



A STRATEGIC APPROACH TO OPTIMISING POWER PLANT OPERATIONS AND PERFORMANCE

For power plant owners and operators, adopting a strategic approach to power plant operations and performance is an opportunity to optimise lifecycle efficiency, increase return on investment and achieve lifecycle cost predictability. Such an approach is particularly important when energy production has to be balanced according to a fluctuating market's needs. Over the power plant's lifecycle this calls for long-term thinking regarding operations and maintenance planning as well as upgrades. A strategic approach can also offer solutions for finding and training competent personnel, as well as ensuring occupational health and work safety.

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WÄRTSILÄ SERVICES BUSINESS WHITE PAPER

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PLANNING FOR LIFECYCLE EFFICIENCY

When planning operations, it is important to take into account the full lifecycle costs, not just the investment and the operation and maintenance costs for the initial period after commissioning. Any savings achieved through lower fixed operational costs will be very quickly lost if neglects in maintenance and operations lead to even minor efficiency losses.

OPTIMISING TOTAL COST OF OWNERSHIP

The essential thing is to create a balance between capital expenditure (CAPEX) and operational expenses (OPEX), so that the total cost of ownership is optimised. Analysis of lifecycle costs is especially fruitful for assets with a long lifecycle. In these, operational costs can be expected to be many times the investment costs, making lifecycle cost predictability a key factor in achieving success. From a risk management perspective, the costs for unscheduled maintenance should also be accounted for and made predictable through a long-term strategic partnership.

When analysing the total cost of ownership, fuel costs, maintenance requirements, stable performance and the life expectancy of the equipment are the primary considerations.

ENVIRONMENTAL EFFICIENCY AS A SOURCE OF LONG-TERM ADVANTAGE

Improving environmental efficiency will improve operational efficiency through lower fuel costs and reductions in other fees. This can be seen as a two-way relationship: reducing the environmental footprint helps improve energy efficiency, and vice versa, improving fuel efficiency also helps reduce the environmental footprint.

The best possible strategy to meet the ever tightening environmental regulation is to move from merely reacting to new requirements as they arise to anticipating them. This will allow optimisation, not only according to the current situation, but also according to future demands in terms of both environmental and operational efficiency.

Professionally managed environmental compliance can also be a source of competitive advantage through enhanced reputation among customers and other stakeholders, as well as securing uninterrupted operation.



UPGRADES FOR AN EXTENDED LIFECYCLE

The lifecycle of an asset can be extended and its efficiency improved through upgrades and modernisations. An asset can also be converted to, for example, operate on a different fuel. Gas conversions are an increasingly common example of such a solution, offering both environmental and financial benefits.

During the lifecycle of an asset, upgrades are typically needed for:

- engine performance
- cooling systems
- automation software and hardware
- automatic voltage regulator
- power monitoring unit
- human machine interface or operator interface
- engine speed/load controller.

When planning a modernisation or conversion project, a strategic partner with the right resources can offer help in design and project management, as well as securing and structuring financing solutions. By providing professional project management such a partner can also assist in risk mitigation and insurance issues – not least through ensuring reliable operation and a safe working environment.

OPTIMISING OPERATIONS

Operational expenses (OPEX) are determined by the performance of the equipment and how the operations and maintenance are organised. By optimising these, savings can be achieved through maintaining the fuel and lube oil consumption and from the reduction of maintenance costs.

PERFORMANCE OPTIMISATION

To achieve maximum operational efficiency, performance must be optimised. By knowing and fully understanding the operating equipment and procedures, it is possible to increase efficiencies, lower costs, improve reliability and maximise uptime through improved availability and extended time between stops for maintenance.

Optimisation can lead to 3% lower fuel costs and up to 15% savings in maintenance costs. (Source: Wärtsilä)

Performance optimisation requires strategic decisions. Investing in systems, solutions and new technologies can improve performance, while savings can be achieved through systems integration and replacing inefficient components.

Knowing where to invest and where to save is a key factor in strategies geared towards optimisation. Creating a strategic partnership with an experienced service provider can give access to expertise in these issues, thereby freeing own resources for concentrating on core business development.

ENSURING EXPERTISE

There are, in general, two strategies available to power plant operators for ensuring the availability of know-how and securing their investment. They can choose to rely on their own employees' skills, and only use partners for maintenance. Another option is to choose an experienced partner to manage the operations and maintenance of the investment.

Both can be arranged through various types of service agreements. Of these, an asset management agreement is the most comprehensive, enabling the owner of the plant to lock in the level of future returns in terms of operational performance. The agreement creates a partnership working towards the same business goals, making it highly valuable from both a financial and a risk management point of view. (See Figure 2.)

A partnership based on a service agreement is also a way to tackle the challenges of personnel competence and training, as well as environmental and health and safety issues. An expert partner with an up-to-date QEHS policy can bring in competent personnel trained in safe work procedures when and where needed. Knowing that all work is done safely and in an environmentally sound and legally compliant way allows the power plant owner and operator to focus on more business-critical issues.

When choosing a partner for outsourcing a power plant's operations and maintenance to, it should be ensured that they have the experience and capabilities needed. Things to look for are:

- critical mass of assets under service agreements
- established global agreement execution management organisation
- recognition by major financial institutions and insurance companies
- lifecycle cost guarantee
- latest technology in maintenance planning and remote condition monitoring
- well established and documented process
- direct access to OEM technical support and spare parts.

THE ADVANTAGE OF OUTSOURCING

When evaluating the advantages and disadvantages of outsourcing operations and maintenance, it is essential to include the whole lifecycle in the analysis. Quick wins and savings in operations and maintenance can become quite expensive in the long term, as any savings achieved through lower fixed operational costs will be very quickly lost if compromised maintenance and operations lead to even minor efficiency losses.

Outsourcing enables the owner of the power plant to lock in the level of future returns in terms of operational performance. Therefore an asset management agreement is highly valuable from both a financial and a risk management point of view. This can be illustrated by looking at three different lifecycle scenarios for a 100 MW gas-fired power plant. The base assumptions for the analysis are:

- power capacity 100 MW, 4000 running hours per year
- project life time 15 years, 12 month construction period
- total project cost 750 EUR/kW (incl. O&M mobilization)
- 30% equity financing, ROE demand 15%
- loan tenor 11 years, interest rate 4%
- gas price 8 EUR/MMBtu (lower heating value).

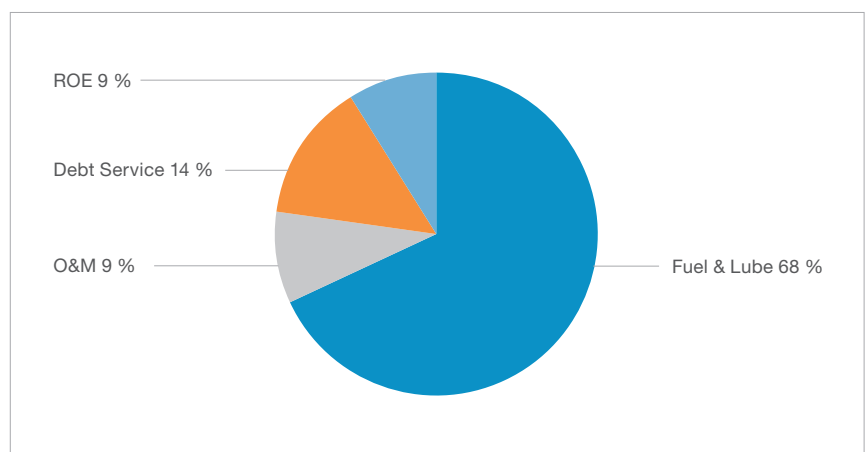


Figure 1. Total lifecycle costs including return demand over 15 years. (Source:Wärtsilä)

In the first scenario operations and maintenance are outsourced to a professional operator who provides performance and lifecycle cost guarantees. In this comparison the 15 year internal rate of return (IRR) on equity is forecast to be 12.4%. With an asset management agreement that includes a facility efficiency guarantee, the IRR demand would be ensured.

In the second scenario the power plant owner decides to self operate. If a 20% decrease in fixed and a 5% decrease in variable operations and maintenance costs can be achieved, the lifetime IRR increases to 14.1%.

In the third scenario the power plant is self operated, but the efficiency drops from 49.7% to 47.8% because of compromised maintenance, no condition-based monitoring and engines not dispatched optimally. As a result, IRR falls from 12.4% to 7.2%. Discounted over 15 years, this is 8 MEUR, or 27% less return for investors compared to the scenario where operations and maintenance was outsourced to a professional operator.

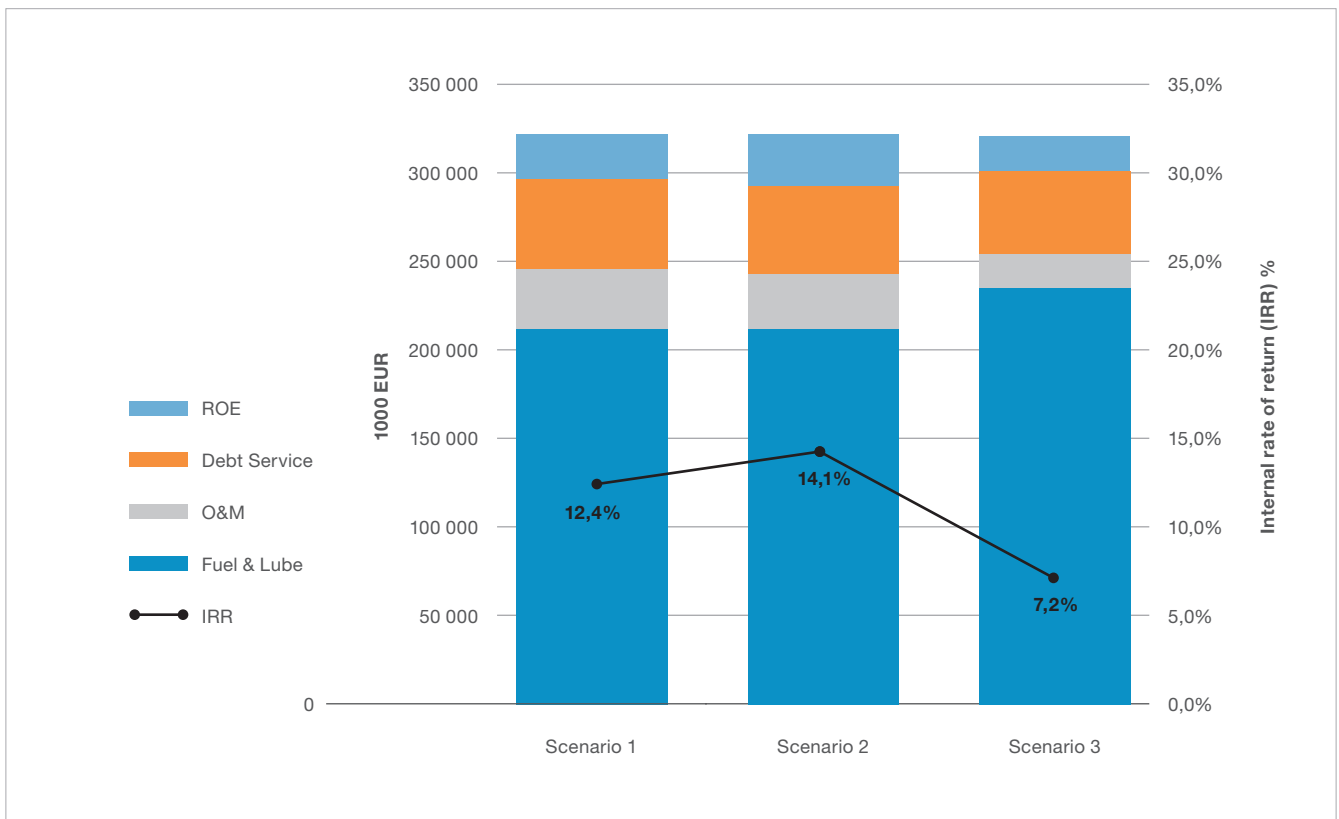


Figure 2. Comparison between three lifecycle scenarios from an IRR point of view. (Source: Wärtsilä)

OPTIMISING MAINTENANCE

Reliable, continuous performance and predictable costs throughout the entire lifecycle of an asset are essential for sustaining a profitable business. Unexpected interruptions can be extremely expensive, so preventing them is a key element of a lifecycle approach. But even when it comes to scheduled maintenance outages, less is more. Maximising availability through optimised maintenance plays a big part in optimising return on investment over the asset's lifecycle.

MAINTENANCE PLANNING

Maintenance should not be planned blindly with disregard to the profitability of the power plant. Instead, maintenance should be optimised according to needed capacity based on dispatching forecasts in order to maximize profitable revenue potential and minimize lost profitable revenue. The idea is to ensure availability when market conditions are favourable, and to perform maintenance when the demand is low.

Dynamic maintenance can increase the total availability of an asset with about 5–20%. (Source: Wärtsilä)

To maximise availability, and thereby minimise downtime costs, a system of dynamic maintenance planning that allows maintenance to be planned from a dispatching and cash flow point of view should be implemented. In a multiple engine power plant, this means performing maintenance unit by unit.

DYNAMIC MAINTENANCE

A dynamic maintenance schedule means that maintenance is not always done according to the original maintenance schedule (Figure 3.). Rather, the condition of the equipment is monitored constantly. This way trends and changes in operating parameters can be identified well before they might compromise asset performance. Maintenance can thus be performed only when needed, which optimises operational availability and productivity. Highest uptime can be achieved during the most profitable operation hours, and planned downtime hours can be eliminated by performing maintenance during off-peak hours.

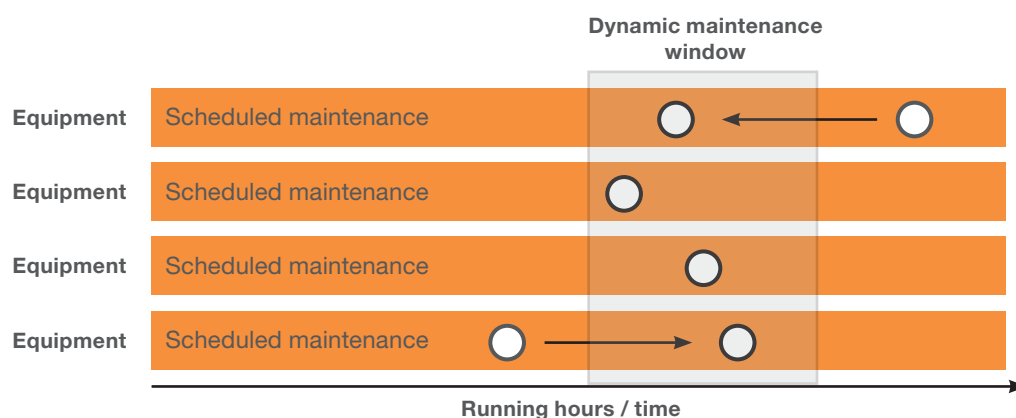


Figure 3. Availability can be improved by grouping maintenance of different equipment into a single window. (Source: Wärtsilä)

PARTNERING WITH WÄRTSILÄ

20 YEARS OF OPERATION AND MAINTENANCE EXPERIENCE

Wärtsilä can add value to your business at every stage in the lifecycle of your asset, from installation and commissioning, performance optimisation, including upgrades and conversions, to environmental solutions, training, technical information and online support. Our solutions cover everything from complete service agreements to basic support with parts, field service and technical support.

With us as your service partner, you can receive many measurable and guaranteed benefits, such as availability and performance, productivity gains and cost benefits. Above all, you will enjoy peace of mind in the knowledge that your asset is being serviced by the most experienced partner you could have.

10 reasons for choosing Wärtsilä as your partner

- 1. References:** Wärtsilä's service agreements cover more than 20,000 MW of generating capacity in both marine and land-based installations globally – a total of more than 500 installations.
- 2. We know your installation, products and your needs:** As an OEM manufacturer we know what are the correct solutions for your installation.
- 3. Lifecycle support:** A lifecycle approach enhances business by minimising risks and improving reliability and cost predictability through efficient operation and optimal asset management.
- 4. Excellence in project execution:** Extensive experience in executing projects from maintenance agreements to complete new builds.
- 5. QEHS policy:** We operate in a safe and environmentally sound way, compliant with the applicable legal requirements and regulations.
- 6. Financing solutions:** A Wärtsilä service agreement makes it easier to obtain competitive financing and insurance solutions.
- 7. Global field services:** 4,500 qualified service professionals in 70 countries.
- 8. Guarantees:** Performance and service guarantees, lifecycle cost guarantees.
- 9. Warranty:** Strict quality management ensures that our products are of high quality, and therefore always delivered with full warranty.
- 10. Training services:** Global training solutions provided by Wärtsilä cover all aspects of management, operation, maintenance and safety issues.

Ensuring your lifecycle operations

Wärtsilä is an experienced operator, with a proven track record in operation and maintenance services since the 1990's. Globally, more than 20,000 MW of generating capacity in both marine and land based installations – a total of more than 500 installations – is covered by Wärtsilä's service agreements.

Our lifecycle solutions offer you measurable and guaranteed benefits in a safe, reliable and sustainable way. These include improved availability and performance, productivity gains and cost benefits, as well as maximised lifetime for your installation.

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Want to know more?

Please contact us on wartsila.com/services or contact your nearest Wärtsilä Services Representative on addresses.wartsila.com

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