FLEXICYCLE™ POWER PLANTS
The challenge of serving the energy market with competitive baseload power, while also supporting the dynamic power market with quick start peaking power, has now been solved. With Wärtsilä Flexicycle plants you can choose both high efficiency and agility, enabling competitive operation on both energy and capacity markets.

Flexicycle plants range from 60 MW up to 600 MW, and are thus perfect for both municipal power generation and the larger utility market.

Traditionally, the baseload generation capacity has consisted of large, centralised coal and/or nuclear power plants alongside combined cycle gas turbine (CCGT) plants, with long ramp-up and ramp-down times. The intermediate load is often handled by combined cycle gas turbines, while the reserve and peaking capacity is often based on smaller, less efficient generating units, which are expensive to operate. The introduction of the Flexicycle power plant solution makes the concept of using different dedicated power plant technologies for different load ranges and operation profiles obsolete.

The Flexicycle power plants are based on gas or multi-fuel internal combustion engines (ICEs) and a steam turbine combined cycle. Each engine is equipped with a waste heat...
Efficient baseload and intermediate load capacity
Superior part load performance
Quick start and shut down, fast ramp-up capability without restrictions or influence on maintenance schedule and costs
Grid black-start without external power
Size range 60–600 MW; additional investments can be done in 10 or 20 MW blocks
Compliance with the strictest international and local emissions legislation
Easy siting in grid nodes even within city limits
Low impact of ambient conditions on plant performance
Low water consumption, no water consumption in simple cycle mode
Fast-track equipment or EPC delivery
Wide range of operations and maintenance agreements available
24/7 service from more than 160 Wärtsilä points of service worldwide

WÄRTSILÄ FLEXICYCLE POWER PLANTS
Two operation modes: dynamic simple cycle and highly efficient combined cycle. Combined cycle operation extends plant electrical efficiency past 54%, whereas in simple cycle 50% can still be exceeded, providing even further operational flexibility.

- Efficient baseload and intermediate load capacity
- Excellent load following and peaking power capabilities
- Superior part load performance
- Quick start and shut down, fast ramp-up capability without restrictions or influence on maintenance schedule and costs
- Grid black-start without external power
- Size range 60–600 MW, additional investments can be done in 10 or 20 MW blocks
- Compliance with the strictest international and local emissions legislation
- Easy siting in grid nodes even within city limits
- Low impact of ambient conditions on plant performance
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FiXECYCLE 34 gas power plant
Delivered: 2012

GAS GENSETS

<table>
<thead>
<tr>
<th>Type</th>
<th>Power, electrical (60 Hz/514 rpm) kW</th>
<th>Power, electrical (60 Hz/720 rpm) kW</th>
<th>Genset dry weight (tonne) ±5%</th>
<th>Reduced transport weight (tonne) ±5%</th>
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<td>Wärtsilä 34SG</td>
<td>9730</td>
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MULTI-FUEL GENSETS

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<th>Genset dry weight (tonne) ±5%</th>
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LIQUID FUEL GENSETS

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<th>Genset dry weight (tonne) ±5%</th>
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TWO-IN-ONE
The Flexicycle power plant solution’s two-in-one characteristic makes it a very competitive solution for taking care of a grid system’s intermediate load. Thanks to its high combined cycle efficiency, the Flexicycle power plant can also be the best choice for baseload generation, depending on the power system’s capacity mix. Features like fast synchronisation and ramp times, as well as the flexibility of multiple independent units, make the power plants outstandingly well suited to support grid systems requiring flexibility due to daily load fluctuations, or having a significant installed base of wind or other non-dispatchable power.
Flexicycle Combined Cycle System

1. Exhaust gas boiler
2. Feed water tank
3. Steam turbine
4. Water cooled condenser
5. Condensate preheater
6. Heat recovery container including auxiliary boiler
7. Cooling tower
8. Engine preheater

Flexicycle 50 gas power plant starting and loading in simple cycle and combined cycle mode.

Efficiency %

<table>
<thead>
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<th>Time (hours:minutes)</th>
<th>Load %</th>
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<td>36</td>
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<tr>
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<td>10</td>
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</tbody>
</table>

Start-up

SC Loading 91% (5 minutes)

Load follow

½ of engines 0-100% load

½ of engines running + CC, ½ of engines standstill

Shut-down

SC shut down (1 minute)

CC shut down (10 minutes)
Dry Flexicycle™ POWER PLANTS

Dry Flexicycle is a concept that combines all the benefits of Flexicycle technology with drastically reduced water requirements. Where conventional CCGT or Flexicycle technologies use water for their cooling systems, Dry Flexicycle uses ambient air in a water-cooled condenser connected to the radiator closed-loop cooling circuit. This system extracts the heat from the cold leg of the steam cycle, by means of a heat exchanger that dissipates it through radiators boosted by fans, to ensure efficient heat transfer. Energy that would usually be dumped to the disposal water is instead dumped to the ambient air.

Dry Flexicycle solution also reduces acquired footprint of the power plant by placing the whole cooling system on the roof and it has a fast start-up time which is a techno-economical benefit for plant owners and therefore a clear value for system operators. When intermittent renewable energy increases its share in the power market, fast load-following power is needed to maintain system reliability.

Dry Flexicycle is particularly well suited to geographical locations in which water use is restricted due to environmental concerns, or where water is in short supply – such as in arid areas or deserts.

Wärtsilä Dry Flexicycle features and benefits

- Maximum efficiency over a wide load range
- Decentralized production
- High reliability
- Superb load-following ability
- Low emissions
- Negligible water consumption
- Limited footprint
- Easy plant operation

Flexicycle™ solutions deliver outstanding financial performance while dramatically reducing the amount of water consumed. Particularly, a Dry Flexicycle plant needs 96% less water per USD of profit generated than a comparable gas turbine plant.
Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.