O&M
at the forefront

A major O&M operator's perspective

Revamping and Repowering Anticipating power plant degradation

What considerations are fundamental in power plant operation and maintenance (O&M)? We spoke to Kazuhisa Yurita of ORIX Renewable Energy Management, a company that manages mega-solar power plants with an output of 450 MW, and asked him about appropriate O&M for aging plants.

Power plant O&M begins with correcting initial failures

How should power plant defects and degradation be dealt with to ensure stable, long-term operation of solar power plants?

ORIX Renewable Energy Management Corporation manages a total of eighty-six solar power plants across Japan totaling 450MW (as of August 2020). According to Yurita, the company's Chief Strategy Officer , proper O& M begins at the start of operations.

"Upon examination, we discovered that 0.1% of initial failures can be found in the solar modules, which is consistent with reports by research institutes. In terms of our 450-MW operations, 0.1% is equivalent to 450 kW, so it's no exaggeration to say that we can produce that much more power just by improving initial defects."

Power generation decline is inevitable as time passes Required actions change over time

So, after the initial faults have been corrected, what should be done next?

"The degradation of solar power plant components is inevitable due to their physical properties, but the rate of degradation varies from one component to another. Consequently, it is necessary to apply countermeasures for the deterioration of each component. Our approach to O&M is to deal with the various components of a solar power plant by predicting when they will deteriorate. We think preemptive measures are the only course of action in the long run."

The diagram on the right shows Yurita's view of long-term operation of a mega solar power plant with revamping scheduled for the fifth, seventh, tenth, and fifteenth years, and a list of components that are expected to fail during each of those periods. The premise of long-term O&M is that repairs due to physical properties are unavoidable and therefore should be factored into operations in advance.

Kazuhisa Yurita
Chief Strategy Officer
ORIX Renewable Energy Management Corporation

Revamping as an approach for restoring power plant capacity

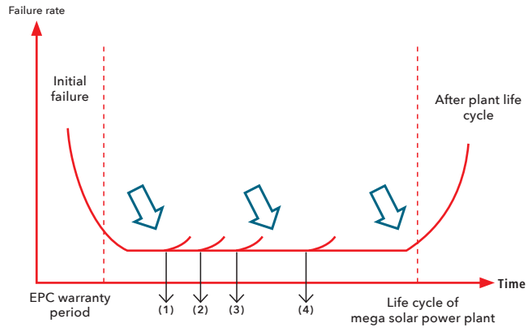
Furthermore, Yurita's approach to O&M is to distinguish between revamping and repowering.

"Repowering is about increasing a plant's power generation capacity (potential), while revamping is about striving to get back to 100% of the plant's original capacity. In other words, repowering requires technology and revamping requires management."

Distinguishing between the two and identifying whether a particular power plant requires technology or management is what facilitates proper O&M.

Anticipate aging degradation with a long-term O&M approach

Measures to consider for mega-solar businesses.



Graph depicts life cycle of mega-solar plant, where operation period is broadly divided into five phases.

i. Commissioning Error Period

Design and construction errors unapparent at time of completion which surface as the machine beings to operate

ii. Revamping (1) Period (5th year)

When batteries, drivers of ventilation fans, etc. begin to fail

iii. Revamping (2) Period (7th year)

When communication equipment and diode switches begin to fail

iv. Revamping (3) Period (10th year)

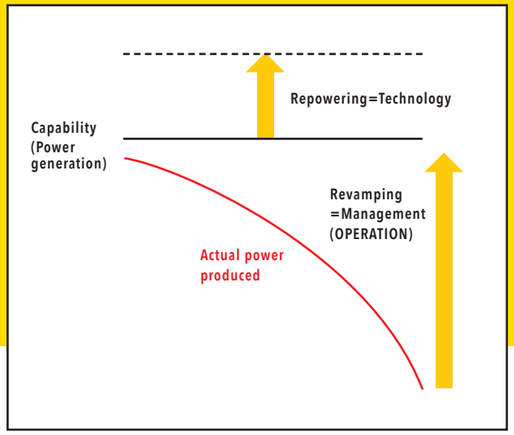
When fuses, air conditioners, high-powered measuring equipment (power meters, voltage meters, etc.) begin to fail

v. Revamping (4) Period (15th year)

When circuit breakers and isolator switches begin to fail

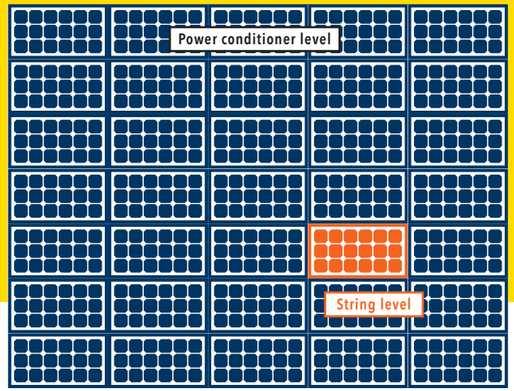
Source: Kazuhisa Yurita

Repowering and Revamping



Repowering attempts to increase a plant's power generation capacity, while revamping strives to reclaim a plant's original capacity.

Range of defect identification at different monitoring levels



The range of faults identifiable in advance differ considerably between power and string levels. It is clear from this figure that string-level monitoring is essential for proper O&M.

String-level monitoring is imperative

Moreover, "string-level monitoring" is imperative.

"If you only monitor at the power conditioner level when a problem arises, you have to identify the issue among thousands or tens of thousands of modules. If you monitor at the string level, you can quickly identify the string producing the error and the extent of the problem."

As shown in the figure above, string-level monitoring is clearly advantageous, but many power plants still do not implement it.

Power conditioner replacement and the Ampt String Optimizer

When planning long-term operations that exceed 20 years, it is also necessary to consider the replacement of power conditioners. Ampt String Optimizers are increasingly being installed in Japan as they provide string-level monitoring and allow power conditioners to be replaced without rewiring the modules. Ampt optimizers also perform string-level maximum power point tracking (MPPT) to optimize power generation. Yurita explains.

"The replacement of power conditioners early on can be difficult for some companies because decommissioning costs affect annual balance sheets. However, we think they provide excellent solutions because they allow us to increase power generation at the string level and simultaneously conduct string-level monitoring, as well as reduce replacement costs."

After rectifying initial failures, anticipate inevitable aging degradation that results from physical processes and implement revamping management. When repowering, select the right timing and technology.

This approach should be "a given" in the operation of solar power plants.