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 combustion engines and a steam turbine combined cycle. Each engine is equipped with a waste heat recovery steam
WÄRTSILÄ FLEXICYCLE POWER PLANTS

Two operation modes: dynamic simple cycle and highly efficient combined cycle. Combined cycle operation extends plant electrical efficiency past 53%, whereas in simple cycle 49% 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
- 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

GAS GENSETS

<table>
<thead>
<tr>
<th>Wärtsilä</th>
<th>Type</th>
<th>Total output (MW)</th>
<th>Genset dry weight (tonne) ±5%</th>
<th>Reduced transport weight (tonne) ±5%</th>
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<tbody>
<tr>
<td>34SG</td>
<td>20V34SG</td>
<td>110</td>
<td>130</td>
<td>285</td>
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<tr>
<td>50SG</td>
<td>18V50SG</td>
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MULTI-FUEL GENSETS

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<th>Total output (MW)</th>
<th>Genset dry weight (tonne) ±5%</th>
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<tr>
<td>34DF</td>
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<tr>
<td>50DF</td>
<td>18V50DF</td>
<td>17080</td>
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LIQUID FUEL GENSETS

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<th>Reduced transport weight (tonne) ±5%</th>
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<tbody>
<tr>
<td>46</td>
<td>18V46</td>
<td>200</td>
<td>360</td>
<td>296</td>
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</table>

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.
LIBERTY POWER TECH, PAKISTAN

Customer: ............................................ IPP

Type: ........................................ Flexicycle 46 liquid fuel power plant

Operating mode: .......................Baseload

Gensets: ........................................ 11 x Wärtsilä 18V46

Total output: .................................. 200 MW

Fuel: ........................................ HFO & LFO

Scope: ........................................ EPC (Engineering, Procurement & Construction)

Delivered: ..................................... 2011

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

Control room view.

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

Engine preheater

Control room view.

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

Efficiency %

<table>
<thead>
<tr>
<th>Load %</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
</tr>
</tbody>
</table>

Start-up

Load follow

Shut-down

Time (hours:minutes)
Examples of Flexicycle power plant alternatives

100+MW

Seaboard Flexicycle power plant, Dominican Republic, with 6 x Wärtsilä 18V50DF engines providing a total output of 110 MW.

200+MW

Aliaga Flexicycle power plant, Turkey, with 28 x Wärtsilä 20V34SG engines providing a total output 270 MW.

400+MW

Quisqueya I & II Flexicycle power plant, Dominican Republic, with 2 x 12 x Wärtsilä 18V50DF engines providing a total output of 430 MW.
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.