

NTPC, India's largest power utility, chooses Cargill's high performing and environmentally better transformer FR3<sup>®</sup> fluid for largest floating solar project in India

# Situation

National Thermal Power Corporation (NTPC) Limited, India's largest utility, envisioned building India's largest floating solar project in 2018, and the project in Ramagundam was born. 100MW of renewable solar energy capacity would be built, making it the largest floating solar project in India. BHEL was chosen as the EPC that would be developing and operating the solar plant for 3 years.

There were numerous technical and environmental considerations that needed to be taken into account for the project, especially since the solar panels and transformers would be built above a body of water. The transformer fluid needed to be able to meet the widely varying load capacity that comes with solar energy production, needed to be low maintenance, and above all, needed to be safe for the environment, wildlife, and people.



FR3 natural ester dielectric fluid has been a key player in solar power applications since 2010, and its benefits are unmatched for both land-based and floating installations

# Goal

When evaluating what kind of transformer to specify, the most critical goal was to avoid any harm to aquatic life in the water where the transformers would be placed. The project originally kicked off with dry type transformers, which don't use transformer fluid, specified to float above the water to avoid any potential leakage of fluid into the body of water. But dry transformers come with several major drawbacks, including being very heavy, large in size, and expensive. BHEL investigated other alternatives and found that Cargill's FR3 fluid could provide a better solution.

# Solution

After the team at NTPC and BHEL met with Cargill's power systems sales team to discuss FR3 fluid and all the benefits it could bring to their project, it became clear that there was a better solution than using dry type transformers to meet their project goals. A transformer filled with the high performing, reliable, and better-forthe-planet biodegradability FR3 fluid would not only deliver all the goals for their floating solar application, but also deliver it at a lower cost. After discussions with BHEL's project team, a detailed presentation was given to



NTPC Limited is set to complete construction of India's largest floating solar power plant located in Ramagundam in June 2022.

NTPC's engineering, quality assurance, and project management teams, and approval was given to change the specification from dry type transformers to transformers filled with Cargill's FR3<sup>®</sup> fluid.

## **Results**

BHEL and NTPC couldn't be more satisfied with how the project turned out using FR3 fluid filled transformers. "We knew the project teams would initially be interested in FR3 fluid because of the biodegradability and non-toxic (in soil and water) characteristics of the product," Sabine Bowers, Global Renewable Energy Leader at Cargill, explained. "The more the teams learned about the other benefits of FR3 fluid, they were also impressed by its reduced need for service and maintenance and high fire safety. When the cost analysis was conducted, the project team was surprised to see that they could get all these benefits at a lower cost than the dry type transformers originally specified, which made adopting FR3<sup>®</sup> an easy decision."

The FR3 fluid filled transformers provide reliable power in a smaller, lower weight package, making them easier to install and maintain. In the unlikely event of a leak, FR3 fluid biodegrades in as little as 10 days and is also non-toxic, so it won't negatively impact aquatic life in the area.

It also handles higher peak loads than a dry type or mineral oil filled transformer, so NTPC can be assured of high performance even during peak power generation. Because of FR3 fluid's

ability to absorb high amounts of water from the atmosphere and continuously dry the paper insulation in the transformer, lower maintenance is necessary.

# **Key Findings**

Together, the collaboration between Cargill, NTPC, and BHEL solved many problems the power utility initially did not think could be solved. NTPC was able to choose higher performing, smaller, lighter, and safer transformers by using FR3 fluid.

Initially drawn by the environmental benefits of being non-toxic and biodegradable in order to protect aquatic life in the water the transformers are floating on, NTPC learned that it could actually lead to a higher performing, more reliable, and lower cost transformer as well.

"The project was a success thanks to the hard work of all the partners involved and because of the adoption of FR3<sup>®</sup>," said Javi McGuiggan, Global Business Leader for Power Systems at Cargill. "Because of FR3 fluid, we were able to help build the largest floating solar project in India, bringing 100MW of additional renewable energy capacity to Ramagundam while also protecting the highly sensitive area where the transformers are placed."

As of January 2022, 20 FR3 fluid filled transformers have been installed, and the project continues to be built out, with a total of 40 transformers to be installed when the project is completed.

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