF simulated hourly operations over a full year and evaluated multiple system configurations with integrated renewable energy to identify potential economic incentives for its adoption. The study supported project gate success and accelerated engineering development.

» Renewable Coverage:

Over 90% of electricity and 25% of steam demand met through renewable sources.

» CO₂ Reduction:

More than 200,000 tons annually, primarily driven by renewable electrification.

» Financial Outcome:

The recommended setup delivers proven economic performance, aligning sustainability goals with a compelling business case.



“ILF empowers industrial clients to achieve their decarbonization goals through advanced simulation and optimization of energy concepts — enabling the realization of sustainability targets and unlocking economic value through smart integration of renewable energy.”

Harry Griffith,
Energy Infrastructure Consultant

» BUSINESS CASE STUDIES

Modelling of a business idea & assessment of business case KPIs.

» CONCEPT SELECTION STUDIES

Identification of concept design and techno-economic assessment providing input for engineering activities.

» CONCEPT ENDORSEMENT STUDIES

Techno-economic assessment to endorse the project's concept prior to further engineering development.

» PERFORMANCE MODELLING STUDIES

Third-party techno-economic assessment of energy assets.

» MASTER PLANS

Least-cost expansion planning for multi-faceted regional advisory (e.g. policy, legal, techno-economical).



MASTER PLANS, ENERGY INFRASTRUCTURE – KSA

PROJECT OVERVIEW

AMAALA, an ultra-luxury resort on the Red Sea coast, is planned to operate entirely on renewable energy. ILF is delivering comprehensive technical services, including feasibility studies, off-grid solar PV and battery storage design, grid integration analysis, and tender preparation. Through advanced energy system modelling and optimization, ILF's ESMO team ensured a design that combines ambitious sustainability goals with reliable engineering solutions.

» High Renewable Coverage combined with high reliability:

Lowest-cost energy system achieves 95% annual renewable energy supply while respecting availability limits.

» Sizing balance between electrical and thermal system:

Co-optimization with district heating and cooling for best storage options.

» Strategic Recommendation:

Optimal Tendering Scope for Phase 1 of the Project.



“ILF’s comprehensive view on optimization looks beyond a single component or project but rather the entire system and provides the client with the most cost-effective, overarching solution.”

Stefan Oberleitner,
Power Systems Expert

CONCEPT SELECTION, POWER-TO-X – CHILE

PROJECT OVERVIEW

To support cost-effective green ammonia production development in Chile, ILF conducted a multi-scenario optimization study for a GW-scale facility. Using its ESMO tools, ILF assessed the Levelized Cost of Ammonia (LCOA) across various infrastructure layouts, including hydrogen and ammonia production sites and transmission options; to identify the most economically & technically viable configuration.

» Identified technically viable configurations for three main architecture types: an ammonia pipeline, hydrogen pipeline and high voltage line.

» Quantified KPIs:

CAPEX, OPEX, and LCOA calculated to guide decisions through project decision gates.

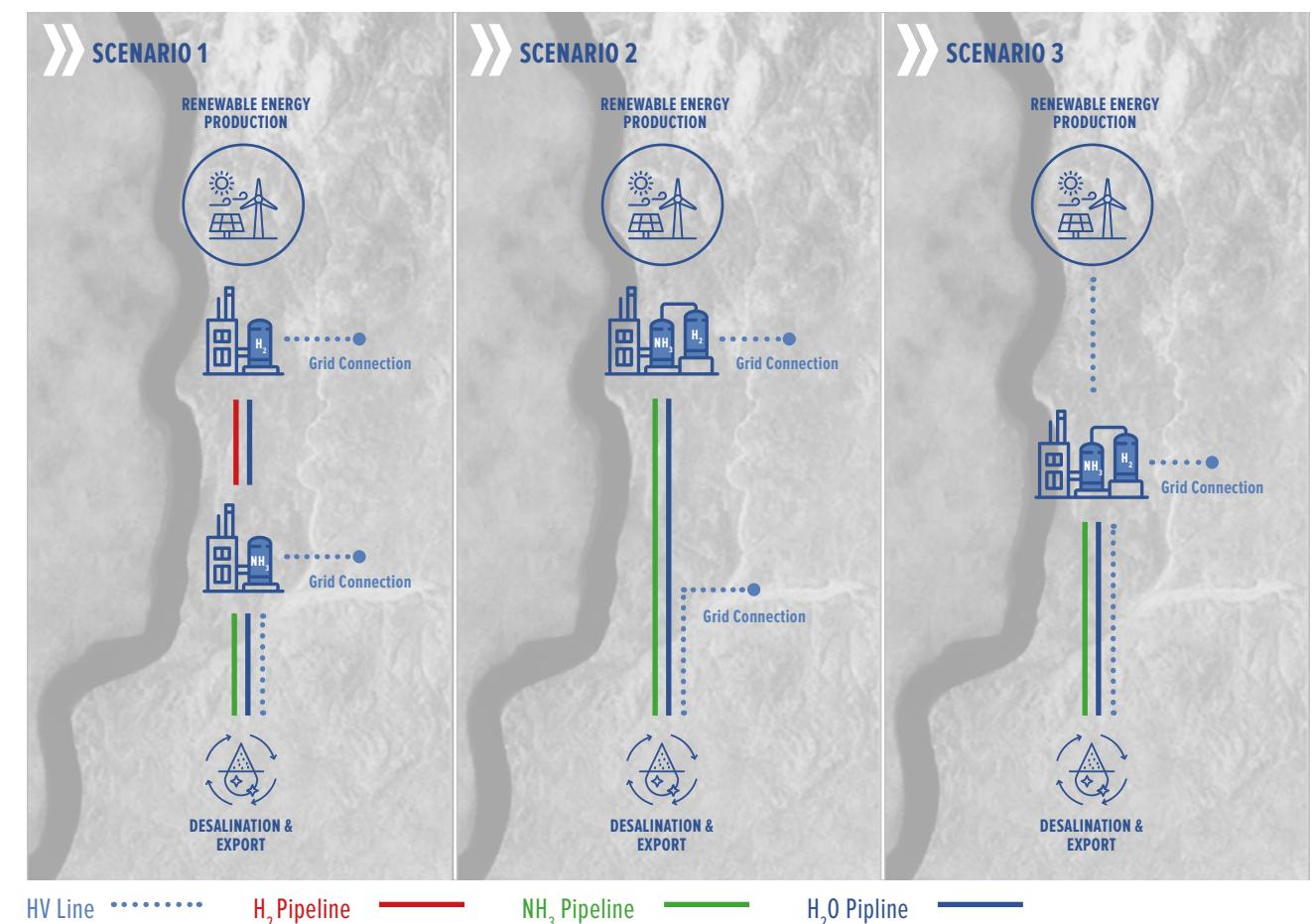
» Economic efficiency:

Most economically viable solution identified reducing the cost gap between clean and conventional ammonia.



“ILF’s holistic, performance-driven approach enables quantitative, apples-to-apples comparisons of alternative green ammonia pathways making it a powerful tool for concept studies and efficient project development.”

Lorenzo La Porta;
Power-to-X Expert





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