



Meeting Environmental Objectives to Reduce Emissions on Offshore Oil and Gas Projects Using Crondall's ZETA Tool.

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Crondall has developed a tool to estimate and benchmark Scope 1, 2 & 3 greenhouse gas emissions for offshore developments - Zero Emissions Tracking and Assessment (ZETA) tool.

Supporting Operators to provide practical solutions to reduce emissions and develop implementation strategies

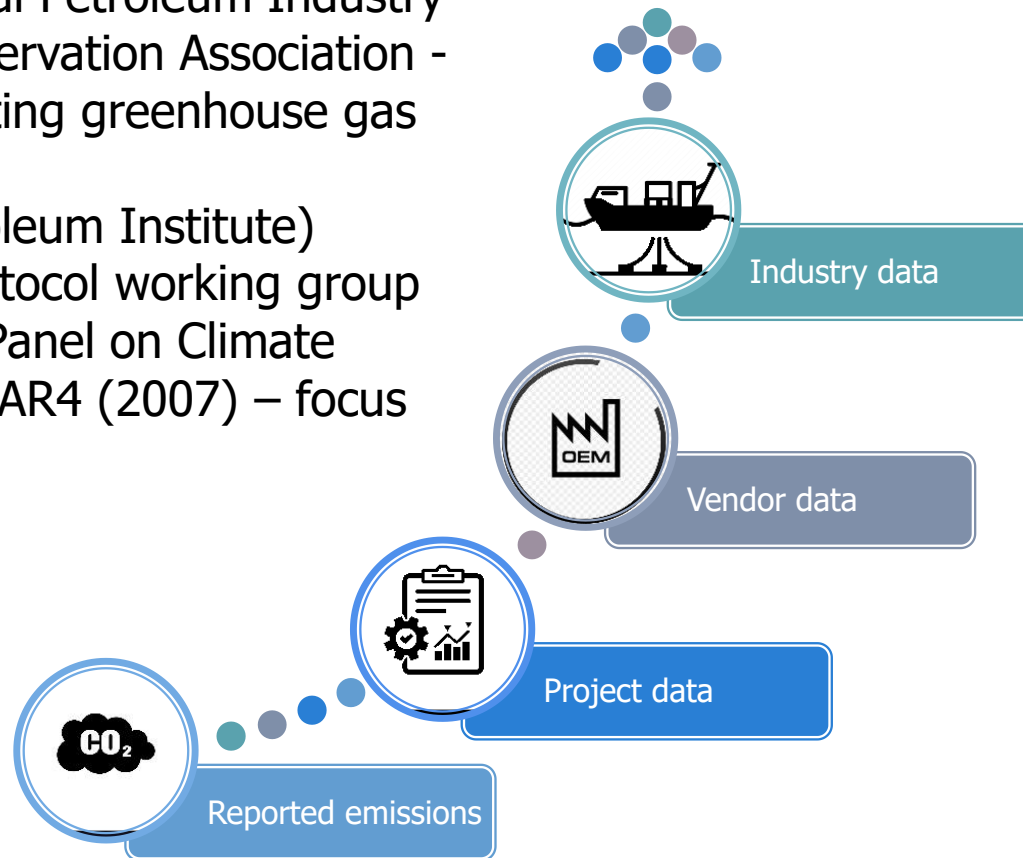


Supporting Financiers in assessing environmental impact of projects



Framework:

- IPIECA (International Petroleum Industry Environmental Conservation Association - guidelines for reporting greenhouse gas emissions)
- API (American Petroleum Institute)
- Greenhouse gas protocol working group
- Intergovernmental Panel on Climate Change (IPCC) e.g. AR4 (2007) – focus areas for GHG



Data sources:

- Operator recorded data
- Project design data
- Vendor input/specification
- Industry data – historic or basin specific, US/UK govt etc.

ZETA tool validation:

- IOGP data validation
- Environmental consultants review on projects
- Client review on NS project
- Lease operate contractor review vs own internal tool

Re-assessing the design of oil & gas facilities through the lens of CO₂ emissions reduction.

Electrification & Electrical
Architecture

Energy use optimisation

Process technologies

Flaring

Carbon capture

Generation
efficiency

Alternative
generation

Alternative
distribution

Power
import
capability

Heat
recovery
optimisation

Heat pump
optimisation

Smarter
heating
systems

Oil-water
separation
technology

Oil
degassing
technology

Compressor
efficiency

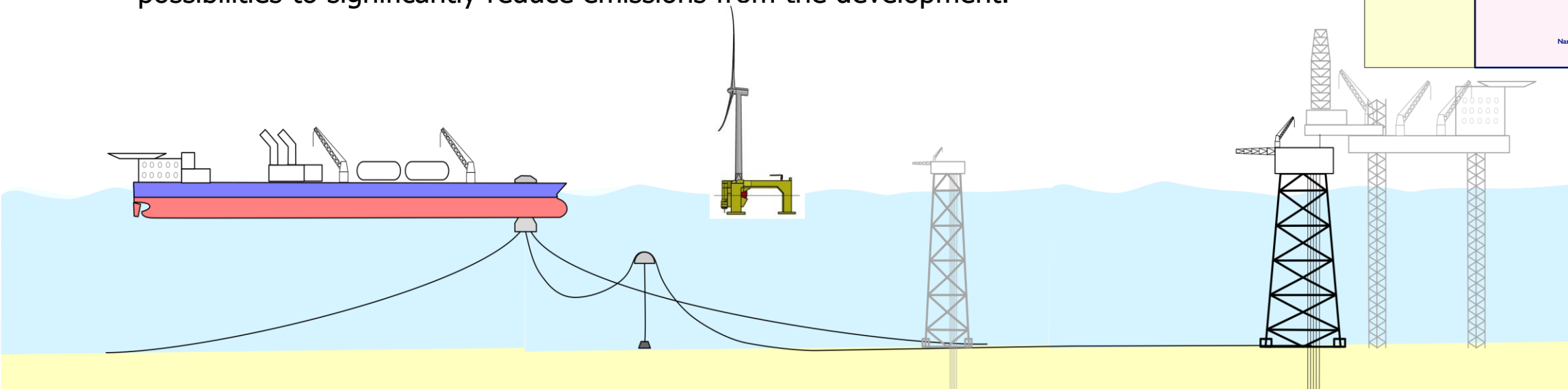
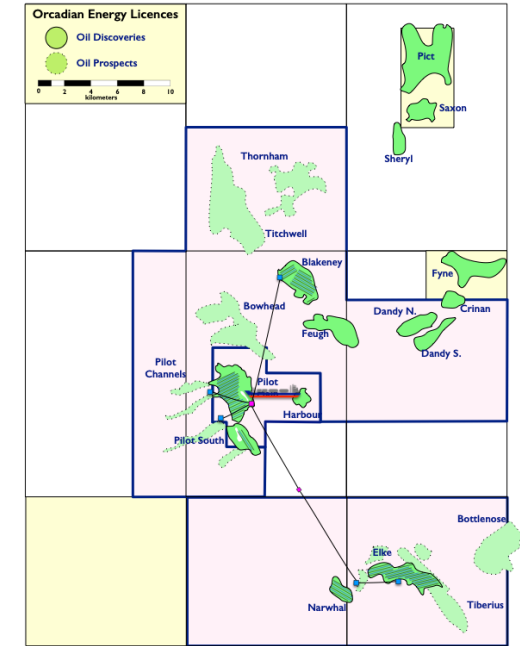
Minimising
flaring &
venting

Compact,
modularised
technology

Energy
integration
management

Project Example – Orcadian Pilot Field

- The Pilot field, Operated by Orcadian Energy has 2P reserves of 76 MMbbls of Kraken like oil, based upon the low-salinity polymer flood project described in Orcadian's CSR submission.
- The project would facilitate development of another 77 MMbbls of 2C resources in tieback opportunities in the Elke, Narwhal and Blakeney discoveries; (3P plus 3C potential is almost 300 MMbbls) and there are another 195 MMbbls of prospective resources on the licences.
- Orcadian has been working with Crondall and potential wind farm operators on possibilities to significantly reduce emissions from the development.



“Nearer zero” initiatives

1. Reducing process heating demand– looking at ways to separate and stabilise oil with lower levels of process heating (and consequent reduction in CO₂).
2. Electrical energy efficiency – looking at ways to improve the (thermal) efficiency of both power generation, distribution and energy efficiency of users.
3. Capture of CO₂ from post combustion flue gases – looking at available technologies for removing CO₂ from exhaust gases in order to separately dispose of the CO₂ from combustion. Also pre-combustion CO₂ capture.
4. CO₂ disposal as dense phase gas or via injection of carbonated water into aquifers (reservoir dependent).
5. Options to reduce flaring/venting of nuisance gas – looking at options for the reduction of flaring/venting of nuisance associated gas and or VOCs.

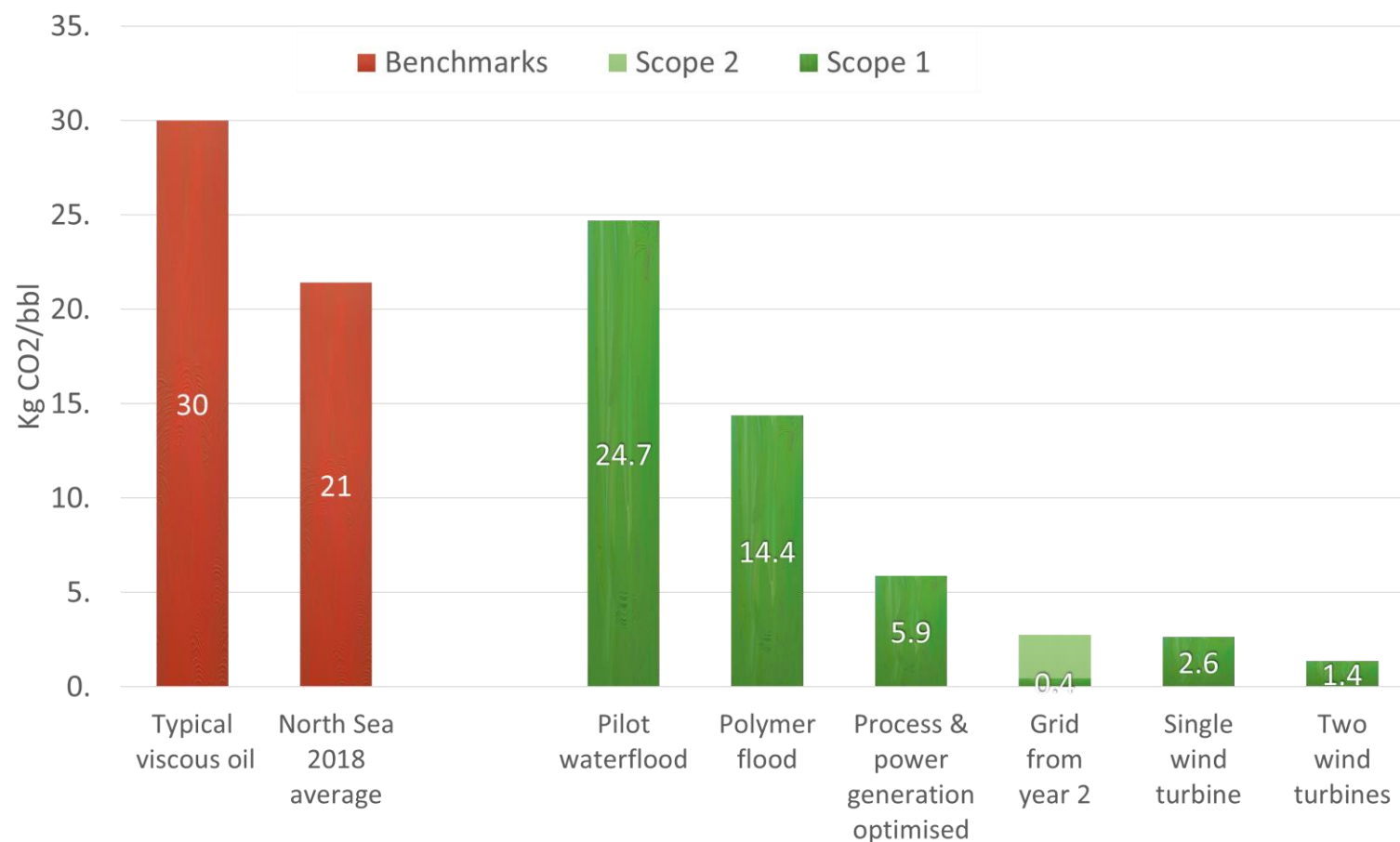
Outcomes – Delivering Pilot on OGA’s Net Zero Agenda

Integration of aggressive process heat management with high efficiency back-up power generation and electrification has the potential to drive emissions down by over 80%

Local wind farm power, with highly efficient back-up gas engines, reduces emissions as low as connection to a future grid with half of today’s CO₂ intensity

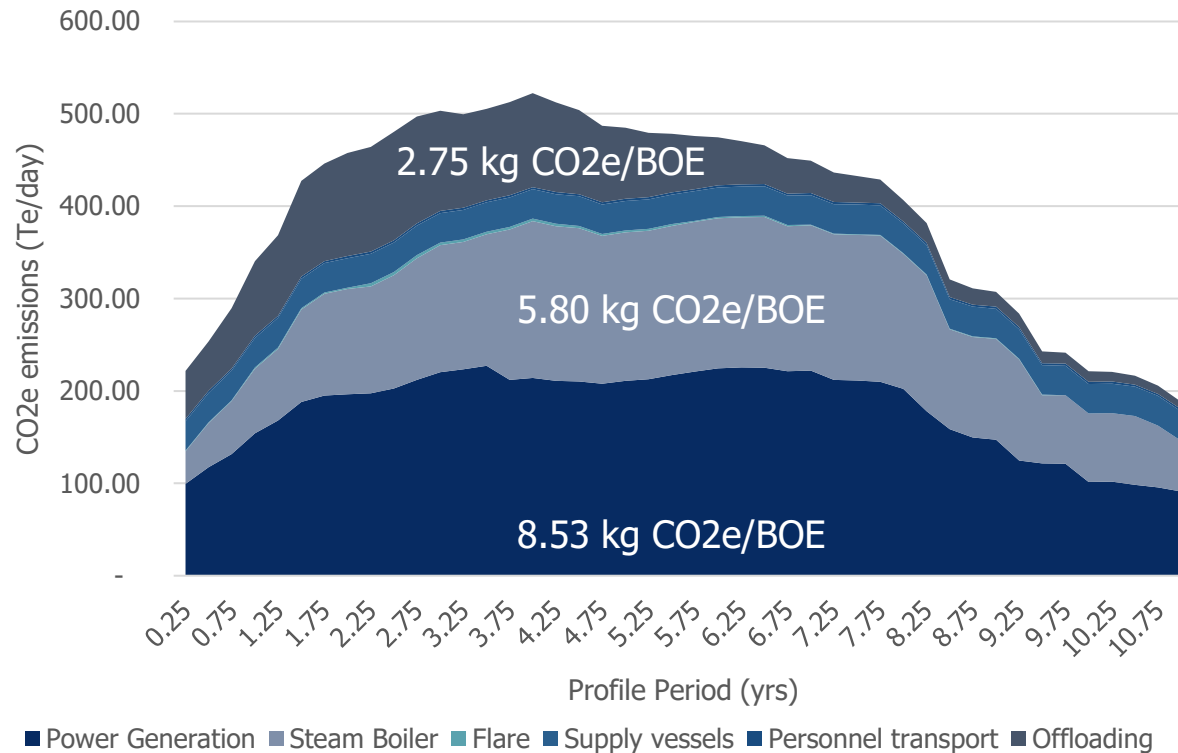
Net cost to project – zero. (Primarily driven by elimination of gas import pipeline originally required for power generation)

Developed Roadmap & “future-proofing” for future reductions – including CO₂ CCUS.

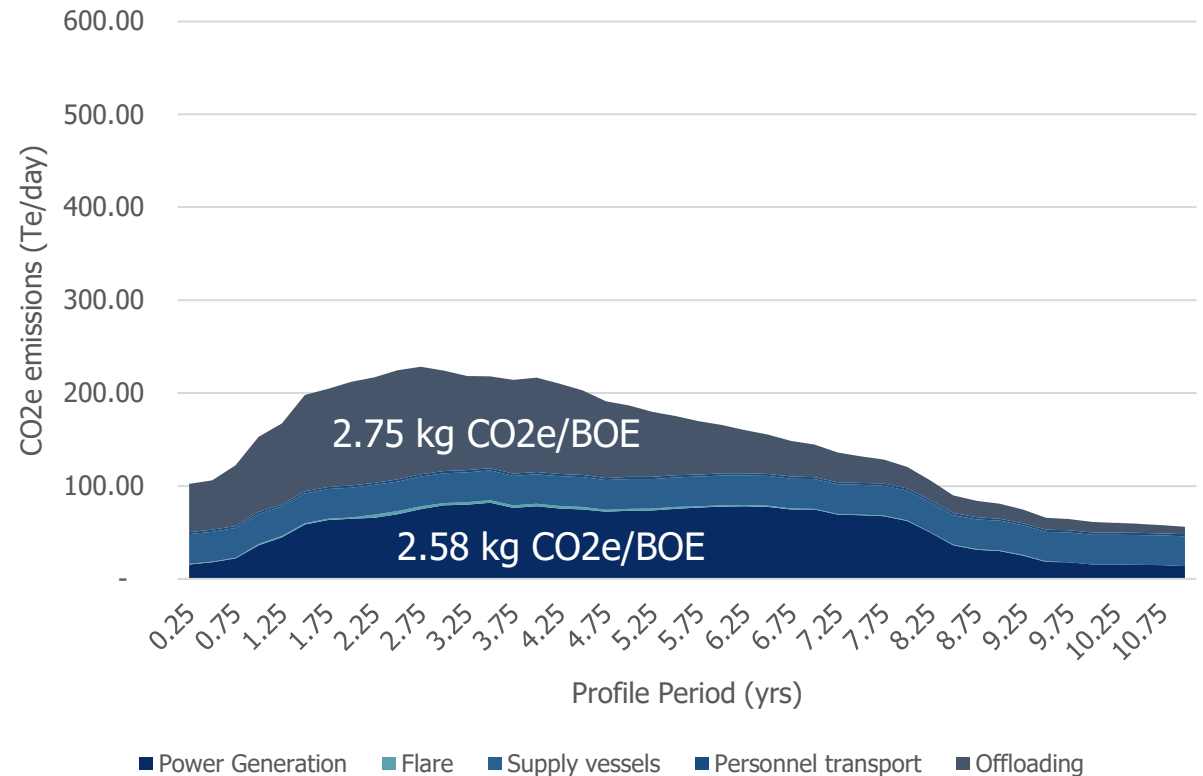


Typical ZETA Outputs

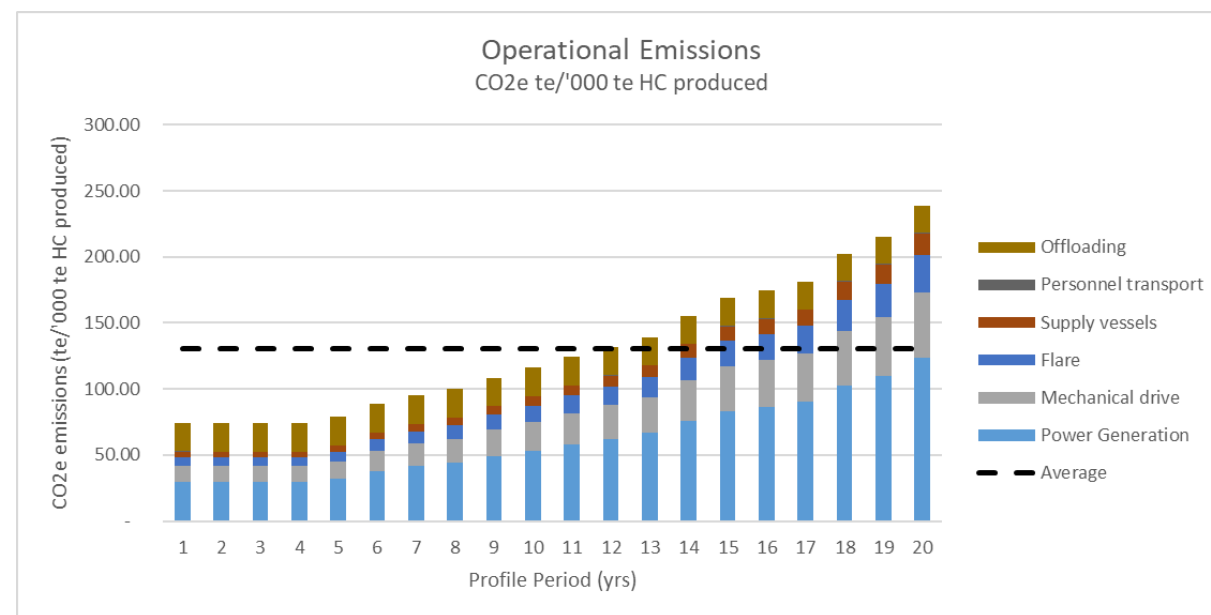
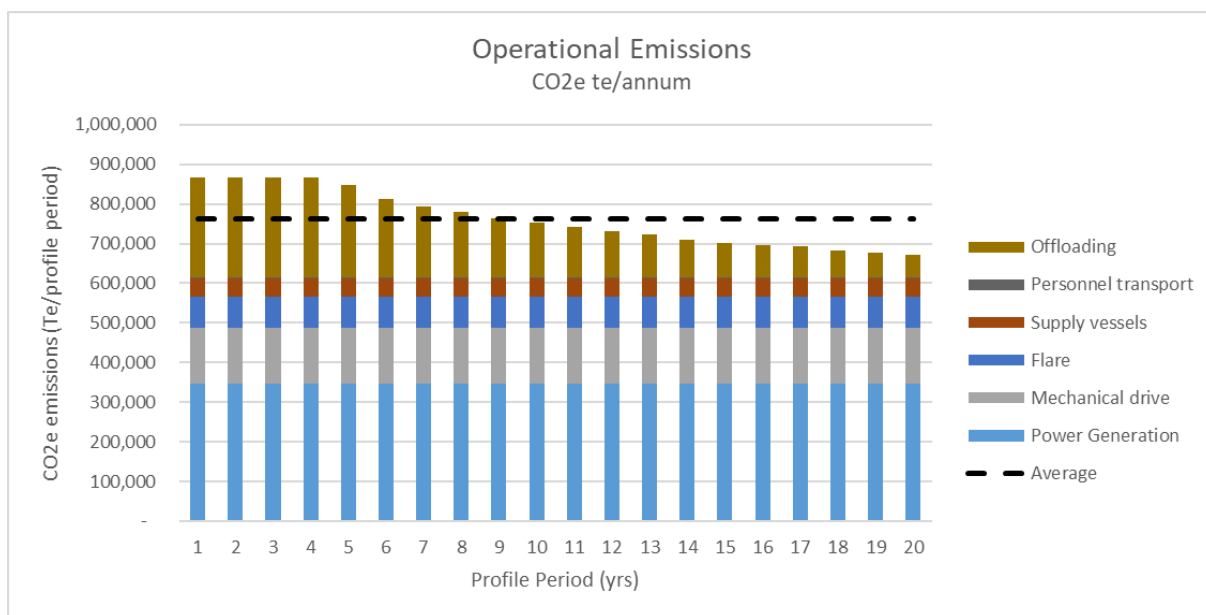
Base case - Operational Emissions
CO2e Te/day



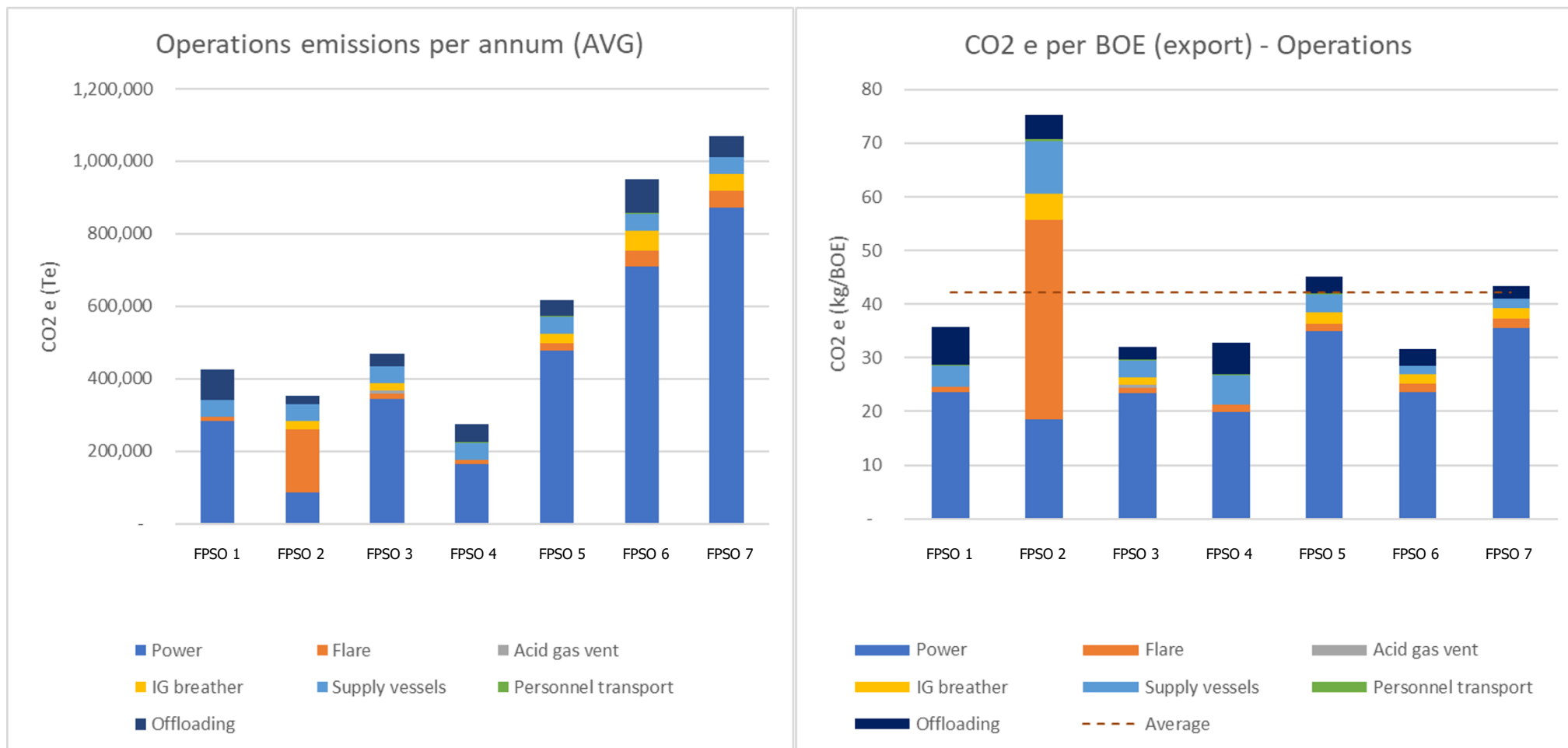
Optimised solution - Operational Emissions
CO2e Te/day



FPSO Operational Emissions per annum



Operational Emissions – FPSO Benchmark Example



For more information go to

www.crondall-energy.com

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