Comments to Duke Energy Indiana Regarding Energy Efficiency in DEI's 2021 Integrated Resource Plan

Indiana Advanced Energy Economy

AEE is a national trade association dedicated to making the global energy system more secure, clean, reliable and affordable. AEE represents more than 100 companies and organizations that span the advanced energy industry and its value chains. Technologies represented include electric storage, energy efficiency, demand response, solar photovoltaics, solar thermal electric, ground-source heat pumps, wind, biofuels, electric vehicles, advanced metering infrastructure, transmission and distribution efficiency, fuel cells, advanced nuclear power, combined heat and power and enabling software. Used together, these technologies and services will create and maintain a higher performing energy system – one that is reliable, resilient, diverse, cost effective, and clean – while also improving the availability and quality of customer-facing services. AEE's membership also includes large users of electricity with corporate goals for ensuring that the energy they use is both clean and affordable. AEE has been operating in the State of Indiana as Indiana Advanced Energy Economy since 2016.

Executive Summary

Analysis of 2019 EIA Form 861 data shows no indication of increasing cost per unit energy savings (diminishing returns) for utilities pursuing savings at least into the range of 3% reporting year incremental savings per annual sales, for either residential or commercial sales. We therefore recommend that DEI include in its IRP annual energy efficiency programming of at least 2% reporting year incremental savings per annual sales and examine the potential for additional savings beyond that.

Introduction

We comment on the level of energy efficiency programming that should be considered in Duke Energy Indiana's ("DEI's") 2021 IRP to adequately consider energy efficiency as a resource and in consequence present a plan that is cost-effective and reduces greenhouse gas emissions. Since the cost-effectiveness of energy efficiency and demand response are well documented[1], a true least-cost integrated resource plan would most certainly include substantial energy efficiency programming.

DEI's approach so far to considering energy efficiency in their 2021 IRP follows the common practice of basing expected savings from energy efficiency on a potential study. As with most energy efficiency potential studies, the flow of the analysis is to develop a profile of sales by customer class and decompose those sales to end-uses, then to identify a list of potential energy efficiency measures that could be adopted by customers (with DEI's help) to reduce energy use and to evaluate the technical potential, economic potential, and achievable potential from each measure. Potential savings by measure are then aggregated to customer classes and the overall system. Achievable potential may be

[1] See, for example, Goldman et al. 2020. The Cost of Saving Electricity: A Multi-program Cost Curve for Programs Funded by U.S. Utility Customers, available from https://emp.lbl.gov/publications/cost-saving-electricity-multi-program.

presented at multiple levels of investment and these can be considered as options for adoption in the integrated resource plan.

Although we respect the analysis that is included in energy efficiency potential studies and have closely studied many of them, we find that they are fraught with uncertainties that are usually addressed by making "conservative" assumptions. This is particularly true with respect to achievable potential. Achievable potential addresses expected customer uptake of utility program offers. The adoption curves that are commonly used in assessing achievable potential often have weak empirical foundations or are based on surveys or other methods that do not appear to produce reliable results.

We show below that if DEI performs energy efficiency programs at costs comparable to all other investor-owned utilities, energy efficiency is a less costly resource than any new generation option. We also show that even reasonably aggressive energy efficiency programs, as measured by savings as a percentage of sales, do not appear to have increasing costs per unit of savings. We also show that DEI programs have achieved, and will achieve, energy savings below those of many investor-owned utilities in the United States. Thus, we strongly urge DEI to develop an integrated resource plan that includes significant energy efficiency programming.

DEI's Recent Energy Efficiency Programs

The US Energy Information Administration ("EIA") requires each investor-owned electric utility and most other electric utilities to annually file considerable information about the utility's operations in each state in which they operate, using Form 861. This reporting has included Energy Efficiency data since 2013. EIA compiles those data and publishes these annual compilations via the EIA website.[2] For purposes of this comment, we examined the data submitted to EIA by DEI and by other utilities to summarize and compare DEI's energy efficiency programs to those of other, comparable utilities.

Attachment 1 provides the instructions from EIA to utilities completing the energy efficiency portion of Form 861. In these Form 861 data, EIA requires that a utility submit Reporting Year Energy Savings and Peak Demand Reduction on an annualized Reporting Year basis and Life Cycle Energy Savings and Peak Demand Reduction. In the industry, Reporting Year savings are often referred to as first-year savings and means the annualized savings in the first year that an energy efficiency measure is installed. Life Cycle savings are the sum of annual savings throughout the life of the measure. It is common to discuss energy efficiency program levels as first-year savings as a percentage of sales. Peak Demand Reduction is the reduction in electricity demand at the time of the utility's peak demand and generally is the same in both the Reporting Year and Life Cycle reports. EIA further requires that energy efficiency program costs be provided as Reporting Year and Life Cycle costs; when a utility expenses all energy efficiency program expenditures, these will generally be the same. For our analyses, we focus on first-year savings as a percentage of sales as the primary gauge of program accomplishment and on life-cycle costs as the measure of costs. We characterize Life-Cycle Energy Savings and Peak Demand Reduction as functions of Reporting Year Energy Savings as a percentage of sales.

All Form 861 reporting is Incremental Savings, meaning that the report for 2019 includes the savings attributable to program activities in 2019 and not savings in 2019 from accumulated effects of programs prior to 2019.

[2] See https://www.eia.gov/electricity/data/eia861/

For context, DEI's 2019 sales as reported in Form 861 were 9,246,649 MWH to residential customers, 8,263,162 MWH to commercial customers, and 10,327,072 MWH to industrial customers.

DEI reported residential energy efficiency programs from 2013 through 2019 as follows:

Exhibit 1. DEI Residential Energy Efficiency Programs as Summarized in EIA Form 861

Year	Incremental Reporting Year Energy Savings (MWH)	Incremental Life Cycle Energy Savings (MWH)	Incremental Peak Demand Savings (MW)	Incremental Life Cycle Costs - All Costs ($1000)	Incremental Reporting Year Energy Savings (% Sales)	Incremental Life Cycle Costs - All Costs ($/kWh Sales)	Incremental Life Cycle Costs ($/Reporting Year kWh Savings)
2019	122,661	905,994	12	14,899	1.33%	$ 0.0016	$ 0.121
2018	127,794	823,455	13	12,967	1.34%	$ 0.0014	$ 0.101
2017	125,832	752,789	23	13,648	1.46%	$ 0.0016	$ 0.108
2016	115,682	945,878	21	11,562	1.28%	$ 0.0013	$ 0.100
2015	78,148	348,997	12	8,918	0.88%	$ 0.0010	$ 0.114

DEI reported commercial energy efficiency programs from 2013 through 2016 as follows:

Exhibit 2. DEI Commercial Energy Efficiency Programs as Summarized in EIA Form 861

Year	Incremental Reporting Year Energy Savings (MWH)	Incremental Life Cycle Energy Savings (MWH)	Incremental Peak Demand Savings (MW)	Incremental Life Cycle Costs - All Costs ($1000)	Incremental Reporting Year Energy Savings (% Sales)	Incremental Life Cycle Costs - All Costs ($/kWh Sales)	Incremental Life Cycle Costs ($/Reporting Year kWh Savings)
2019	79,389	992,646	16	14,154	0.96%	$ 0.0017	$ 0.178
2018	101,678	949,164	17	16,021	1.20%	$ 0.0019	$ 0.158
2017	131,655	1,625,929	23	24,198	1.60%	$ 0.0029	$ 0.184
2016	103,291	1,047,740	16	16,873	1.22%	$ 0.0020	$ 0.163
2015	47,758	597,665	7	7,188	0.57%	$ 0.0009	$ 0.151

In these exhibits, Incremental Reporting Year Energy Savings (% Sales) is the appropriate metric to compare DEI's level of program effort to that of other utilities. In 2019, DEI's residential energy efficiency program achieved 1.33% reporting year savings as a percentage of residential sales. This was 35th out of 88 reporting investor-owned utilities (40th percentile). In 2019, DEI's commercial program achieved 0.96% reporting year savings as a percentage of commercial sales. This was 49th out of 89 reporting investor-owned utilities (55th percentile).

In these exhibits, Incremental Life Cycle Costs – All Costs ($/kWh Sales) characterizes the level of sales surcharge needed to fund the program. Comparisons between utilities on costs should be related to levels of savings, which we examine later in these comments.

In these exhibits, Incremental Life Cycle Costs ($/kWh Life Cycle Savings) is the appropriate metric to roughly compare the costs of energy efficiency to the costs of power supply, though in an IRP, time discounting and the distinct avoided costs of capacity and energy should be used.

Comparison of DEI's Energy Efficiency Programs to High Performance Utilities

To establish context for considering DEI's existing and proposed energy efficiency programs, we present below an exhibit of the investor-owned utilities that had the highest levels of Reporting Year Savings as

a percentage of Sales for residential and commercial customers, respectively, developed from EIA's Form 861 data.

The most robust residential energy efficiency programs by investor-owned utilities are:

Exhibit 3. Investor-owned Electric Utilities with Highest Reporting Year Incremental Annual Residential Energy Savings in 2019 as % of Residential Electricity Sales

Rank	Utility	State	Reporting Year Incremental Annual Savings (% of Sales)	Incremental Life Cycle Costs ($/kWh Life Cycle Savings)
1	Massachusetts Electric Co	MA	6.65%	$ 0.068
2	The Narragansett Electric Co	RI	6.17%	$ 0.056
3	NSTAR Electric Company	MA	4.75%	$ 0.090
4	Otter Tail Power Co	MN	3.91%	$ 0.011
5	Commonwealth Edison Co	IL	3.77%	$ 0.016
6	Public Service Co of Colorado	CO	2.55%	$ 0.016
7	Pacific Gas & Electric Co.	CA	2.52%	$ 0.028
8	The Potomac Edison Company	MD	2.40%	$ 0.027
9	Baltimore Gas & Electric Co	MD	2.32%	$ 0.032
10	Pennsylvania Electric Co	PA	2.22%	$ 0.021
11	Tucson Electric Power Co	AZ	2.16%	$ 0.007
12	Southwestern Public Service Co	NM	2.15%	$ 0.019
13	DTE Electric Company	MI	2.07%	$ 0.023
14	MidAmerican Energy Co	IL	1.98%	$ 0.025
15	Southern Indiana Gas & Elec Co	IN	1.92%	$ 0.016
16	Metropolitan Edison Co	PA	1.87%	$ 0.024
17	El Paso Electric Co	NM	1.86%	$ 0.019
18	Pennsylvania Power Co	PA	1.84%	$ 0.019
19	Northern Indiana Pub Serv Co	IN	1.78%	$ 0.017
20	UNS Electric, Inc	AZ	1.75%	$ 0.006
21	Potomac Electric Power Co	MD	1.71%	$ 0.060
22	San Diego Gas & Electric Co	CA	1.65%	$ 0.020
23	Indianapolis Power & Light Co	IN	1.65%	$ 0.024
24	Cleveland Electric Illum Co	OH	1.61%	$ 0.014
25	Niagara Mohawk Power Corp.	NY	1.59%	$ 0.029
…	…			
35	Duke Energy Indiana	IN	1.33%	$ 0.016

The most robust commercial energy efficiency programs by investor-owned utilities are:

Exhibit 4. Investor-owned Electric Utilities with Highest Reporting Year Incremental Annual Commercial Energy Savings in 2019 as % of Commercial Electricity Sales

Rank	Utility	State	Reporting Year Incremental Annual Savings (% of Sales)	Incremental Life Cycle Costs ($/kWh Life Cycle Savings)
1	Indianapolis Power & Light Co	IN	5.96%	$ 0.009
2	ALLETE, Inc.	MN	3.74%	$ 0.009
3	Commonwealth Edison Co	IL	3.44%	$ 0.015
4	Massachusetts Electric Co	MA	2.69%	$ 0.021
5	NSTAR Electric Company	MA	2.36%	$ 0.034
6	Indiana Michigan Power Co	MI	2.33%	$ 0.010
7	Public Service Co of Colorado	CO	2.32%	$ 0.009
8	Public Service Co of NH	NH	2.29%	$ 0.019
9	Unitil Energy Systems	NH	2.28%	$ 0.046
10	Oklahoma Gas & Electric Co	AR	2.12%	$ 0.015
11	Nevada Power Co	NV	2.08%	$ 0.008
12	DTE Electric Company	MI	2.03%	$ 0.014
13	Indiana Michigan Power Co	IN	2.00%	$ 0.006
14	Consumers Energy Co	MI	2.00%	$ 0.017
15	Potomac Electric Power Co	MD	1.97%	$ 0.022
16	Northern States Power Co	MI	1.96%	$ 0.010
17	Pennsylvania Electric Co	PA	1.96%	$ 0.004
18	The Narragansett Electric Co	RI	1.96%	$ 0.035
19	Pennsylvania Power Co	PA	1.88%	$ 0.005
20	San Diego Gas & Electric Co	CA	1.87%	$ 0.027
21	Pacific Gas & Electric Co.	CA	1.86%	$ 0.017
22	Connecticut Light & Power Co	CT	1.83%	$ 0.033
23	Northern Indiana Pub Serv Co	IN	1.82%	$ 0.009
24	Entergy Arkansas LLC	AR	1.74%	$ 0.011
25	Idaho Power Co	ID	1.72%	$ 0.000
…	…			
49	Duke Energy Indiana	IN	0.96%	$ 0.014

The two preceding exhibits demonstrate that many investor-owned utilities are able to achieve Reporting Year residential and commercial energy efficiency savings at a pace that is materially larger than was achieved by DEI in 2019 at costs that are less than the locational marginal price of power in MISO. Put simply, DEI lags many peer utilities when it comes to residential and commercial customer efficiency programs. Many utilities, including DEI, can avoid generating power through energy efficiency programs at significantly less than the marginal cost of power.

Energy Efficiency as a Resource for DEI's 2021 IRP

In order to consider energy efficiency as a resource in DEI's 2021 IRP, it is necessary to identify the amounts and costs of this resource that could be made available for selection. Ideally, DEI will give the identification and characterization of energy efficiency resources the same level of attention as they give to generation resources. As an anchor to that analysis, we examined potential energy efficiency resources using EIA Form 861 data from all investor-owned utilities under the hypothesis that DEI could produce energy efficiency for costs equivalent to the average investor-owned utility.

In order to assess what it would cost for DEI to achieve levels of energy efficiency programming distinctly different than those they currently attain, we used Form 861 data about energy efficiency programs by customer class from all of the reporting investor-owned utilities. As shown in Attachment 2, we found statistical relationships for each customer class between levels of energy efficiency programs as measured by Reporting Year Incremental Savings and Annual Life Cycle Incremental Cost, as well as of Peak Demand Savings and of Life Cycle Savings in relation to Reporting year Energy Savings. Those statistical relationships constitute an empirical energy efficiency supply curve appropriate for use in an IRP.

In an IRP, a primary driver of the need for new resources is the ability of the utility to meet peak demand each year with reasonable reliability. Peak demand plus a reserve margin determines the aggregate generating capacity required by the utility, with energy use throughout the year determining the types of generating capacity that are most cost-effective. Thus, peak demand reduction is an important benefit of energy efficiency in an IRP.

Energy efficiency generally reduces electricity demand throughout the year, including at the time of peak demand. Many efficiency measures provide savings proportional to demand, so have a proportionate benefit at the time of the peak. Still other measures (such as high-efficiency air conditioning) are focused on the time of peak demand and thus have a disproportionate benefit at the time of the peak. Because we have characterized peak demand reduction statistically based on the mix of energy efficiency measures commonly used across the industry, our projection of demand reduction in relationship to the level of overall energy efficiency programming is reasonable for DEI. Based our regression results, saving an average of one MWH per hour over the course of a year through residential energy efficiency reduces peak demand by about 2.34 MW while commercial energy efficiency reduces peak demand by about 1.26 MW by saving an average of one MWH per hour. Viewed as capacity factors per MW peak demand reduction, residential energy efficiency operates with a capacity factor of 43% while commercial energy efficiency operates with a capacity factor of 79%. Based on our regression results, these can be obtained with costs equal to $17.17 per kW-yr of residential demand reduction and $67.15 per kW-yr of commercial demand reduction. Net cost of these demand reductions will be the energy efficiency program cost per life-cycle MWh of energy saved less the locational marginal price per life-cycle MWh of energy saved, which is likely to be a negative value.

By executing more robust energy efficiency programs at costs comparable to peer utilities that have such programs, DEI could avoid generation costs far exceeding the costs of the energy efficiency programs.

Our analysis of 2019 EIA Form 861 data shows no indication of increasing cost per unit energy savings (diminishing returns) for utilities pursuing savings at least into the range of 3% reporting year

incremental savings per annual sales, for either residential or commercial sales. We therefore recommend that DEI include in its IRP annual energy efficiency programming of at least 2% reporting year incremental savings per annual sales and examine the potential for additional savings beyond that.