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Organic Rankine Cycle systems, a new efficient solution for heat recovery from reciprocating engines in isolated electrical grids

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Organic Rankine Cycle systems have become more common place and a popular choice in recent years. Used for power production from renewable energy sources, including geothermal, biomass, waste heat and CSP, ORC systems are the best solution when the enthalpy level of the heat source is low, or if the size of the application is too small for a steam power plant to be the most efficient, cost effective or practical solution.

In a context of limited growth of the continental markets, where the power supply need is experiencing a long downturn, the isolated grids represent a unique chance to apply the most advanced heat recovery technologies with ORC.

ORC installations prove to be a particularly advantageous application in these contexts for several reasons. Remote areas generally incur high costs connected with the supply of fuel (transportation, distribution...), which exist in addition to the base costs, even in times of low oil price. Considering small islands or remote areas, land occupation and environmental impact can be an additional challenge, as a wide extension of land for greenfield projects is not available: improving the efficiency of the existing plants is favourable and more effective than looking for new installations.

On the point of view of the plant operators, the ORC gives an automated and comprehensive solution which does not require a substantial increase in operational costs or require the installation of auxiliary systems (such as water supply or treatment) which increase the risk of unplanned outages.

Considering for example a 40 MWe plant based on gas-fired reciprocating engines, with the installation of the ORC there is a potential for repowering up to 5 MWe in power supply to the grid without any increase in fuel consumption and with a limited ground occupation. In an isolated environment, such as an island, where there are a limited number of similar small plants, this solution helps keeping up the medium-term needs (10-15% growth) without major changes in the infrastructures.

As a combination of the above, and in contrast to the general downturn of the interconnected electricity systems, there is an increased power demand in isolated areas as well as the need to replace old plants going offline. We foresee a strong development of this application, which can lead to projects for hundreds of MW in the next 5 years that will confirm the ORC amongst the main power production technologies not only in the niche renewable energy and industrial markets but also in the IPPs and utility-scale power markets.

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