

1 **Q. 4.1 Distribution Reliability Initiative**

2  
3 **Page 1 of the report state “In 2012 the Canadian Electricity Association began**  
4 **reporting on 2 additional indices; Customer Hours of Interruption per Kilometer**  
5 **(“CHIKM”) and Customers Interrupted per Kilometer (“CIKM”). CHIKM and**  
6 **CIKM are used to rank the reliability performance of distribution feeders on the**  
7 **length of line exposed to the outage.”**

8  
9 **Describe how Newfoundland Power uses these new indices either by themselves or**  
10 **in conjunction with other indices to rank its feeders when deciding where it should**  
11 **allocate its capital for the maximum leverage.**

12  
13 A. There are numerous reliability indices used by utilities and regulatory authorities to  
14 evaluate the frequency and duration of customer outages. SAIDI and SAIFI are customer  
15 based indices that normalize reliability data on a customer basis.<sup>1</sup> They are an indication  
16 of the service continuity that customers experience. CHIKM and CIKM are plant based  
17 indices that normalize reliability data on the basis of kilometres of distribution plant in  
18 service.<sup>2</sup> They are an indication of plant condition. When evaluating reliability  
19 performance both customer based statistics and plant based statistics provide useful  
20 information.

21  
22 To illustrate the value of considering both perspectives, consider two distribution feeders  
23 of 10 km and 100 km respectively. Each serves 1,000 customers. If each of the two  
24 feeders were exposed to 20 events which caused the same number of customer  
25 interruptions (say, 10,000 aggregate interruption) and customer hours of interruption  
26 (say, 20,000 aggregate hours of interruptions), the statistical conclusion would differ  
27 depending upon the indices used. The SAIDI and SAIFI would be the same for both  
28 feeders.<sup>3</sup> However, the CHIKM and CIKM would indicate that reliability for the 10 km  
29 feeder was 10 times worse than the reliability for the 100 km feeder.<sup>4</sup>

30  
31 From an engineering perspective, it is widely accepted that system reliability is largely a  
32 function of the condition of electrical system assets.<sup>5</sup> Use of CHIKM and CIKM will

---

<sup>1</sup> SAIDI is the system average interruption duration index and is calculated by dividing aggregate customer hours of outages by the number of customers served. SAIFI is the system average interruption frequency index and is calculated by dividing aggregate number of customer interruptions by the number of customers served.

<sup>2</sup> CHIKM is the customer hours of interruption per kilometer and is calculated by dividing aggregate customer hours of outages by the kilometers of distribution plant. CIKM is the customers interrupted per kilometer and is calculated by dividing aggregate number of customer interruptions by the kilometers of distribution plant.

<sup>3</sup> SAIDI would be 20 ( $20 = 20,000/1,000$ ) and SAIFI would be 10 ( $10 = 10,000/1,000$ ) for both the 10 km and 100 km feeders.

<sup>4</sup> CHIKM for the 10 km feeder would be 2,000 ( $2,000 = 20,000/10$ ) and for the 100 km feeder would be 200 ( $200 = 20,000/100$ ). CIKM for the 10 km feeder would be 1,000 ( $1,000 = 10,000/10$ ) and for the 100 km feeder would be 100 ( $100 = 10,000/100$ ).

<sup>5</sup> This was recognized in, amongst other places, the 1991 *Report on the Technical Performance of Newfoundland Light & Power Co. Limited*, prepared by George Baker, P.Eng., for the Board.

1 simply provide an additional screen for assessing the reliability performance of  
2 Newfoundland Power's distribution feeders. In the past Newfoundland Power relied on  
3 SAIDI and SAIFI to identify feeders on which to perform a detailed reliability  
4 assessment. On a go forward basis, CHIKM and CIKM will be used in conjunction with  
5 SAIDI and SAIFI to identify feeders for reliability assessment.<sup>6</sup>

6  
7 As in the past, reliability indices will be used only to *identify* feeders upon which detailed  
8 reliability assessment will be performed. The worst 15 performing feeders for each of  
9 customer minutes, SAIDI, SAIFI, CHIKM and CIKM will be identified on an annual  
10 basis. An engineering review will be performed on all identified feeders. Where  
11 necessary, a detailed engineering inspection will determine if any work, capital or  
12 otherwise is required.

13  
14 The addition of CHIKM and CIKM as screens for assessing reliability performance will  
15 not necessarily result in materially increased expenditures to improve distribution  
16 reliability.<sup>7</sup> It will however, result in a more informed screening process which should  
17 result in more cost effective reliability assessment and improvement over the long term.

---

<sup>6</sup> In the Distribution Reliability Initiative June 2014 report Newfoundland Power has presented 5 reliability indices in Appendix A, customer minutes of interruption, SAIFI, SAIDI, CHIKM and CIKM. The 5 separate reliability indices identified a total of 42 distribution feeders as candidates for *worst performing feeders*. The reliability data for these 42 feeders were examined to determine if an engineering review was warranted.

<sup>7</sup> The 2015 Distribution Reliability Initiative identified 42 distribution feeders for assessment. Work is being proposed for two distribution feeders in 2015.