

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF INDIANA MICHIGAN POWER )  
COMPANY, AN INDIANA CORPORATION, FOR )  
(1) AUTHORITY TO INCREASE ITS RATES AND )  
CHARGES FOR ELECTRIC UTILITY SERVICE )  
THROUGH A PHASE IN RATE ADJUSTMENT; (2) )  
APPROVAL OF: REVISED DEPRECIATION )  
RATES; ACCOUNTING RELIEF; INCLUSION IN )  
BASIC RATES AND CHARGES OF QUALIFIED )  
POLLUTION CONTROL PROPERTY, CLEAN )  
ENERGY PROJECTS AND COST OF BRINGING )  
I&M'S SYSTEM TO ITS PRESENT STATE OF )  
EFFICIENCY; RATE ADJUSTMENT MECHANISM )  
PROPOSALS; COST DEFERRALS; MAJOR )  
STORM DAMAGE RESTORATION RESERVE )  
AND DISTRIBUTION VEGETATION )  
MANAGEMENT PROGRAM RESERVE; AND )  
AMORTIZATIONS; AND (3) FOR APPROVAL OF )  
NEW SCHEDULES OF RATES, RULES AND )  
REGULATIONS. )

CAUSE NO. / 0 / &

**SUBMISSION OF DIRECT TESTIMONY OF  
Q. SHANE LIES**

Petitioner, Indiana Michigan Power Company (I&M), by counsel, respectfully submits the direct testimony and attachments of Q. Shane Lies in this Cause.



\_\_\_\_\_  
Teresa Morton Nyhart (Atty. No. 14044-49)

Nicholas K. Kile (Atty. No. 15023-23)

Jeffrey M. Peabody (Atty No. 28000-53)

Barnes & Thornburg LLP

11 South Meridian Street

Indianapolis, Indiana 46204

Nyhart Phone: (317) 231-7716

Kile Phone: (317) 231-7768

Peabody Phone: (317) 231-6465

Fax: (317) 231-7433

Email: [tnyhart@btlaw.com](mailto:tnyhart@btlaw.com)

[nkile@btlaw.com](mailto:nkile@btlaw.com)

[jpeabody@btlaw.com](mailto:jpeabody@btlaw.com)

Attorneys for Indiana Michigan Power  
Company

**CERTIFICATE OF SERVICE**

The undersigned certifies that the foregoing was served upon the following via electronic email, hand delivery or First Class, or United States Mail, postage prepaid this 26th day of July, 2017 to:

William I. Fine  
Abby R. Gray  
Indiana Office of Utility Consumer Counselor  
Office of Utility Consumer Counselor  
115 West Washington Street  
Suite 1500 South  
Indianapolis, Indiana 46204  
infomgt@oucc.in.gov  
wfine@oucc.in.gov  
agray@oucc.in.gov



---

Jeffrey M. Peabody

Teresa Morton Nyhart (No. 14044-49)  
Nicholas K. Kile (No. 15023-23)  
Jeffrey M. Peabody (No. 28000-53)  
BARNES & THORNBURG LLP  
11 South Meridian Street  
Indianapolis, Indiana 46204  
Nyhart Phone: (317) 231-7716  
Kile Phone: (317) 231-7768  
Peabody Phone: (317) 231-6465

Attorneys for INDIANA MICHIGAN POWER COMPANY

I&M Exhibit: \_\_\_\_\_

**INDIANA MICHIGAN POWER COMPANY**

**PRE-FILED VERIFIED DIRECT TESTIMONY**

**OF**

**Q. SHANE LIES**

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**PRE-FILED VERIFIED DIRECT TESTIMONY OF Q. SHANE LIES  
ON BEHALF OF  
INDIANA MICHIGAN POWER COMPANY**

1 **Q. What is your name and business address?**

2 A. My name is Quinton Shane Lies. My business address is Donald C. Cook Nuclear  
3 Plant (Cook Plant or Cook), One Cook Place, Bridgman, Michigan 49106.

4 **Q. By whom are you employed and in what capacity?**

5 A. I am employed by Indiana Michigan Power Company (I&M or the Company) as the  
6 Site Vice President at the Cook Plant.

7 **Q. What are your responsibilities as the Site Vice President of the Cook Plant?**

8 A. As the Site Vice President, I am responsible for providing overall management and  
9 oversight of Operations, Radiation Protection, Chemistry, Maintenance, Work  
10 Control, Outage Management, Environmental, Safety and Human Performance,  
11 Regulatory Affairs, Training, Performance Improvement, Security, Information  
12 Technology, Procedures, Emergency Preparedness, and Work Force Planning.

13 **Q. What is your education and professional background?**

14 A. I received a Bachelor of Science Degree in Nuclear Engineering from Kansas State  
15 University in 1994. Additionally, I received a Master's Degree in Mechanical  
16 Engineering in 1996, also from Kansas State University. I was previously a  
17 licensed engineer in the state of Michigan.

18 I began my career with I&M in June 1996 as a System Engineer at Cook.  
19 In 2000, I joined the Operations Department and obtained my Senior Reactor  
20 Operator's license. After serving in the Cook control rooms as a Unit Supervisor,

1 I held the positions of System Engineering Manager, Operations Manager,  
2 Assistant Plant Manager, Engineering Director, Plant Manager, and Engineering  
3 Vice President prior to assuming my current position as Site Vice President in  
4 2015. In this position, I report directly to the Chief Nuclear Officer of Cook.

5 **Q. Have you previously submitted testimony in any regulatory proceedings?**

6 A. Yes. I provided testimony before the Indiana Utility Regulatory Commission  
7 (Commission) in Cause Nos. 44182 LCM 4 and 44182 LCM 5 related to the Cook  
8 Plant's Life Cycle Management (LCM) Project. I also submitted direct testimony  
9 before the Michigan Public Service Commission in Case No. U-18370.

10 **I. PURPOSE OF TESTIMONY**

11 **Q. What is the purpose of your testimony in this proceeding?**

12 A. The purpose of my testimony is to describe the operations of I&M's nuclear  
13 generating asset, the Cook Plant. I support Cook's operation and maintenance  
14 (O&M) expenses during twelve-month forward-looking test period ending  
15 December 31, 2018 (the Test Year). I also support the projected capital  
16 expenditures at Cook from January 1, 2017 through December 31, 2018 (the  
17 Capital Forecast Period). I also support the historic nuclear O&M expenses during  
18 the historical period from January 1, 2016 through December 31, 2016. I support  
19 these expenditures on a total Company basis; Company witness Stegall supports  
20 the allocation to the Indiana jurisdiction.

21 To provide context for I&M's investments in Cook, I address several topics  
22 in depth: modifications related to the March 2011 event at the Fukushima Dai-ichi

1 Nuclear Power Station (Fukushima) in Japan; the Open Phase Condition Project;  
2 the Baffle Bolt & Up-Flow Conversion Projects; the Cyber Security Project; dry  
3 cask storage of spent nuclear fuel; and the Cook Improvement Project (CIP). I  
4 discuss each of these topics from an operational perspective. Company witness  
5 Williamson describes the regulatory treatment requested for the LCM Project, dry  
6 cask storage, and the CIP.

7 **Q. Are you sponsoring any attachments in this proceeding?**

8 A. Yes. I am sponsoring the following attachments:

- 9 • Attachment QSL-1: Cook Plant Systems Diagram
- 10 • Attachment QSL-2: Baffle Bolt Diagram

11 **Q. Were the attachments that you are sponsoring prepared by you or under**  
12 **your direction?**

13 A. Yes.

## 14 **II. THE COOK NUCLEAR PLANT**

15 **Q. Please describe the Cook Plant's organization.**

16 A. The Cook Plant is operated by I&M's Nuclear Generation Group (NGG), which  
17 consists of approximately 1200 full time I&M employees. Cook also employs  
18 approximately 100-200 contract workers on a long-term basis and 600-1000  
19 temporary contract workers for refueling outages. The NGG is organized to ensure  
20 that all activities required to operate and maintain the Cook Plant are accomplished  
21 in a safe and efficient manner.

1 **Q. Please describe the design of the Cook Plant.**

2 A. The Cook Plant is a two-unit nuclear power plant located along the eastern shore  
3 of Lake Michigan in Bridgman, Michigan. Both units are pressurized water reactors  
4 with four-loop Westinghouse nuclear steam supply systems. A diagram of the  
5 Cook Plant is provided as Attachment QSL-1. The former combined nominally-  
6 rated net electrical output for both units was 2191 megawatts (MWe). However,  
7 Cook has recently completed the Unit 2 High Pressure and Low Pressure Turbine  
8 Replacement Project, which has increased the net electrical output for both units  
9 to approximately 2278 MWe.

10 Unit 1 received its operating license from the Nuclear Regulatory  
11 Commission (NRC) in 1974 and began commercial operation in 1975. Unit 2  
12 received its operating license in 1977 and began commercial operation in 1978.  
13 The NRC initially granted forty-year licenses to each unit and granted twenty-year  
14 license extensions in 2005. Unit 1 is currently licensed to operate until 2034, and  
15 Unit 2 until 2037.

16 **Q. Please describe the NRC's regulation of the Cook Plant.**

17 A. The NRC provides specific technical requirements through regulations regarding  
18 the components that must be incorporated into the design of the systems to ensure  
19 the protection of public health and safety. The NRC defines compliance with these  
20 regulations during facility operation, in part, by incorporating certain Technical  
21 Specifications into the facility Operating License. These Technical Specifications  
22 provide Limiting Conditions for Operation (LCO) that must be met on a continuous



1 basis to operate the plant. If an LCO is not met within a specific timeframe, the  
2 plant must be shut down until the condition is satisfied.

3 **Q. What is the overall condition of the Cook Plant?**

4 A. The Cook Plant is well maintained, in good condition, and is necessary for I&M's  
5 provision of electric service.

6 **Q. Please describe the Cook Plant's performance.**

7 A. Cook's performance is strong, as substantiated by NRC performance indicators.  
8 For example, the current ratings in the NRC's Revised Reactor Oversight Process  
9 are all green (the highest acceptable level) for both Unit 1 and Unit 2. Additionally,  
10 Cook remains in the Licensee Response Column receiving the lowest level of NRC  
11 oversight due to satisfactory performance. The Cook Plant is able to attain and  
12 maintain such high levels of performance in large part due to the expenditures  
13 supported in my testimony.

14 **Q. How has this performance been achieved?**

15 A. Cook Plant is a continuous learning organization which is steadily strengthened  
16 through the use of internal lessons learned, operating experience, benchmarking,  
17 and applying industry best practices to all facets of the plant's design,  
18 maintenance, and operation. These practices have allowed Cook to operate  
19 efficiently, safely, reliably, and cost-effectively during both routine operations and  
20 unanticipated events.

1 **Q. Does the Cook Plant benefit I&M's customers?**

2 A. Yes. Nuclear power is an important resource in I&M's energy portfolio. Cook  
3 provides safe, low-cost, and emission-free generation to I&M's customers.  
4 Annually, the Cook Plant generates enough electricity to supply approximately 1.5  
5 million homes. Additionally, Cook has a long-standing commitment to nuclear  
6 education, community outreach, and non-profit agency support.

7 **Q. Please describe the planning and management practices of the Cook Plant.**

8 A. Cook engages in planning and resource allocation through a Nuclear Asset  
9 Management (NAM) Process and a strategic Long Range Plan (LRP), which  
10 identify critical components and the projects necessary to ensure their reliability.  
11 The NAM Process is used for making operational, resource allocation, and risk  
12 management decisions to maximize the asset while maintaining the safety of the  
13 plant and meeting regulatory requirements. NAM helps to ensure that only  
14 necessary capital improvements are made.

15 The LRP is an element of the NAM Process and is used to identify  
16 necessary work years in advance of actual implementation. Plant needs are  
17 evaluated and refined by key plant personnel and undergo multiple internal  
18 reviews. Cook also works collaboratively with I&M and the American Electric  
19 Power Service Corporation (AEPSC)<sup>1</sup> to evaluate the plant's needs.

20 As part of the NAM Process and LRP, Cook identifies projects that are  
21 necessary to meet regulatory requirements and projects aimed at increasing the

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<sup>1</sup> AEPSC supplies engineering, financing, accounting, planning, advisory, and other services to the subsidiaries of the American Electric Power (AEP) system, one of which is I&M.

1 value of the asset. Cook applies industry best practices to identify optimum  
2 refurbishment and replacement schedules for critical plant components. Projects  
3 are prioritized and strategically scheduled into the LRP. The goal is to ensure that  
4 components continue to operate consistent with our NRC operating license so as  
5 to maintain the Cook Plant at maximum capacity.

6 **Q. Please describe Cook's refueling outages.**

7 A. Refueling outages occur every eighteen months at each unit. Typically, every year  
8 at least one unit is refueled (in either the spring or fall), and every third year both  
9 units are refueled (one each in the spring and fall). The length of the outage limits  
10 the amount of work that can be performed on the unit. Since the Cook Plant  
11 provides reliable, low cost generation, Cook seeks to minimize the duration of  
12 refueling outages.

13 **III. COOK PLANT OPERATION AND MAINTENANCE EXPENSES**

14 **Q. Please provide an overview of the Cook Plant's O&M expenses.**

15 A. O&M expenses include base operating expenditures and non-outage equipment  
16 reliability expenditures. Included in the base operating expenditures are refueling  
17 outage amortizations, which can have a significant impact on O&M expenditures  
18 in any given year depending on the refueling outage cycle. The majority of Cook  
19 O&M expenses can be broken down into the following categories:

- 20 • Labor, including straight time and over time.
- 21 • Outside services, including design, fabrication, installation, manufacture,  
22 inspection, testing, training, facility maintenance, and other services  
23 procured from sources outside the NGG.
- 24 • Indirect costs.

- 1           • Materials, including direct purchase and storeroom stock.
- 2           • Refueling outage amortizations.

3           Operating and maintaining the Cook Plant involves managing technically complex  
4           systems and components. Practically all of Cook's O&M activities are subject to  
5           comprehensive regulation and continuous inspection by the NRC.

6   **Q. How did you develop a forecast of O&M expenses for the Cook Plant?**

7   A. The NGG is constantly evaluating the future needs of Cook to ensure that it  
8           continues to operate safely, reliably, efficiently, and in compliance with all  
9           regulatory requirements. Cook employees continually assess the condition of  
10          plant equipment and plan not only for the modification or replacement of equipment  
11          when it reaches the end of its useful life, but also for unforeseen failures. The  
12          NGG and Cook management review Cook's needs and historical O&M  
13          expenditures to develop forecasts, and then reassess those forecasts prior to  
14          approval. Forecasts are then refined annually in a collaborative process that  
15          involves Cook Plant management, I&M management, and AEPSC management.  
16          These reviews ensure that work is performed at a reasonable cost.

17   **Q. What was the actual level of Cook O&M expense for the twelve-month  
18          historical base period ending December 31, 2016?**

19   A. The Cook O&M expense for the twelve-month historical base period ending  
20          December 31, 2016 was \$252.159 million.

1 **Q. What is the projected Cook O&M expense for the forward-looking twelve-**  
2 **month Test Year ending December 31, 2018?**

3 A. The projected Cook O&M expense for the twelve-month Test Year ending  
4 December 31, 2018 is \$270.822 million.

5 **Q. How does the Historical 2016 O&M expenses compare to the Test Year?**

6 A. The Test Year level of O&M is approximately 7% higher than the 2016 historical  
7 levels. Contributing to this cost increase are items such as escalation and an  
8 increase in refueling outage amortizations. The refueling outage amortizations are  
9 being impacted by the extended outage durations necessary to complete the Baffle  
10 Bolt and Up-Flow Conversion Projects that I discuss later in my testimony.

11 **Q. Is the Test Year O&M expense reasonably representative of I&M's expected**  
12 **activities and expenses necessary to provide ongoing safe and reliable Cook**  
13 **generation?**

14 A. Yes. I&M has a long history of operating the Cook Plant, which allows for reliability  
15 when forecasting O&M expenses. The Test Year O&M expenses represent a  
16 reasonable level going forward. These O&M expenses have been scrutinized at  
17 the plant, operating company, and corporate levels and are representative of the  
18 necessary O&M expenses.

1 **IV. COOK PLANT FORECASTED CAPITAL EXPENDITURES**

2 **Q. What is the period I&M is using for projected capital expenditures?**

3 A. The projected period (Capital Forecast Period) is the time from January 1, 2017  
4 through December 31, 2018. This twenty-four month period commences after the  
5 end of the historical period and continues through the end of the Test Year.

6 **Q. What is the amount of capital expenditures for the Cook Plant during the  
7 Capital Forecast Period?**

8 A. The total forecasted amount of capital expenditures for the Cook Plant during the  
9 Capital Forecast Period is approximately \$340 million (excluding AFUDC), as  
10 shown on Figure QSL-1 below. As also seen in Figure QSL-1, the forecasted Cook  
11 capital expenditures can be broken down into six categories. This level of capital  
12 spending is included in the forecast presented by Company witness Lucas.<sup>2</sup>

**Figure QSL-1  
Cook Capital Expenditures  
(\$000 – Total Company – Excluding AFUDC)**

<b>Category</b>	<b>2017 Capital Expenditures</b>	<b>2018 Capital Expenditures</b>	<b>2017-2018 Total Capital Expenditures</b>
LCM Project	\$87,017	\$52,027	\$139,043
Preventative & Corrective Maintenance	\$18,756	\$14,239	\$32,995
Equipment Reliability	\$3,581	\$25,414	\$28,995
Regulatory Compliance	\$45,075	\$55,851	\$100,926
License Renewal	\$14,693	\$1,711	\$16,403
Other	\$10,857	\$10,534	\$21,391
<b>Total</b>	<b>\$179,979</b>	<b>\$159,775</b>	<b>\$339,754</b>

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<sup>2</sup> Figure DAL-1 of Company witness Lucas's testimony shows how AFUDC is added to capital expenditures.

1 In addition, approximately \$436 million of Cook capital (including AFUDC) is  
 2 forecasted to be placed in service during the Capital Forecast Period, as shown  
 3 on Figure QSL-2 below.<sup>3</sup> This amount is accounted for as electric plant in service  
 4 (EPIS).

**Figure QSL-2**  
**Cook Additions to EPIS**  
**(\$000 – Total Company – Including AFUDC)**

Category	2017-2018 Additions to EPIS
LCM Project	\$237,059
Preventative & Corrective Maintenance	\$32,728
Equipment Reliability	\$29,049
Regulatory Compliance	\$102,168
License Renewal	\$10,327
Other	\$24,581
Total	<b>\$435,912</b>

5 **Q. Is the forecasted amount of Cook capital expenditures reasonable?**

6 A. Yes. As the systems, structures, and components of Cook Plant deteriorate, fail,  
 7 or become obsolete over time, they must be replaced to maintain safe and reliable  
 8 operation. Additionally, capital expenditures must be made in response to evolving  
 9 regulatory requirements. The amount of capital expenditures to be made during  
 10 the Capital Forecast Period represents an appropriate cost based on the needs of  
 11 the Cook Plant to maintain its level of service.

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<sup>3</sup> Figure DAL-2 of Company witness Lucas's testimony shows how nuclear additions to EPIS are used to forecast total Company Plant in Service activity during the Capital Forecast Period.

1 **Q. How is the total amount of projected Cook capital expenditures determined?**

2 A. Similar to O&M expenses, proposed capital expenditures undergo an extensive  
3 development and refinement process. As discussed above, the LRP identifies  
4 necessary expenditures years in advance of implementation and the Cook Plant's  
5 needs are evaluated and refined through multiple levels of review involving Cook  
6 Plant personnel and I&M and AEPSC management. Whether and when capital  
7 expenditures are made depends on the immediacy of the need, economic  
8 conditions, and regulatory or safety compliance requirements. All of these factors  
9 are evaluated by the management teams responsible for approving capital  
10 projects.

11 **Q. Please describe the forecasted capital expenditures for the LCM Project**  
12 **category.**

13 A. As noted above, in 2005, the NRC granted twenty-year license extensions for both  
14 Cook units. The Life Cycle Management (LCM) Project is a comprehensive effort  
15 to identify and undertake the necessary capital investment to the Cook units so  
16 that they can operate through the end of their license extensions. In Cause No.  
17 44182, the Commission approved the LCM Project and authorized I&M timely  
18 recovery of LCM costs through I&M's LCM Rider. I&M forecasts approximately  
19 \$139 million of capital expenditures on the LCM Project during the Capital Forecast  
20 Period. In addition, approximately \$237 million of LCM capital (including AFUDC)  
21 will be placed in service during the Capital Forecast Period. I&M has and continues  
22 to provide the Commission detailed updates on the status of the LCM sub-projects



1 in its LCM Rider adjustment filings (Cause No. 44182 LCM 1 through LCM 7).  
2 Company witness Williamson explains the Company's proposal to move all in  
3 service LCM projects (on a net basis) from the LCM Rider into base rates at the  
4 Test Year end. The active LCM subprojects that will not be placed in service until  
5 after 2018 will continue to be tracked through the LCM Rider as discussed by  
6 Company witness Williamson. See Company witness Williamson for discussion  
7 of these LCM ratemaking issues.

8 **Q. Please describe the forecasted capital expenditures for the Preventative &**  
9 **Corrective Maintenance category.**

10 A. The expenditures in this category relate to necessary expenditures for maintaining  
11 and replacing Cook systems and equipment. A substantial amount of the  
12 forecasted expenditures is related to Cook's routine capital blanket (NMIB) and  
13 Preventative & Corrective Maintenance budgets, which reflect capital costs for  
14 items that Cook Plant management knows will be needed each and every year to  
15 operate.

16 **Q. Please describe the forecasted capital expenditures for the Equipment**  
17 **Reliability category.**

18 A. Representative expenditures in the Equipment Reliability category include pump  
19 and valve replacements, chemistry lab equipment upgrades, installation of  
20 monitoring and detection systems, battery replacements, and switchyard  
21 upgrades, to name a few. Substantial projects within this category include:

- 22 • Unit 2 Main Generator Rewind – As a result of low megger readings, this  
23 project entails the modification and replacement of the main generator rotor.

1 This will avoid future issues with the diagnosed low insulation resistance to  
2 ground in the wind area of the current rotor. It has been determined that  
3 the spare rotor at AEP's Central Machine Shop is a viable spare. Therefore,  
4 the engineering, vendor support, and construction will be used to modify the  
5 spare rotor, remove the old rotor, and install the modified rotor. This project  
6 is forecasted to be placed in service by June 2018 at a total cost of \$23.27  
7 million (including AFUDC).

- 8 • Unit 1 and Unit 2 Feedwater Leading Edge Flow Meters (LEFM) – These  
9 projects will replace the obsolete Feedwater LEFM electronics cabinet. The  
10 Original Equipment Manufacturer (OEM) has indicated that future support  
11 for the current platform is limited. However, the OEM has developed a fit-  
12 form-function solution including central processing units and acoustical  
13 processing unit circuit boards, resistance to condensation issues, enhanced  
14 man-machine interface, data trend capability, and cyber-security  
15 enhancements. These projects are forecasted to be placed in service by  
16 December 2017 at a total cost of \$683 thousand (including AFUDC).

17 **Q. Please describe the forecasted capital expenditures for the Regulatory**  
18 **Compliance category.**

19 A. Forecasted capital expenditures for the Regulatory Compliance category relate  
20 mainly to projects that I describe in separate sections of my testimony below,  
21 including Fukushima modifications, Open Phase Condition Project, the Baffle Bolt  
22 and Up-Flow Conversion Projects, and the Cyber Security Project. Remaining  
23 capital costs in this category relate to NRC inspections, programs, and security  
24 requirements.

25 **Q. Please describe the forecasted capital expenditures for the License Renewal**  
26 **category.**

27 A. Forecasted capital expenditures for the License Renewal category relate to those  
28 activities that are necessary to support Cook's renewed operating licenses,  
29 including License Renewal Commitments made to the NRC. Substantial projects  
30 within this category include:

- 1 • Unit 1 Control Rod Guide Tube Split Pin Replacements (Split Pins) – This  
2 project will replace the Split Pins within the Unit 1 nuclear reactor with an  
3 improved design that will be fabricated from a non-PWSCC (primary water  
4 stress corrosion cracking) susceptible material. The Split Pins for Unit 2  
5 were previously replaced in 2016. This project is forecasted to be placed in  
6 service during the Unit 1 Cycle 28 refueling outage in the fall of 2017 at a  
7 total cost of \$7.02 million (including AFUDC).
- 8 • Unit 1 and Unit 2 MRP-227-A Inspections – The MRP-227-A Inspections  
9 are reactor vessel internals inspections required by the Cook Reactor  
10 Vessels Internals Aging Management Program. This program was  
11 developed following guidance in MRP-227-A, an NRC approved guidance  
12 document for reactor internals inspection and evaluation. The intent of the  
13 project is to validate material reliability of reactor internals components.  
14 Every domestic nuclear utility is following this guidance. Further, this project  
15 was one of the commitments that Cook made as part of its NRC operating  
16 license renewal (License Renewal Commitments). These projects are  
17 forecasted to be placed in service over the course of multiple refueling  
18 outages. In relation to this proceeding, Unit 1 is forecasted to be placed in  
19 service during the Unit 1 Cycle 28 refueling outage in the fall of 2017 at a  
20 total cost of \$8.77 million (including AFUDC). Unit 2 is forecasted to be  
21 placed in service during the Unit 2 Cycle 25 refueling outage in the fall of  
22 2019, which falls outside the Capital Forecast Period in this proceeding.

23 The remaining capital expenditure in the License Renewal category relates to  
24 required visual inspections and eddy current testing of Residual Heat Removal  
25 Heat Exchangers. The heat exchangers need to be tested in order to meet one of  
26 the Cook Plant's License Renewal Commitments.

27 **Q. Please describe the forecasted capital expenditures for the Other category.**

28 Forecasted capital expenditures in the Other category relate to numerous  
29 necessary capital projects that are not captured in the categories discussed above.  
30 Representative expenditures include computer replacements, simulator upgrades,  
31 self-contained breathing apparatus (SCBA) bottle replacements, radiation  
32 protection training aids, and general plant improvements.

1 **Q. Is the projected level of Cook capital expenditures reasonably necessary to**  
2 **serve I&M's customers?**

3 A. Yes. The work included in the Capital Forecast Period accurately represents  
4 planned projects. Although Cook Plant management has the ability to prioritize  
5 capital dollars on an as-needed basis as circumstances warrant, the overall  
6 projected level of capital expenditures is reasonable and likely to occur in the  
7 forecast period. These capital expenditures are required for maintaining  
8 operational excellence, which in turn provides low cost, safe, and reliable electric  
9 generation for I&M's customers.

10 **V. FUKUSHIMA MODIFICATIONS**

11 **Q. Please provide a brief overview of the event at Fukushima.**

12 A. On March 11, 2011, a massive earthquake and subsequent tsunami occurred off  
13 the coast of Japan, resulting in severe damage to the northeast coast of the  
14 country, including the Fukushima Dai-ichi Nuclear Power Station. The tsunami  
15 that impacted the station exceeded the design basis of the plant and resulted in  
16 core damage due to loss of cooling on several units.

17 **Q. What were the NRC's actions in response to this event?**

18 A. In 2011, the NRC chartered the Near Term Task Force (NTTF) to perform an initial  
19 review of the events at Fukushima and provide a set of recommendations. The  
20 Task Force concluded that there was no imminent risk from the continued  
21 operation of the nation's reactors but recommended safety and emergency  
22 preparedness enhancements for the NRC's consideration. In 2012, the NRC

1 issued its first regulatory requirements based on the lessons learned at  
2 Fukushima. In addition, the NRC issued orders and requests for information to  
3 each U.S. nuclear power plant to begin planning to cope with beyond-design-basis  
4 events. The NRC continues to evaluate and act on the lessons learned from  
5 Fukushima to ensure that appropriate safety enhancements are implemented. For  
6 example, in November 2015, the NRC issued a Proposed Rule for post-Fukushima  
7 measures that could increase procedures and testing requirements and require  
8 physical modifications to the Cook Plant.

9 **Q. What action has the Cook Plant taken as a result of Fukushima?**

10 A. The Cook Plant is working with the rest of the nuclear industry to develop  
11 consistent responses to Fukushima lessons learned. Significant examples of  
12 Fukushima-related activities Cook has already undertaken include:

- 13 • Constructed a robust Mitigating Strategies Equipment Storage Building  
14 (also called a FLEX Equipment Storage Facility).
- 15 • Installed a Spent Fuel Pool Level Instrumentation System.
- 16 • Performed an external flood hazard reevaluation.
- 17 • Implemented interim flood protection modifications.

18 Significant examples of planned Fukushima-related activities at Cook include:

- 19 • Perform a seismic probabilistic risk analysis.
- 20 • Perform a flood hazard integrated assessment.
- 21 • Implement flood protection and barrier modifications.

22 Cook has implemented – or plans to implement – all of these activities to respond  
23 to Fukushima-related NRC requirements. Cook currently expects to complete all

1 Fukushima-related activities and improvements over the next four to five years  
2 (i.e., from 2017 to 2020). However, ongoing Fukushima-related engineering  
3 analyses may identify the need for additional undefined modifications to the Cook  
4 Plant, which may cost an additional \$5 million to \$10 million. Lastly, other actions  
5 may be required by the Nuclear Regulatory Commission.

6 **Q. What is the total project cost of Fukushima-related activities through the end  
7 of the Capital Forecast Period?**

8 A. The total cost for Fukushima-related projects that will be placed in service by the  
9 end of the Capital Forecast Period is \$37.37 million (including AFUDC). The  
10 additional \$5 to \$10 million for any undefined modifications, as mentioned above,  
11 is not included in the Capital Forecast.

12 **VI. OPEN PHASE CONDITION PROJECT**

13 **Q. Please describe the Open Phase Condition issue at nuclear power plants.**

14 A. A Level 2 Industry Event Report issued by the Institute of Nuclear Power  
15 Operations (INPO) and NRC Bulletin 2012-03 identified a design weakness related  
16 to Open Phase Conditions (OPC) on a nuclear plant's offsite power. This  
17 weakness affects Cook and the majority of other nuclear plants. The OPC issue  
18 was identified after incidents at the Nine Mile Point plant in 2005, at the Beaver  
19 Valley plant in 2007, and at the Byron plant in 2012. For example, Byron's loss of  
20 phase resulted in an automatic reactor trip from 100 percent power. The loss of  
21 phase was caused by a failed insulator on the offsite power feed. The event was  
22 complicated as the existing under-voltage protection scheme failed to detect and

1 isolate the degraded voltage condition on two 6.9kV buses that fed two Reactor  
2 Coolant Pumps. It took operators an extended amount of time to recognize the  
3 degraded condition after multiple safety related motors failed to power up as  
4 designed. The operators had to take manual action to separate the degraded  
5 offsite source from the safety buses and restore shut down cooling.

6 These failures have highlighted the need for protecting against open phase  
7 conditions which affect the function of safety equipment. An OPC at Cook on the  
8 offsite power circuit can result in a significant voltage unbalance to downstream  
9 reactor coolant pump buses. A large voltage unbalance can quickly damage the  
10 motor running on these buses. Moreover, OPCs are difficult to detect when there  
11 is no load on the offsite power transformers. Because there is no standard  
12 protection scheme for OPCs, the nuclear industry has been working closely with  
13 the NRC, the INPO, and the Nuclear Energy Institute (NEI) to develop a prudent  
14 and practical plan to address this issue.

15 **Q. Please describe the OPC Project at Cook.**

16 A. In 2014, Cook performed a detailed study to estimate the voltage unbalance  
17 caused by an OPC on electrical buses at Cook. The study confirmed that OPCs  
18 on the high side of certain offsite power transformers will result in voltage  
19 unbalance on downstream buses and in some cases may not be detected by the  
20 existing under-voltage protection scheme. To address this issue, Cook prepared  
21 a conceptual design utilizing the Schweitzer Engineering Laboratories 487E relays  
22 with custom settings (which is one of five solutions being utilized in the industry).

1 Cook has committed to the NRC via the NEI initiative to have all relays installed  
2 and enabled by December 2018.

3 **Q. Is it necessary to implement the OPC Project?**

4 A. Yes. This project is driven by regulatory requirements and satisfies NRC Bulletin  
5 2012-01, NEI 13-12, NRC letter to NEI (ML14120A203, dated 11/25/14), and AEP  
6 letter to NRC (NRC-2012-93) - affirmation statement in response to NRC request.

7 **Q. What is the total project cost of the OPC Project?**

8 A. The OPC Project is forecasted to be placed in service by May 2018 at a total  
9 project cost of \$11.11 million (including AFUDC).

10 **VII. BAFFLE BOLT & UP-FLOW CONVERSION PROJECTS**

11 **Q. What is a baffle bolt?**

12 A. The reactor cores at Cook Plant and other Westinghouse pressurized water  
13 reactor nuclear plants are surrounded by a series of vertical plates, called baffle  
14 plates, which are bolted to former plates. The baffle plates are attached to the  
15 former plates by stainless steel bolts known as baffle bolts. The former plates are,  
16 in turn, attached to the cylindrical core barrel. The function of the baffle-former  
17 assembly is to direct coolant flow through the core. It also provides lateral support  
18 to the core during a seismic event or loss of coolant accident. The Cook Plant has  
19 832 baffle bolts per unit. The bolts are 2 inches long, with a 5/8-inch thread  
20 diameter, and are made of stainless steel. Attachment QSL-2 illustrates baffle  
21 bolts and the interfacing components.



1 **Q. How long do baffle bolts last?**

2 A. As originally designed, Cook's baffle bolts were intended to remain intact  
3 throughout the plant's life. However, age-related degradation of the reactor vessel  
4 internals is an important consideration as nuclear plants reach extended lives. A  
5 particulate concern for aging baffle bolts is irradiation-assisted stress corrosion  
6 cracking (IASCC).

7 **Q. Has Cook had to replace baffle bolts in the past?**

8 A. Yes. In 2010, a visual inspection of Unit 2's baffle bolts during an outage found  
9 eighteen baffle bolts exhibiting varying degrees of degradation. In addition, bolt  
10 fragments were discovered on the lower core plate of the reactor. Cook  
11 implemented a permanent repair of the observed condition before restarting the  
12 plant, replacing fifty-two baffle bolts – which included replacing the degraded bolts  
13 as well as surrounding bolts. After analyzing the baffle bolts that were removed,  
14 the cause of the failures was determined to be IASCC. Cook conducted a  
15 complete visual inspection of Unit 2's baffle bolts during the next outage and found  
16 no deficiencies.

17 **Q. What regulatory requirements apply to baffle bolts?**

18 A. Cook is required by Materials Reliability Program (MRP) MRP-277-A to conduct  
19 inspections of plant internals, including baffle bolts. In addition, after recent  
20 inspections at two other nuclear facilities found baffle bolt degradation,  
21 Westinghouse issued Nuclear Safety Advisory Letter (NSAL) NSAL-16-1 and  
22 identified Westinghouse reactors with Cook's design as the most susceptible to

1 having degraded baffle bolts. The NSAL provided all Westinghouse plants with  
2 recommended actions based on plant categorization. Subsequently, MRP-2016-  
3 021 was issued prescribing interim guidance requiring that plants that are most  
4 susceptible to baffle bolt degradation – labeled “Tier 1a” – perform baffle bolt  
5 ultrasonic test (UT) inspections at the next scheduled refueling outage. Based on  
6 the applicable criteria, the Cook Plant is in Tier 1a.

7 **Q. Please provide an overview of the Baffle Bolt Project.**

8 A. Following the regulatory guidance described above, Cook will conduct UT  
9 inspections on all baffle bolts on Units 1 and 2. Bolts that are discovered to be  
10 structurally inadequate will be replaced. The Project will also install a Minimum  
11 Bolt Pattern (MBP), which is the minimum number of new bolts needed to maintain  
12 structural integrity.

13 **Q. What is up-flow conversion, and how is it related to baffle bolts?**

14 A. To cool the baffle structure, water flowing through the reactor vessel is directed  
15 between the core barrel and the baffle plates, either downwards or upwards. Prior  
16 operating experience indicates that baffle bolts are more susceptible to  
17 degradation in plants, such as Cook, that have a down-flow reactor internals  
18 configuration. A down-flow coolant path places more stress on baffle bolts, which  
19 contributes to susceptibility of degradation. Up-flow conversion is a modification  
20 of the reactor lower internals to alter the coolant flow through the baffle-former  
21 assembly. Plants with an up-flow configuration have shown little baffle bolt  
22 degradation as compared to the down-flow designs. Newer pressurized water

1 reactor plants are designed with the up-flow configuration, and several older units  
2 have converted to the up-flow configuration.

3 **Q. Please provide an overview of the Up-Flow Conversion Project.**

4 A. The Up-Flow Conversion Project will convert Cook Units 1 and 2 to up-flow  
5 configurations. Performing an up-flow conversion along with the installation of the  
6 MBP will resolve the issue of baffle bolt failure and minimize the consequences of  
7 any future bolt failures. Reducing the quantity of bolts required to establish an  
8 MBP will reduce the overall outage duration required to complete the project. In  
9 addition, the presence of old bolts in the baffle plate without performing an up-flow  
10 conversion has the potential to introduce foreign material in the reactor coolant.  
11 The foreign material could cause fuel or equipment damage. By performing the  
12 up-flow conversion, the likelihood of having a foreign material event in the reactor  
13 is reduced.

14 **Q. What is the status of the Baffle Bolt and Up-Flow Conversion Projects for**  
15 **Unit 2?**

16 A. In the Unit 2 Cycle 23 outage in the fall of 2016, Cook conducted a UT inspection  
17 of all Unit 2 baffle bolts. Of the 832 bolts tested, 651 bolts were satisfactory, 9 bolt  
18 locations were untestable and had to be replaced, 2 bolt locations that could not  
19 be replaced in 2010 had to be replaced, and 170 bolts exhibited degradation under  
20 the UT test had to be replaced. (Of the 170 bolts that showed degradation under  
21 the UT test, only 4 showed visual indications of degradation.) In total, Cook  
22 replaced 201 baffle bolts during this outage.

1 Up-flow conversion for Unit 2 is planned for the Unit 2 Cycle 24 outage in  
2 the spring of 2018. Although the baffle bolts replaced on Unit 2 in the Cycle 23  
3 outage in 2016 met an acceptable pattern for operation, the replacements were  
4 insufficient to meet an MBP. Accordingly, in connection with the Unit 2 Cycle 24  
5 outage, Cook will replace approximately 225 baffle bolts to achieve the MBP.

6 **Q. What is the status of the Baffle Bolt and Up-Flow Conversion Projects for**  
7 **Unit 1?**

8 A. Baffle bolt replacements on Unit 1 will take place in the Unit 1 Cycle 28 outage in  
9 the fall of 2017 and the Unit 1 Cycle 29 outage in the spring of 2019. The up-flow  
10 conversion of Unit 1 also will take place in the Unit 1 Cycle 29 outage.

11 **Q. Is Cook required to complete the Baffle Bolt and Up-Flow Conversion**  
12 **Projects?**

13 A. Yes. As mentioned earlier, MRP-227-A, “Materials Reliability Program:  
14 Pressurized Water Reactor Internals Inspection and Evaluation Guidelines,”  
15 contains the mandatory requirement for each nuclear plant to develop a program  
16 for the management of aging of reactor vessel internals components, and the  
17 program is also required as part of NRC License Renewal Commitments. MRP-  
18 227-A was issued by one of the Issue Programs under NEI 03-08, “Guidelines for  
19 the Management of Materials Issues.” The Baffle Bolt and Up-flow Conversion  
20 Projects allow Cook to comply with the requirements and guidelines. If I&M does  
21 not comply and cannot demonstrate effective aging management of the reactor  
22 vessel internals, the Cook Plant would not be allowed to operate.

1 **Q. Do the Baffle Bolt and Up-Flow Conversion Projects have any impact on**  
2 **scheduled refueling outages?**

3 A. Yes. Because performing UT inspections and replacing baffle bolts is time  
4 consuming, Cook has determined that the best approach is to replace bolts during  
5 two refueling outages on each unit, instead of one. However, even with the  
6 inspections and baffle bolt replacements being divided amongst multiple refueling  
7 outages, each individual refueling outage with that scope of work will still be  
8 extended longer than the duration of a typical refueling outage.

9 **Q. What is the total project cost of the Baffle Bolt and Up-Flow Conversion**  
10 **Projects through the end of the Capital Forecast Period?**

11 A. As noted above, for Unit 2, the first baffle bolt replacement took place in the Unit 2  
12 Cycle 23 outage in Fall 2016, and the up-flow conversion and second baffle bolt  
13 replacement is taking place in the Unit 2 Cycle 24 outage in Spring 2018. The total  
14 cost of the Unit 2 Baffle Bolt and Up-Flow Conversion project is \$43.624 million  
15 (including AFUDC).

16 For Unit 1, the first baffle bolt replacement is taking place in the Unit 1 Cycle  
17 28 outage in fall 2017. The total cost of the Unit 1 Baffle Bolt Project through the  
18 end of the Capital Forecast Period is \$25.426 million (including AFUDC).

19 The up-flow conversion and second baffle bolt replacement for Unit 1 is  
20 taking place in the Unit 1 Cycle 29 outage in Spring 2019 and thus falls outside the  
21 Capital Forecast Period in this proceeding.

1 **Q. Have the Baffle Bolt and Up-flow Conversion Projects had any impact on**  
2 **other Cook Plant projects?**

3 A. Yes. Due to the significant cost and resources needed to replace baffle bolts and  
4 implement up-flow conversions, Cook was required to defer other capital  
5 expenditures – including LCM expenditures, as discussed above.

6 **VIII. CYBER SECURITY PROJECT**

7 **Q. What are Cook’s regulatory requirements for cyber security?**

8 A. Federal regulations (10 CFR 73.54) require the Cook Plant to “provide high  
9 assurance that digital computer and communication systems and networks are  
10 adequately protected against cyber-attacks.” This rule requires Cook to expand  
11 its cyber security protection. Whereas previously Cook provided cyber security to  
12 nuclear significant systems, continuity of power systems, and emergency  
13 response systems, the revised federal regulations require Cook and all nuclear  
14 power licensees to protect digital computers and communications systems and  
15 networks associated with safety-related and important-to-safety functions; security  
16 functions; emergency preparedness functions, including offsite communications;  
17 and support systems and equipment which, if compromised, would adversely  
18 impact safety, security, or emergency preparedness functions. These  
19 requirements are further refined by the NRC’s Regulatory Guide 5.71 and the  
20 Nuclear Energy Institute’s NEI-08-09, which provided a model implementation  
21 plan. Moreover, FERC Order 706-B clarifies that the balance of nuclear plant  
22 equipment is subject to the North American Electric Reliability Corporation (NERC)

1 Critical Infrastructure Protection Reliability Standards approved in FERC Order  
2 706.

3 **Q. Please summarize the Cook Cyber Security Project.**

4 A. The Cook Cyber Security Project involves expenditures that are needed for Cook  
5 to meet cyber security regulatory requirements. Cook submitted its Cyber Security  
6 Plan (AEP-NRC-2009-73) to the NRC in November 2009, which included an  
7 implementation schedule. The Cyber Security Plan and implementation plan were  
8 based on NEI-08-09 and were consistent with the plans of other nuclear plants. In  
9 addition, several plant modifications related to cyber security have been  
10 completed, are in progress, or are planned to address cyber compliance on the  
11 following systems, structures, or components (SSCs): Security Computer, Plant  
12 Process Computer, Control Room Annunciators, Radiation Monitoring, Main  
13 Generators, Supplemental Diesels, Meteorological Information and Dose  
14 Assessment System (MIDAS), and Centralized Cyber Security Network. Existing  
15 SSCs will have cyber controls retrofitted, while new SSCs will have cyber controls  
16 installed when implemented.

17 Cook's Cyber Security Project is responding to cyber threats through the  
18 use of preventative and detective controls. For instance, Cook is mitigating the  
19 threat of portable media and mobile devices (such as viruses) through the use of  
20 malware scanning kiosks, application whitelisting, and malicious code protection.  
21 Similarly, system hardening and network intrusion detection systems are being  
22 used to protect against network threats. Tamper seals, locked and alarmed

1 cabinets, and port blocks are being used in defense against physical threats.  
2 Lastly, supply chain threats are being mitigated through controls such as security  
3 testing, validation of vendors, and cyber procurement specifications. The Cyber  
4 Security Project also involves implantation of key processes, including vulnerability  
5 management, system logging and monitoring, configuration and patch  
6 management, and incident response.

7 **Q. What is the total project cost of the Cyber Security Project?**

8 A. The Cyber Security Project is anticipated to be placed into service in December  
9 2017. The total project cost of the Cyber Security Project is \$23.60 million  
10 (including AFUDC).

11 **IX. DRY CASK STORAGE**

12 **Q. Please describe the breach of contract by the United States Department of**  
13 **Energy (DOE) as it pertains to the disposal of spent nuclear fuel?**

14 A. I&M is the “Purchaser” under a Standard Contract with the DOE for the acceptance  
15 of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) under the  
16 Nuclear Waste Policy Act. See 10 CFR 961.11. Under the Standard Contract,  
17 DOE was supposed to begin accepting SNF and HLW from Cook “not later than  
18 January 31, 1998.” However, the DOE has never accepted this material from any  
19 facility nor issued an acceptance schedule as required. This has resulted in a  
20 partial breach of contract. Because the DOE has failed to fulfill its contractual  
21 obligation to accept Cook’s SNF and HLW, Cook has been required to construct  
22 Dry Cask Storage to store this material on site.



1 **Q. What is the purpose of Dry Cask Storage?**

2 A. The purpose of Dry Cask Storage is to provide spent nuclear fuel dry storage  
3 capacity at the Cook Plant at an Independent Spent Fuel Storage Installation  
4 (ISFSI) pad. If additional fuel storage space were not made available, the Spent  
5 Fuel Pool (SFP) would become full and the ability to offload spent fuel from the  
6 reactor to the SFP would be lost. If the spent fuel cannot be removed from the  
7 reactor due to a loss of space in the SFP, new fuel cannot be loaded into the  
8 reactor. This would require a shutdown of both units.

9 **Q. Please describe the Dry Cask Storage process and major components.**

10 A. SNF assemblies are loaded into stainless steel canisters while submerged in the  
11 SFP. These canisters are capable of storing both damaged and intact SNF  
12 assemblies. Upon loading, a transfer cask is used to insert the canister into a dry,  
13 concrete overpack cask. The transfer cask serves multiple purposes, such as  
14 protecting the canister (and the SNF contained within) and providing radiation  
15 shielding when the loaded canister is removed from the SFP and placed into the  
16 concrete cask. Similarly, the dry cask provides passive cooling and physical  
17 protection of the internal canister. Furthermore, it provides radiation shielding for  
18 plant personnel and the public. Once the dry cask is loaded with the canister, the  
19 entire unit is moved along a haul path via a specialized heavy haul transport  
20 vehicle. The dry cask is taken to the ISFSI, which is a large concrete pad with a  
21 current configuration of 94 cask storage locations. A separate transport vehicle is

1 then used to position the loaded dry cask into its place on the ISFSI. The SNF  
2 remains in the dry casks until final disposition occurs.

3 **Q. Has any spent nuclear fuel been loaded into the Dry Casks?**

4 A. Yes. The first loading campaign occurred in 2012. During this campaign, 12 casks  
5 were loaded with a total of 384 fuel assemblies (32 per cask) and placed at the  
6 ISFSI. The second loading campaign took place in 2015. During this campaign,  
7 16 casks were loaded with a total of 512 fuel assemblies and also placed at the  
8 ISFSI. The next loading campaign is scheduled to occur in 2018.

9 **Q. Does I&M have a settlement agreement with the DOE as a mechanism for**  
10 **submitting and recovering costs associated with Dry Cask Storage?**

11 A. Yes. I&M has had a Settlement Agreement with the DOE since October 2011.  
12 Claims are submitted on an annual basis according to terms laid out within the  
13 Agreement. The Settlement Agreement was recently extended to recover costs  
14 incurred through December 31, 2019. To date, I&M has submitted seven claims  
15 and has recovered \$127.45 million from the DOE. This equates to a recovery rate  
16 of approximately 96%. Company witness Williamson further discuss the treatment  
17 and impact of these funds.

18 **X. COOK IMPROVEMENT PROJECT**

19 **Q. Please provide a brief summary of the Cook Improvement Project.**

20 A. The Cook Nuclear Plant has provided safe and reliable energy and capacity for  
21 many years. I&M reviewed ways to continue to provide benefits associated with  
22 the Cook Plant and considered ways to increase that benefit through an increase

1 in the plant's generation output. The focus led to considering what was necessary  
2 to extend the life of the existing plant and also what was needed to increase  
3 capacity.

4 Cook Plant management started a formal review of the long-term potential  
5 of the plant to ensure a logical progression of projects and planning to maintain the  
6 state of the facility as the industry progressed and to ensure the facility was in line  
7 with future optionality. Age-related degradation affected a number of systems,  
8 structures, and components. The Company studied and analyzed how to maintain  
9 and improve the safety, reliability, efficiency and availability of the Cook Plant  
10 through the extended life cycle of the units. This effort was labeled the Cook  
11 Improvement Project (CIP)

12 The CIP focus includes the Company's successful effort to extend the  
13 license life of the plant, which also presents the opportunity to leverage the value  
14 of the plant to customers by safely and economically increasing the electrical  
15 power output of each unit. Generally speaking, the CIP studied and analyzed a  
16 series of projects to be performed over multiple years with the objective to identify  
17 and integrate the improvements that would cost-effectively develop each unit to  
18 the maximum safe and reliable reactor power reasonably achievable. The nature  
19 of the improvements analyzed falls into three main categories:

- 20 **1. Life Cycle Management (LCM)** – This category refers to those  
21 projects that must be performed to keep the plant in normal operating

1 condition and typically consists of equipment replacements to ensure  
2 overall plant safety and reliability.

3 **2. Nuclear Safety Margin Improvement (NSMI)** – Original plant  
4 design and licensing was predicated on simplified models and analyses that  
5 could not credit non-safety related equipment for accident mitigation.  
6 However, with the advent of more sophisticated models and more modern  
7 evaluations of plant design and operations, the plant risk profile can now  
8 use both safety and non-safety related equipment, and certain equipment  
9 becomes more important in regulatory performance measures because it  
10 has the ability to improve the licensee and NRC evaluated risk profile and  
11 provide regulatory margin. Additionally, some operating margins were  
12 identified as being needed to support day-to-day operational flexibility. In  
13 short, NSMI projects are projects that either regain nuclear safety margin or  
14 improve the nuclear safety margin of the plant. The margin improvements  
15 are typically achieved through the addition of redundant equipment or the  
16 replacement of existing equipment with equipment of improved design that  
17 allows the plant to operate more efficiently or more effectively. The CIP  
18 assessed the overall margin improvement requirements and opportunities  
19 and identified the margin improvement projects to be included.

20 **3. Extended Power Uprate (EPU)** – With the improved performance  
21 characteristics and margins provided by replacement systems, structures,  
22 and components, and the inherent margin available within the Nuclear

1 Steam Supply System (NSSS - i.e., reactor, reactor coolant pumps, steam  
2 generators), the Cook Plant is capable of safely operating well beyond the  
3 power level for which it was originally licensed. Accordingly, EPU projects  
4 are those projects that develop the plant to safely and reliably increase its  
5 electrical output through the addition of improved equipment as compared  
6 to existing equipment.

7 **Q. Please provide more background on the CIP at the Cook Plant.**

8 A. In the past, the nuclear industry as a whole progressed to seriously consider uprate  
9 options. Similarly, the objective of the CIP program is to study the Cook Plant  
10 needs on an ongoing basis, determine available options, and develop the optimal  
11 mix of projects to ensure it is running at its most efficient and beneficial level. To  
12 determine the appropriate path forward, it was necessary to assess all project  
13 categories. Focusing on one category, to the exclusion of others, could have  
14 caused some important options to be foreclosed. The different areas of the CIP  
15 are intertwined, because one decision impacts each area of the project. The areas  
16 are all considered in tandem to ensure the present day operation of Cook and the  
17 future operations are all considered and focused on running efficiently.

18 There were some areas where design and operating margins at the Cook  
19 Plant were less than optimal and had been effectively reduced due to operational  
20 challenges, regulatory changes, and equipment degradation. Additionally, there  
21 were also some instances where improved performance for operational flexibility

1 was desired. To accomplish the CIP objectives, significant activities and complex  
2 feasibility studies were needed, including the following:

- 3 • An initial expert panel review by Westinghouse Electric Company  
4 (Westinghouse) concluded that intermediate power uprates up to 3600  
5 megawatts thermal (MWt) were feasible at Cook.
- 6 • A more detailed feasibility study by Westinghouse demonstrated that the  
7 thermal power of both Cook units could be safely increased to 4000  
8 MWt.
- 9 • An independent expert panel review validated the Westinghouse study.
- 10 • A conceptual design was developed by Westinghouse to perform an  
11 intermediate uprate to approximately 3600 MWt.
- 12 • A feasibility study was developed by Shaw Nuclear Services / Stone &  
13 Webster (Shaw) to identify those secondary and nuclear support  
14 systems and components that had to be upgraded to support an uprate  
15 to 4000 MWt.<sup>4</sup>

16 Based on the studies, an extended power uprate was determined to be  
17 technically achievable, financially beneficial, and would maintain acceptable  
18 design and operating margins. However, with the advent of world-economic  
19 slowdown, the reduced availability of capital funding, and the lower demand for  
20 power, various changes were incrementally incorporated into the plan. To

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<sup>4</sup> The current licensed reactor thermal power ratings are 3304 MWt and 3468 MWt, for Unit 1 and Unit 2 respectively. The NSSS power rating for each unit is 3316 MWt and 3480 MWt.

1 recognize these conditions, the CIP was scaled back to assess a 3600 MWt  
2 (SPU+5) and a 4000 MWt (direct EPU) uprate with minimal capital expenditure.  
3 The intermediate uprates were not considered cost effective due primarily to the  
4 long lead times and high cost of licensing intermediate uprates. (Significant  
5 licensing activities are required to be performed prior to formally applying for  
6 approval to uprate.) The direct EPU would eliminate one complete licensing cycle  
7 for each unit and result in considerable cost savings. However, even with the  
8 licensing cost savings, the total cost to implement the uprate was substantial.

9 Given the potential cost of the uprate and the impact of the economic  
10 downturn on I&M's customer need for electricity, the Company decided to  
11 implement CIP in phases. The Company moved forward with an initial set of LCM  
12 projects, which would maintain operating standards and preserve the ability to  
13 move forward with the power uprate when appropriate. The LCM portion of the  
14 CIP was separated out and formally became the LCM Project which was approved  
15 in Cause No. 44182.

16 **Q What is the current status of the CIP?**

17 A. The CIP, including the uprate, remains important to the continued development of  
18 the Cook Plant in a safe and reliable manner. The studies and analysis performed  
19 to date lay the foundation for the projects currently being implemented as well as  
20 the future projects that will be implemented as necessary and appropriate to  
21 manage the Cook Plant through its complete life cycle. The precise timing and  
22 nature of the next CIP projects will depend on economic conditions, I&M's

1 customers' need for electricity as the future unfolds, and other factors, such as the  
2 impact of environmental regulation and commodity markets.

3 The costs, not related to the LCM Project, were incurred to critically and  
4 comprehensively study, analyze and develop a safe, reliable and cost effective  
5 path forward for the Cook Plant as a vital part of the CIP. The recovery is described  
6 and supported by Company witnesses Williamson and Brubaker as an  
7 amortization over 15 years at a cost of approximately \$1.58 million per year.

8 **XI. SUMMARY**

9 **Q. Please summarize your testimony.**

10 A. The Cook Plant prudently manages its costs and relies on a systematic review  
11 process to ensure that it will effectively continue to provide a benefit to our  
12 customers. Although I&M has the ability to prioritize costs on an as-needed basis  
13 and as circumstances warrant, the forward looking test year levels of O&M and  
14 capital are reasonable and represent planned Cook Plant expenditures. Specific  
15 O&M and capital expenditures were discussed in detail, including their importance  
16 and need and why they are necessary to the ongoing development of the Cook  
17 Plant to provide safe, low cost, reliable, and emission-free generation to  
18 customers.

19 **Q. Does this conclude your pre-filed verified direct testimony?**


20 A. Yes.



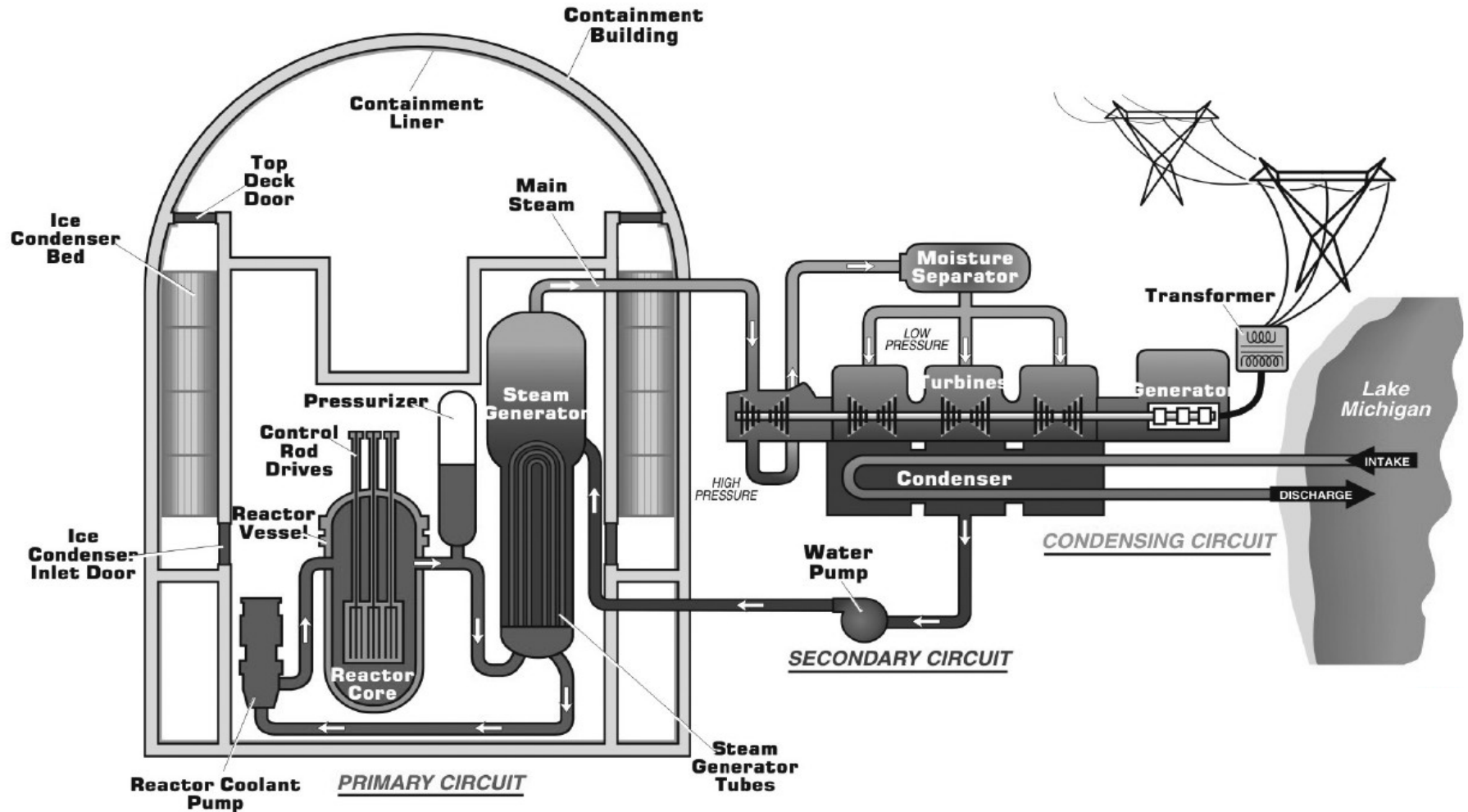
**VERIFICATION**

I, Q. Shane Lies, Engineering Vice President of Donald C. Cook Nuclear Plant of Indiana Michigan Power, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information, and belief.

Date: 7/12/17

  
\_\_\_\_\_  
Q. Shane Lies

# Cook Nuclear Plant Pressurized Water Reactor



## Baffle Bolt Diagram

