GIGA PTX®

ENABLE FORCES – SIMPLIFY LOGISTICS
FUELLING HOMELAND DEFENCE

TAKING RESPONSIBILITY IN A CHANGING WORLD

RHEINMETALL

SECURING SUPPLIES.
GUARANTEEING OPERATIONAL READINESS.

Europe's changing security landscape demands a reliable energy supply for the armed forces – operationally essential and strategically critical. Fossil fuel supply chains are efficient but highly vulnerable to crises, disruptions and attacks. The answer lies in decentralised, robust and scalable solutions: renewable energy and locally produced e-fuels. Projects like Giga PtX® convert energy into storable, transportable fuels, integrate seamlessly into existing logistics and strengthen resilience, flexibility and energy independence.

Rethinking energy: resilient, compatible, ready for action.

Hydrocarbon-based fuels will remain essential for modern armed forces. Their high energy density, storage capability and proven handling make diesel and kerosene the backbone of military mobility on land, at sea and in the air. Yet operational reality reveals a critical dependency: armed forces require 20–60 litres of fuel per soldier per day. Energy is therefore not just fuel, but a strategic capability determining operational readiness and endurance.

Today's fossil fuel logistics consume major resources and create vulnerabilities, with supply routes among the greatest operational risks. The solution lies in synthetic drop-in fuels. Produced from electricity, water and CO_2, e-diesel and e-kerosene can be used immediately in existing vehicles, aircraft and infrastructure without modification.

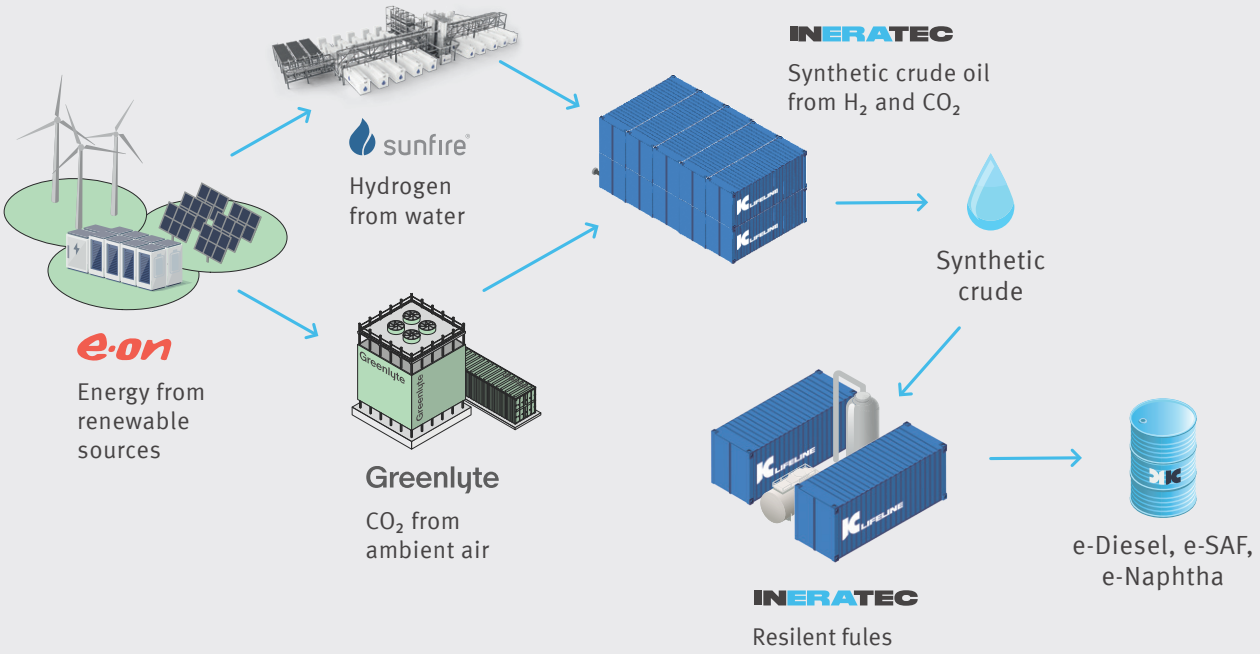
Giga PtX® advances this concept through a resilient network of modular production plants combining local energy generation, hydrogen, CO_2 supply and fuel synthesis. The result: decentralised, scalable and disruption-resistant energy supply, fully compatible with existing military structures and enabling greater operational freedom.

Giga PtX®: decentralised production, overcoming strategic dependencies.

Energy is more than an operational factor – it defines operational capability. Those with secure access to energy remain mission-ready; those dependent on fragile supply chains remain vulnerable. Today's global fossil fuel logistics are efficient but highly exposed to disruption, creating a strategic risk.

The answer is decentralisation. Synthetic fuels enable an independent, resilient and fully compatible energy supply using existing infrastructure without modifications. Rheinmetall and INERATEC are jointly advancing this approach through a network of modular production plants designed to replace vulnerable supply chains. Distributed across regions, each facility can produce several thousand tonnes of synthetic fuel annually, ensuring local availability where it is needed most.

The concept is built for resilience. Renewable energy powers production without requiring major grid expansion, while CO_2 can initially be sourced from industrial or biogenic point sources. Direct air capture may complement supply in the future but is not essential for market ramp-up.



This decentralised network reduces dependency on critical hubs, increases redundancy and strengthens overall system resilience. Its modular design also enables rapid scaling: initial plants can be deployed quickly and replicated in a standardised way. Rheinmetall and INERATEC are thus creating a robust, scalable and mission-ready energy solution that strengthens long-term military operational capability.

The result is a robust energy architecture built for resilience rather than ideal conditions: decentralised, reliable and capable of ensuring security of supply directly within the operational environment.

Generating energy where operational readiness matters.

In dynamic operational environments, secure energy supply is no longer guaranteed – it is a strategic advantage. Wherever fossil fuel supply chains are disrupted or fail, rapidly deployable and independent solutions become essential.

Modular plants for synthetic fuel production are designed precisely for these scenarios. By converting CO_2 and hydrogen into liquid energy carriers directly on site and on demand, they reduce transport dependency and create greater operational flexibility. Their standardised, pre-configured design enables rapid deployment, while grid-independent operation ensures functionality even when external infrastructure is unavailable or compromised.

This is critical for military operations and operators of critical infrastructure alike. Locally produced e-fuels provide a resilient alternative to conventional supply models while remaining fully compatible with existing standards, vehicles and systems – without technical modifications.

STEPS TO A GIGA PTX® PLANT

1. Defining the type and size

Together, we analyse application scenarios, supply requirements and existing infrastructure in the context of your procurement.

2. System manufacturing

We configure a system in accordance with technical, operational and regulatory requirements.

3. Receiving and commissioning

We support you throughout planning, integration and roll-out – for rapid, scalable implementation in the field.

INERATEC

Reactor technology for resilient fuels – reimagined.
The patented microstructure is the key to highly efficient synthetic fuel production from CO_2 and renewable hydrogen. Inside the reactors, the reverse water-gas shift reaction and Fischer-Tropsch synthesis are precisely coupled through ultra-fine channels integrated into stacked reactor foils. This enables exceptionally efficient heat and material exchange, maximising energy efficiency. The result: compact, modular and flexibly scalable production units that adapt dynamically to renewable energy availability – enabling resilient, future-ready fuel production.

Greenlyte

Green Feedstock from Air, Water and Renewable Energy
Greenlyte produces green carbon feedstock using its patented, location-independent LiquidSolar™ technology. CO_2 is first captured from ambient air and bound as stable bicarbonate, serving as intermediate storage. It is then electrochemically released as a pure CO_2 gas stream, while green hydrogen is produced in parallel as a co-product. This separation of low-energy capture and energy-intensive release enables production to follow fluctuating renewable energy availability. The result is modularly scalable, fossil-free carbon feedstock for e-fuels.

sunfire®

Hydrogen on demand
Sunfire's pressurized alkaline electrolyzer (AEL) produces green hydrogen on demand in Giga PtX®'s eFuel plants, operating continuously with dynamic load management powered by renewable energy. The modular system is easily scalable, runs at 30 bar(g) and reduces process steps, interfaces, and costs through integrated compression. In electrolysis, water is split into H_2 and O_2; hundreds of cells form high-performance stacks. Sunfire already supplies large quantities in Europe and makes hydrogen a reliable basis for local e-fuel production.

e·on

A holistic approach to energy infrastructure for resilient fuel production.
E.ON Energy Infrastructure Solutions develops sustainable energy systems and translates complex requirements into economical, reliable, and scalable solutions. This capability is essential for Giga PtX®: converting CO_2, water and renewable electricity into synthetic fuel requires requires a connected, robust infrastructure. E.ON Energy Infrastructure Solutions plans and integrates energy generation (photovoltaics and wind power), battery storage, grid connection, as well as essential process media including steam, heat, cooling and compressed air.

STRATEGIC ADVANTAGE
Transforms fuel into a standalone capability that ensures security of supply and enables independent operations.

DECENTRALISED PRODUCTION
Establishing a network of generation facilities – to strengthen a resilient energy infrastructure across Europe.

SCALABLE CAPACITY
Each plant is designed to make use of locally available raw materials, whilst the Giga-PtX® network, with its combined capacity, supplies the fuel that is essential for meeting Europe's energy needs.

RELIABILITY IN EVERY OPERATIONAL SCENARIO
The modular design of our IC -Lifeline systems ensures redundancy in all critical components. With no single points of failure, systems remain operational – and can be repaired quickly in the event of an outage.

RAPID DEPLOYMENT – ANYWHERE
Standardised, systems adapt to any environment and integrate seamlessly into existing infrastructure. Rapid installation and scaling thanks to modularity and mass production. Mission-ready – ASAP!

OFF-GRID CAPABLE
The plants offer maximum load flexibility to cope with irregular supplies of raw materials and electricity. Integrated fuel synthesis and processing produce drop-in fuels – self-sufficient, even off-grid production. Mission-ready – ASAP!

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