**BEFORE THE**
**PUBLIC SERVICE COMMISSION OF WISCONSIN**

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| Joint Application of American Transmission Company, ITC Midwest LLC, and Dairyland Power Cooperative, for Authority to Construct And Operate a New 345 kV Transmission Line From the Existing Hickory Creek Substation in Dubuque County, Iowa, to the Existing Cardinal Substation in Dane County, Wisconsin, to be Known as the Cardinal-Hickory Creek Project | ) | 5-CE-146 |

# DIRECT TESTIMONY OF JON WELLINGHOFF ON BEHALF OF THE DRIFTLESS AREA LAND CONSERVANCY AND WISCONSIN WILDLIFE FEDERATION

## TESTIMONY SUMMARY

There is not sufficient evidence of record for this Commission to definitively conclude that the Cardinal-Hickory Creek (CHC) transmission line project is the highest priority energy option that is also cost effective and technically feasible as required by Wisconsin law. My conclusion is based on the Application in this proceeding, the direct testimony and exhibits submitted by the Applicants, the responses to data requests from the parties, and the testimony and exhibits submitted by witnesses for the Driftless Area Land Conservancy and Wisconsin Wildlife Federation (DALC-WWF).

In order to determine the highest priority energy option that is cost effective and technically feasible, this Commission should direct the Applicants to develop technically feasible least cost Alternative Transmission Solutions (ATS) that are properly and fully formulated and optimized. Once the ATSs are formulated, their total estimated costs should be compared to the updated total projected costs of the CHC transmission line project rather than simply the allocated Wisconsin share in order to achieve a true apples-to-apples comparison of cost effectiveness of alternative project options. Upon completing this analysis, Applicants should

submit the analysis to the Commission for a determination of which alternative is the highest priority energy option to be selected for Wisconsin, and other parties should be allowed a full and fair opportunity to respond.

The Commission is likely to find that a properly analyzed ATS is the most cost effective alternative for the Cardinal-Hickory Creek project because: there are a number of significant high priority energy options that could be included in that analysis that Applicants have failed to consider, the price of solar energy generation is rapidly declining as solar panels become more efficient, energy storage costs are rapidly declining, and there are many untapped low cost energy efficiency and demand response opportunities that can be realized. Solar energy is an especially valuable peak resource as the Commission recently recognized in approving 500 megawatts of new solar projects in Wisconsin. ATS involving robust combinations of these resources are more flexible, more in-state, more available at peak when most needed and can be more cost effective compared to approving a Certificate of Public Convenience and Necessity (CPCN) which locks in for 40 years a potentially less flexible high voltage transmission line alternative carrying an unspecified mix of out of state electricity generation to Wisconsin and potentially displacing development of more renewable energy resource projects in Wisconsin.

The Commission should adopt this "no regrets" approach. Approving this Application now without having a proper comparable analysis of the alternatives would potentially result in adopting a suboptimal alternative. Such action by this Commission may fail to deliver the benefits that an optimal portfolio of cost effective high priority resources could deliver to the state. Furthermore, there is no near term reliability need that would require proceeding with the proposed CHC transmission line project now without conducting the full and fair ATS analysis that I have explained in my testimony.

Moreover, based on my experience as Chair of the Federal Energy Regulatory Commission (FERC) and my overall utility regulatory and market experience, the costs of Alternative Transmission Solutions, including ones that incorporate high priority energy options as I discuss below, should be eligible for regional cost-sharing by the Midcontinent Independent

System Operator (MISO). This is certainly true if the ATS provides comparable services and is more cost effective than the proposed Cardinal-Hickory Creek transmission line.

**Q: Please state your name, employer, title, and business address.**

A: My name is Jon Wellinghoff. I am Chief Executive Officer for GridPolicy, Inc. My business address is 2120 University Ave, Berkeley, CA 94704.

**Q: Please describe your current position and provide your education and professional experience as it relates to this direct testimony.**

A: I have been an energy regulatory attorney and consultant for the past forty-three (43) years holding various positions at the local, state and federal government level as well as industry. I have served as the Chair and as a Commissioner of the Federal Energy Regulatory Commission (FERC), in senior-level federal and state utility and energy regulatory positions, and in senior-level private sector business positions as more fully explained below.

I have testified in a number of proceedings including before the regulatory commissions of Nevada, Texas, Washington and the District of Columbia, the U.S. Congress and the Federal Trade Commission (FTC). I have been offered to testify as an expert on Integrated Resource Planning (Nevada), energy efficient lighting systems (Texas and D.C.), solar energy industry (FTC), transmission planning procedures and policies (U.S. Congress, House of Representatives) and demand response (private lawsuit).

I am currently the CEO of GridPolicy, Inc., an international consulting firm. We provide energy policy and strategic consulting services to our client base on a range of topics including wholesale and retail electric energy services and markets, transmission and distribution grid issues, distributed energy resources (DER), renewable energy, storage and other issues related to electric energy systems and markets.

Previously, I was the Chief Policy Officer for SolarCity/Tesla, which, at that time, was the largest developer of both residential and commercial solar systems in the U.S. While I worked at SolarCity, we were responsible for the

development and installation of over one gigawatt of rooftop, community and large scale solar, and solar plus storage systems.

I served as a Commissioner at the Federal Energy Regulatory Commission (FERC) from 2006 through 2013, and was designated Chairman by the President for the last five of those years. At FERC, I initiated and/or assisted in the development of rulemaking proceedings on demand response (Order 755, Order 745 and Order 719), transmission planning (Order 890 and Order 1000), renewable system integration into the transmission grid (Order 764) and accounting for new electric storage systems (Order 784) among other issues and Orders. While serving as Chair of FERC, I also initiated a reporting system for demand response that provides data on the historical installed capacity of and future potential for demand response within the transmission grid.

I also served as a regulatory attorney at the Federal Trade Commission in the Bureau of Consumer Protection, Division of Energy Product Information. I was responsible for oversight of the solar industry from the perspective of industry product information being provided to consumers.

I served as Nevada's first Advocate for Consumers of Public Utilities, heading a division of the Nevada Attorney General's Office working to protect the interests of utility ratepayers. While serving in that position, I participated in numerous certificate proceedings for transmission lines as well as Integrated Resource Planning (IRP) proceedings analyzing alternatives to transmission projects. In 1983, I wrote the IRP statute for Nevada, which was later adopted in whole or in part by seventeen (17) other state jurisdictions.

I served as General Counsel to the Nevada Public Utilities Commission. Again, in that position, I participated in transmission certificate proceedings and in IRP proceedings analyzing transmission and transmission alternatives.

I was the regional director of NORESCO, one of the nation's largest energy service companies, providing comprehensive energy efficiency, demand

response and renewable energy project development services to commercial and industrial customers in the Southwestern U.S.

I was also one of two principals in the energy efficiency-consulting firm, Efficiency Energy Systems, Inc. (EEIS). As an EESI principal, I oversaw the specification and installation of over ten megawatts of energy efficient lighting upgrades in the facilities of multiple clients such as Nellis Air Force Base, Southern California Edison, Pasadena City College, Hawaiian Electric, Orange County School District and others. Also, as an EESI principal, I designed the curriculum and taught energy efficient lighting system technology and auditing to over 300 of Southern California Edison's Energy Service Representatives.

I received a BS in mathematics from the University of Nevada, Reno, a MAT in mathematics from Howard University, and a JD from Antioch School of Law. Although my BS is in mathematics, I started my academic career as physics major. Thus, before changing my major I took all the physics courses required of an engineering major.

I have been a member of the Nevada State Bar since 1975. My complete résumé is attached as Ex.-DALC-WWF-Wellinghoff-1**.**

**Q: On whose behalf are you testifying in this proceeding?**

A: I am testifying on behalf of the Driftless Area Land Conservancy and the Wisconsin Wildlife Federation (DALC-WWF), which are intervenor parties in this proceeding.

**Q: What is the purpose of your direct testimony?**

A: The purpose of my testimony is to review the Application in this proceeding for the proposed Cardinal-Hickory Creek (CHC) transmission line and specifically the "Non Transmission Alternative" (NTA) analysis conducted by the Applicants. I will relate that NTA analysis to both Wisconsin statutory requirements and the requirements for transmission planning under applicable FERC standards.

**Q: Do you have any exhibits to offer in support of your direct testimony?**

A: Yes.

- Ex.-DALC-WWF-Wellinghoff-1
- Ex.-DALC-WWF-Wellinghoff-2
- Ex.-DALC-WWF-Wellinghoff-3
- Ex.-DALC-WWF-Wellinghoff-4
- Ex.-DALC-WWF-Wellinghoff-5

**Q: What are the Wisconsin requirements regarding evaluation of alternatives to transmission projects in a proceeding such as this one?**

A: The Public Service Commission of Wisconsin (PSCW or Commission) stated in its Final Decision in the Badger Coulee transmission line case: "The Commission has the responsibility to ensure that Wisconsin receives adequate, reliable, and economical electric service now and in the future."[1]

In that context, the Commission is required by statute, to the extent cost effective and technically feasible, to consider options to meet energy demands by prioritizing energy conservation and efficiency and noncombustible renewable energy resources before other energy resources.[2] Regarding those priorities, the Wisconsin Supreme Court stated that in a case such as this one for a Certificate of Public Convenience and Necessity (CPCN):

> *The EPL itself states that the priorities are to be applied '[i]n meeting energy demands." Wis. Stat. § 1.12. Wisconsin Stat. § 196.025(1) states the priorities of § 1.12(4) are to be applied "in making all energy-related decisions and orders.' When the PSC makes a determination on a CPCN under the Plant Siting Law, it applies the EPL in the context of determining whether to approve the requested plant siting.* ***The question the PSC should ask is thus: Given the requirements of the Plant Siting Law, what is the***

[1] PSCW Docket No. 5-CE-142, *Final Decision* (April 23, 2015) (PSC REF#: 236151).
[2] **Wis. Stat. § 1.12(4)**

***highest priority energy option that is also cost effective and technically feasible?*** [3]

With that framing by the Wisconsin Supreme Court, the PSCW should then ask: "Is the Cardinal Hickory Creek transmission line project the highest priority energy option that is also cost effective and technically feasible?"

**Q: Did Applicants provide sufficient evidence for the Commission to answer this question?**

A: No, they did not.

**Q: Please explain why.**

A: As I explain more fully below, and as explained in more detail in the testimony of DALC-WWF witness Kerinia Cusick, the Applicants failed to conduct a legally sufficient project options analysis that would allow a comparison of the CHC Project to Alternative Transmission Solutions (ATS) composed of feasible high priority energy resources that are optimized for cost effectiveness as required by Wisconsin law and FERC regulations.

**Q: Why are you using the terminology Alternative Transmission Solutions or ATS instead of the terminology used by Applicants of Non Transmission Alternatives or NTA?**

A: Although some use ATS and NTA as equivalent terms, they actually have distinct and significant legal meanings. An Alternative Transmission Solution or ATS is a term used by FERC in its Order 890 on transmission planning to designate potential alternative solutions to transmission problems that have been identified by a utility transmission provider, a third party project developer or a planning authority. Those solutions could encompass traditional transmission infrastructure such as wires and towers and substations. The FERC made clear in Order 890,

[3] *Clean Wisconsin, Inc. v. Public Service Commission of Wisconsin*, 282 Wis.2d 250 (2005) at ¶ 122. Emphasis added.

however, that Alternative Transmission Solutions also encompass another category of transmission assets, Advanced Transmission Technologies (ATT). Specifically, Order 890 states:

> *436…the Commission concludes that it is necessary to amend the existing pro forma OATT to require coordinated, open, and transparent transmission planning on both a local and regional level…**Through EPAct 2005 sec. 1223, Congress also directed the Commission to encourage the deployment of advanced transmission technologies in infrastructure improvements**, including among others optimized transmission line configurations (including multiple phased transmission lines), controllable load, distributed generation (including PV, fuel cells, and microturbines), and enhanced power device monitoring.*
> *437. Accordingly, **each public utility transmission provider is required to submit, as part of a compliance filing in this proceeding, a proposal for a coordinated and regional planning process that complies with the planning principles and other requirements in this Final Rule.***[4]

**Q: What are Advanced Transmission Technologies?**

A: The term Advanced Transmission Technologies (ATT) identifies a distinct class of potentially FERC jurisdictional transmission assets defined by Congress in the Energy Policy Act of 2005. They are broadly defined as:

> …the term 'advanced transmission technology' means a technology that increases the capacity, efficiency, or reliability of an existing or new transmission facility,…[5]

The statute then provides a list of 18 examples of ATTs that include battery storage, solar photovoltaic systems, load control and numerous other technologies.

[4] *Preventing Undue Discrimination and Preference in Transmission Service***,** FERC Order 890, p. 436-437 (2007). Emphasis added.

[5] Pub. L. 109–58, title XII, § 1223, Aug. 8, 2005, 119 Stat. 953.

**Q: How are battery storage and solar PV systems considered as potential Alternative Transmission Solutions under the FERC Order 890 and Order 1000 transmission planning process?**

A: For such resources to be considered as an Alternative Transmission Solution by FERC, two criteria must be met. First, they must fit within the Congressionally determined categories of an Advance Transmission Technology. Second, they must be assessed in the transmission planning process to provide transmission services for the transmission problem identified. FERC indicated a requirement for comparable treatment in the planning process for Advanced Transmission Technologies if they are found to provide transmission services in Order 890:

> *We therefore find that, where demand resources are capable of providing the functions assessed in a transmission planning process, and can be relied upon on a long-term basis, they should be permitted to participate in that process on a comparable basis. This is consistent with EPAct 2005 section 1223.*[6]

**Q: What does "comparable basis" and treatment mean in this context?**

A: To consider Alternative Transmission Solutions comparably, each separate proposed solution should be formulated independently to provide the transmission services required to solve the transmission planning problem at issue. That formulation should be structured to use the most cost effective assets possible. Once a set of Alternative Transmission Solutions have been formulated and tested for both feasibility of resolving the planning problem and cost effectiveness they should be compared to each other to determine the most cost effective among the alternatives.

**Q: What is the significance of an ATT being designated as a potential FERC jurisdictional Alternative Transmission Solution?**

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[6] *Preventing Undue Discrimination and Preference in Transmission Service***,** FERC Order 890, p. 479 (2007). Note the reference to EPAct 2005 section 1223 refers to Advanced Transmission Technologies.

A: Designating an Alternative Transmission Solution as an aggregation of Advanced Transmission Technologies capable of providing a transmission services solution means that the solution, as an ATS, is eligible for regional cost recovery under FERC transmission planning Orders 890 and 1000. That is a significant benefit. FERC specifically stated in Order 890:

> *Through the regional transmission planning process, public utility transmission providers will be required to evaluate, in consultation with stakeholders, alternative transmission solutions that might meet the needs of the transmission planning region more efficiently or cost-effectively than solutions identified by individual public utility transmission providers in their local transmission planning process. …* ***When evaluating the merits of such alternative transmission solutions, public utility transmission providers in the transmission planning region also must consider proposed …alternatives on a comparable basis****. If the public utility transmission providers in the transmission planning region, in consultation with stakeholders, determine that an alternative transmission solution is more efficient or cost-effective than transmission facilities in one or more local transmission plans, then* ***the transmission facilities associated with that more efficient or cost-effective transmission solution can be selected in the regional transmission plan for purposes of cost allocation.***[7]

**Q: Did FERC also use the term "Non-Transmission Alternative" (NTA) in its transmission planning orders, and what is your understanding of the meaning and use of that term?**

A: Yes, FERC referenced the term "Non-Transmission Alternative" in both Orders 890 and Order 1000. In the Introduction to Order 890, the FERC stated:

> *Transmission planning is a critical function under the pro forma OATT because it is* ***the means by which customers consider and access new sources of energy and have an opportunity to explore the feasibility of non-transmission alternatives****. Despite this, the existing pro forma OATT provides limited guidance regarding how transmission customers are treated in the planning process and provides them very little information on how transmission plans*

[7] *Preventing Undue Discrimination and Preference in Transmission Service***,** FERC Order 890, P 148 (2007). Emphasis added.

*are developed.* ***These deficiencies are serious, given the substantial need for new infrastructure in this Nation.***[8]

**Q: Did FERC link the term Advanced Transmission Technology with how a Non-Transmission Alternative becomes a transmission asset as an Alternative Transmission Solution and thus eligible for cost recovery?**

A: Yes. In referring to the ***"…need for new infrastructure…"*** in the above Introduction, FERC then sites the Advanced Transmission Technologies text in a section of the 2005 Energy Policy Act. This section taken together with paragraphs 436 and 437 of FERC Order 890, quoted above, makes it clear that a Non-Transmission Alternative does not become a FERC jurisdictional Alternative Transmission Solution until it meets the two criteria stated above: (1) It is classified as an Advanced Transmission Technology, and (2) It has been assessed in the planning process to be capable of providing transmission services. Then, it can be considered for regional rate base cost recovery.[9]

FERC brought home this point in Order 1000 in discussing Non-Transmission Alternatives and the mechanism for cost recovery for such alternatives in the Order, stating:

> *As we make clear above in the section on Regional Transmission Planning, we are maintaining the approach taken in Order No. 890 and will require that generation, demand resources, and transmission be treated comparably in the regional transmission planning process. However,* ***while the consideration of non-transmission alternatives to transmission facilities may affect whether certain transmission facilities are in a regional transmission plan, we conclude that the issue of cost recovery for non- transmission alternatives is beyond the scope of the transmission cost allocation reforms we are adopting here, which are limited to allocating the costs of new transmission facilities****.*[10]

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[8] *Preventing Undue Discrimination and Preference in Transmission Service***,** FERC Order 890, P 3 (2007). Emphasis added.

[9] There may be other non-discriminatory criteria established by the regional planning authority and approved by FERC to qualify for regional cost recovery.

[10] *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, 136 FERC ¶ 61,051 at P 779 (2011). Emphasis added.

**Q: Did FERC then specify under what circumstances a Non-Transmission Alternative that meets the criteria of an Alternative Transmission Solution will be eligible for cost recovery?**

A: Yes. FERC indicated in a footnote to the above-quoted paragraph how Non-Transmission Alternatives could become eligible for rate base cost recovery as a transmission asset:

> *As we stated in the Proposed Rule,* ***the Commission has recognized that, in appropriate circumstances, alternative technologies may be eligible for treatment as transmission for ratemaking purposes****. See Proposed Rule, FERC Stats. & Regs. ¶ 32,660 at n.58 (citing Western Grid Development, LLC, 130 FERC ¶ 61,056 (2010)).*[11]

The "appropriate circumstances" cited by the FERC are those explained above. The ATS must be an ATT (as in the case of *Western Grid Development*- battery storage) and be found by the regional planning authority (CAISO in *Western Grid's* case) to be capable of providing the transmission services needed to meet the identified regional transmission problem. FERC stated in *Western Grid* that for the ATT asset to be considered transmission infrastructure for the purposes of rate base FERC jurisdictional cost recovery, the ATT asset should "mimic" the transmission services necessary to solve the transmission need posed.[12]

**Q: What are the implications of these FERC determinations regarding ATS and NTA for this case?**

A: The most significant is that Applicants approached their analysis of their constricted NTA option in a manner that will potentially deny and deprive Wisconsin ratepayers of the opportunities for regional cost recovery through rate base treatment of that option at the FERC jurisdictional level.

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[11] Ibid, Fn 563. Emphasis added.

[12] *Western Grid Development, LLC,* 130 F.E.R.C. ¶ 61,056 at P 43 (2010.)

**Q: Overall, how did Applicants conduct their NTA analysis?**

A: In his deposition, excerpts included in Ex.-DALC-WWF-Wellinghoff-5, Applicant witness Thomas Dagenais describes the general process that he and his colleague, Erik Winsand, used to develop the NTA portfolio for this case:

> *For the non-transmission alternative we looked at the cost of the proposed project to Wisconsin rate payers, and we assumed that that same amount of dollars would be spent on non-transmission alternative developments.*
> *So as I discussed earlier, we had approximately $90 million in 2023 dollars to spend, and we attempted to maximize the benefits of the non-transmission alternative while hitting the four different types of non-transmission components that we included.*[13]

**Q: Is this approach legally defensible under the requirements of FERC Orders 890 and 1000?**

A: No. FERC requires comparability when analyzing separate transmission options. The requirement is stated repeatedly in FERC Orders 890 and 1000.

**Q: How and why was the Applicants' approach not consistent with comparability?**

A: Applicants started with a $90 million limit and worked from there. The Cardinal-Hickory Creek transmission line was not planned that way, so neither should comparable options such as the NTA option. Instead, the PSCW should require the Applicants to consider the NTA option on a comparable basis to other options including the CHC transmission line project as required by FERC Orders 890 and 1000.

**Q: What does this mean as to how NTA options should be approached?**

A: That means that NTA options should first be designed to meet the transmission needs identified in the planning process in the most cost effective manner possible and then their total costs and capabilities should

[13] Ex.-DALC-ATC-Wellinghoff-5, page 3 of 4.

be compared to all other options. There should not be such an upfront cost limit placed on the NTA options design. ATT resources should instead be cost effectively chosen and aggregated as necessary in order to best mimic the transmission services required to meet the desired transmission solution. In order to comply with Wisconsin law, Applicants should select ATT resources that optimize the portfolio for the most cost effective high priority energy resources available. Applicants clearly did not do that. They started with a basket of suboptimal resources, they also started with a cost limiting resource assumption that they should not have used.

**Q: So does Applicant's analysis of its NTA option fail to meet FERC's criteria for cost recovery?**

A: Yes. Applicants fail to meet the FERC criteria. First, they failed to test each of their NTA technologies against the criteria for ATT in the 2005 EPAct. They did not determine if the resource set that they chose would "…increase the capacity, efficiency, or reliability of an existing or new transmission facility…". Second, they entirely failed to design their NTA solution in a manner that would "mimic" the transmission services of the Cardinal-Hickory Creek line as required by the *Western Grid* order cited by FERC.[14] In performing their analysis in a less than rigorous and proper manner by ignoring these two critical requirements, the Applicants' NTA solution cannot be considered an ATS by FERC. Therefore, this constricted approach by the Applicants limits consideration for regional cost recovery.

**Q: If a properly conducted NTA analysis had determined that the components of the NTA were ATTs and those technologies provided transmission services making the NTA an ATS, could the full cost of the ATS then be considered by FERC for rate base cost recovery?**

[14] *Western Grid Development, LLC*, 130 F.E.R.C. ¶ 61,056 at P 43 (2010.)

A: Yes. The *Western Grid* case makes that clear, and FERC reiterated that point in Order 1000 as set forth above.

**Q: Did MISO evaluate an NTA option as an ATS for the proposed Cardinal-Hickory Creek transmission line as part of the MVP portfolio analysis?**

A: No. A review of MTEP 2011 indicates that MISO apparently did not consider an NTA as an ATS in the MVP planning process.[15]

**Q: If MISO did not fully and comparably evaluate an NTA option against the CHC line as an ATS for this MVP Project, why should Applicants be required now to do so in this proceeding?**

A: Because they are required to do so by Wisconsin law. As stated above, Applicants must provide sufficient evidence of record for this Commission to conclude that the proposed CHC transmission line is the highest priority energy option that is cost effective and technically feasible.

**Q: Did the Applicants do that?**

A: No, they did not. Instead of solving for the transmission problems and needs by optimizing a set of high priority technologies, which could comply with both Wisconsin and federal transmission planning law and regulations, they chose a seemingly random set of technologies and applied a constricted dollar cap to the total package to comprise their limited NTA. Ex.-DALC-WWF-Wellinghoff-2 sets out the technology categories, the proposed investment in 2018 and 2023 dollars, and the maximum peak megawatts saved for the Applicants' NTA technologies. These numbers are taken directly from the Applicants' work papers. From these numbers I calculated the dollars per kilowatt (kW) for each kilowatt

[15] This seems to be further confirmed from a review of the Direct Filed Testimony of MISO Witness Rauch in PSCW Docket 5-CE-142 in the Badger-Coulee proceeding where she indicated for that project that MISO only considered traditional transmission alternatives. Direct-MISO-Rauch-1, PSCW Docket 5-CE-142, September 15, 2014, p. 29, l. 3-11, DALC-ATC-00002492.

of maximum peak saved from the 2023 dollars invested (column 3/column 4/1000).

**Q: What observations do you have from the numbers that you calculated?**

A: It appears that Applicants propose to spend an average of $1,400/kW for each kW of maximum peak load saved in 2023 dollars. Ex.-DALC-WWF-Wellinghoff-2. This ranges from a high of $3,265/kW for the proposed residential solar component of the NTA package to $645/kW for the demand response component. From my knowledge, experience and understanding of potential NTA technologies that could be classified as Advanced Transmission Technologies and thus qualify for FERC rate recovery, the costs of the Applicants' NTA energy options are 4 to 10 times higher than would be expected if one selected an optimized bundle of Advanced Transmission Technologies to provide a comprehensive transmission services solution for Southwestern Wisconsin. Applicants appear to have chosen NTA energy options that are clearly not the most cost effective available as required by statute.

**Q: Did the Applicants optimize the NTA technology bundle?**

A: No, the Applicants did not. First, they improperly capped the total expenditures for the NTA bundle at $92.5 million and should have considered the full cost of the CHC transmission line project as an upper boundary.

Moreover, the PSCW Staff now states in the Draft Environmental Impact Statement:

> After considering all of the costs (including the capital cost, project financing, and operation and maintenance) that would be associated with the proposed project, the projected MVP allocated present value (discounted to year 2018) cost to the MISO footprint of the proposed Cardinal-Hickory Creek project is $629.2 million. By contrast, the "Applicants' estimate that the capital cost of the

proposed Cardinal-Hickory Creek project would be between $492 million and $543 million in year-of-occurrence dollars."[16]

Second, the Applicants also made numerous errors and improper assumptions in technology choices and the costs of technologies. Those errors resulted in the Applicants producing a suboptimum bundle of technologies.

**Q: Please explain those errors?**

A: The Applicants first error is that they did not review or consider some of the most cost effective transmission specific technology available. There currently exist commercially proven, technically feasible and cost effective power line technologies that the Applicants appear to have completely ignored.

**Q: What are some of these technologies and how do they fit into the FERC/Congressional definitions of ATT?**

A: They are all included in the EPAct 2005, Section 1223 definitions of Advanced Transmission Technology. They all increase the capacity and/or efficiency of existing transmission facilities and improve system reliability, and they are specifically called out in Section 1223. They include: "…(14) enhanced power device monitoring…" and "…(17) power electronics and related software…".[17]

**Q: What can these technologies do, and how do they work?**

A: There are two types of technologies that are currently in use which meet the above ATT definitions. Both of these technologies are used in conjunction with existing transmission lines such as the 161 kV lines found in Southwest Wisconsin. When used with those lines, these technologies can improve reliability, reduce congestion and increase flows at peak periods. These are all transmission services of the type that the CHC transmission line is intended to provide. For example, one technology is an enhanced power line monitoring device that places sensors

[16] Staff Draft Environmental Impact Statement, p.77. PSC REF#: 360500
[17] Pub. L. 109–58, title XII, § 1223, Aug. 8, 2005, 119 Stat. 953.

adjacent to the line taking measurements of line flow, ambient temperature and wind speeds. From these readings the grid operator can determine the appropriate line rating in real-time and potentially increase flows as appropriate. Using machine learning algorithms, the technology can then reliably increase the capacity on congested lines with forecasted line ratings and real-time dynamic line ratings (DLR).

The second technology is a power electronics package that can provide in essence an intelligent "valve" for transmission lines by dynamically increasing or decreasing line reactance.[18] By increasing or decreasing flows on the transmission line in real time in the flow gate, the grid operator can direct flows as needs, improving reliability and increasing throughput of the system. Minnesota is now successfully using this technology in its transmission system to improve system efficiency.[19]

**Q: How cost effective are these technologies?**

A: In general, they are certainly less expensive than the least expensive technology that Applicants examined, demand response at $645/kW. In certain use cases, these technologies could be as inexpensive as $100/kW.

**Q: Should the Applicant have reviewed more use cases for the CHC transmission line with such technologies?**

A: Yes. Ignoring these clearly cost effective and technically feasible technologies is, in part, evidence that Applicants failed to attempt to optimize an NTA solution and thus failed to meet their burden in this case.

[18] Reactance is the non-resistive component of impedance in an AC circuit. It can also be thought of as the opposition of a circuit element to a change in current or voltage due to that element's inductance or capacitance.

[19] Available at: https://www.duluthnewstribune.com/business/4124502-minnesota-power-partners-smart-wires

**Q: What other concerns do you have with the Applicants' analysis of the NTA option?**

A: A second error is apparent from reviewing their estimates for both utility scale solar and residential solar technologies. As shown in Ex.-DALC-WWF-Wellinghoff-4, readily available public source data demonstrates that their cost estimates for both of these technologies are much higher than is reasonable. Moreover, they apparently failed to consider in their NTA analysis over 300 MW of utility scale solar that is approved to be built in Montfort, Wisconsin close to the proposed CHC transmission line location, as well as an additional 50 MW of utility scale solar that is approved to be built in neighboring Richland County, Wisconsin. DALC-WWF witness Kerinia Cusick discusses in more detail the Applicants' failures in the area of solar technology.

**Q: Do you have comments on other components of Applicants' NTA option package?**

A: Yes, let me turn to a third set of errors. I have comments on both the demand response program and the energy efficiency program. First, with respect to demand response, it appears from the deposition of Applicant witness Dagenais that neither he nor his colleague, Mr. Winsand, fully considered the multiple types of demand response potentially available to provide transmission services. I conclude this from the explanation that Mr. Dagenais gave in his deposition on how he approached the NTA demand response component. He stated in his deposition at pages 47 and 48:

> *The most effective summer peak reducer is demand response where you're simple[y] having large industrial loads shut down during high usage times and they're compensated through that – to do that through more favorable rates.*
> *Looking at the load projections for the study area and evaluating where we knew industrial loads were located, we came up with – I did jot down some notes if I can refer to them. 31.5 megawatts of demand response, which we thought was a reasonable amount to*

*assume based on the loads in the area, and then based on MISO's MTEP 18 futures workshop…they had published a dollar per kilowatt cost of the initial implementation of demand response. And we put $20 million on the $90 million towards demand response to get us the 31.5 megawatt peak savings, which is the most bang for our buck, but we didn't feel it was appropriate to go larger than that because we didn't feel based on other studies we have reviewed that it was feasible to ask industrial customers to have a larger share of demand response than that.*[20]

**Q: What did Applicants overlook in this approach?**

A: They appear to have focused entirely on demand response resources from industrial customers. Applicants seem to have entirely ignored the commercial and residential customer class as sources of achieving demand response.

**Q: Is it technically feasible and cost effective to derive demand response resources from the commercial and residential customer classes?**

A: Yes, it is technically feasible and cost effective to derive demand response resources from residential and commercial customer classes. The most recent FERC staff report on demand response indicates that in 2016, nationwide, there is a potential for over 10,000 MW of residential demand response, and over 11,000 MW of commercial sector demand response.[21] By overlooking these two large sectors, the Applicants excluded a significant transmission services resource in this case.

**Q: Do you also have concerns regarding the price that Applicants used for demand response?**

A: Yes, and that is a fourth error. The aggregation of demand response resources can be done by third-party aggregators or by load-serving entities. As such, the provision of demand response services can be very competitive. Certain resource assets like residential controllable thermostats may already be in place and paid

[20] Ex.-DALC-WWF-Wellinghoff-5, p. 1-2 of 4.
[21] Available at: https://www.ferc.gov/legal/staff-reports/2018/DR-AM-Report2018.pdf

for by the customer. The cost to activate those resources and provide a demand response resource to reduce transmission congestion or assure reliability at peak times can be extremely low depending on the customers' perceived cost to participate. For example, Portland General is offering residential customer $1/kWh for peak demand reductions.[22] This is considerably less than the Applicants proposed cost of $645/kW.

**Q: What concerns do you have regarding the Applicants energy efficiency NTA option?**

A: It appears that Applicants spent their entire energy efficiency budget on LED light bulbs. That is a fifth error. Mr. Dagenais states in his deposition:

> *Q: So in your cost analysis, is it true that you assumed the entire cost of the EE measures would be charged against the NTA budget? I can rephrase that if it would be helpful.*
> *A: Yes, please.*
> *Q: How much did you assume your energy efficiency measures would cost?*
> *A: $2.4million in 2023 dollars.*
> *Q: And did you assume those costs reflected the entire cost of the energy efficiency measure or only part of the cost of that measure?*
> *A: The $2.4 million in 2023 dollars was implemented to achieve 2.6 megawatts of max peak savings in terms of energy efficiency, so, yes, the entire cost of the 2.6 megawatt max peak savings came from the pool of dollars available to the NTA.*
> *Q: And you used—you modeled those measures as LED light bulbs?*
> *A: Correct.*[23]

**Q: Why is that a concern?**

A: There are several significant problems with this approach. First, for LED light bulbs to be cost effective energy efficiency measures, they need to replace higher wattage incandescent and halogen bulbs. Under current United States Department of Energy regulations, however, most of the higher wattage incandescent and

[22] Available at: https://www.utilitydive.com/news/portland-general-pilot-proposes-reward-to-customers-for-reducing-energy-use/546095/
[23] Ex.-DALC-WWF-Wellinghoff-5, p. 4 of 4.

halogen bulbs that Applicants' LED bulbs are intended to replace will no longer be manufactured or available to consumers after 2020.[24] Second, LED lighting is not the most cost effective measure that Applicants could have selected for providing maximum peak savings.

**Q: Why do you believe that LED bulbs are not the most cost effective high priority energy resource that Applicants could have selected for the energy efficiency portion of their NTA option?**

A: On Ex.-DALC-WWF-Wellinghoff-3, I have reproduced pages from the Wisconsin Focus on Energy Evaluation Report, Volume I, for calendar year 2016. That report sets forth data for the incentive dollars spent for all Wisconsin energy efficiency programs and the verified kilowatts saved for each program. This data indicates the residential LED program spent approximately $8.3 million and achieved kW savings of 15,639 kW for a cost of $533/kW.[25] However, the residential HVAC controls program spent $508,726 and achieved kW savings of 3,642 kW for a cost of $140/kW. Further, in the commercial sector, the commercial rooftop unit/split system AC program spent $420,400 and achieved kW savings of 1,095 kW for a cost of $384/kW. And the commercial variable speed drive program spent $1.3 million and achieved kW savings of 5,771 kW for a cost of $234/kW. Apparently Applicants failed to select the most cost effective high priority energy efficiency resources for their limited NTA option analysis.

**Q: What conclusions do you reach from your analysis of the demand response and energy efficiency programs that the Applicants included in their NTA option analysis?**

[24] Available at: https://www.epa.gov/cfl/how-energy-independence-and-security-act-2007-affects-light-bulbs

[25] It is interesting to note that even this figure is considerably lower than the $800/kW number of Applicants for energy efficiency programs shown on Ex.-DALC-WWF-Wellinghoff-2.

A: I conclude that Applicants failed to consider and incorporate into that analysis demand response and/or energy efficiency resources that were very cost effective and available. The Applicants' failure to do so is a critical flaw in their NTA option analysis.

**Q: Please summarize your review of the Applicants' NTA option?**

A: From my review, I have concluded that the NTA option presented by Applicants in this proceeding does not optimize an aggregation of the highest priority energy resources to meet the transmission service needs. By failing to do so, Applicants have not set forth a comparable Alternative Transmission Solution composed of Advanced Transmission Technologies as defined by FERC, which could then be reviewed against the CHC transmission line project and considered for cost recovery.

**Q: Based on your review, what do you recommend that the Public Service Commission of Wisconsin do in this proceeding?**

A: There is not sufficient evidence of record for this Commission to definitively conclude that the Cardinal-Hickory Creek transmission line project is the highest priority energy option that is also cost effective and technically feasible as required by Wisconsin law. In order to determine the highest priority energy option that is cost effective and technically feasible, this Commission should direct the Applicants to develop technically feasible least cost Alternative Transmission Solutions that are properly and fully formulated and optimized. Once the Alternative Transmission Solutions are formulated, their total estimated costs should be compared to the updated total projected costs of the CHC transmission line project rather than simply the allocated Wisconsin share in order to achieve a true apples-to-apples comparison of cost effectiveness of alternative project options.

Upon completing this analysis, Applicants should submit the analysis to the Commission for a determination of which alternative is the highest priority energy option to be selected for Wisconsin, and other parties should be allowed a full and fair opportunity to respond.

**Q: Do you believe that the Commission should adopt this "no regrets" approach?**

A: Yes, I do. The Commission should adopt this "no regrets" approach. Approving this Application now without having a proper comparable analysis of the alternatives would potentially result in adopting a suboptimal alternative. Such action by this Commission may fail to deliver for Wisconsin the benefits that an optimal portfolio of cost effective high priority resources could deliver to the state. Furthermore, as I understand from the testimony of DALC-WWF witness Rao Konidena, there is no near term reliability need that would require proceeding with the proposed CHC transmission line project now without conducting the full and fair ATS analysis that I have explained in my testimony.

**Q: Does this conclude your testimony?**

A: Yes, it does.