Why is Wärtsilä entering the solar business?
Utility-scale solar is a booming market, and we see significant business potential there. According to Bloomberg New Energy Finance, the installed base of large-scale solar PV will grow from about 100 GW to 450 GW between 2015 and 2025.

What is the business idea?
Wärtsilä offers utility-scale solar projects with a full EPC (engineering, procurement and constructing, or turn-key) delivery. These turn-key projects can be pure solar PV power plants, or engine-solar PV hybrids. The solar hybrid option is a combination of Wärtsilä’s engine-based Smart Power Generation (SPG) power plant and a dedicated solar PV system, operated in synchronisation. Wärtsilä is the first company offering large-scale solar hybrids.

What is your competitive edge?
Wärtsilä is capable of delivering EPC power plant projects practically anywhere in the world. We have developed our EPC know-how by building hundreds of engine-based Smart Power Generation plants with EPC scope in more than 100 countries. We have a global sales and services network, and a decades-long presence in countries with good growth potential for large-scale solar, particularly in Africa, the Middle East, Latin America and South-East Asia. In addition, we offer complete project development and financing services, helping customers to create an optimal solar project.

Why is the EPC capability important?
In an EPC project, the customer works with only one supplier who takes full responsibility for the project management, budget, schedule, guarantees, civil works etc. This one-stop-shop approach is preferred by many customers, instead of dealing with multiple players. Wärtsilä offers EPC delivery anywhere in the world, including areas that are challenging in terms of logistics, weather conditions and security.
What is included in an EPC solar project?
An EPC contract covers project management, site management and supervision, engineering, materials and equipment, civil works and site infrastructure works, transport, installation and commissioning, as well as schedule and performance guarantees for the entire solution. In solar projects, the equipment includes solar PV modules, inverters, and switchgear and control systems. Hybrid projects include connection to the electricity system of the engine unit, and the technology for synchronising the solar and engine units.

What size range are you looking at?
The target capacity for solar PV parks and the solar unit of hybrid plants is 10 MW and above. The first project announced by Wärtsilä is a retrofit hybrid project where an existing 250 MW SPG power plant in Jordan will be extended with 46 MW of solar modules.

Where do you expect to have projects?
The most promising areas for Wärtsilä’s solar solutions are Africa, the Middle-East, Latin America and South-East Asia.

Where do the solar PV modules come from?
Wärtsilä does not manufacture solar modules but we acquire them from leading module suppliers, for inclusion in the EPC delivery.

How much land does a solar farm require?
Land availability has to be taken into account when planning pure solar parks or engine-solar hybrids. Typically 1-2 hectares per MW of solar PV is required. Roughly 1-2 km² of land is needed for 100 MW of PV modules. Wärtsilä’s 46 MW hybrid project in Jordan with AES requires 81 hectares for the modules. As in Jordan, the solar PV field does not need to be immediately adjacent to the engine unit.

How does an engine-solar PV hybrid work?
Engine-solar PV hybrids are all about saving fuel – be it oil, natural gas or biofuel. The engine unit and the solar PV unit of the hybrid work in synchronisation, so that the solar modules go first and the engines come second. Whenever there is enough solar irradiation for the PV modules to produce electricity, the engines are ramped down or stopped. When clouds cover the sun or the sun sets, the engines ramp up. All this happens automatically.

How do the engines follow solar output?
When a cloud covers the sun, the output of solar PV modules can drop by 80 percent within one minute. In a hybrid plant, the engines are instantly ramped up to compensate for the lost solar energy. When the cloud withdraws and the solar modules go back to full power, the engines are ramped down. Internal combustion engines are known for their ultra-flexible, load-following operation – and they represent the only technology capable of doing this. Wärtsilä’s engine power plants can go from start to full load in less than 2 minutes and can be stopped within 1 minute. They can start and stop continuously without impact on maintenance.
How much fuel, money and carbon emissions does a hybrid plant save?

The economic logic of an engine-solar PV hybrid plant is to save fuel and thus pay back the additional investment in solar PV modules. In other words, a hybrid becomes economically feasible when the value of the displaced fuel exceeds the investment in the PV modules:

\[
\text{Value of fuel saved} > \text{value of additional PV investment} = \text{economically feasible investment}
\]

However, there are many variables in the equation. For example, fuel savings depend on the operating profile. The savings are quite different for a baseload plant that runs at full capacity 24/7 than for a peaker plant that operates for only a few hours per day. The size of the solar PV park and its relative size to the SPG unit have a direct impact on the savings. Usually the most important element is the fuel price. The more costly the fuel, the more economically feasible a hybrid plant is. Our market research shows that there is a lot of interest in hybrid plants in countries with high fuel prices, e.g. in land-locked Africa.

What is the connection between hybrids and Wärtsilä’s power plants that integrate wind and solar power?

Wärtsilä has delivered several Smart Power Generation plants of over 200 MW in the US to support integration of wind energy. Due to the ultra-fast starting and quick ramping of the engines, these plants are capable of compensating for sudden losses in the output from wind turbines. When the wind stops blowing, the engines are turned on. The first solar-balancing project by Wärtsilä is being initiated in Hawaii.

This grid-level integration of intermittent renewable energy, means that the engine power plant and the renewable sources can be located in different places and owned by different entities. In solar hybrid projects, the engine and solar units are in the same location, with directly connected electrical systems operating in synchronisation, and are normally owned by the same company.