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Cause No. 45235

INDIANA MICHIGAN POWER COMPANY

PRE-FILED VERIFIED DIRECT TESTIMONY

OF

AARON L. HILL

INDEX

PRE-FILED VERIFIED DIRECT TESTIMONY OF AARON L. HILL ON BEHALF OF INDIANA MICHIGAN POWER COMPANY

Q. Please state your name and business address.

A. My name is Aaron L. Hill. My business address is One Riverside Plaza, Columbus, Ohio 43215.

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

A. I am the Director of Trusts and Investments for American Electric Power Service Corporation ("AEPSC").

Q. Please briefly describe your educational background and professional experience.

A. I received a Master's of Business Administration in Finance from the Ohio State University in 2009, where I was named a Weidler Scholar. I received a Bachelor of Science Degree in Civil Engineering from the United States Military Academy at West Point in 2001. I hold the Chartered Financial Analyst ("CFA") designation. Prior to joining AEP, I served approximately six years as a U.S. Army Officer in various combat engineering and project management positions. I began my career with AEP in 2009 as an Associate in AEP's Commercial Operations business unit. In 2011, I was hired into AEP's Strategic Initiatives group. Our department supported business development and transaction efforts on a company-wide basis. In April 2016, I was named to my current position in Trusts and Investments.

PURPOSE OF TESTIMONY

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

A. The purpose of my testimony is to make a recommendation on the annual provision for nuclear decommissioning expense, expanding the Pre-April 7, 1983 spent nuclear fuel disposal fund investment guidelines and support the forecasted prepaid pension asset. In this testimony, I show that the annual decommissioning funding amount for the Indiana jurisdiction should be increased to $10.0 million from the current level of $2.0 million. I discuss the estimation of future decommissioning costs, the rules and guidelines for determining adequate funding levels, and a methodology for determining an appropriate funding level. I recommend that there is no current need to resume funding for the Pre-April 7, 1983 spent nuclear fuel disposal fund.

Q. Are you sponsoring any exhibits in this proceeding?

A. I sponsor Operation and Maintenance (O&M) Adjustment 7 on Exhibit A-5.

Q. Are you sponsoring any attachments in this proceeding?

A. I sponsor Attachment ALH-1: Summary of Decommissioning Liability.

Q. Are you sponsoring any workpapers in this proceeding?

A. I am submitting the following workpapers:

- WP-ALH-1: Nuclear Decommissioning Cost Escalation Rates, Fuel and Energy Escalation
- WP-ALH-2: Nuclear Decommissioning Cost Escalation Rates, Labor Escalation
- WP-ALH-3: Nuclear Decommissioning Cost Escalation Rates, Barnwell South Carolina Disposal Site, Historical Burial Cost for Radioactive Wastes
- WP-ALH-4: Expected Return on Assets

- WP-ALH-5: Historical Annual Investment Returns
- WP-ALH-6: Nuclear Decommissioning Trust Beginning Balances As Of December 31, 2018
- WP-ALH-7: Pre-April 7, 1983 Spent Nuclear Fuel Disposal Market Value of Trust Assets
- WP-ALH-8: Pre-April 7, 1983 Spent Nuclear Fuel Disposal, Indiana Spent Fuel Asset Growth
- WP-ALH-9: Pre-April 7, 1983 Spent Nuclear Fuel Disposal, Indiana Spent Fuel Liability Amount

Q. Were the exhibits, attachments, and workpapers that you are supporting prepared by you or under your direction?

A. Yes.

NUCLEAR DECOMMISSIONING TRUST

Q. What is the purpose of the decommissioning trust?

A. The purpose of the external decommissioning trust is to ensure that adequate funds are available to pay for the safe dismantlement of the Cook Plant and related facilities, disposal of the radioactive portions of the plant, storage of spent nuclear fuel as needed, and restoration of the plant site. The external decommissioning trust is also needed to comply with certain State and Nuclear Regulatory Commission ("NRC") requirements.

Q. What is the purpose of annual funding of the decommissioning trust?

A. Making regular, periodic contributions to fund the decommissioning trust provides funds for the future cost of decommissioning the nuclear power plant by customers who are receiving the benefits of its electric power generation during the plant's useful life. Failure to make sufficient contributions to the trust may cause the trust to violate Nuclear Regulatory Commission requirements. A lack of sufficient contributions could also result in funding decommissioning costs for the plant through rates charged to future generations who may not receive electric power from the plant.

Q. How will the decommissioning trust be used?

A. At the end of the plant's life, the contributions and investment earnings built up in the trust will be used to pay for the expense of safely dismantling the plant, disposing of the irradiated portions of the plant and restoring the plant site to its original condition. In addition, any taxes due on the trust fund's investments will be paid.

Q. How can the appropriate amount of contributions to the decommissioning trust fund be determined?

A. Unit 1 of the Cook Nuclear Plant is scheduled to be retired in 2034, and Unit 2 of the plant is scheduled to be retired in 2037. Given that the plant is expected to run for another eighteen years and that the decommissioning process will last many more years after the plant is retired, determining the amount of current contributions needed to fully provide for decommissioning requires several assumptions. My testimony and work papers detail the assumptions I have made and the techniques used to reasonably estimate the necessary contributions. The steps can be briefly summarized as estimating the current cost for decommissioning the plant, projecting those costs to the time of the plant's retirement, projecting the after-tax value of the decommissioning trust fund, and evaluating the probability of whether or not the contributions were sufficient to fully fund decommissioning costs.

Q. What amount was recognized in the cost of service in I&M's last rate case for the funding of the Cook Plant's decommissioning costs?

A. The Commission most recently reviewed the Cook Plant's decommissioning costs in a comprehensive rate proceeding in Cause No. 44967. In the May 30, 2018 Order approving the Settlement Agreement in that Cause, the Commission approved decommissioning costs of $2.0 million per year in the cost of service (divided evenly between Units 1 and 2 of the plant). As will be shown in this testimony, the funding level should rise to $10.0 million per year to increase the likelihood adequate funds are available to decommission the plant and mitigate risks associated with assumptions and events that cannot be predicted with certainty, given the updated estimates in the recent decommissioning cost study from TLG Services, Inc. ("TLG") sponsored by Company witness Knight in Attachment RWK-2. O&M Adjustment 7 increases the annual funding level by $8.0 million to a total annual funding level of $10.0 million.

Q. How does Indiana's annual funding contribution and probability of successfully funding the decommission liability compare to the Michigan jurisdiction?

A. Michigan currently contributes approximately $2.8 million which results in a 99% probability of success. To put this funding level into relative terms for Indiana, that would equate to an annual funding level in Indiana of approximately $12.6 million ($2.8 million divided by Michigan's demand allocation factor of 14.4% times Indiana's demand allocation factor of 65.2%) which would result in a 92% probability of success.

Q. What is the basis for your conclusion regarding the level of the nuclear decommissioning costs to be included in the Company's cost of service?

A. I began with the decommissioning cost estimates from the January 2019 TLG decommissioning cost study, included as Company witness Knight's Attachment RWK-2. I projected those costs using escalation rates I developed from authoritative data sources identified in my work papers and later in this testimony. Next, I used a Monte Carlo simulation technique to determine the probability of whether the current contribution rates would provide sufficient funds to decommission the plant. The results show that a level of $10.0 million for the annual decommissioning trust contribution in the Indiana jurisdiction is adequate for satisfying the expected future decommissioning obligation. The details of my analysis will be discussed later in this testimony.

Q. Are there specific guidelines for the establishment and funding of decommissioning trusts related to nuclear power plants such as the Cook Plant?

A. Yes, the NRC has established guidelines to ensure the adequacy of funds for the safe dismantlement, decontamination and disposal of generating units at the end of their useful lives. These guidelines apply to both the amounts of fund contributions and the methods for funding the ultimate decommissioning of the units.

Q. What are the guidelines from the NRC regarding funding of nuclear decommissioning trusts?

A. The NRC requirements are detailed in 10 Code of Federal Regulations (CFR) §50.75. The requirements are intended to provide reasonable assurance that adequate funds will be available for the decommissioning process. To accomplish this, the NRC regulations require that the decommissioning fund assets should be held in an account segregated from the company, that the account must be outside the administrative control of the company owning the trust fund, and licensees inform the NRC of any material changes to the trust agreement. Further, the regulations specify a minimum amount to be accumulated in the fund for the radiological portion of the decommissioning. The regulations also require that each licensee of a nuclear power plant must prepare a biennial certification of assurance demonstrating that the licensee has accumulated at least a minimum amount of decommissioning funds. The regulations lay out the minimum amounts required for radiological decommissioning of reactors of different sizes and types in 1986 dollars. The regulations also specify how the decommissioning costs should be escalated.

Q. How were the current decommissioning costs estimated for the Cook Plant?

A. The Company engaged an unaffiliated third party, TLG, to perform a detailed decommissioning cost study, Attachment RWK-2. The results of that study are supported by Company witness Roderick Knight. The study assumed the use of the most current available technology to dismantle the plant and safely dispose of the irradiated portions of the plant waste.

Q. What are the estimated decommissioning costs for the Cook Plant from the Cook Plant Decommissioning Cost Study?

A. The NRC License Termination, Spent Fuel Management and Site Restoration costs for the plant were estimated to total $2.03 billion in 2018 dollars, as shown in Attachment ALH-1. The decommissioning expenditures for Unit 1 are scheduled to begin in 2034 and the decommissioning expenditures for Unit 2 are scheduled to begin in 2037, which are the end of the NRC operating license lives. Complete decommissioning of the plant is expected to take many years. In addition, ongoing costs for spent nuclear fuel storage are expected to continue indefinitely.

Q. How did you use the costs from the Cook Plant Decommissioning Cost Study to develop the proposed funding levels?

A. The costs from the Cook Plant Decommissioning Cost Study are expressed in 2018 dollars. As shown in my workpapers, I then project the costs to the time of decommissioning in order to assess the sufficiency of the level of decommissioning contributions. The decommissioning expenditures were escalated from their 2018 base level using the formula prescribed by the NRC for development of escalation rates for nuclear decommissioning costs. The NRC formula breaks the decommissioning costs into three components: labor, energy, and radioactive waste burial. The weight of each component is based on the detailed estimates in the TLG study. The weighted annual inflation of all components comprises the total cost escalation for decommissioning. The purpose of escalating decommissioning costs is to ensure that the forecasted costs account for the rate in which decommissioning costs are expected to increase over the long time horizon between now and the completion of the decommissioning process. As described in detail later in my testimony, the decommissioning cost escalation for the Cook Plant from 2018 to the expected end of the plant's life was based on historical updates of inflation components from the Bureau of Labor Statistics and recent estimates of waste disposal costs published by the NRC.

DETAILS OF I&M'S DECOMMISSIONING TRUST

Q. Are the decommissioning fund assets held in an account external to the Company as required by the Nuclear Regulatory Commission?

A. Yes, the assets for I&M's nuclear decommissioning funds are held in a trust fund by The Bank of New York Mellon (BNY Mellon). BNY Mellon maintains separate accounting records for each unit and each jurisdiction of the Cook Plant decommissioning trust.

Q. Are the trust fund investments maintained outside of the administrative control of I&M?

A. Yes, the investment decisions for the trust fund are made by an independent investment manager, NISA Investment Advisors, L.L.C. (NISA). NISA, based in St. Louis, Missouri, was selected based on their performance and experience in managing both equity and fixed income investments in nuclear decommissioning trusts.

Q. What are the total assets in the Cook Plant nuclear decommissioning trust and how much of that total is jurisdictional to Indiana?

A. At the end of 2018, the market value of assets in the decommissioning trust totaled $2,158,403,478. Those assets will have taxes due on investment gains when the investments are sold. At the current decommissioning trust tax rate of 20%, my estimate is that the taxes would total $158,931,883 leaving $1,999,471,595 in net assets available to pay decommissioning expenses (known as the liquidation value).

For the Indiana jurisdiction, the total market value at the end of 2018 was $1,542,554,623, and estimated taxes on unrealized gains would be $116,253,519, leaving a liquidation value of $1,426,301,104. To estimate the accumulation of the Indiana jurisdiction's liquidation value through the final date of decommissioning, contributions of $2.0 million and pre-tax investment earnings of 6.3% annually were assumed.

At December 31, 2020, the market value of assets available for the Indiana jurisdictional portion of the liability is projected to be $1,747,011,865, with taxes due of $156,344,968, resulting in a net liquidation value of $1,590,666,897.

Q. Are the assets in the Cook Plant nuclear decommissioning trust above the minimum amount required by the NRC?

A. Yes, at the end of 2018, the balance in the I&M decommissioning trust was above the NRC minimum. The NRC has specified that only the portion of the decommissioning trust allocated for radiological decommissioning can be used to fulfill the minimum requirements. The portion of the Cook decommissioning fund applicable to the NRC minimum is 62% of the fund and this balance allocated to radiological decommissioning meets the NRC minimum requirements.

The NRC minimum requirements are a base level of funding necessary just to assure the safe dismantlement and disposal of the irradiated components of the plant, but not the dismantlement of the plant buildings and non-radioactive portions of the plant. I&M has a commitment to restore the plant site to a greenfield condition; i.e. the plant site should be restored to a condition comparable to that prior to the construction of the plant. Other NRC requirements in 10 CFR 50.54(bb) cover the storage cost for spent nuclear fuel. Those costs will be required until the Department of Energy (DOE) takes possession of spent fuel and are in addition to the amounts needed to meet the NRC minimum for radiological decommissioning.

DETAILS OF DECOMMISSIONING EXPENSE MODELING

Q. Is a comparison of the current estimate of decommissioning cost to the current balances in the decommissioning trust fund a valid method to evaluate the need for continued contributions to the trust fund?

A. No, it is not. Comparing current decommissioning cost estimates with current asset balances would be valid only if the plant were to be decommissioned immediately. In the case of the Cook Plant, the decommissioning will not begin for nearly two decades. To evaluate the prospects for adequately providing for decommissioning the plant, both the expected cost of decommissioning the plant and the value of the funds that will be used to pay for it need to be extended through the entire decommissioning process.

The expected costs of decommissioning the plant have grown steadily and are expected to grow continuously in the future. In the modeling process I describe in detail below how an analytical process was used to estimate the expected future costs of decommissioning. The process examines the expected rate of inflation for the different cost components of decommissioning. The process then uses the cost component escalation rates to escalate costs over the time horizon needed to safely decommission the plant.

The decommissioning trust fund assets can be expected to grow erratically, and, at times, may have periods of negative growth. The investment markets have a considerable amount of volatility. That volatility adds uncertainty to the amount of assets that will be accumulated over time, and makes forecasting the adequacy of funding the decommissioning trust complicated. Continued contributions at an adequate level helps assure the sufficiency of the amount of assets that will ultimately be available for decommissioning, and reduces the probability of a funding failure.

For these reasons, it is clear that a static comparison of the current assets in the trust to the currently estimated decommissioning cost is an overly simplistic method of analysis and could lead to erroneous conclusions about the need for continued funding for decommissioning expense.

Q. How is the annual funding requirement for decommissioning calculated?

A. To calculate the funding requirements, the individual component amounts of the decommissioning costs taken from the cash flow tables shown in the Cook Decommissioning Cost Study, Attachment RWK-2, Table 3.1a and Table 3.2a of the TLG Study were escalated at rates appropriate for each component. The total of those escalated component costs were then used as the future decommissioning expenses. The current balances of the decommissioning trusts (less the taxes that will be due on current capital gains when the investments are sold) were then used as the beginning point for the amount of assets available to pay for the decommissioning expenses. The projected balances, plus an assumed amount of annual future funding, were escalated at a range of after-tax rates of investment return through a Monte Carlo simulation process to determine the likelihood of having sufficient assets available at the end of the plant's useful life to pay for the decommissioning expenses.

Q. How was the decommissioning cost escalation rate calculated?

A. The escalation rate is a combination of several components, and was calculated for each year in accordance with NRC requirements. Separate forecasts were made for each of the formula's component pieces: the forecasted costs of labor, the rate of increase for energy costs, and the cost of radioactive waste disposal. Those costs were escalated at the base inflation rate of 2.25%, plus their inflation premium, as determined below. Costs not included in those specific categories were escalated at the base inflation rate. The components were then weighted according to the detailed estimates from the TLG Study. The weighted rates were then summed to determine the annual escalation rate for the cost to decommission the Cook Plant.

Q. How were the forecasts for labor and energy costs developed?

A. The forecast data for labor and energy costs came from historical information of the Bureau of Labor Statistics. For the labor cost component, the historical increases in compensation for the Midwest region were compared to the Consumer Price Index. Statistics dating back to the 1983 inception of the Midwest regional labor index show that, on average, the increase in compensation exceeds the base rate of inflation by approximately 0.53%.

The energy cost component has two sub-components: Electricity and Fuel. For the escalation of the Electricity sub-component, the Electric Power Index was used and for the Fuel sub-component, the Petroleum Price Index was used. The indexes for these two cost components were compared to the rate of inflation extending back to the inception of the Electric Power Index in 1958. Consistent with the NRC formula and guidance, the composite energy factor was then calculated by using a 58% weighting for the electricity component and a 42% weighting for the fuel component. While the rate of increase for the labor cost index and the electric power price index have been relatively stable compared to the general rate of inflation for the past few years, the fuel price index has fluctuated dramatically. The weighted average for the combined cost of energy was calculated to have historically increased by 1.61% in excess of the base rate of inflation.

Q. How was the escalation rate for waste disposal costs calculated?

A. The NRC periodically publishes a report on waste burial charges. The report, called *NUREG 1307 Report on Waste Burial Charges*, gives current estimates of waste disposal costs for decommissioning of nuclear power plants. Historical data is also provided in the report, allowing a trend line for costs to be estimated. The most recent version of the report, NUREG-1307 Revision 17, was released in February 2019.

There are very few waste burial sites available for use by the Cook Plant. One site currently available for disposal of low-level waste from the Cook Plant is located in Clive, Utah, and is run by a private company named Energy*Solutions*.

The Energy*Solutions* site can take the lowest level of radioactive wastes, but it would not be able to accept the more highly radioactive debris. Accordingly, the TLG study assumes that the Energy*Solutions* site would be used for the lowest-class waste to be disposed of from the Cook Plant. However, because a long term public cost history from the Energy*Solutions* site is not available, costs from the site cannot be used to estimate an escalation factor for future increases in the waste disposal expense.

A new radioactive waste disposal facility has opened near Andrews, Texas. The TLG study assumed that the Texas site will be used for the burial of higher-level Class B and C radioactive waste. However, since the site is new, there is not yet a long term history of publicly available waste disposal costs from which to estimate a trend line, so it also cannot be used to estimate an escalation factor for waste disposal costs.

The radioactive waste burial site in Barnwell, South Carolina has been used in previous decommissioning cost studies for the Cook Plant. However, that site was closed in 2008 to most waste generators, including the Cook Plant. So, although the Barnwell site cannot be used in the decommissioning plan for the Cook Plant, the publicly available history of costs for the use of that site give an indication of the pattern of cost increases that can be expected for similar sites, including the Texas facility. For that reason, the disposal costs at the Barnwell, South Carolina site were used to estimate the escalation factor for nuclear waste disposal.

Although historical waste disposal cost data for the Barnwell site is available for more than 25 years, changes in regulations resulted in a high rate of increase in waste burial costs in the 1990's. More recent data better reflects current conditions, and is more useful for establishing a trend for future cost increases.

Over the past 19 years, the cost of waste burial has increased by an average of 0.38% more than the base rate of inflation.

Q. What asset classes for investments were used in developing estimates of investment returns?

A. The major asset classes used were the broad categories of domestic equities, fixed income, and cash. Each of these asset classes has a long history which can be used to evaluate return potential, risks, and correlations with the other classes. The average rates of return used for the asset classes reflect the long term outlook, and are based on the rates used for setting the rate of return expectations for the AEP pension fund. The rates for equities and cash were not adjusted for investment restrictions in the decommissioning trust funds.

Q. What is the impact of taxes on the investment portfolio?

A. The trust fund must pay taxes on the investment income and any investment gains that are realized in the portfolio. The taxes paid detract from the growth of the trust fund, and reduce the amount of funds that will ultimately be available to pay for decommissioning expenses. Currently, the tax rate on the qualified trust fund is 20%.

Q. How will the asset allocation of the decommissioning trust investment portfolio change over the life of the trust fund?

A. The allocation will be changed as the planned date for decommissioning the plant draws near to reduce the amount of investment risk in the portfolio and to provide sufficient liquid assets to pay for decommissioning costs. The current allocation is appropriate for the long-term growth of the fund. However, as decommissioning draws closer, the investment portfolio will be shifted to reduce the potential for investment losses. Beginning about ten years prior to the retirement of the plant, the level of equities will be reduced and more fixed income securities will be held in the portfolio in order to reduce the level of equity market risk in the decommissioning trust fund. Although the reduction in the equity allocation will reduce the expected rate of return on the fund, prudent investment practice calls for a reduction of risk when there is less time available to recover from a potential market loss before the funds are needed for decommissioning. The projected changes in asset allocation were included in the modeling.

Q. How were the projected costs of decommissioning the plant allocated between I&M's retail jurisdictions?

A. In order to determine the net decommissioning cost responsibility for I&M's retail jurisdictions it is necessary to first reduce the total decommissioning cost estimate by an estimate of the total contributions from I&M's wholesale customers. This properly recognizes the reduced decommissioning liability for retail customers as a result of wholesale customers' contributions over time. The remaining balance of decommissioning cost responsibility is then allocated to I&M's Indiana and

Michigan retail jurisdictions using the demand allocation factors determined by Company witness Duncan. Indiana's portion of the remaining decommissioning obligation amounts to 81.9% of the total decommissioning cost.

Q. How were the decommissioning projections accomplished?

A. As in previous cases, a Monte Carlo simulation was used to project both the trust fund and decommissioning costs. Monte Carlo simulation is a problem solving technique utilized to approximate the probability of certain outcomes by performing multiple trial runs, called simulations.

Q. Why is a Monte Carlo simulation useful in modeling the nuclear decommissioning funding requirements?

A. Monte Carlo simulation is a useful method to create a set of possible results for situations in which the inputs are uncertain. In the case of the decommissioning funds, the investment returns and the base cost inflation rate are the uncertain variables. The output of the Monte Carlo model is a set of probabilities that there will be sufficient funds available to successfully achieve the decommissioning goal. In this case, it is useful in determining the funding requirements for the nuclear decommissioning trust fund since it can be used to simulate a range of possible investment returns for the fund in the future. Although it is impossible to know in advance what the actual rate of return the trust fund's investments will be over the life of the plant and the subsequent decommissioning, an estimate of the possible ranges of annual returns can be constructed. The Monte Carlo simulation generates a large number of possible outcomes for the decommissioning fund by varying the annual rate of return on the fund's investments. In doing so, it can help estimate the probability of meeting the goal of having enough assets to fully pay for decommissioning the plant. The probability of having sufficient funds at the time of the planned plant retirement available to fully decommission the plant was computed to determine the appropriateness of the current level of funding.

Q. What will be done with the spent nuclear fuel when the plant is retired?

A. Since funding for the national spent fuel repository has been canceled, it has become more likely that the spent fuel will remain at the plant site indefinitely. The 2019 TLG Decommissioning Study includes cost of storing the spent nuclear fuel at the plant site indefinitely. The fuel will be removed from the plant and transferred to an Independent Spent Fuel Storage Installation ("ISFSI") at the plant site, where it can be secured and monitored.

When DOE failed to commence compliance with its contract, I&M pursued a law suit against DOE for damages. In 2011, I&M and DOE reached a settlement agreement, creating a process by which I&M submits annually its claim for damages, DOE reviews it, and the Government pays the amount agreed to out of the Judgment Fund (a U.S. Government account administered by the Department of Justice). Under this settlement process, I&M has been successful in the recovery of most of the storage costs for the spent nuclear fuel. However, the current settlement agreement with the DOE expires at the end of 2019. I&M believes that DOE will ultimately extend the settlement agreement that allows for recovery of costs associated for spent fuel storage, but cannot be certain of the timing or terms of such agreement. Alternately, I&M would hope to prevail if no agreement is reached and litigation proves necessary. However, neither path is certain nor provides reasonable assurance that funds would be available when needed to manage spent nuclear fuel. Additional details related to the recovery of costs from the DOE are contained within the testimony of Company witness Shane Lies.

For the projections performed for this testimony, I assume that, starting in 2034, the decommissioning fund will need to provide reasonable assurance that funding is available for managing spent nuclear fuel storage as required by 10 CFR 50.54(bb). The annual costs for the storage of the spent fuel that is in the reactor at the time of plant shut-down were escalated out to year 2100, effectively reflecting indefinite storage for accounting purposes. Storage costs for the spent nuclear fuel that had been used and removed from the reactor prior to shut-down are not included in the decommissioning cost estimate.

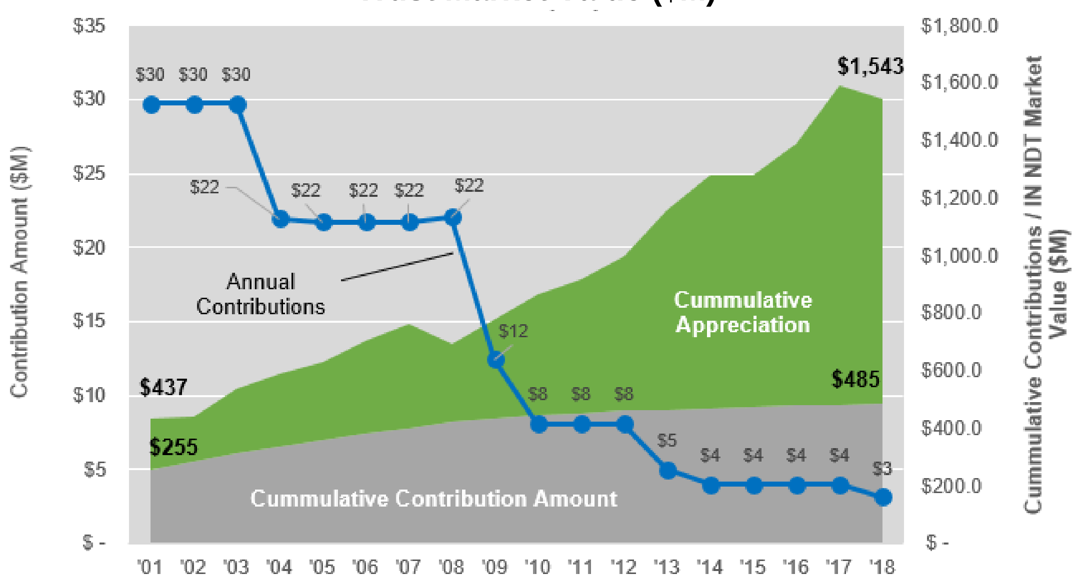
In addition to the costs for the storage of the final load of spent nuclear fuel, there will also be costs incurred to decommission the ISFSI when the spent fuel is finally removed, whether that occurs in 2100 or another date, from the plant site. Those costs are also included in the decommissioning cost estimates.

Q. What is the most significant risk for the decommissioning trust fund?

A. Although the risk of an investment loss is commonly associated with an investment portfolio, the greatest risk to the decommissioning trust is the possibility of a shortfall – not having sufficient assets to fully pay for the cost of decommissioning the plant. A shortfall in the fund is difficult to manage, and would be difficult to recover from. A shortfall would mean that the fund has failed to meet its basic objective of fully providing for the decommissioning of the plant. Since the decommissioning activities will continue for many years after the plant is removed from service, the existence of a shortfall and the extent of a shortfall may not be known for some time after the decommissioning process begins. Since annual contributions to the fund would have already ceased and since the investments would be positioned in a conservative asset allocation to accommodate payments for decommissioning expenses, the shortfall could not be eliminated with either extraordinary gains or normal annual contributions.

As shown in Figure ALH-1 below, contributions and their subsequent appreciation is essential to avoiding such a shortfall since contributions today have the potential to compound in value and provide the funds necessary to decommission the plant in the future.

Figure ALH-1
Historical Indiana Contributions and Nuclear Decommissioning Trust Market Value ($M)



The smaller the amount of contributions, the less principal and appreciation there will eventually be at the time of decommissioning and the higher the risk of a shortfall. Figure ALH-1 shows that cumulative Indiana contributions at year end 2018 total $485 million, while the total market value of the Indiana Nuclear Decommissioning Trust is $1,543 million. This difference of $1,058 million equates to less money customers need to fund when the time comes to decommission the plant.

Q. What could cause the decommissioning fund assets to be less than anticipated?

A. The investment returns on the trust fund's assets will be affected by future investment markets. The investment markets are unpredictable, and the investment returns achieved may lag behind the returns projected. A slight decrease in the cumulative investment rate of return could cause a large shortfall in the funds available for decommissioning at the time the plant is retired. For example, a 1% decrease in the average investment rate of return on the qualified fund would cause an approximately $500 million decrease in the Indiana jurisdictional fund balance at the plant retirement date in 2034.

Q. Are there any other risk factors in planning for decommissioning?

A. Yes. Although I&M certainly intends to operate the plant until its planned retirement there still remains the possibility that the plant may be shut down prior to the expiration of the operating license. This possibility would have the effect of not allowing the decommissioning funds to grow for as long as is currently planned, and would increase the probability that the decommissioning funds available may be insufficient to pay for the decommissioning expenses. In recent years, several nuclear plants in the United States have shut down prior to the expiration of their licenses. Among those shut down prematurely are the Crystal River Unit 3 in Florida, San Onofre Units 2 and 3 in California, the Kewaunee plant in Wisconsin, and the Vermont Yankee plant.

While we estimate future decommissioning cost escalation rates with assumptions and methodologies that we consider to be reasonable, the actual cost escalation rates will be different and are not possible to predict. Contingency for this unpredictability is not included in TLG's cost study and could materially change the probability of having enough funds to successfully decommission the plant. For example, a 0.5% increase in our base rate inflation assumption increases 2034 to 2046 cumulative escalated base decommissioning costs by over $350 million.

Q. Is the current amount of funding adequate for the Cook Plant decommissioning?

A. No. As discussed in the risk factors above, seemingly small variances in our assumptions could materially decrease the amount of funds available to decommission the plant or increase the cost to decommission the plant, or both. Increasing the annual decommissioning funding level for the Indiana jurisdiction to $10 million will help mitigate these risks. The modeling shows that at this funding level, the probability of having sufficient funds is approximately 90%. Stated another way, there is approximately a one in ten chance the trust fund will not have enough money at the end of the plant life to fully pay for decommissioning. This will also put the probability of successful funding of the decommissioning liability on better parity with Michigan retail customers and reduce the risk that Indiana retail customers will have to significantly increase annual funding late in the Cook Plant's life or continue contributions after the Cook Plant retires.

It is important to note that the probability is based on inherently sensitive forecast assumptions and is no guarantee. If the plant were to have closed at the end of 2018, Indiana's jurisdictional liability would have been $1,804,246,857, as shown in Attachment ALH-1, while the liquidated value of Indiana's assets was $1,426,301,104, equating to a shortfall of $377,945,754. Decommissioning success is reliant on realizing a combination of favorable future investment returns and favorable cost inflation results to cover this current shortfall. The decommissioning bill will certainly come due, the market assumptions and results may not.

In addition, the time horizon to recover from negative market cycles, increased cost inflation and to post gains to cover the shortfall, continues to become considerably smaller since Unit 1 obtained its operating license 45 years ago in 1974 and Unit 2 obtained its license 42 years ago in 1977. We are now only 15 years away from the first unit shutting down in 2034. We are only five years away from beginning to de-risk the nuclear decommissioning asset allocation, which is scheduled to begin ten years prior to the start of decommissioning. These are relatively short time horizons to recover from losses and post gains. It is critical that as we get closer to the plant's shutdown, the probability of successfully decommissioning the plant increases accordingly, so that at shutdown, the probability of success is 100% and the liability is fully funded.

This is why it is important to increase the funding level now, when there is time to gradually protect against a future short fall, rather than suffer one prior to decommissioning, with little time to recover. I&M will continue to report to the Commission every three years on the adequacy of the existing provision, however, and it may recommend adjusting the level of decommissioning fund contributions needed in the future.

Q. Should the commission order in this cause incorporate language regarding the funding to assist I&M in obtaining compliance with regulations of the Internal Revenue Service regarding qualified nuclear decommissioning trust funds similar to past orders?

A. Yes, the Commission should include the language below:

(1) The amount of decommissioning costs to be included in the cost of service for Units No. 1 and No. 2 of the Donald C. Cook Plant is $5.00 million and $5.00 million, respectively.

(2) The assumptions used in determining the amount of the decommissioning costs to be included in the cost of service for each of the two Units are as follows:

(a) The weighted after-tax rate of return expected to be earned by amounts collected for decommissioning is 5.0%.

(b) The method of decommissioning each of the two Units assumed in the Decommissioning Study of the D. C. Cook Nuclear Power prepared by TLG dated January 4, 2019 (the "TLG Study") is immediate decommissioning of the site ("DECON"), on-site storage of spent fuel, and clean removal.

(c) The total estimated cost of decommissioning in 2018 dollars in total for the Donald C. Cook Plant is $2,404,017,000, consisting of $2,032,121,000 in base decommissioning costs per the TLG Study, $335,013,000 of annual post decommissioning spent fuel storage costs through 2098, and $36,883,000 for the eventual decommissioning of the independent spent fuel storage installation ("ISFSI"). The estimated cost of decommissioning for each unit is $1,165,328,721 for Unit 1 and $1,238,688,279 for Unit 2.

(d) The methodology used to convert the current dollars estimated decommissioning cost to future dollars estimated decommissioning costs is to use the formula prescribed by the Nuclear Regulatory Commission ("NRC") for development of escalation rates for nuclear decommissioning costs. The NRC formula breaks the decommissioning costs into 3 three components: labor, energy, and radioactive waste burial. The weight of each component is based on the detailed estimates in the TLG Study. A base rate of 2.25% was assumed. The escalation rates for labor, energy and radioactive waste burial were assumed to exceed the base rate of inflation by 0.53%, 1.61% and 0.38%, respectively.

(e) Decommissioning costs to be included in the cost of service are an amount of $10.0 million apportioned between units as shown in Item No.1 expected to be included annually in the cost of service for each of the two units, continuing through the dates shown in Item (f), unless changed by future order of the Commission.

(f) The estimated date on which it is projected that the nuclear unit will no longer be included in I&M's rate base is October 31,2034, for Unit 1 and December 31,2037, for Unit 2.

(g) The TLG Study was utilized in determining the amount of decommissioning costs to be included in I&M's cost of service.

SPENT NUCLEAR FUEL TRUST FUNDING LEVEL

Q. What is the history of the funding for the disposal of spent nuclear fuel?

A. The Nuclear Waste Policy Act of 1982, signed into law on January 7, 1983, established that the Federal Government had responsibility to provide for the permanent disposal of spent nuclear fuel and the costs of such disposal were the responsibility of the generators and owners of the spent nuclear fuel. The DOE promulgated rules under this Act that relate, in part, to the disposal of spent nuclear fuel from commercial nuclear reactors including Cook Plant. In June 1983, I&M signed a contract with the DOE that provided, among other things, for payment of fees to the U.S. Treasury for such disposal. The contract consisted of fees derived by two cost mechanisms. One mechanism was a one-time fee for nuclear fuel spent to generate electricity at civilian nuclear power reactors prior to April 7, 1983 (Pre-April 7, 1983). The second mechanism was a fee per kilowatt-hour of generation for spent nuclear fuel resulting from the generation and sale of electricity on or after April 7, 1983 (Post April 6, 1983).

So, in addition to the liability for decommissioning the nuclear plant, I&M also has an obligation to the DOE to pay for the disposal of spent nuclear fuel used prior to April 7, 1983. The obligation is a fixed amount that increases with interest accumulated each year.

Amounts included in the fuel cost adjustment mechanism for the Post-April 6, 1983 spent nuclear fuel disposal costs are required to be deposited quarterly with the U.S. Treasury. Starting in June 2014, the DOE concluded that appropriate quarterly payment is zero until a viable spent fuel disposal program is progressing. These collections will continue at the present zero level unless the U.S. Government either funds and executes the current program or revises the statutes to start up an alternate, viable program. Those amounts do not directly affect decommissioning.

Q. How much is the liability for disposal of Pre-April 7, 1983 spent nuclear fuel?

A. On a total Company basis, the initial liability for Pre-April 7, 1983 spent nuclear fuel disposal was $71,963,830. The liability increases each quarter based on the most current yield for 3-month Treasury bills. It has increased through the accumulation of interest to $273,606,297 as of December 31, 2018, and, based on the current Treasury bill rate, is projected to increase only slightly by December 31, 2019 to about $279,672,149. The portion of the liability allocated to Indiana, after applying assets accumulated from wholesale customers, was approximately $187,224,569 at December 31, 2018, and it should grow to about $191,591,550 by December 31, 2019 as shown in WP-ALH-9.

Q. Please describe the Pre-April 7, 1983 spent nuclear fuel disposal trust fund.

A. Like the nuclear decommissioning trust, the spent nuclear fuel trust fund is held at BNY Mellon. The fund is considered to be a non-qualified fund, and, as such, contributions to it are not tax deductible and investment income and capital gains are subject to corporate income taxes.

Q. What is the value of the assets in the trust fund for the Pre-April 7, 1983 spent nuclear fuel disposal liability?

A. As of December 31, 2018, the Indiana jurisdictional portion of I&M's spent nuclear fuel trust fund had a market value of $224,741,622. That balance is expected to increase to about $228,677,814 by December 31, 2019 as shown in WP-ALH-8. The Indiana jurisdictional balance of the spent nuclear fuel trust fund is currently greater than the spent fuel liability allocated to it, and is projected to remain so for the projected test year. As such, the trust may be considered fully funded at this time and for the duration of the projected test year.

It is important to note that the spent nuclear fuel liability will continue to increase through the accrual of additional interest until paid. Furthermore, as further discussed in the recommendation to update the fund's investment guidelines, the liability can move from fully funded to less than fully funded through changes in the market value of trust fund securities, differences between the liability accretion rate and the investment earnings rate and other factors.

Q. Is the spent nuclear fuel trust being used to cover the cost of spent nuclear fuel storage prior to the DOE permanently disposing of the fuel?

A. No. Company witness Lies explains the Cook Plant's current spent nuclear fuel storage program.

Q What are your recommendations for the funding of the spent nuclear fuel liability?

A. The spent nuclear fuel trust is adequately funded at the present time. As the current level of assets exceeds the liability and both are growing very slowly, the fund does not appear to be in danger of becoming under-funded in the near future. For those reasons, additional funding is not necessary at this time. I recommend that the funding for the Pre-April 7, 1983 spent nuclear fuel disposal remain suspended.

It should be noted that the obligation to the DOE has not yet been satisfied, and that the need for funding of the spent nuclear fuel disposal trust will be evaluated periodically. If additional funding is needed in the future, I&M will make a recommendation at that time.

SPENT NUCLEAR FUEL TRUST INVESTMENTS

Q Is I&M proposing to change the spent nuclear fuel trust asset allocation guidelines?

A. Yes. As further discussed below, I&M recommends that for the balance of Indiana jurisdictional pre-April 7, 1983 assets that exceed the Indiana jurisdictional liability by a factor of 1.05 or more, those assets should be permitted to be invested pursuant to the investment guidelines currently in place for the Indiana Nuclear Decommissioning Trust.

Q How are the Spent Nuclear Fuel Trust investments managed?

A. As discussed above, the Indiana jurisdictional portion of I&M's spent nuclear fuel trust fund had a market value of $224,741,622 and the portion of the liability allocated to Indiana, after applying assets accumulated from wholesale customers, was approximately $187,224,569 for a surplus of $37,517,053 as of December 31, 2018. The liability increases each quarter based on the most current yield for 3-month Treasury bills. The fund attempts to match the growth of the assets with the growth of the liability and assets are generally invested in 3-month Treasury bills, or in investments allowed in the current set of investment guidelines that will provide returns similar or superior to 3-month Treasury bills.

Q Does this investment strategy fully immunize the liability so that the current Spent Nuclear Fuel Surplus will be maintained or even grow?

A. No. Over the long run, this strategy will have the effect of reducing the surplus to zero, eventually leading to a deficit. Deposits will need to be resumed at some point in the future. While the liability grows with no consideration for taxes, the assets are taxed on their earnings and capital gains. Thus, in order for the trust fund assets to keep pace with the liability, the after-tax return on the investments must be more than the pre-tax yield on 3-month Treasury bills. Historically, there have been two factors in particular that have provided tail winds to this dilemma. First, there have been periods of time when the fund has been able to find investments, such as tax-exempt municipal bonds, that had yields greater than the yield on 3-month Treasury bills. In recent years, investments such as these have been difficult to find. Second, for the seven-year period after the great financial crisis, when the Federal Reserve on December 16, 2008 set the Federal Funds rate to a level ranging from 0.0% to 0.25% until December 17, 2015, when the Federal Reserve gradually started to increase the Federal Funds rate, interest rates experienced historic lows, including periods of *negative* interest rates. This mitigated the tax drag on Spent Nuclear Fuel trust assets.

Q What are the current Spent Nuclear Fuel Trust investment guidelines?

A. The guidelines were established in the 1980s and allowable investments include cash, obligations of the United States of America, obligations guaranteed by the United States of America, obligations of any state in the United States of America which are exempt from tax and have a rating from a nationally recognized rating service equivalent to “A” or higher as to general obligation bonds and “AA” or higher as to other obligations, repurchase agreements, “A-2” or higher rated commercial paper, “AA” or higher rated corporate notes and bonds and interest in investment companies and investment trusts which limit their investments to the foregoing.

Q How should the Spent Nuclear Fuel trust investment guidelines be changed to protect the Spent Nuclear Fuel surplus, given its expected erosion and the current circumstances surrounding Yucca Mountain?

A. I am recommending and asking the commission to approve a change to the Spent Nuclear Fuel trust investment guidelines to reflect these realities, especially since spent nuclear fuel is expected to remain on site longer than the Cook Plant is in operation. For the balance of Indiana jurisdictional pre-April 7, 1983 assets that exceed the Indiana jurisdictional liability by a factor of 1.05 or more, those assets should be permitted to be invested pursuant to the investment guidelines currently in place for the Indiana Nuclear Decommissioning Trust. The Indiana Nuclear Decommissioning Trust investment trust guidelines limit investments to cash, and high quality U.S. fixed income and U.S. equity securities. Among other quality restrictions, corporate bonds must be rated “AA” or higher at the time of acquisition and U.S. stocks must have at least a “B+” rating by Standard & Poors or other nationally recognized rating service. U.S. equities are limited up to two-thirds (2/3) of the portfolio. Our analysis shows that providing the option to invest the surplus in this manner, can provide improved diversification benefits compared to investing under the current guidelines.

Working with our investment advisor, NISA, which currently manages our Nuclear Decommissioning Trust and Spent Nuclear Fuel assets, a Monte Carlo simulation was used to evaluate potential asset allocation policies.

Figure ALH-2
Current investment Guideline Strategy to Invest in Treasuries/Investment Grade Bonds

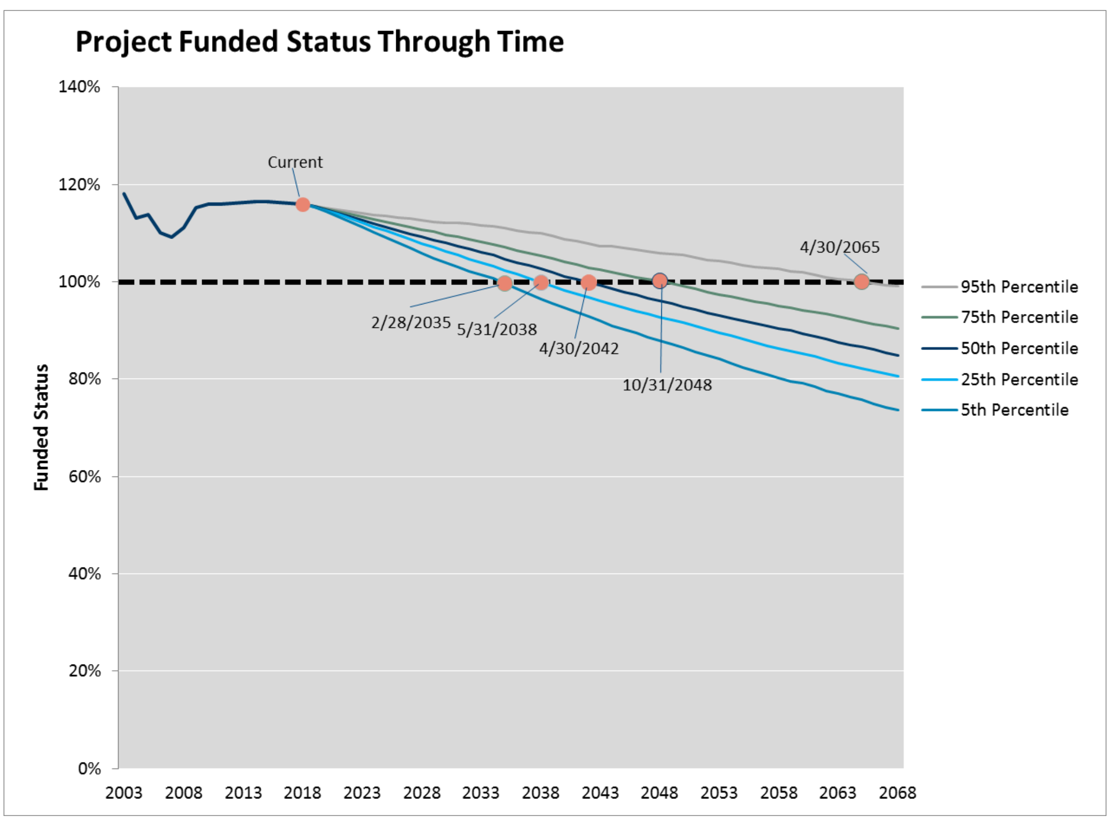
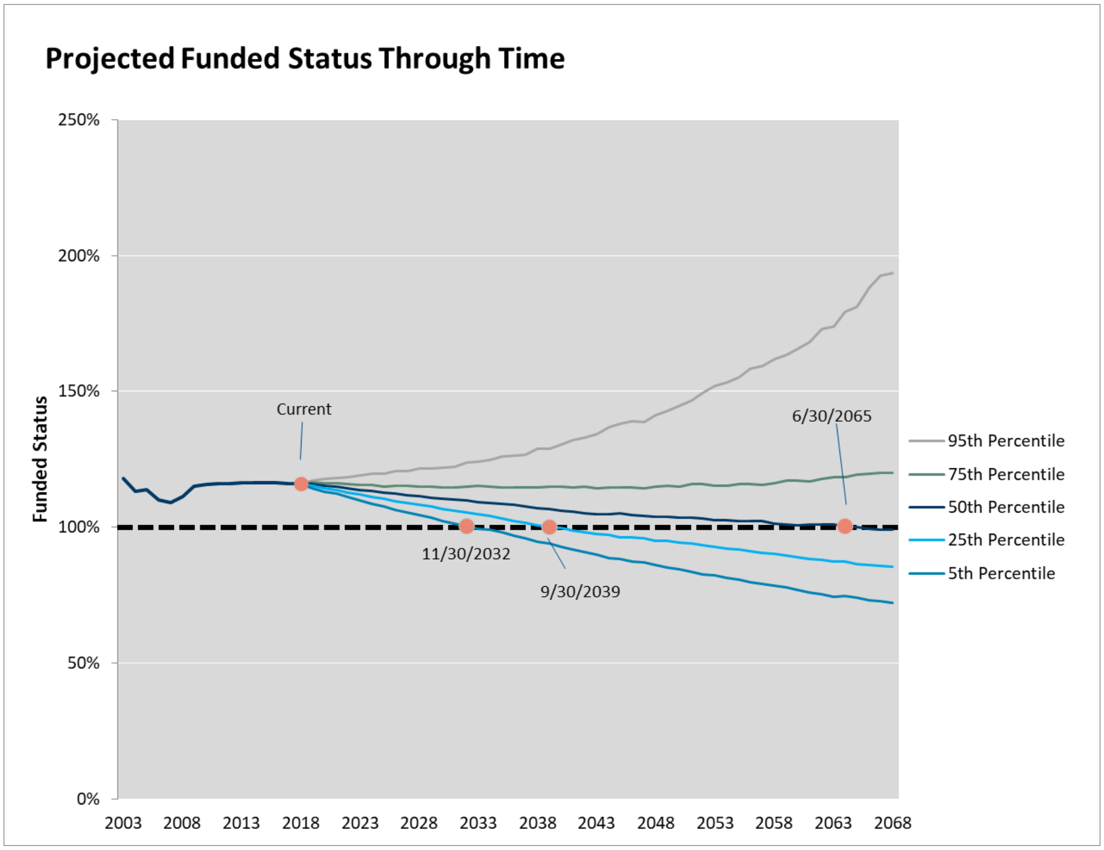


Figure ALH-3
Option to Invest Assets That Equal 105% of the Liability in Treasuries/Investment Grade Bonds (Current Guidelines) and Investing the Excess Similarly to the Qualified NDT Portfolio



The percentile groups in the figures above can be viewed as the percentage of observations that fall within a particular range of outcomes. For example, in Figure ALH-2 under the current strategy, for the 25th percentile, by May 31, 2038 the surplus is lost in 25% of simulation results and the surplus is maintained past this date in 75% of the remaining simulation scenarios. For the 50th percentile, the surplus is lost in 50% of the simulations by April 30, 2042 or earlier and in 50% of the simulations the surplus is lost at a later date. For the 75th percentile, the surplus is lost in 75% of the simulations by October 31, 2048 and the surplus is maintained past this date in 25% of the remaining simulation scenarios. In other words, the

25th percentile represents the 25% worst performing scenarios, the 50th percentile represents the median simulation results and the 75th percentile represents the 25% best performing scenarios.

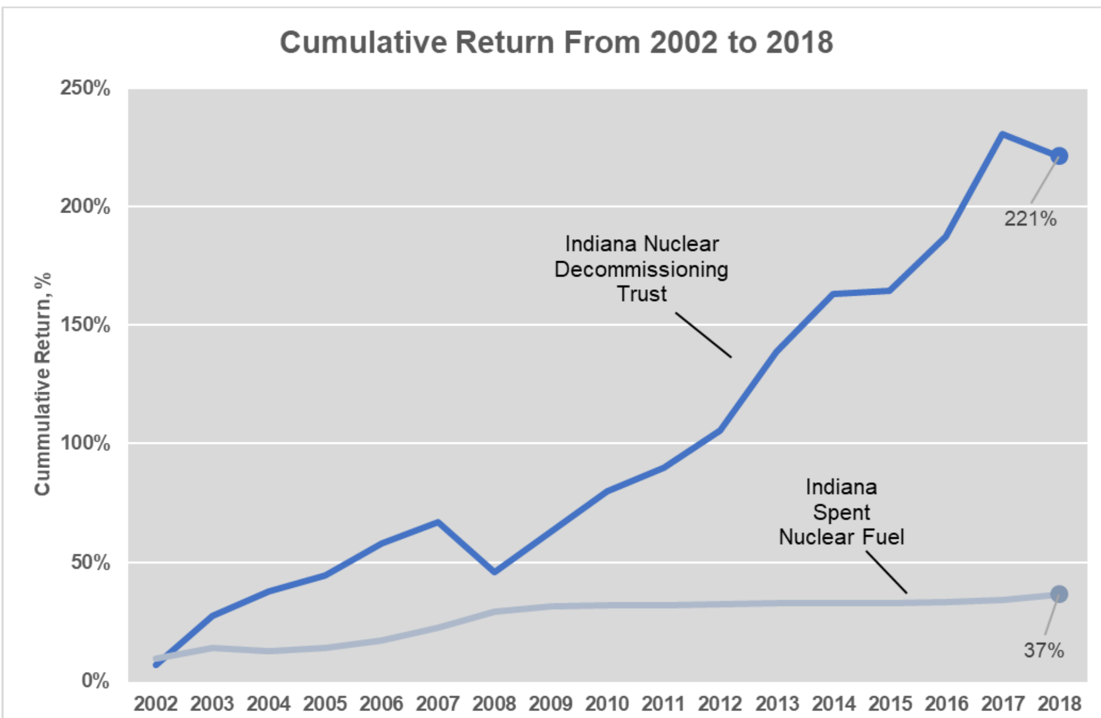
The results show that when assets that exceed the liability by a factor of 1.05 are invested in a manner consistent with the current strategy and the surplus is invested in a manner consistent with the Indiana Nuclear Decommissioning Trust, under the 50th percentile outcome, the funded status surplus is extended by 23 years compared to the current strategy. At around the 75th percentile outcome and better, the Spent Nuclear Fuel surplus is expected to *increase* over time if invested under the expanded guidelines compared to the current investment strategy. In the 25th percentile of outcomes the new strategy would still extend the funded status surplus by sixteen months. This is due to realizing the diversification benefit of the expanded investment guidelines.

Besides potentially extending the surplus life, there are two additional reasons to expand the investment guidelines: 1) the recent Federal decrease in corporate tax rates reduced the tax drag between Spent Nuclear Fuel asset growth and liability growth. However, future tax law changes are uncertain and could have the opposite effect. 2) Policies around Spent Nuclear Fuel could change over the next thirty years and beyond. While our liability accrues at the 3-month Treasury Bill rate, we do not know what the true disposal cost will be. The actual spent fuel obligation could be increased or modified when the time comes to ultimately dispose of the spent fuel. Having the flexibility to further diversify the Spent Nuclear Fuel trust asset mix could help offset these impacts.

Q What is the relative performance of the Nuclear Decommissioning Trust compared to the Spent Nuclear Fuel Trust since NISA began managing the assets?

A. NISA began managing the Nuclear Decommissioning Trust and Spent Nuclear Fuel Trust assets at the end of 2001. Below are the cumulative returns for each trust from 2002 to 2018.

Figure ALH-4
Cumulative Return for the Indiana Nuclear Decommissioning Trust and the Indiana Spent Nuclear Fuel Trust from 2002 to 2018



<u>**PRE-PAID PENSION ASSET**</u>

Q. Has I&M included a prepaid pension asset in this case?

A. Yes. Consistent with the Orders in IURC Cause Nos. 44967 and 44075, I&M seeks to continue the inclusion of Prepaid Pensions in I&M's rate base. The order in Cause No. 44075 stated that the prepaid pension asset was recorded on the

Company's books in accordance with governing accounting standards, the prepaid pension asset reduced the pension cost reflected in the revenue requirement in the case, preserves the integrity of the pension fund, and should be included in rate base.

Q. Please describe I&M's ongoing funding strategy for the employee pension plan.

A. I&M's strategy is to fund at least the annual minimum amount required by the Employee Retirement Income Security Act of 1974 (ERISA). Additional discretionary contributions may be made to maintain the funded status of the plan.

Q. Please define a prepaid pension asset.

A. A prepaid pension asset can be defined as cumulative pension cash contributions less cumulative pension cost.

Q. What is the value of the prepaid pension asset included in I&M's rate base?

A. The value of the prepaid pension asset is projected to be $89,244,007 on December 31, 2020, I&M's test year end.

Q. Please describe the process of forecasting the prepaid pension asset.

A. The prepaid pension asset is forecasted similar to other asset balances, beginning with an actual balance as of a period end and adjusting for forecasted activity. The value of the prepaid pension asset was $97,553,896 as of December 31, 2018. Forecasted pension cash contributions of $1,110,000 and $6,391,000 for years 2019 and 2020 respectively, are added to the December 31, 2018 prepaid pension asset balance. Forecasted pension costs of $8,062,000 and $7,749,000 for years

2019 and 2020 respectively, are subtracted. The result is the projected December 31, 2020 prepaid pension asset balance.[1]

Q. What process does I&M use to forecast pension contributions and costs?

A. I&M uses the services of a professional actuarial firm, Willis Towers Watson, to develop this forecast. I collaborate with them, along with internal AEP departments such as Accounting and Human Resources, to ensure the assumptions included in Willis Towers Watson's model are consistent with plan provisions, participant demographics, asset balances and other important data and plan characteristics.

SUMMARY

Q. What is your recommended level of funding for the Cook Plant nuclear decommissioning trust, the Pre-April 7, 1983 spent nuclear fuel trust and prepaid pension asset treatment?

A. The current funding rate of $2.0 million annually should be increased to $10.0 million. While I have determined probabilities of successful decommissioning based on methods and assumptions that I believe to be reasonable and appropriate, increasing the current funding level will increase the probability of successfully decommissioning the plant and mitigates shortfall risks associated with investment return, cost inflation, future events, and other assumptions that cannot be predicted with certainty.

The funding for the Pre-April 7, 1983 spent nuclear fuel disposal should remain suspended for the time being. I&M will continue to monitor the level of funding for nuclear decommissioning and for Pre-April 7, 1983 spent nuclear fuel

[1] These amounts are Total Company and exclude the River Transportation Division.

disposal and will continue to report to the Commission every three years, with this testimony and attachments serving as the report for the current three-year cycle.

The investment guidelines for the Pre-April 7, 1983 spent nuclear fuel disposal should be expanded so the balance of Indiana jurisdictional pre-April 7, 1983 assets that exceed the Indiana jurisdictional liability by a factor of 1.05 or more, should be permitted to be invested pursuant to the investment guidelines currently in place for the Indiana Nuclear Decommissioning Trust. This would allow for increased diversification in the Spent Nuclear Fuel trust portfolio and is expected to extend the life of the trust surplus compared to the current strategy. The downside outcomes with the expanded guidelines are expected to be in line with the current strategy, while the surplus could experience an increase in the best performing cases.

The prepaid pension asset is accurately forecasted and its continued inclusion in I&M's rate base is appropriate.

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

A. Yes.

VERIFICATION

I, Aaron L. Hill, Director of Trusts and Investments of American Electric Power Service Corporation (AEPSC), affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information, and belief.

Date: 5/8/2019

Aaron L. Hill

Attachment ALH-1

Cook Nuclear Plant
Summary of Decommissioning Liability
January 2019 Decommissioning Study
2018 Dollars

Decom Method	Spent Fuel Storage	Storage Site / Systems	Spent Fuel Repository Open	Base Decom Costs	Spent Fuel Storage Costs to 2098	ISFSI Decom	Total Decom. Costs to Year 2100 in 2018 Dollars	Indiana Jurisdictional Portion of Liability
DECON	Dry	On-Site	Never	$2,032,121,000	$ 335,013,000	$ 36,883,000	$ 2,404,017,000	$ 1,804,246,857