Future-proof, flexible engine power plants to integrate renewable energy in Vietnam

How is an internal combustion engine power plant different from a gas turbine power plant?

Internal combustion engines (ICEs) have been around since the 19th century. ICE power plants are based on the well-established reciprocating engine technology used in automobiles, trucks, and marine propulsion. In ICEs, the expansion of hot gases pushes a piston within a cylinder, which in turn rotates a crankshaft to generate power. Each movement of the piston within the cylinder is called a stroke.

In power applications, most ICEs are 4-stroke medium-speed versions, with Intake, Compression, Combustion, and Exhaust, meaning that the combustion occurs intermittently. Conversely, in a gas turbine, a compressor, combustor and turbine are all mounted on the same shaft, and hence the combustion process is continuous.

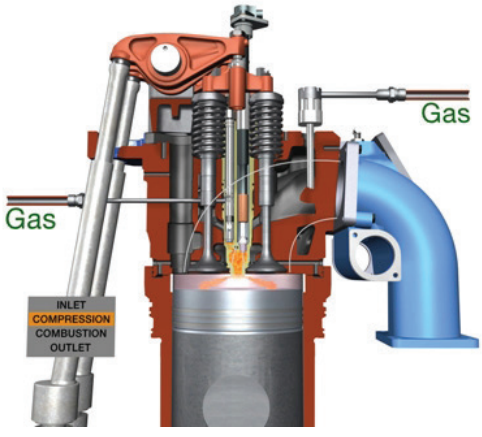
Due to their flexible dynamic capabilities, ICEs have become the preferred technology for balancing, peaking, and reserve power generation. They have largely replaced traditional gas turbine solutions, which have the operational limitations of a longer start-up time, and a slow ramp rate to full load.

Flexible ICE power plants create a balancing link between power generation and consumption, thus providing effective system level resilience. These plants are de-centralised, with a modular design, a compact minimal site footprint, and are able to be delivered on a fast-track basis in less than 12 months.

How flexible is an ICE power plant?

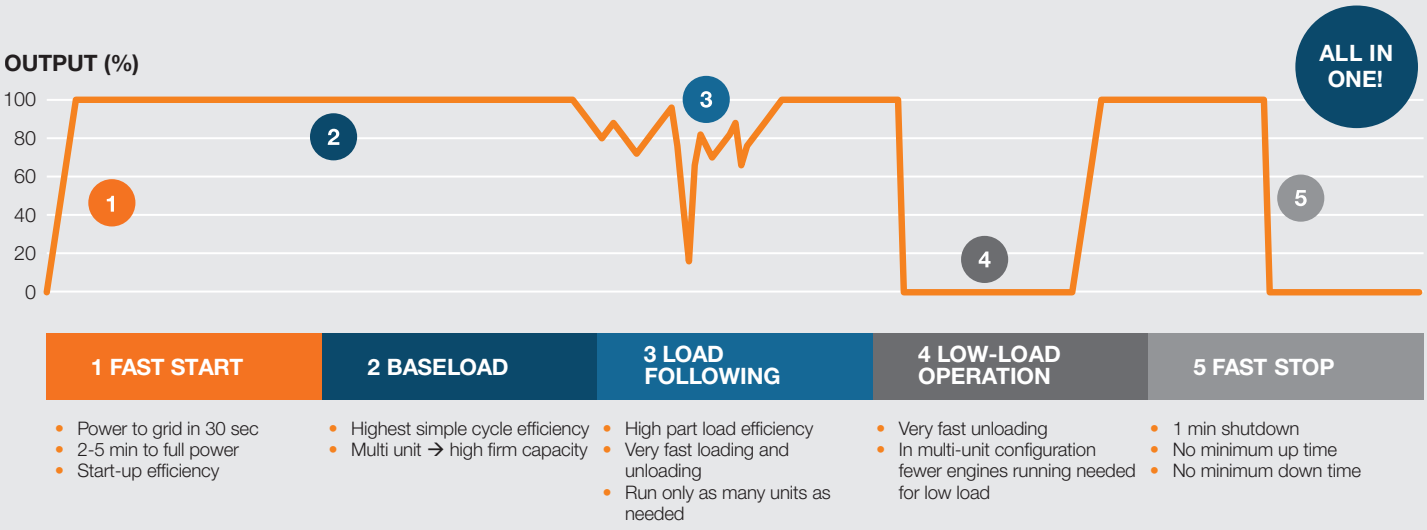
With the capability to operate in multiple modes, ICE power plants can offer fast, low-emission, non-spinning grid reserve for any contingency situation or grid black start. They can connect to the grid in less than 30 seconds from start-up, and reach full load in less than two minutes. They are designed to start and stop – at the push of a button – without any impact on maintenance. The multi-unit configuration allows plant availability and reliability of close to 100%. They also ensure rapid load following and peak load capability, with fast frequency regulation and an efficient spinning reserve.

Power plants based on multiple engine generating set units can operate efficiently on part load, while also offering the highest available open-cycle energy efficiency of 50% or more.



Spark-ignited ICE during Compression stroke

Wärtsilä 31SG – The highest efficiency gas engine in the world



An all-in-one power plant from Wärtsilä for the power system of the future.

ICE power plants enable the continuous choice of the most feasible fuel, including liquid (LFO, HFO) and gaseous fuels (piped natural gas/LNG). The fuel flexibility of the engine improves energy security and increases resilience against unpredictable interruptions to the fuel supply.

How can an ICE power plant benefit the entire power system?

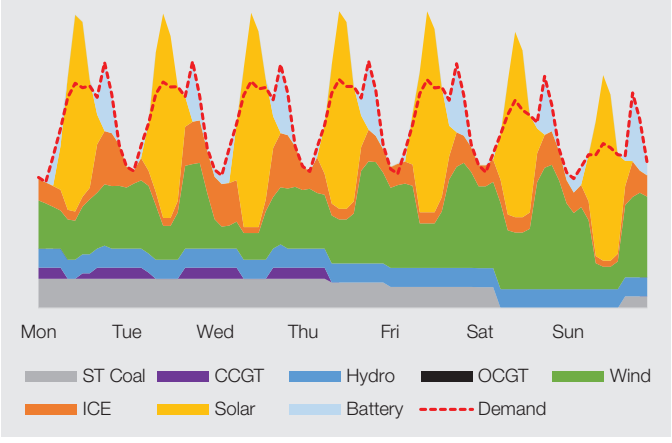
The energy landscape is in transition towards more flexible and sustainable energy systems. As renewables become increasingly competitive, even without subsidies, there is a strong need for flexible solutions, notably engine power plants.

ICE technology will help to balance the input fluctuations of wind and solar, allow baseload plants to be released from cyclic operation and provide a high efficiency base load, contribute to grid frequency regulation and system stability, improve the total efficiency of power systems, and reduce total system costs.

How Wärtsilä can support Vietnam to integrate renewable energy?

Vietnam is blessed with a very high potential for renewable energy, with nearly 5,000 MW of solar added in just one year. As the penetration of renewable energy will certainly continue to increase, the role of traditional baseload generation (coal & CCGT) will, due to their inflexibility, decline. Vietnam has now a great opportunity to take advantage of a high-renewables future with the introduction of flexible technologies.

Wärtsilä offers a complete range of flexible solutions capable of delivering numerous benefits to Vietnam's power system. Our future-proof & flexible engine power plants and energy storage systems have been installed in 180 countries, with a total capacity of 72 GW of which nearly 10 GW is within the South East Asia region.



An example of weekly operational dispatch with ICE (in orange) to balance renewables production.

PLTDG Pesanggaran Bali 200MW plant powered by 12 Wärtsilä 50DF dual-fuel engines.

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