STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF NORTHERN INDIANA PUBLIC SERVICE COMPANY FOR APPROVAL OF PETITIONER'S 7-YEAR PLAN FOR ELIGIBLE TRANSMISSION, DISTRIBUTION AND STORAGE SYSTEM IMPROVEMENTS, PURSUANT TO IND. CODE 8-1-39-10(a).	)))))	**CAUSE NO. 44370**

OUCC PREFILED TESTIMONY

MACLEAN O. EKE - PUBLIC'S EXHIBIT #2

ON BEHALF OF THE

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

OCTOBER 11, 2013

Respectfully Submitted,

INDIANA OFFICE OF UTILITY CONSUMER

Jeffrey M. Reed, Atty. No. 11651-49
Deputy Consumer Counselor

CERTIFICATE OF SERVICE

This is to certify that a copy of the foregoing ***Office of Utility Consumer Counselor Prefiled Testimony of Maclean O. Eke*** has been served upon the following counsel of record in the captioned proceeding by electronic service and/or by depositing a copy of same in the United States mail, first class postage prepaid, on October 11, 2013.

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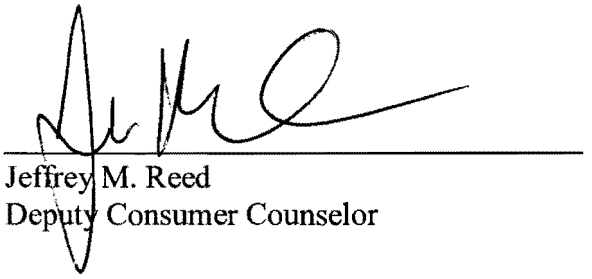

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OUCC TESTIMONY OF MACLEAN O. EKE, P.E.
CAUSE NO. 44370
NORTHERN INDIANA PUBLIC SERVICE COMPANY

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is Maclean O. Eke, and my business address is 115 West Washington Street, Suite 1500 South, Indianapolis, IN 46204.

Q: By whom are you employed and in what capacity?

A: I am employed by the Indiana Office of Utility Consumer Counselor (OUCC) as a Utility Analyst in the Resource Planning and Communications Division.

Q: Please describe your educational background and experience.

A: I hold a Master of Science Degree in Civil Engineering from Purdue University, a Master of Science Degree in Management from Indiana Wesleyan University, a Graduate Certificate in Hazardous Materials Management from Indiana University Purdue University (IUPUI), Indianapolis and a Bachelor of Science Degree in Civil Engineering from Prairie View A&M University, Prairie View, Texas.

Q: Are you registered as an engineer in any jurisdiction?

A: Yes. I am a Registered Professional Engineer in the States of Indiana and Ohio.

Q: Do you belong to any professional organizations?

A: Yes. I am a member of the Society for Risk Analysis.

Q: What other training have you completed?

A: I completed the Practical Regulatory Training–Electrical Industry Program in Albuquerque, New Mexico sponsored by the National Association of Regulatory Utility

Commissioners (NARUC) and the Center for Public Utilities at New Mexico State University.

Q: Please discuss your work experience prior to joining the OUCC.

A: Prior to joining the OUCC, I worked for the Indiana Department of Transportation (INDOT) as a Project Engineer for 14 years. My primary duties at INDOT included, but were not limited to, supervision of construction projects, specification enforcement and interpretation, and reports and estimates for construction contracts. In 2004, I became the Principal and Operations Engineer for Moe Construction Company. My primary duties included estimating, scheduling procurement, project scoping, and the day-to-day operation of the company. I joined the OUCC in 2011.

Q: Have you previously provided testimony to the Indiana Utility Regulatory Commission (IURC or Commission)?

A: Yes. I have testified on matters similar to the issues presented in this Cause.

Q: What is the purpose of your testimony?

A: My testimony recommends the IURC (1) approve Northern Indiana Public Service Company's (NIPSCO) use of the B&V model, (2) approve the projects proposed in the Plan, and (3) accept NIPSCO's "optimization" reprioritizing certain projects regarding the proposed 7-Year Plan for Eligible Transmission, Distribution and Storage System Improvements (Plan).

Q: What did you do to conduct your analyses and prepare your testimony?

A: I reviewed the NIPSCO testimonies of Mr. Frank A. Shambo, and Mr. Timothy A. Dehring, as well as the Black & Veatch (B&V) Long-Term Transmission & Distribution

(T&D) Capital Plan Business Case Report. I also participated in internal case team meetings, as well as meetings with Petitioner regarding a number of issues.

II. TDSIC 7-YEAR PLAN OVERVIEW

Q: Please describe NIPSCO's proposed TDSIC 7-Year Plan.

A: NIPSCO's Plan focuses on T&D replacement investments made for capital assets within its T&D facilities from 2014 through 2020 at an estimated cost of $1.07 billion (in nominal dollars). The assets NIPSCO proposes to replace include transmission lines and ancillary components to the transmission lines as well as distribution lines and ancillary components.

Q: Please describe the asset replacement model.

A: NIPSCO engaged B&V to evaluate the utility's long-term electric T&D plan that focuses on replacing aging high-risk infrastructure across its electric system. According to NIPSCO witness Timothy A. Dehring, NIPSCO's electric system assets grew considerably during the 1960's and 1970's and several of these infrastructure assets are at or nearing the end of their useful life[1]. In considering the replacement of the aged assets, NIPSCO and B&V used NIPSCO's CASCADE substation database as the data source[2] for the risk model to quantify the criticality of the different T&D assets on the whole NIPSCO system.[3] The model uses the standard definition of risk:

Risk = Probability of Failure (POF) x Consequence of Failure (COF)

[1] Petitioner's Exhibit No. TAD, page 14, lines 9-11
[2] B&V "Long Term Capital Plan Report", Petitioner's CONFIDENTIAL Exhibit No. TAD-2, page 3–4
[3] *Ibid*, page 1–1.

While there may be nuances and variations in quantifying risk, this methodology generally sets the limits of the COF and the POF event of the system. Criticality is an essential element within this type of qualitative analysis; B&V appropriately captured this in their "Criticality Score", an element of the COF calculation. Each major asset is scored based on the different COF and POF for each asset class, with 1 being the least risk and 5 the most risk.[4]

Simplified depictions of the analysis are found in figures 3-1 and 3-2 of Petitioner's CONFIDENTIAL Exhibit TAD-2. This "heat band matrix" methodology shows risk increasing as assets age moving along the diagonal from the lower left-hand corner (low consequence and low probability of failure) to the upper right corner (higher consequence and high probability of failure). The upper right-hand corner zone demands special consideration and attention. (This zone represents 61% to 80% probability of failure, high consequence of failure).[5]

Using this methodology, NIPSCO can gain a better understanding of which assets pose the highest risk to the electric system and assist the Company in optimizing the portfolio of aging asset replacement.[6]

Q: Please explain POF, COF and Risk Score.

A: In this case, the first step in the risk assessment is calculating the POF, the approximate likelihood of a failure event occurring. POF in B&V's analysis is predominantly based on the age of the assets or deterioration-related asset failure that is not repairable.[7] COF is

[4] *Ibid,* page 2-4, paragraph 2.2.1
[5] *Ibid,* page 3-9
[6] Petitioner's Exhibit No. TAD, page 19, lines 12–14
[7] Petitioner's CONFIDENTIAL Exhibit No. TAD-2, page 3-3

direct undesirable results of a failure event as measured with respect to customers and the system. Risk is the product of POF and COF. B&V's risk score combines the normalized COF scoring factors with an age-based POF. POF percentages were derived using survivor curves to calculate discrete failure probabilities by year then sums up the cumulative probabilities of failure for the next 7 years for each individual asset.[8]

Q: Does the OUCC accept the COF portion of B&V's analysis?

A: Yes. The analysis is robust, includes reasonable assumptions and inputs and is tailored to specific asset classes.

Q: Does the OUCC accept the POF portion of B&V's analysis?

A: Yes. A quantitative risk assessment such as this brings additional transparency and logic to a replacement planning program. The OUCC recommends the IURC find that a comparable analysis be included as part of a utility's case-in-chief in future TDSIC 7-year plan petitions.

Q: Does the OUCC have recommendations for the B&V model?

Yes. B&V's POF analysis considers age and survivor curve data but does not incorporate NIPSCO's asset-specific information regarding performance or condition, in part because some of this information does not exist. Based on the information available to B&V at this time, age is a reasonable parameter for POF assumptions. Asset failures do not happen at fixed times or ages; they occur based on failure modes and distribution. As NIPSCO moves forward and collects more asset-specific data, that information can be included in the POF analysis. Probability failure distribution information for assets will,

[8] *Ibid,* page 3-8

in turn, produce increasingly improved POF estimates. The OUCC recommends the IURC find that it is appropriate for a utility to incorporate asset specific performance and condition data into their probability of failure analysis.

Q: What asset groups are evaluated in the Plan?

A: The three main classes of T&D assets evaluated under the T&D risk model were Transmission (345kV and 138kV systems)[9]; Sub-Transmission (69kv and 34kv system)[10] and Distribution (12.5kV and 4.5kV).[11]

III. SURVIVIOR CURVES

Q: What role do survivor curves play in determining the replacement of assets in the Plan?

A: To fully understand the age replacement plan, there must be a basic understanding of the survivor curves as used in the Petitioner's CONFIDENTIAL Exhibit No. TAD-2[12]. Because different assets have different life expectancy, the survivor curves represent the percentage of the individual assets remaining in service at various age intervals. The average remaining age of an asset class can be determined by comparing actual experience with the asset class against the various survivor curves. B&V used a set of representative Iowa survivor curves for the assets in the model.

Survivor curves graphically illustrate the number of assets existing at each age. They are not a probability distribution, but can be used to calculate the average life of the asset, the remaining life expectancy, the probable life, and the frequency. The average life is

[9] Includes, circuits, and substations (Breakers, Transformers and Balance of substation equipment).
[10] Includes, circuits, and substations (Breakers, Transformers and Balance of substation equipment).
[11] Includes, circuits, and substations (Breakers, Transformers and Balance of substation equipment).
[12] Petitioner's CONFIDENTIAL Exhibit TAD-2, pages 3-4 through 3-5

obtained by calculating the area under the survivor curve, from age zero to the maximum age, and dividing the area by the ordinate at zero. The remaining life expectancy at any age is calculated by obtaining the area under the curve, from the observed age to the maximum age, and dividing the area by the percent surviving ordinate at the observed age.[13] For the NIPSCO replacement schedule and risk models, the average lives of the assets are used in selecting the appropriate survivor curves for the assets. The survivor curve percentage on the y-axis shows the "percent surviving" among a given asset group.[14]

Q: Are the projects included in the Plan reasonable based on the survivor curve data you reviewed?

A: Yes.

Q: Does the OUCC take issue with NIPSCO's prioritization or "optimization" of the selected projects within the Plan?

No. The risk model shows that assets having greater cascading effect if they failed receive higher risk scores, justifying earlier replacement. For example, a breaker replacement has a relatively low capital cost yet high risk reduction capability due to the cascading effect on downstream assets. NIPSCO is reprioritizing several of these assets upward.

Also, assets without built-in redundancies ranked higher in the replacement schedule even if they have lower risk scores. Example of these assets includes the sub-

[13] http://books.google.com/books?id=6Q_rKMfB7m0C&pg=PA774&lpg=PA774&dq=Exhibit+C-2+Iowa+Type+S+Curve&source=bl&ots=3dY_O-QNu-&sig=FNboJTd0aTdAsvjkynIET6JPoBw&hl=en&sa=X&ei=1bBSUs3QA8qFyQGzp4D4CQ&ved=0CCkQ6AEwAA#v=onepage&q=Exhibit%20C-2%20Iowa%20Type%20S%20Curve&f=false

[14] Petitioner's CONFIDENTIAL Exhibit TAD-2, page 3-7

transmission circuits. *See,* for example, NIPSCO's response to OUCC DR 8-1, CONFIDENTIAL Attachment A.

On the other hand, the balance of 138 kV substations and every other asset was modeled as a single asset, although other ancillary assets make up the substation. The substation is moved down (delayed) in the replacement schedule for good reasons: (1) Constructability issues - once personnel are in the station, several other materials may well be taken care of, and (2) other items may need to be replaced before initiating work on the substation itself. These types of situations are factored into NIPSCO's implementation plan.

IV. RECOMMENDATIONS

Q: Please summarize your recommendations.

A: I recommend the Commission (1) approve NIPSCO's use of the B&V risk model for purpose of this 7–Year TDSIC Plan, (2) approve the projects proposed in the Plan, and (3) accept NIPSCO's "optimization" reprioritizing certain projects. I also recommend the Commission require NIPSCO to continue gathering asset-specific condition and performance data and incorporate this information into the risk model's POF calculations going forward.

Q: Does that conclude your testimony?

A: Yes.

AFFIRMATION

I affirm, under the penalties for perjury, that the foregoing representations are true.

By: Maclean O. Eke
Indiana Office of
Utility Consumer Counselor

Date: 10/11/13

CAUSE NO. 44370

OUCC ATTACHMENT MOE-1

CONFIDENTIAL

PAGES 1-2