NAME : Igor Gutman
COUNTRY : Sweden
REGISTRATION NUMBER : 1385

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When the authors present the value of the current required to prevent icing; it would be calculated that nearly twice the actual average loads would be required. In this case, the main problem is that such a large amount of current can no longer flow on the transmission line. Or is the problem that there isn't that much power generation nearby? If the former is the case and the limiting element is the conductor, is it possible to supplement the simulations using Dynamic line rating?

Our paper 10515 describes the results of feasibility studies of countermeasures against ice accretion on the conductors of overhead lines (OHL) using current for heating of both phase conductors and shield wires. The applicability and expected gain are evaluated through a case study comprising two actual OHL of Norwegian TSO Statnett with recorded ice-related issues. This case study used actual historical weather parameters, ice loads calculated based on measurements and modelling and operational data to make the evaluation as representative as possible. Based on critical literature review and practical considerations, two options, i.e., re-distribution of current between the sub-conductors in the same bundle for phase conductors, and heating of insulated shield wires by AC current, were selected for detailed case studies.

The question from Special Reporter concerns the heating of conductors. We have shown that the historical average current loading collected during several years is in the range 210-270 A, see Fig. 1. At the same time as seen in Fig. 2, a load current in the order of 500 A, i.e., more than twice the average load current of any of two lines, is required to prevent ice accretion in 90% of time. The thermal capacity of the OHL allows for such currents, but the actual load currents are too low to heat the conductors sufficiently. Considering actual average load currents (Fig. 1), it is estimated that 21-35% and 15-26% of expected ice accretion may be prevented for OHL-1 and OHL-2, respectively.

Parameters	OHL-1	OHL-2
Period of data collection	2015-2018	2013-2018
Average load current (A) with the line in or out of operation	157	165
Average load current, line in operation (A)	217	208
Maximum current (A)	1120	1282
Average current in operation and ambient temp. <0 °C *	242/250/272	213/213/236

* Values corresponded to temperatures at the three positions along the line route

Fig. 1 Historical current loading during selected time periods

Percentage of prevented ice accretion	Required power for iced areas (kW/km)		Required current for iced areas (A)	
	OHL-1	OHL-2	OHL-1	OHL-2
10%	3	4	146	174
30%	7	9	232	267
50%	12	15	301	332
70%	16	21	350	400
90%	27	32	452	495
99%	42	51	562	619

Fig. 2 Power and current required to prevent ice accretion on a single HLTS conductor. Estimated from expected icing events in the period 1980-2020.

It is thus stated in the article, that the concept focused on re-distribution of the current between the sub-conductors in the bundle is not a promising solution on its own in the studied cases. This concept requires that the line has a sufficiently high load current to be effective. However, a potentially promising solution would be to combine this concept with an increased phase conductor current obtained by intentional short circuiting of the line at the remote end, possibly via a transformer.