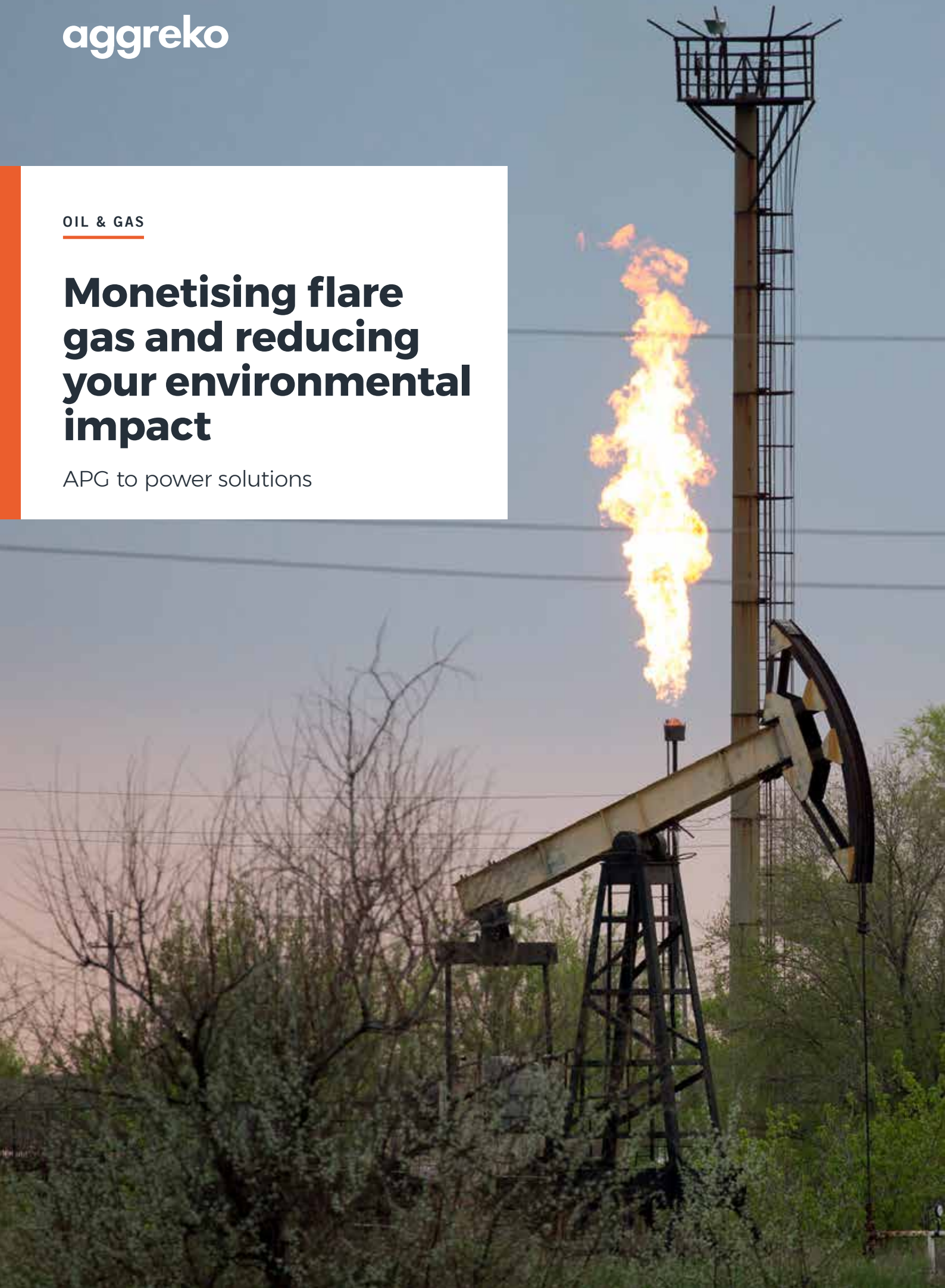
aggreko

OIL & GAS

Monetising flare gas and reducing your environmental impact

APG to power solutions



Aggreko can help you generate power from Associated Petroleum Gas (APG) which will **reduce your carbon footprint** and can be used for your own needs to **reduce your operating costs, or create a new revenue stream** when sold to a third party

One of sixteen OMV Petrom APG to power project sites in Europe

We can engineer a bespoke solution to match your individual needs and provide full turnkey solutions with industry leading reliability and the highest safety standards.

Historically APG has been seen as a valueless waste product from the oil industry, and is often classed as a problematic stranded gas reserve when in a remote oil field or when piped export isn't viable. This is could be why there has been very little push to use it and it has traditionally been burnt off in flares.

However, recently the oil industry has looked to monetize APG and this, coupled with the World Bank's 'Zero Routine Flaring by 2030' initiative is driving new environmental regulations to prevent gas flaring globally. Subsequently, there has been an increase in 'APG/Flare to Power' projects, with Aggreko becoming a key global player in this market.

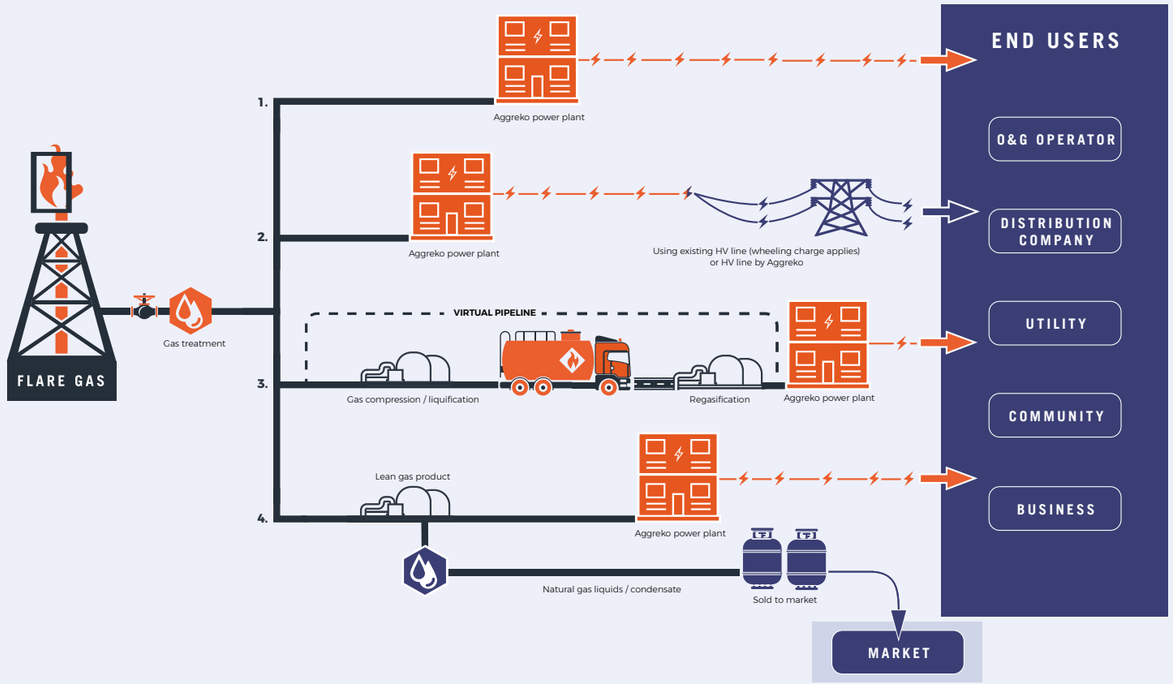
We have secured to date more than 1 GW of installed capacity for projects using APG as a their fuel for customer projects in every corner of the world. From the extreme cold climate of Siberia, Russia to the searing heat of the Middle East. We are materially reducing customers' cost of energy by using this previously flared gas to power their operations or export it to the grid.

As APG volumes change over a project's lifetime, and geological study estimates at feasibility stage are rarely accurate, our flexible offering is ideal for operators. We can match gas availability over the project lifetime and our equipment can be adjusted to match a wide range, including varying gas compositions.

While the quality of the some APG can prevent its use directly into our generators – such as high H^2S, high-water content or low methane content. In most cases, these can be overcome with our in-house expert application knowledge and sophisticated engineering capabilities which encompass/include a variety technologies such as H^2S treatment and NGL stripping.

Aggreko can assume a wide scope of work both technically and commercially, and we are willing to invest in project infrastructure and to partner as an investor with operators where appropriate to deliver such projects.

Flare gas to end user route options



Global APG to power project experience

To date, we have successfully delivered more than 180 flare to power projects globally, with an installed capacity exceeding 1 GW of power for our customers.

POWER USE

- **145 Projects / 657 MW** — PRODUCTION
- **19 Projects / 32 MW** — PRODUCTION + EXPORT TO GRID
- **6 Projects / 64 MW** — PRODUCTION + DRILLING
- **5 Projects / 47 MW** — PRODUCTION + ON-SITE OPERATIONS
- **6 Projects / 12 MW** — ON-SITE OPERATIONS
- **1 Projects / 165 MW** — EXPORT TO GRID
- **1 Projects / 8 MW** — DRILLING

111 projects
175 MW*
NORTH AMERICA

19 projects
32 MW*
EUROPE

41 projects
563 MW*
EURASIA

6 projects
20 MW*
AFRICA

5 projects
45 MW*
SOUTH AMERICA

2 projects
170 MW*
MIDDLE EAST

SUPPLEMENTARY POWER
10 Projects / 132 MW

EXPORT TO GRID
4 Projects / 195 MW

MAIN POWER
48 Projects / 361 MW

EARLY POWER
119 Projects / 277 MW

POWER SEGMENT

*MW shown is installed capacity.

To produce 1 mw/h we need
- 260-270 nm^3 of gas
- 9180 -9534 mbtu /scuff

CASE STUDIES

Flare to power first for Oman

Location: Oman, Middle East

THE CHALLENGE

Design and engineer a flare gas to power solution for critical oilfield areas

The oilfield was situated in extreme conditions with temperatures in excess of 50˚C, frequent sandstorms, and heavy fog moisture all to contend with. In addition, the location itself was remote, with only sand roads for access.

With several challenges including the availability of the APG, treatment and cooling of the gas, and the biggest technical challenge being the flare holding condensates too hot to be fed directly into a gas engine, a bespoke engineered solution was needed.

THE SOLUTION

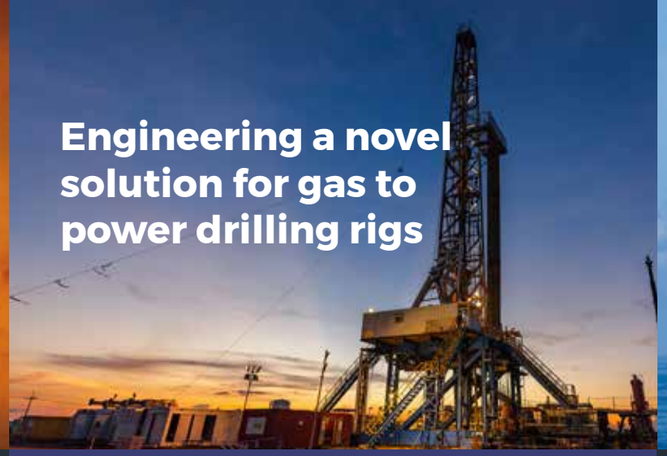
4 MW of centralised power with bespoke gas treatment and custom designed central control system

We engineered a solution to treat, scrub and cool the gas prior going into the engine which meant we could use the gas and make the project viable.
We replaced 5MW of diesel decentralised power with 4MW of centralised continuous gas power. This was made up of ten QSK60 gas generators, along with a purpose-built gas conditioning skid that was connected and controlled by a central controls system. It was also monitored by a Fire and Gas detection system that ensured safety at all times, and for further safety controls we installed a custom-made high voltage distribution panel.

THE IMPACT

Significant operational cost savings, reduced environmental impact and enhanced market reputation

The customer saved $50,000 USD a month as they no longer needed to use diesel fuelled power for critical loads in their oilfield. They de-carbonised their operations through a reduction in gas flaring and they gained recognition and credibility in the Oman oil industry for being the first to use flare to power.



Engineering a novel solution for gas to power drilling rigs

Location: Russia

THE CHALLENGE

Develop a solution that enables gas generators to handle typical swing loads of a drilling rig and reduce costs by monetising APG

Drilling rigs are usually powered by diesel generators since the engine technology is less sensitive to voltage spikes.

However, this means high costs for Operators as they consume significant amounts of diesel fuel. In October 2019, Aggreko won a tender to provide gas power for drilling rigs. The company was contracted by an oil producer specializing in the development, production, testing and introduction of new technologies and equipment to develop hard-to-recover hydrocarbon reserves and increase oil recovery.

THE SOLUTION

Engineering a super capacitor into a gas power centre to stabilise frequency and voltage providing reliable gas power

Aggreko's design team proposed a comprehensive solution for the construction of a gas power plant based on seven gas generators with a single capacity of 1375 kVA, two transformer substations and a gas treatment unit. The super capacitor stabilises the frequency and voltage in the network during sudden changes and fluctuations in the consumption of electric power.

THE IMPACT

50% cost reduction to power drilling rigs and emissions reduction

This novel concept solves several problems: it monetises APG instead of burning it, and it achieved a 50% reduction in the cost of energy supply to drilling rigs. This is especially important against the background of changing economic conditions: falling oil prices, reduced purchasing power and other factor.

Cleaner, cheaper power for offshore platform

Location: Southern North Sea, Europe

THE CHALLENGE

Reduce emissions and increase efficiency of offshore platform

New emission regulations on soot and nitrogen oxide (NOx) production required Neptune to rethink their approach for their offshore gas turbine.

The turbine itself was inefficient and producing more power that was needed, and excess gas required flaring. The company wanted to avoid a CAPEX investment in updating the turbine, but with growing reliability issues and maintenance costs, they needed a solution that would be more efficient, meet new emissions regulations and not impact their profit margins.

THE SOLUTION

Aggreko 1.1MW gas generators meet new regulation parameters

One of our mobile, modular 1.1MW gas generators would provide ample power to the platform with the portable equipment ideal for offshore sites. More importantly our solution would lower emissions compared to the existing turbine, thanks to increased efficiency and a right sized solution.

THE IMPACT

Efficiency up, costs and emissions down

A Factory Acceptance Test (FAT) was implemented to verify the lowered emission values, and confirming it's suitability before installation. The 36% efficiency of the new power package meant that the customers gas turbine was no longer needed and the platform stayed live with no capex investment required.

Power management solution provides 10:1 payback per month

Location: Texas, USA

THE CHALLENGE

Find a cheap alternative fuel quickly

As a result of limited power from the grid, more than 16 wells were underdeveloped or shut in. The customer, (BC operating) needed a temporary power solution, however neither diesel, LPG, LNG or CNG as power generation fuel source were economic options. Field gas was available, however it was in the form of hazardous wet-sour gas, containing greater than 200ppm of H2S. A permanent solution to clean the gas was also proved uneconomical. With the utility upgrade six months away, they needed an alternative solution quickly.

THE SOLUTION

SulfaBate tower and gas liquid separators to turn toxic gas into an asset

Aggreko's technical specialists helped engineer a cost-efficient solution to clean up the toxic wet-sour gas and convert it into a fuel source to power the natural gas power plant. We designed a temporary station to work in parallel with the utility grid, providing incremental power to supply and run operations.

THE IMPACT

16 under-performing wells brought back to 100% capacity

The solution generated greater than 10:1 payback, providing BC operating with an additional $2Million extra revenue per month. With the additional power, the system allowed eight well conversions from rod pump to electric submersible pump (ESP). This increased operational capacity to immediately begin drilling new wells and continue toward 100% operation of available production.

Beat the grid

Operators are faced with a strategic dilemma when it comes to powering their operations. They usually only consider two options - connecting to the grid or to move beyond their core business by owning and operating their own power generation.

There is however a third option that often makes better commercial sense especially in off-grid, marginal grid, or high grid cost locations, and that's outsourcing your main power needs to experts like Aggreko who offer a full turn-key service.

Connecting to the grid

Available connection

In many places across the world where local grid prices are high and the power unreliable, outsourcing your power to Aggreko delivers savings and stability.

So, while connecting to the local grid may seem like the best option that allows you to focus on maximising your return from your operations and assets, it's not.

Investment required to connect

Where your operations are off-grid or in a marginal grid location, it's important to consider the total cost of the connection to that grid. This includes the capex investment required for the high voltage line and substation upgrades, the opex costs for maintaining these and all of the approvals and permits required to build and operate..

You also need to consider that being at the end of a grid line can also lead to stability issues once the grid is connected and the impact this could have on your operations.

Once connected to the grid, aside from the impact of its unreliability – you are then at the mercy of price increases which are not always easy to predict.

Owning and operating your own power generation assets

Cost considerations

When you purchase and operate your own power generation assets such as gas turbines, there are a three cost factors to consider; the cost of the capital outlay required including the financing, associated interest and depreciation costs, the opex costs including maintenance and breakdown repairs, and the general hassle of managing a power operation including health and safety, staffing, spares, logistics and training.

Limited flexibility

Buying your own power generation assets means you need to purchase enough to cover peak demand, meaning your power generation equipment can be underutilised, or worse still, run a lower efficiency for the life of the project, adding unnecessary cost.

Furthermore, as the energy transition, legislation and new technologies change the environment we operate in, it is better to be flexible and not tie yourself to a technology which could be wildly inefficient or even obsolete before the end of its design life.

Outsourcing your power - from permits to demobilisation

Choosing to outsource your power to a full turn-key service provider like Aggreko doesn't only take away the hassle of managing your own power generation and fluctuating costs, it gives you the ultimate 'future proof' and flexible solution.

With more than 50 years' experience a global footprint, and a vast local reach we differentiate ourselves from the competition by offering not only world-class products and services, but also fully engineered solutions designed to increase productivity while reducing your overall costs.

From helping you get power permits, to engineering and delivery, installation, commissioning, operations, maintenance and demobilisation, our goal is to offer all of this while beating the available grid price or cost of ownership.

In the right circumstances, we can even go as far as to contractually agree to beat the grid price with a continued discount margin across a long-term contract.

Client: Oil Company
Region: Eurasia

From short term power solution to long term power partnership

THE CHALLENGE

In 2014, an operator with a greenfield development located close to the polar circle in central Siberia planned to be operational by 2019 when the grid would reach the area.

When oil prices reduced significantly but the demand for oil was on the rise, the Customer wanted to begin operations as soon as possible and needed early power, and a reliable partner who could help them treat and use the APG to also avoid associated flaring fines.

The Customer was CAPEX limited, and the remote location of the area and extreme climate conditions would also pose a significant challenge for the power provider.

The power solution also needed to be able to accommodate further parallel grid connections and connect to the supply of the Customer's own planned gas turbine.

SOLUTION

The Customer had its own engineering team that had designed a ramp-up plan that required progressive power starting at 18 MW and increasing to 32 MW in 2015 and 48 MW by 2017. The Customer's engineering team was open to best practice and innovation and this is where we forged a close relationship working with their team to develop an effective strategy of power supply using Fuel (APG and Natural Gas) provided by the Customer via a separate purchase contract for the cluster, with us assuming full responsibility for logistics, flexibility, winterization, remote control and digital monitoring of the power assets – provided with no CAPEX requirement from the Customer.

As our relationship continued to develop and the level of trust between the Customer and our teams grew, we moved from providing Early Power, to Peak Shaving power and most recently where we proposed to cover a certain portion of their power instead of them investing into the grid or their own power at the same job sites. This has led to Aggreko distributed power being the base power for the Northern part of the cluster while the grid is becoming the adjustment variable.

We did this through a long-term contract of +15 years, where we have contractually agreed to Beat the grid price for the duration of the contract, by tracking at a fixed percentage below the grid price.

IMPACT

This complicated full-scale, highly risky turnkey project has been valued by the Customer and led to this ground breaking partnership where the Customer has complete flexibility at all stages of their project life cycle, and can rely on the continued proven technical reliability of our solution at a lower cost than the grid price, giving them continued optimised cost savings.

Supporting a global reduction in Flaring

Aggreko is proud to support the World Bank's **"Zero Routine Flaring by 2030"** initiative, aiming to end all routine gas flaring by 2030, if not before.

Aggreko's technologies to generate electricity from associated gas can help to reduce gas flaring globally and have been featured in the World Bank's Global Gas Flaring Reduction Partnership's Technology Overview.

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

GGFR
Global Gas Flaring Reduction Partnership

The flaring of gas contributes to climate change and impacts the environment through the emission of CO2, black carbon and other pollutants. Moreover, it wastes a valuable energy resource that could be used to advance the sustainable development of producing countries.

For example, the World Bank estimates that if this amount of gas was used instead for power generation, it could provide about 750 billion kWh of electricity, or more than the African continent's current annual electricity consumption.

While we recognise that associated gas cannot always be used to produce power, we are committed to making these types of gas to power projects a reality where possible. We're ready to help governments, oil companies and development institutions to implement economically viable solutions to climate legacy flaring as soon as possible.

Flaring occurs most frequently and in order of magnitude: **Russia, Iraq, Iran and the USA.**

The natural gas wasted through flaring every day in North Dakota alone is enough to heat **100,000 homes daily in the USA.**

150 billion cubic metres of natural gas is flared into the atmosphere **each year** - almost **one third** of the **EU's total gas consumption**

Gas flared in Nigeria could meet the power or cooking needs of **320 million people.**

Power **how** you need it,
when you need it, **where** you need it.

aggreko

Visit us at **aggreko.com** to get in touch