

WHITE PAPER

THE OIL GRID

A new integrated production architecture for oil and gas fields

1 The conventional model and its shortfalls

In the conventional model, raw, unstable fluid travels from every well, often over long distances, to one central gathering centre. There it is separated, treated and held in a tank farm. A dedicated power plant or substation keeps the plant running, and a flare burns the gas that cannot be used. Not every field has every feature, but the pattern holds: every barrel passes through one place.



Figure 1. The conventional model. A central plant, with storage tanks and a flare, receives the fluid from every well. Illustrative image of a conventional development.

The model has thirty-two shortfalls, set out with public data and the Founder's own account in Table 1. They are structural: they follow from centralisation itself, which is why patching them one at a time has not resolved them. The last column shows the benefit groups in Section 6 that bear on each one.

TABLE 1. THE THIRTY-TWO SHORTFALLS OF THE CONVENTIONAL MODEL. BENEFIT GROUPS: 1 ENGINEERING · 2 HEALTH, SAFETY AND ENVIRONMENT · 3 ECONOMIC · 4 BUSINESS · 5 MANAGEMENT · 6 LOGISTICS · 7 PROTECTION

NO.	SHORTFALL	WHAT IT MEANS	BENEFIT GROUPS
01	One plant, one point of failure	Every well feeds one central gathering centre, so a fault on a shared section can stop the whole facility.	5, 7
02	Cost overruns are the norm	Of 365 oil and gas megaprojects reviewed, 64 per cent ran over budget and 73 per cent missed their schedule.	3
03	The wait for first oil keeps growing	From 4.9 years in 1960–1980 to about 15.1 years for fields starting in 2025.	3
04	Flaring wastes gas and pollutes	Global flaring in 2024 reached its highest level since 2007.	2
05	Surface storage is a standing hazard	Tank farms carry fire, explosion, asphyxiation and toxicity hazards, and release fugitive emissions.	2, 7
06	Long-distance multiphase transport	Congested flow lines, extra pumps, lost heat and pressure, and water occupying pipeline capacity.	1
07	Downtime is concentrated	A central fault stops everything behind it; offshore facilities average around 27 days of unplanned downtime a year.	5, 3
08	Rigid, and prone to stranding	Sized once, cannot be partly maintained or expanded without a shutdown.	1, 3
09	Black powder	An abrasive contaminant that forms inside almost every pipeline and wears meters, valves, pumps and compressors.	1, 5
10	High energy use, and the grid it forces	Compression and pumping require a power plant or substations before product can move.	1, 3
11	Facilities wear and tear	Water, salt, hydrogen sulphide and carbon dioxide corrode pipelines, tanks and platforms.	1, 3
12	Health, safety and environment	Concentrated hydrocarbons, high pressure and manned facilities; travel to and from remote sites is the leading cause of extraction-worker deaths.	2
13	Logistics	Oversized equipment of up to about 20 tonnes moved over poor roads, by special vessel or by helicopter.	6
14	Sour-gas exposure	About 40 to 43 per cent of the world's gas reserves are sour.	1, 2
15	Erosion	Sand and high-velocity flow wear chokes, valves, pumps and lines.	1
16	Hydrate formation	Hydrates form in cold, pressurised multiphase lines and block them.	1

NO.	SHORTFALL	WHAT IT MEANS	BENEFIT GROUPS
17	High engineering complexity	Every central plant is engineered from scratch for its field.	1, 5
18	Well-type inflexibility	One plant cannot take every pressure and every crude, so the field is divided around it.	1
19	No intelligent field management	Central control cannot run a field unit by unit, in real time.	1, 5
20	Product-allocation rigidity	Blended streams are hard to measure and allocate per well and per customer.	1, 5
21	High baseline operating cost	Maintenance, operation, labour, energy and chemicals, for the life of the field.	3
22	Poor marginal-well economics	About 80 per cent of US oil wells are marginal; some 10,000 to 20,000 are plugged and abandoned each year.	3
23	Large project size	Scale drives cost, safety, security and engineering difficulty together.	3, 4
24	Nations locked out	Many nations with known deposits do not produce, because the infrastructure costs too much.	3, 4
25	Large land footprint	The plant, tank farm, flare area and surface corridors take significant land.	2
26	Security and theft exposure	In one major producing nation, an estimated 200,000 to 400,000 barrels a day are lost to theft and sabotage.	2, 7
27	Large implementation burden	One long, complex, single-site construction campaign.	5, 6
28	Innovation constrained by the architecture	Improvements are dropped because the fixed system cannot take them.	4, 5
29	Resistance to change	Organisational inertia slows the adoption of a better model.	4, 5
30	Methane beyond flaring	Leaks, venting and incomplete combustion; the fossil fuel sector accounts for nearly a third of methane emissions from human activity.	2
31	Produced water	About three barrels of water for every barrel of oil worldwide, and more in mature fields.	1, 2
32	Decommissioning at end of life	Fixed wells, pipelines and plants must be removed and the land restored when production ends.	3, 2

2 The idea: move the factory to the oil

THE OIL GRID reverses a model that has changed little in more than a hundred years. Instead of moving the raw materials to the factory, it moves the factory to the raw materials.

It is a patented, decentralised, modular production system. It is designed to put a sealed, self-energised unit at each well, join the units with a buried ring and run the field with artificial intelligence (AI). The central gathering centre, the tank farm, the flare system and the central power plant are designed out.

The system is designed to be built from equipment the industry already knows and trusts. What is new is how that equipment is put together. Each of the four subsystems is a new combination of established equipment, and the four are joined under the Smart Field, the governing intelligence of the whole project, into one production architecture.

3 The battery limit

A battery limit is the line that marks where a scope of work starts and ends. The scope of GGC-ALPHA's business runs from the wellhead to the customer's intake.

Inside the scope are the four subsystems of THE OIL GRID and the handling of produced water:

- the SERM-GC unit at each well;
- the CL Unit, a buried ring with three lines, for oil, gas and water;
- the AI-CS, under the Smart Field, as the control layer over every unit;
- the DS, with treatment, metering and custody transfer (the point at which ownership passes from producer to buyer);
- the handling of produced water, up to and including its re-injection or treatment.

Outside the scope are:

- each well and its Christmas tree, the assembly of valves that controls the flow from the well;
- the customer's intake after the DS, whether a pipeline, a tanker or a refinery.

Produced water, the water that comes up with the oil, is designed to be separated at each well, carried on the ring's water line and sent on from the DS to re-injection or treatment, which lies inside GGC-ALPHA's scope. The regulatory obligations for treatment and disposal remain, and they are specific to each field.

The rings of neighbouring fields are designed to be joined, locally or across borders, so that the fields can be linked.

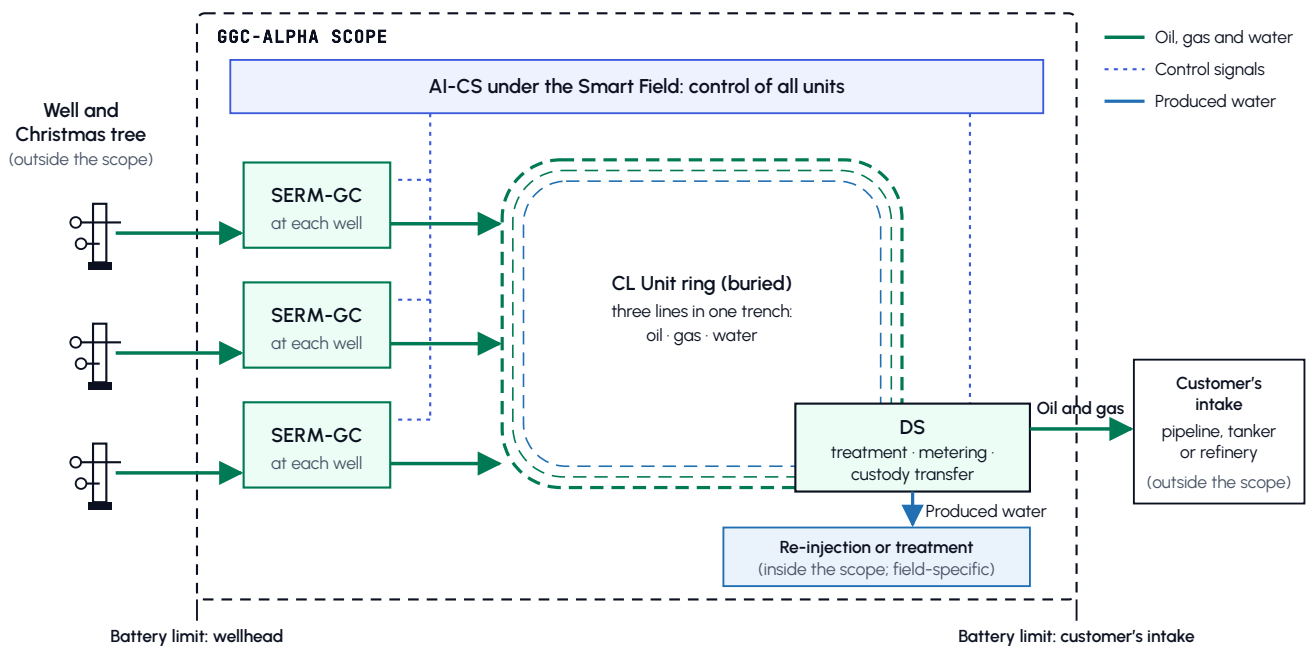


Figure 2. The battery limit. GGC-ALPHA's scope runs from the wellhead, with the Christmas tree outside it, to the customer's intake, which is also outside it. The re-injection or treatment of produced water lies inside it. Schematic for illustration; not to scale. No Oil Grid installation has yet been built.

4 The four subsystems

SERM-GC — Self Energised Remote Mini Gathering Centre. A complete gathering centre in miniature: a sealed unit about the size of a load truck, usually one per well, with its own fire and explosion protection. It is designed to separate the stream into oil, gas and water, manage pressure inside itself, and power itself from energy already at the well site.

CL Unit — the Circle Pipeline (the Oil-Grid). A closed ring, buried beneath the field, that joins every SERM-GC: three lines in one trench, for oil, gas and water. Product is designed to travel either way around the ring, so an offline segment can be bypassed rather than shut the field down. The ring is designed to carry the product and to hold it, so no surface storage tank is needed.

AI-CS — AI Control Station, under the Smart Field. Every unit is designed to carry its own local AI, which reports to the AI-CS and acts on its instructions. The AI-CS is designed to monitor, predict and optimise the field around the clock. Above it, the Smart Field is designed to set the production plan for the whole project.

DS — Product Dispatch Station. The station at the ring's low point, where the finished product leaves the grid. It is designed to remove remaining impurities and bring the crude to the customer's specification. Metering and custody transfer are designed into the station, so that ownership changes hands only after the product has been cleaned, upgraded and metered. The DS holds no storage tanks.

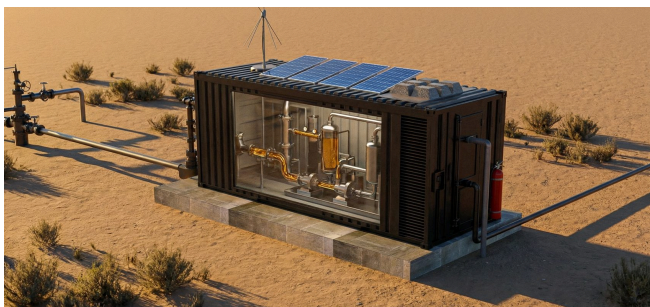


Figure 3. SERM-GC. A sealed, load-truck-sized unit beside the wellhead, shown with a cutaway of its separation vessels and solar panels on its roof. The Christmas tree on the left lies outside GGC-ALPHA's scope. Visualisation · not an installed field.



Figure 4. The field from above. The CL Unit ring joins the SERM-GC units at its nodes. The ring is designed to be buried; it is drawn above ground here for clarity. Visualisation · not an installed field.

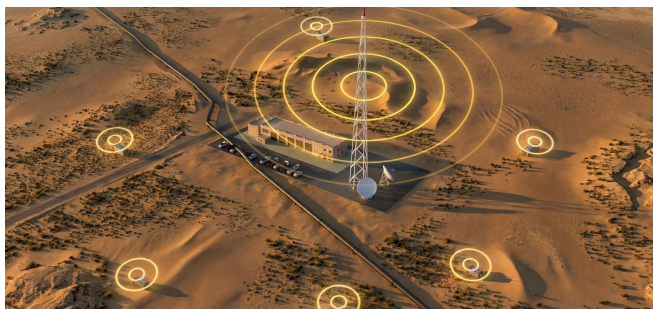


Figure 5. AI-CS. The AI Control Station at the centre of the field, linked to the local AI in each unit. Visualisation - not an installed field.

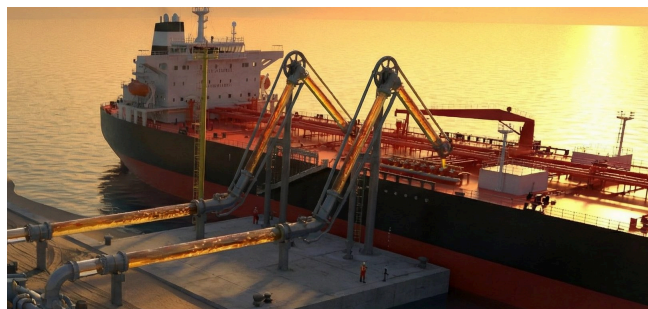


Figure 6. DS. The Product Dispatch Station at the coast: the metered product passes through loading arms to the customer's tanker, which lies outside GGC-ALPHA's scope. The DS holds no storage tanks. Visualisation - not an installed field.

5 How the field is designed to work

Start-up. The system is designed to take a field from zero to full capacity with one command, and to start up and shut down in minutes rather than days. Production is designed to begin with the first commissioned units, and to grow as each new well joins the ring.

A fault. A fault is designed to stop one well while the rest of the field keeps producing. The AI is designed to alert the owner in real time, and the faulty unit is planned to be exchanged for a working one within about two days.

Safe state. If communication with the AI-CS is lost, each unit is designed to hold itself in a safe state.

Risks. The architecture is designed to remove some conventional risks and reduce others, and it introduces a few new ones. In the design, cyber exposure is to be addressed by a control-system security architecture to IEC 62443, the international standard for the security of industrial control systems; distributed maintenance by unit exchange and predictive maintenance; and dependence on communications by the local safe state. Site-specific engineering, leak detection and repair, water treatment and disposal, and decommissioning obligations remain, and the integrity of the buried ring is to be managed as a pipeline.

6 The benefits of THE OIL GRID

THE OIL GRID is designed to deliver thirty-three benefits in seven groups, listed in Table 2. What the design removes no longer has to be built, powered, staffed or protected.

Every percentage in Table 2 compares THE OIL GRID with a conventional development of the same field, built around a central gathering centre, tank farm, flare system and power plant. The comparison is made on the reference case: a virgin (greenfield) onshore field with no existing supporting utilities. Where such infrastructure already exists the advantage narrows, and results vary from field to field. Deployment is measured from decision to full build-out: 5–7 years for THE OIL GRID against 18–21 years for a conventional, centrally gathered field. Public data use a different clock: recent major field developments average 15–16 years from discovery to start-up, and complex ones 18–23 (Global Energy Monitor).

Each benefit carries its class. A **process-simulation result** is a calculated comparison, not a real or measured figure. The cost figures are concept-stage estimates. A **design characteristic** is a property of the design. A **design intent** is a target the system is engineered to meet, to be confirmed at validation. A **commercial or strategic statement** describes the business model or a possible outcome; it is not a performance claim.

TABLE 2. THE THIRTY-THREE BENEFITS OF THE OIL GRID. FIGURES FOR THE OIL GRID ARE PROCESS-SIMULATION RESULTS, NOT REAL OR MEASURED FIGURES: UPPER-BOUND VALUES AGAINST THE REFERENCE CASE

NO.	BENEFIT	WHAT IT MEANS	CLASS
1	Engineering		
01	Separation at source	The SERM-GC is designed to separate oil, gas and water at the wellhead and send each on its own line.	design characteristic
02	Wide well and crude compatibility	High-, medium- and low-pressure wells, high gas-oil ratio and different crude types, within the operating limits (pressure, temperature and fluid properties) defined for each field.	design characteristic
03	Self-energised units	Units are designed to draw on well-stream pressure and heat and permitted local sources, with no central power plant; the energy balance is to be confirmed by prototype testing and certification.	design characteristic
04	Corrosion, erosion and hydrate control built in	Pressure and chemistry are designed to be managed inside the sealed unit, and separation at source shortens raw-fluid transport.	design intent

NO.	BENEFIT	WHAT IT MEANS	CLASS
05	The pipeline as the buffer	The underground ring is designed to provide transport and dynamic buffering, so no surface storage tank is needed.	design characteristic
06	Standardised and factory-built	Repeatable manufacture in place of a bespoke plant built on site.	design characteristic
07	Intelligence in every unit	Each SERM-GC, the CL Unit and the DS carry local AI that reports to the AI-CS under the Smart Field.	design characteristic
2	Health, safety and environment		
08	Zero routine flaring	Gas is designed to be captured and processed at the well; no flare system is fitted; emergency provisions remain under safety standards. Zero routine flaring depends on the captured gas having an outlet.	design intent
09	Zero surface tanks	The architecture contains no surface storage tanks; the ring is the buffer.	design characteristic
10	Up to 80% less energy	Self-energised units and no central energy-intensive facilities.	process-simulation result
11	Up to 60% smaller footprint	Distributed units and a buried ring; no permanent on-site estate.	process-simulation result
12	People kept out of hazardous areas	Remote and automated operation is designed to reduce routine presence near hazardous inventory.	design intent
13	Fire and explosion protection in every unit	Protection, detection and shutdown built into each sealed unit.	design characteristic
14	Water handled responsibly	Produced water is designed to be separated at the well and routed to re-injection or treatment.	design characteristic
3	Economic		
15	Up to 70% lower CAPEX	About 40% at the floor, where a site already has utilities; around 49% on average across fields; up to 70% on the reference case.	process-simulation result
16	Up to 70% lower OPEX	Automation, energy at the well, no permanent crew, maintenance by unit exchange.	process-simulation result
17	60–75% faster deployment	5–7 years against 18–21 years for a conventional, centrally gathered field.	process-simulation result
18	Production before project completion	Units are designed to produce as they are commissioned rather than when the whole field is finished.	design characteristic
19	Up to 90% less production lost to downtime	Against about 8 per cent of potential production lost to unplanned downtime in conventional fields (SPE/JPT, 190 offshore Gulf of Mexico assets). A fault is designed to stop one well only; the unit is planned to be exchanged within about two days.	process-simulation result
20	Marginal wells become potentially economic	A lower shared-infrastructure burden lowers the cost floor for small and low-pressure wells.	commercial or strategic statement
21	Phased, self-funding growth	Deployment and production can grow as units are commissioned and revenue flows.	commercial or strategic statement
4	Business		
22	A route for new producing nations	A lower infrastructure threshold could make development feasible for resource holders that cannot justify a conventional mega-project.	commercial or strategic statement
23	Multiple partnership routes	Joint venture first; direct procurement, build-operate-transfer and licensing.	commercial or strategic statement
24	Design once, deploy repeatedly	Standardised platform engineering reduces repeated bespoke engineering.	commercial or strategic statement
25	Local manufacturing and the seven-year training programme	Local manufacture with skilled local labour, and a seven-year programme planned to hand operation to the client.	commercial or strategic statement
5	Management		
26	24/7 intelligent control	The AI-CS and the Smart Field are designed to monitor, coordinate and optimise the field around the clock.	design characteristic
27	Predictive maintenance and alerts	Unit issues are designed to be identified early and reported to the owner in real time.	design intent
28	Design-to-implementation cycle under a third	Typically 1–2 years, with engineering, permitting and construction in parallel.	process-simulation result
29	Per-well metering and customer connectivity	Metering at every well, custody transfer at the DS and connection of customer systems; accuracy is to be confirmed by prototype testing and certification.	design characteristic
6	Logistics		
30	Road-deliverable logistics	Load-truck-sized units and pipe are planned to arrive by road, with no oversized central-plant modules.	design characteristic
31	Relocatable, expandable, resellable	Units can move between wells and projects as a field expands or contracts.	design intent

NO.	BENEFIT	WHAT IT MEANS	CLASS
7	Protection		
32	Security by design	Physical: sealed units, a buried ring and no exposed tank farm (a design characteristic). Cyber: OT/ICS security to IEC 62443 (a design intent).	design characteristic; design intent
33	Strategic resilience and operational continuity	A local failure is designed to be isolated while the rest of the field keeps producing; to be confirmed site by site.	design intent

7 Where the Company stands

THE OIL GRID is engineered and patented. No installation has yet been built, at prototype or commercial scale. The Company is in its foundation phase: building its advisory and management team, applying to sovereign innovation programmes, and securing the partners and funding for the one-time design stage.

The system grew from the shortfalls of the conventional model that its sole inventor, Eng. Mubarak Taher, observed during his twenty-four years at Kuwait Oil Company. He is now Founder and Chief Executive Officer of GGC-ALPHA. US Patent 9,334,722 B1 was granted on 10 May 2016 and is in force until 2035, and the design has been refined continuously since. The patent is held personally by the Founder; an exclusive licence to it is to be granted to the Company under a licence agreement being finalised with counsel. The Company was incorporated in Dublin, Ireland, on 18 May 2023.

Next comes the one-time design stage: full engineering and manufacturing design, prototype testing, certification and licensing. The first standard units are then planned to be manufactured, ready for the first customer.

This paper gives no money amounts for the Company or its projects, and makes no offer of any kind. Enquiries can be made through the Contact page at ggc-alpha.com.

IMPORTANT NOTICE

THE OIL GRID has not yet been built. All figures in this paper are estimates from process simulation and engineering calculation, not measured results, and actual results may differ materially. Nothing in this paper is a guarantee, an offer of securities or investment advice; readers should make their own enquiries and take their own advice.

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Sources for public data (not results of process simulation), by shortfall number in Table 1: 02 EY, Spotlight on oil and gas megaprojects (365 projects); 03 Global Energy Monitor, Global Oil and Gas Extraction Tracker field-development data; 04 World Bank, Global Gas Flaring Tracker, 2025 (2024 data); 05 OSHA storage-tank hazard guidance and US Chemical Safety Board investigations; 07 Society of Petroleum Engineers, Journal of Petroleum Technology (SPE/JPT; Ziff Energy Gulf of Mexico downtime study) and industry offshore data; 12 IOGP safety data and OSHA; 13 Wipro and Inbound Logistics, oil and gas supply-chain studies; 14 International Energy Agency (IEA), via Stanford Energy Journal; 22 US Energy Information Administration, S&P Global and US Department of Energy; 26 national regulator data, via industry reporting; 30 IEA, Global Methane Tracker 2025; 31 US Department of Energy, via Global Energy Monitor. The other shortfalls are described from US Patent 9,334,722 B1, industry literature and the Founder's own account. In Section 6: deployment benchmark, Global Energy Monitor; downtime baseline, SPE/JPT (Ziff Energy study of 190 Gulf of Mexico producing assets).