Upgradation of 132kV Transmission Line using HTLS Conductors to increase the load transfer capacity.

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MSETCL

- Maharashtra State Electricity Transmission Company Ltd (MSETCL) is the transmission licensees responsible for the transmission for power and infrastructure required for the transmission in the entire Maharashtra State.
- MSETECL is currently the largest State transmission utility in India with a transmission system that extends to 42,258 circuit km having a load transfer capacity of 21,000 MW managed by some 12,000 employees.

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Nashik

- The Nashik City is situated on northwest side of Maharashtra which is 170KMs (106Miles) away from Mumbai.
- Nashik ranks 16th in a global study of fastest developing city *
- The MSETCL transmission system for Nashik City includes a 17.2KMs (10.7Miles) section of 132kV Single Circuit Overhead line between Eklahra and Ozar erected in late 1960's which crosses over two major highways, a railway track and a river; requiring a 400M(1,300ft) span.

*As per study conducted by The City Mayors Foundation, an international think tank on urban affairs.

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Project

- The MSETCL transmission system for Nashik City includes a 17.2KMs (10.7Miles) section of 132kV Single Circuit Overhead line between Eklahra and Ozar erected in late 1960's which crosses over two major highways, a railway track and a river; requiring a 400M(1,300ft) span.
- The load transfer capacity of this section of the transmission system deemed to be inadequate imposing a constraint on the system that could ultimately result in the load shedding at times of peak load. MSETCL was also aware of increasing demands on the system to supply new industrial applications. Therefore variety of reasons including the need to comply with the mandate issued by Indian Ministry of Power to provide reliable 24/7 supply of electrical energy, MSETCL was obliged to upgrade this section of the transmission system.

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System reinforcement alternatives considered

- The possibility of adding one circuit. *Unfortunately the existing lattice structures were not designed to accommodate an additional circuit.*
- Could a new parallel line be built? Perhaps, but rapid urbanization, escalating land costs and *ROW challenges* made this option prohibitively expensive.
- Replacing the existing 158.1 square mm (310kcmil) ‘wolf’ ACSR conductors with conventional conductors would require lattice tower replacement due to added weight and relative condition of the existing structure. Thermal sag associated with the conventional conductors was also a concern.
- MSETCL became aware that there are number of commercially available High-Temperature Low Sag (HTLS) conductors that would replace the existing ACSR conductors without the need to replace or reinforce the existing tower structures.

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Composite core conductor/HTLS

- Key considerations; conductor sag, ampacity, line losses, anticipated longevity and cost.
- Key choices; ACCR, GAP, INVAR, ACSS, ACCC
- ACCR was excluded based on its high cost and INVAR was excluded due to substantial magnetic hysteresis losses of its nickel-iron core (in addition to I^2R losses).
- Initially MSETCL were apprehensive regarding the bending flexibility of the composite core that is the main feature of ACCC conductor but following product demonstrations and on-site handling of this conductor MSETCL had sufficient confidence to select the ACCC conductor for this project.

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Other key factors in selecting composite core technology

- It offered *lowest line losses* compared to other conductors operating under high load conditions, and
- The fact that it was manufactured locally by renowned conductor manufacturing companies hence local sales and service support was no issue.

"MSETCL hence selected the 273.6 square mm (540 kcmil) 'Casablanca' ACCC conductor to increase the load transfer capacity of the circuit without the need to upgrade the existing transmission line towers"

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ACCC Conductor was successfully installed by regional contractor under CTC supervision amidst urban colonies and crop fields in Nashik, Maharashtra

Conclusion

- In addition to the issues linked to seeking an additional ROW, the cost of constructing a new transmission line far exceeds the cost of upgrading existing circuits. Hence, MSETCL's decision to re-conductor the existing line resulted in significant savings in capital expenditure. Higher capacity also equates to greater profitability and lower line losses as discussed above offers improved life cycle costs compared to the other alternatives considered. Conventional line construction project get time overrun which results in cost overrun.
- Instead of constructing new transmission line the replacement of existing conductor with High Ampacity HTLS conductor helps MSETCL to add more power transmission capacity in much lesser time.
- The I^2R losses of HTLS conductor is 20 to 25% less as compared to the conventional conductor.
- The major generation facilities in Maharashtra are on the eastern side of the State near the coal mines some 700-800 km (439- 497 miles) from the western sector of the State that has seen rapid industrialization in the past few decades. Therefore MSETCL are faced with a continuing challenge to upgrade the existing east to west transmission system.

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