Illinois Power Agency Policy Study

Analysis of Economic Benefits

prepared for

The Illinois Power Agency

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~~IPA 2023 CES Study Input-Output Analysis~~

Introduction

Public Act 103-0580 directs the IPA to conduct a Policy Study to evaluate the impacts of the three policy proposals discussed in this report, which include policies to encourage the construction of the SOO Green High Voltage Direct Current (HVDC) ~~HVDC~~ Transmission Link, the construction of a Lake Michigan Offshore Wind (OSW) project, and the implementation of energy storage systems (ESS) statewide. Specific policy proposal responses that were evaluated included: as directed by P.A. 103-0580, an OSW project that would supply 700,000 RECs annually for 20 years, which the IPA assumed would have a capacity of 200 MW; in accord with SB 1587, ~~to implement a~~the procurement of energy storage credits that would support the cost-effective deployment of at least 7,500 MW of Utility Scale ESS ~~of at least 7,500 MW~~; and a policy requiring the agency to procure RECs related to a new ~~high voltage direct current (HVDC~~ HVDC~~)~~ transmission line, which the IPA understands would be the SOO Green HVDC Transmission Link. The IPA also evaluated the impacts associated with Distributed Storage. Since SB 1587 did not specify a target capacity for Distributed Storage, the IPA assumed that 1,000 MW would be a reasonable capacity to ~~be evaluated~~evaluate. Among the impacts to be evaluated for each policy proposal are the ~~proposals'~~ impacts on employment in Illinois and on the state's economy. The IPA used a general input-output model to evaluate and estimate the employment and economic impacts of each proposal.

An input-output analysis is a type of applied economic analysis that tracks the interdependence among various producing and consuming industries in an economy; it measures the relationship between a given set of demands for final goods and services, and the inputs required to satisfy those demands. For the Policy Study, the IMPLAN model was used to analyze the economic impact of the four policy cases (SOO Green HVDC Transmission Link, Lake Michigan OSW Project, Utility ESS, and Distributed Storage) under consideration.

The IMPLAN modeling system is widely used ~~by~~ in many industries to evaluate the economic impacts of policies and investments. IMPLAN utilizes proprietary analytical software to conduct Input-Output analyse~~i~~s and develop a Social Accounting Matrix, which is a type of applied economic analysis that tracks the interdependence among various producing and consuming industries of an economy and the spending of households. It measures the relationship between a given set of demands for final goods and services and the inputs required to satisfy those demands.[1] The results from the IMPLAN model, as with any analysis of economic impacts that occurs prior to the actual implementation of the policies or investments, are dependent on the estimated values that are used as the inputs to the model. The values for these inputs cannot be known with certainty and ~~will likely~~could change significantly as the projects responding to the policy proposals move through the development, financing, and construction phases ~~of~~

[1] "IMPLAN Report Toolkit," IMPLAN Group LLC; August 30, 2023 (https://support.implan.com/hc/en-us/articles/360044985833-IMPLAN-Report-Toolkit)

~~development~~. The IPA therefore presents the values for the economic and employment impacts of the policy proposals in this report as a guide for policymakers and stakeholders in Illinois.[2]

IMPLAN Inputs

To run IMPLAN, a set of input values covering the capital and operating costs associated with the ~~policies~~ policy being evaluated ~~to be evaluated~~ is required ~~in order~~ for the model to estimate the economic impacts of the policy proposal~~s~~.[3] These input values do not include any spending associated with the policy~~ies~~ that will occur outside the state of Illinois, as the economic benefits from ~~this~~ any out-of-state spending will not be realized ~~occur~~ in Illinois. The input values are generally specified as monetary values and a corresponding IMPLAN industry code (the IMPLAN Sector) that specifies which parts of the economy are initially impacted by the policy. The IMPLAN model then tracks the initial economic impacts through a state or regional economy using its proprietary multipliers to estimate the total effect on the modeled economy resulting from the ~~inputs~~policy. The IMPLAN inputs used for each of the policy cases are discussed below. For each policy case, the inputs cover construction (otherwise known as Capital Expenditure or CapEx) and 20 years of operation (otherwise known as Operating Expense or OpEx). The CapEx inputs typically include items such as the installed cost of capital equipment including wind turbines, batteries, transformers, and other necessary electrical equipment. OpEx costs include operating, maintenance and repair costs.

SOO Green HVDC Transmission Link CapEx

Rather than develop an entirely new range of inputs to estimate the economic impact of the SOO Green HVDC Transmission Link, the Policy Study inputs were based on an existing study performed by Strategic Economic Research, LLC (SER).[4] The SER study was commissioned by ~~the developer of~~ SOO Green to estimate the economic benefits that the construction and operation of the Illinois portion of the HVDC line would bring to Illinois. The objective for this study was to provide decision makers, state agencies and other stakeholders in the state with SOO Green's estimates of the policy's economic benefits.

Since "SER conducted a detailed analysis with the developer, contractors, and suppliers to determine if each cost category would be purchased in the State of Illinois or from elsewhere," it was more efficient to utilize the inputs developed for ~~results of~~ this analysis rather than conducting a new bottom-up analysis to evaluate local spend percentages. The SER report defined the CapEx inputs in consultation with SOO Green. ~~,~~ The use of these ~~which reduces the uncertainty for these~~ the input values for~~used in~~ the Policy Study analysis ~~. The~~ reduced uncertainty associated with the SER-based input values and mitigated the need to present a broader~~for a~~ range of economic impacts ~~to be presented~~.

[2] Additional workpapers and supporting information for the analyses discussed in this report were posted to the IPA website following publication of the Draft Policy Study, and remain unchanged for the final Policy Study. This information ~~and~~ can be accessed at "~~Draft Policy Study~~ Supporting Information," ~~Illinois Power Agency; 2024~~ (https://ipa.illinois.gov/ipa-policy-study/draft-policy-study-supporting-information.html)

[3] The costs modeled in IMPLAN are the proposal's total in-state cost without any subsidies or project revenues subtracted.

[4] "Economic Impact Analysis of the SOO Green HVDC Link Transmission Project on the State of Illinois," Strategic Economic Research, LLC; February 2023

The IMPLAN inputs sourced from the SER study are presented in Table 1~~Table 1~~ below. The source's nominal values were deflated into real 2023 dollars using an assumed construction midpoint of 2027 and an assumed annual inflation rate of 2.50%.[5,6] The input values for this case were entered into IMPLAN as real 2023 dollars and exported from IMPLAN as real 2023 dollars.

Table 1. SOO Green HVDC Transmission Link CapEx IMPLAN Inputs (Real 2023 Dollars)[7]

IMPLAN Sector	IMPLAN Sector Description	Illinois (Direct Spending)
5001	Direct labor	$336,249,760
6001	Landowner payments	$455,001
54	Construction of new power and communication structures	$2,492,508
236	Fabricated structural metal manufacturing	$4,208,201
336	Other communication and energy wire manufacturing	$4,299,102
415	Rail transportation	$10,198,690
445	Insurance agencies, brokerages, and related activities	$369,728
447	Other real estate	$15,132,640
457	Architectural, engineering, and related services	$12,826,968
465	Advertising, public relations, and related services	$63,000
Total		**$386,295,598**

SER conducted a related study for SOO Green to estimate the economic impacts that the construction of the Iowa portion of the SOO Green HVDC ~~line~~ Transmission Link would bring to Iowa.[8] A comparison of these two SER studies shows that the Iowa economic impacts are greater than the Illinois economic impacts, with total investment for the line of $663 million in Iowa and $426 million in Illinois. More construction jobs will occur in Iowa (5,439 FTE-years vs. 3,810 FTE-years in Illinois), but more operations jobs will occur in Illinois (4,250 FTE-years vs. 3,893 FTE-years in Iowa).- The comparison of the Illinois and

[5] The assumed construction schedule is based on SOO Green's public redacted response to Question 5 of the consolidated May and August 2023 question set. This response states that construction is estimated to start in Q3 of 2025, finish in Q2 of 2029 and take 45 months to complete.

[6] This inflation rate is consistent with the National Renewable Energy Laboratory's (NREL's) 2023 Annual Technology Baseline (ATB). The latest ATB can be accessed at "ATB | NREL," National Renewable Energy Laboratory; 2023 (https://atb.nrel.gov/)

[7] These inputs were derived from Table 4.2 of the Strategic Economic Research, LLC, report. SER Table 4.2 is titled "Estimated Construction Cost by IMPLAN Category" and SER describes it as "show[ing] the construction costs broken out by IMPLAN sector that will be spent in Illinois in total over the expected three-year construction period." SER Table 4.2 does not provide IMPLAN codes for the first two line items. SER provides valid IMPLAN Sector codes for the other eight line items, which the IPA used in its analysis. ~~Since SER did not provide IMPLAN Sectors or codes for the first two line items, t~~The IPA assigned "Direct labor" to code 5001, which corresponds to "Employee compensation", and "Landowner payments" to code 6001, which corresponds to "Proprietor income". Codes 5001 and 6001 are not typical IMPLAN Sectors (which are numbered 1-546) and therefore do not correspond to a unique part of the economy. LAI deflated the $371 million in direct labor payments to $336 million, and then entered this value into IMPLAN as code 5001, which corresponds to "Employee compensation".

[8] "Economic Impact Analysis of the SOO Green HVDC Link Transmission project on the State of Iowa," Strategic Economic Research, LLC; February 2023. This study was filed with the Iowa Utilities Board on May 3, 2023 in Docket No. E-22496.

Iowa direct costs, excluding the impacts of the renewable resource development in Iowa to supply the HVDC line, while not totally ~~matched~~equivalent in terms of assumptions, provides an indication of the relative economic impacts of SOO Green on Iowa and Illinois.

SOO Green HVDC Transmission Link OpEx

The SER study did not provide the OpEx inputs used for their analysis, so ~~for~~ the Policy Study's analysis ~~these inputs were derived from the SOO Green CapEx analysis results~~used scalars to derive OpEx results from the Policy Study's CapEx results using the relationship between SER's CapEx and OpEx results. The SER study provided the total, direct, indirect and induced output as well as total, direct, indirect and induced employment associated with both the project CapEx and the project OpEx. These values were used to derive eight scalars (total, direct, indirect and induced for both output and jobs) that were applied to the IPA~~LAI~~ SOO Green HVDC Transmission Link CapEx ~~output and SOO Green CapEx jobs IMPLAN~~ results to derive the SOO Green HVDC Transmission Link OpEx output results and SOO Green HVDC Transmission Link OpEx employment results. The scalars deflated the study's output values into real 2023 dollars values based on a 2.50% inflation rate, a 2027 midpoint for CapEx and a 2039 midpoint for OpEx. The scalars also adjusted for the SER study assuming 30 years of operation to reflect the Policy Study's modeling of 20 years of operation. The scalar approach ~~allowed~~was necessary due to the ~~IPA to deal with the~~ lack of public data available regarding the SOO Green operating costs at the time of the IPA analysis ~~to develop the necessary IMPLAN inputs~~.

Lake Michigan Offshore Wind CapEx

This analysis involved the development of a low and high set of CapEx IMPLAN inputs for the 200 MW Lake Michigan Offshore Wind project using the *Great Lakes Wind Energy Challenges and Opportunities Assessment* published by NREL in March 2023.[9] This NREL study provides detailed CapEx cost data for the Advanced Research Technology Scenario, which assumes 17 MW turbines would be used in each of the Great Lakes. The Policy Study analysis used the 5.5 MW wind turbine size from NREL's Current Scenario instead of the 17 MW turbines assumed in NREL's Advanced Research Technology Scenario~~7MW turbines~~. The~~assumes~~ 5.5 MW turbines reflect current onshore technology, which is more reasonable for ~~this~~ the Policy S~~s~~tudy since ~~the~~installing 17 MW turbines ~~size represents a jump in technology which has not been demonstrated through current operational experience~~on the Great Lakes would require overcoming substantial logistical challenges due to the size of the ships required to install turbines of this size. To convert the detailed CapEx cost data for the Advanced Research Technology Scenario to the Current Scenario, the average Current Scenario CapEx of $2,993/kW for all Great Lakes was divided by the average Advanced Research Technology Scenario CapEx of $2,178/kW for all Great Lakes to get a scalar of 1.37419651056015. The CapEx values were also deflated from real 2035 dollars into real 2023 dollars using an assumed 2.50% inflation rate. The input values for this case were entered into IMPLAN as real 2023 dollars and exported from IMPLAN as real 2023 dollars.

The mapping of line items taken from the NREL study to IMPLAN sectors is shown in Table 2~~Table 2~~ below. Given the earlier stage of development of the Lake Michigan Offshore Wind project, a range of CapEx input

[9] Table 10 of "Great Lakes Wind Energy Challenges and Opportunities Assessment," National Renewal Energy Laboratory and Renewable Energy Consulting Services, Inc.; March 2023 (https://www.nrel.gov/docs/fy23osti/84605.pdf)

estimates were used to convey the uncertainties associated with this proposal. ~~These~~ The line items were ~~then~~ aggregated by IMPLAN sector and estimated local spend percentages were applied for the low and high cases as shown in Table 3~~Table 3~~ below. ~~Given the earlier stage of development of the Lake Michigan Offshore Wind project, a range of CapEx input estimates were used to convey the uncertainties associated with this proposal.~~ The low case assumes that a lower percentage of the project's CapEx spending (13.95%) occurs in Illinois compared to the high case (36.74%).

Table 2. CapEx Cost and Line Item Percentages for Lake Michigan Fixed-Bottom Wind for a 200 MW Plant

Category	Line Item	IMPLAN Sector	Fixed-Bottom	
			Percentage	Cost (2023 $)
Turbine	Tower	281	4.50%	$19,449,808
	Rotor Nacelle Assembly	281	27.80%	$120,156,597
Balance of System	Substructure and Foundation	281	16.30%	$70,451,529
	Port, Staging, Logistics, and Fixed Costs	416	1.30%	$5,618,833
	Turbine Installation	416	2.20%	$9,508,795
	Substructure Installation	416	4.70%	$20,314,244
	Array Cabling	329	8.10%	$35,009,655
	Export Cable	329	10.90%	$47,111,759
	Development	457	3.00%	$12,966,539
	Lease Price	5001	4.50%	$19,449,808
	Project Management	462	1.50%	$6,483,269
Soft Costs	Insurance During Construction	444	2.00%	$8,644,359
	Project Completion	462	1.00%	$4,322,179
	Decommissioning	479	1.20%	$5,186,615
	Procurement Contingency	281	4.50%	$19,449,808
	Installation Contingency	416	2.40%	$10,373,231
	Construction Financing	442	4.10%	$17,720,936
Total CapEx		**N/A**	**100.00%**	**$432,217,974**
Total OpEx ~~(Table 12)~~		**60, 281, 416**	**N/A**	**$306,345,024**
Total (CapEx and OpEx)		**N/A**	**N/A**	**$738,562,999**

Table 3. Lake Michigan Offshore Wind CapEx IMPLAN Inputs (Real 2023 Dollars)

	Overall Illinois In-state Spend	13.95%	36.74%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
		Low	**High**	**Low**	**High**
281	Turbine and turbine generator set units manufacturing	0%	20%	$-	$45,901,548
329	Power, distribution, and specialty transformer manufacturing	0%	20%	$-	$16,424,283
416	Water transportation	50%	80%	$22,907,552	$36,652,084
442	Other financial investment activities	50%	80%	$8,860,468	$14,176,749
444	Insurance carriers, except direct life	50%	80%	$4,322,179	$6,915,487
457	Architectural, engineering, and related services	50%	80%	$6,483,269	$10,373,231
462	Management consulting services	50%	80%	$5,402,724	$8,644,359
479	Waste management and remediation services	50%	80%	$2,593,307	$4,149,292
5001	Employee compensation	50%	80%	$9,724,904	$15,559,847
Total		**N/A**	**N/A**	**$60,294,407**	**$158,796,883**

Lake Michigan Offshore Wind OpEx

The NREL study gives OpEx cost data for both the Advanced Research Technology Scenario ($74/kW-year for ~~Fixed~~ fixed foundations in Lake Michigan) and the Current Scenario ($103/kW-year for ~~Fixed~~ fixed foundations in Lake Michigan), so no conversion between scenarios was necessary. The OpEx values were deflated from real 2035 dollars into real 2023 dollars using an assumed 2.50% inflation rate. The input values for this case were entered into IMPLAN as real 2023 dollars and exported from IMPLAN as real 2023 dollars.

The NREL study does n~~'~~ot break the OpEx value down into line items. The total cost for 20 years of OpEx, ~~classified~~ as shown in Table 2~~Table 2~~ above, was divided between three IMPLAN sectors: 12.5% to IMPLAN Sector 60 (maintenance and repair construction of nonresidential structures) for the maintenance work, 75% to IMPLAN Sector 281 (turbine and turbine generator set units manufacturing) for the replacement parts and 12.5% to IMPLAN Sector 416 (water transportation) for the transportation to and from the turbines. Given the earlier stage of development of the Lake Michigan Offshore Wind project, a range of OpEx input estimates were used to convey the uncertainties associated with this proposal. Local spend percentages were applied for the low and high cases to these three IMPLAN line items as shown in Table 4~~Table 4~~ below. ~~Given the earlier stage of development of the Lake Michigan Offshore Wind project, a range of OpEx input estimates were used to convey the uncertainties associated with this proposal.~~ The low case assumes that a lower percentage of the project's OpEx spending (12.50%) occurs in Illinois compared to the high case (38.75%).

Table 4. Lake Michigan Offshore Wind OpEx IMPLAN Inputs (Real 2023 Dollars)

	Overall Illinois In-state Spend	12.50%	38.75%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
		Low	**High**	**Low**	**High**
60	Maintenance and repair construction of nonresidential structures	50%	80%	$19,146,564	$30,634,502
281	Turbine and turbine generator set units manufacturing	0%	25%	$-	$57,439,692
416	Water transportation	50%	80%	$19,146,564	$30,634,502~~.46~~
Total		**N/A**	**N/A**	**$38,293,128**	**$118,708,697**

Utility ESS CapEx

A low set and a high set of CapEx IMPLAN inputs were developed for the 7,500 MW utility-scale energy storage target using the conservative case of the utility-scale battery storage data published in NREL's 2023 ATB.[10] Of the 7,500 MW target, 5,230 MW were assumed to be 4-hour batteries in MISO, 2,230 MW were assumed to be 4-hour batteries in ComEd, 20 MW were assumed to be 10-hour batteries in MISO and 20 MW were assumed to be 10-hour batteries in ComEd. The batteries ~~are~~ were assumed to come online between 2030 and 2035, with each build year having slightly different costs.

A total CapEx cost of $11,911,175,095 in real 2022 dollars was calculated using the NREL data. This value was divided into IMPLAN sectors based on NREL's *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022*.[11] Local spend percentages were then applied for the low and high cases resulting in the IMPLAN inputs shown in Table 5~~Table 5~~ below. The low case assumes that a lower percentage of the proposal's CapEx spending (14.50%) occurs in Illinois compared to the high case (86.25%). The large difference in local spending between the two cases is due to the low case assuming that the battery cells are manufactured out of state and the high case assuming they are manufactured in state. Unlike the other cases, these inputs were entered into IMPLAN as real 2022 dollars and exported from IMPLAN as real 2023 dollars.[12]

[10] "NREL 2023 ATB, Utility-Scale Battery Storage," National Renewable Energy Laboratory; June 2023 (https://atb.nrel.gov/electricity/2023/utility-scale_battery_storage)

[11] Figures 23 and 25 of "U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022," National Renewable Energy Laboratory; September 2022 (https://www.nrel.gov/docs/fy22osti/83586.pdf)

[12] The raw values came from the 2023 NREL ATB. The 2023 NREL ATB provided values in real 2021 dollars. These raw values were converted to real 2022 dollars using FRED data for use in other parts of the analysis. The inputs were then entered into IMPLAN in real 2022 dollars. IMPLAN contains historical and forecasted inflation data that can be used to convert between dollar years. Therefore, there it was not necessary to convert the inputs to real 2023 dollars here since IMPLAN did it internally. All IMPLAN results were exported as real 2023 dollars, including this case.

Table 5. Utility ESS CapEx IMPLAN Inputs (Real 2022 Dollars)

	Overall Illinois In-state Spend		14.50%	86.25%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent of Total CapEx**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
			Low	**High**	**Low**	**High**
329	Power, distribution, and specialty transformer manufacturing	20%	15%	50%	$357,335,253	$1,191,117,510
333	Storage battery manufacturing	61%	0%	100%	$-	$7,265,816,808
457	Architectural, engineering, and related services	15%	50%	75%	$893,338,132	$1,340,007,198
12004	State/Local Govt. Investment	4%	100%	100%	$476,447,004	$476,447,004
Total		**100%**	N/A	N/A	**$1,727,120,389**	**$10,273,388,520**

Utility ESS OpEx

The same study, buildout and cost assumptions that were used for Utility ESS CapEx IMPLAN inputs were used to develop the Utility ESS OpEx IMPLAN inputs. Using the NREL data, a total OpEx cost of $5,955,587,548 in real 2022 dollars was calculated for 20 years of operation. This value was divided into IMPLAN sectors using NREL's *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022*.[13] Local spend percentages were applied for the low and high cases resulting in the IMPLAN inputs shown in Table 6~~Table 6~~ below. The low case assumes that a lower percentage of the proposal's CapEx spending (19.60%) occurs in Illinois compared to the high case (90.35%). The large difference in local spending between the two cases is due to the low case assuming that the battery cells are manufactured out of state and the high case assuming they are manufactured in state. ~~Unlike the other cases, t~~These inputs were entered into IMPLAN as real 2022 dollars and exported from IMPLAN as real 2023 dollars~~Unlike the other cases, these inputs were entered into IMPLAN as real 2022 dollars~~.[14]

[13] Figures 23 and 25 of "U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022," National Renewable Energy Laboratory; September 2022 (https://www.nrel.gov/docs/fy22osti/83586.pdf)

[14] For ESS, ~~T~~the raw values came from the 2023 NREL ATB. The 2023 NREL ATB provided values in real 2021 dollars. These raw values were converted to real 2022 dollars using FRED data for use in other parts of the analysis. The inputs were then entered into IMPLAN in real 2022 dollars. IMPLAN contains historical and forecasted inflation data that can be used to convert between dollar years. Therefore, there it was not necessary to convert the inputs to real 2023 dollars here since IMPLAN did it internally. All IMPLAN results were exported as real 2023 dollars, including this case.

Table 6. Utility ESS OpEx IMPLAN Inputs (Real 2022 Dollars)

	Overall Illinois In-state Spend		19.60%	90.35%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent of Total CapEx**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
			Low	**High**	**Low**	**High**
329	Power, distribution, and specialty transformer manufacturing	20%	25%	60%	$297,779,377	$714,670,506
333	Storage battery manufacturing	61%	0%	100%	$-	$3,632,908,404
442	Other financial investment activities	5.5%	60%	85%	$196,534,389	$278,423,718
457	Architectural, engineering, and related services	5.5%	60%	85%	$196,534,389	$278,423,718
6001	Landowner payments	4%	100%	100%	$238,223,502	$238,223,502
12004	State/Local Govt. Investment	4%	100%	100%	$238,223,502	$238,223,502
Total		**100%**	N/A	N/A	**$1,167,295,159**	**$5,380,873,349**

Distributed Storage CapEx

As with the Utility ESS proposal, a low set and a high set of CapEx IMPLAN inputs were developed for a 1,000 MW Distributed Storage target using the conservative case of the commercial and residential battery storage data published in NREL's 2023 ATB.[15,16] Of the 1,000 MW target, 558 MW were assumed to be 4-hour commercial batteries in MISO, 242 MW were assumed to be 4-hour commercial batteries in PJM, 139 MW were assumed to be 4-hour residential batteries in MISO and 61 MW were assumed to be 4-hour residential batteries in PJM. ~~These batteries are all assumed to come online in~~It was assumed that all of these batteries would come online in 2030.

A total CapEx cost of $2,536,628,550 in real 2022 dollars was calculated using the NREL data. This value was divided into IMPLAN sectors based on NREL's *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022*.[17] Local spend percentages were then

[15] "NREL 2023 ATB, Commercial Battery Storage," National Renewable Energy Laboratory; June 2023 (https://atb.nrel.gov/electricity/2023/commercial_battery_storage)
[16] "NREL 2023 ATB, Residential Battery Storage," National Renewable Energy Laboratory; June 2023 (https://atb.nrel.gov/electricity/2023/residential_battery_storage)
[17] Figures 23 and 25 of "U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022," National Renewable Energy Laboratory; September 2022 (https://www.nrel.gov/docs/fy22osti/83586.pdf)

applied for the low and high cases resulting in the IMPLAN inputs shown in Table 7~~Table 7~~ below. These local spend percentages are slightly higher for each case than for the Utility ESS proposal, since these are smaller systems that would be more likely to use local labor for design and installation. The low case assumes that a lower percentage of the proposal's CapEx spending (18.00%) occurs in Illinois compared to the high case (92.75%). The large difference in local spending between the two cases is due to the low case assuming that the battery cells are manufactured out of state and the high case assuming they are manufactured in state. ~~Unlike the other cases, t~~These inputs were entered into IMPLAN as real 2022 dollars and exported from IMPLAN as real 2023 dollars~~Unlike the other cases, these inputs were entered into IMPLAN as real 2022 dollars~~.[18]

Table 7. Distributed Storage CapEx IMPLAN Inputs (Real 2022 Dollars)

	Overall Illinois In-state Spend		18.00%	92.75%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent of Total CapEx**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
			Low	**High**	**Low**	**High**
329	Power, distribution, and specialty transformer manufacturing	20%	25%	75%	$126,831,428	$380,494,283
333	Storage battery manufacturing	61%	0%	100%	$-	$1,547,343,416
457	Architectural, engineering, and related services	15%	60%	85%	$228,296,570	$323,420,140
12004	State/Local Govt. Investment	4%	100%	100%	$101,465,142	$101,465,142
Total		**100%**	N/A	N/A	**$456,593,139**	**$2,352,722,980**

Distributed Storage OpEx

The NREL buildout and cost assumptions that were used for Distributed Storage CapEx were used to develop the Distributed Storage OpEx IMPLAN inputs. Using the NREL data, a total OpEx cost was calculated of $1,268,314,275 in real 2022 dollars over 20 years. This value was divided into IMPLAN sectors based on NREL's *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022*.[19] Local spend percentages were applied for the low and high cases

[18] For ESS t~~T~~he raw values came from the 2023 NREL ATB. The 2023 NREL ATB provided values in real 2021 dollars. These raw values were converted to real 2022 dollars using FRED data for use in other parts of the analysis. The inputs were then entered into IMPLAN in real 2022 dollars. IMPLAN contains historical and forecasted inflation data that can be used to convert between dollar years. Therefore, there it was not necessary to convert the inputs to real 2023 dollars here since IMPLAN did it internally. All IMPLAN results were exported as real 2023 dollars, including this case.

[19] Figures 23 and 25 of "U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022," National Renewable Energy Laboratory; September 2022 (https://www.nrel.gov/docs/fy22osti/83586.pdf)

resulting in the IMPLAN inputs shown in Table 8~~Table 8~~ below. These local spend percentages are slightly higher for each case than for the Utility ESS proposal, since these are smaller systems that would be more likely to use local labor for design and installation. The low case assumes that a lower percentage of the proposal's OpEx spending (20.70%) occurs in Illinois compared to the high case (94.45%). The large difference in local spending between the two cases is due to the low case assuming that the battery cells are manufactured out of state and the high case assuming they are manufactured in state. ~~Unlike the other cases, t~~These inputs were entered into IMPLAN as real 2022 dollars and exported from IMPLAN as real 2023 dollars~~Unlike the other cases, these inputs were entered into IMPLAN as real 2022 dollars~~.[20]

Table 8. Distr~~u~~ibuted Storage OpEx IMPLAN Inputs (Real 2022 Dollars)

Overall Illinois In-state Spend			20.70%	94.45%		
IMPLAN Sector	**IMPLAN Sector Description**	**Percent of Total CapEx**	**Percent Illinois In-state Spend**		**Illinois (Direct Spending)**	
			Low	**High**	**Low**	**High**
329	Power, distribution, and specialty transformer manufacturing	20%	25%	75%	$63,415,714	$190,247,141
333	Storage battery manufacturing	61%	0%	100%	$-	$773,671,708
442	Other financial investment activities	5.5%	70%	95%	$48,830,100	$66,269,421
457	Architectural, engineering, and related services	5.5%	70%	95%	$48,830,100	$66,269,421
6001	Landowner payments	4%	100%	100%	$50,732,571	$50,732,571
12004	State/Local Govt. Investment	4%	100%	100%	$50,732,571	$50,732,571
Total		**100%**	N/A	N/A	**$262,541,055**	**$1,197,922,833**

Interpreting IMPLAN Results

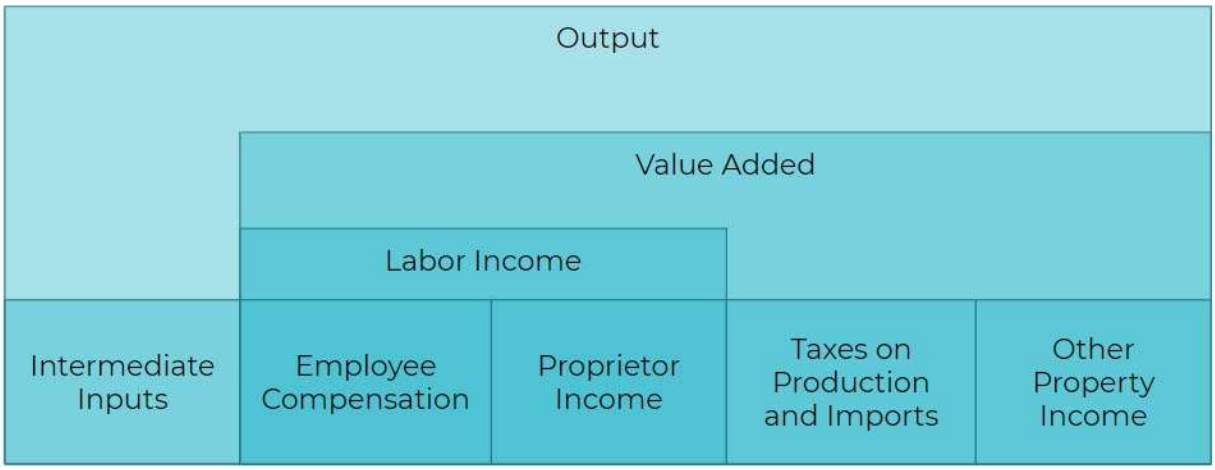
IMPLAN provides results in the form of employment, labor income, value added and output. The differences between labor income, value added and output are illustrated in Figure 1~~Figure 1~~ below.

- Employment is the number of jobs associated with economic activity and is expressed as 2,080-hour FTE-years. For example, an employment impact of one is equal to a single person working 2,080 hours.

[20] For ESS ~~T~~the raw values came from the 2023 NREL ATB. The 2023 NREL ATB provided values in real 2021 dollars. These raw values were converted to real 2022 dollars using FRED data for use in other parts of the analysis. The inputs were then entered into IMPLAN in real 2022 dollars. IMPLAN contains historical and forecasted inflation data that can be used to convert between dollar years. Therefore, there it was not necessary to convert the inputs to real 2023 dollars here since IMPLAN did it internally. All IMPLAN results were exported as real 2023 dollars, including this case.

- Labor income is all forms of employment income, including employee compensation (wages and benefits) and proprietor income.
- Value added is the difference between an industry's or establishment's total output and the cost of its intermediate inputs; it is a measure of the contribution to GDP.
- Output is the value of industry production, including the cost of its intermediate inputs.

Figure 1. Differences Between Labor Income, Value Added and Output



For each of these four metrics, IMPLAN provides the direct effects, indirect effects, induced effects and total effects.

- The direct effects are the effects to a local industry or industries due to the activity or policy being analyzed.
- The indirect effects are the effects stemming from business-to-business purchases in the supply chain taking place in the region.
- The induced effects are effects in the region stemming from household spending of income, after removal of taxes, savings, and commuters.
- The total effects are the sum of the direct, indirect and induced effects.

Output represents the total production value of economic activity and includes all components of production value. This metric includes the cost of intermediate inputs, which should be netted from the total production value to provide a more accurate measure of the impact on the target economy. Value Added, which represents the difference between Output and the cost of intermediate inputs, is considered to be the metric that most accurately reflects the economic impact on the total economy.

All IMPLAN results below were ~~run~~ generated ~~for Illinois~~ using the latest available 2022 data year for the state of Illinois and exported as real 2023 dollars.

IMPLAN ~~Output~~Results

The direct and total employment for the eight IMPLAN cases are presented in the sections below. Due to the significant differences in the total dollar magnitude of the initial economic impact between the cases,

the resulting employment and value added impacts are more appropriately compared on a unitized basis. ~~cannot be compared on an apples-to-apples basis between the different proposals. For example, while the Utility ESS cases have significantly higher employment and value added than the other cases, they also have an initial economic impact that is orders of magnitude larger than the other cases.~~ The direct employment and value added are compared on a unitized basis in Table 9~~Table 9~~ and Table 10~~Table 10~~ below, respectively.

Table 9. Comparison of Direct Employment

Case	Direct Impact		
	FTE-years	FTE-years/MW	FTE-years/TWh
SOO Green HVDC Transmission Link CapEx	174	0.083	0.656
SOO Green HVDC Transmission Link OpEx	80	0.038	0.300
Lake Michigan Offshore Wind Low CapEx	145	0.723	10.586
Lake Michigan Offshore Wind High CapEx	362	1.808	26.454
Lake Michigan Offshore Wind Low OpEx	93	0.467	6.833
Lake Michigan Offshore Wind High OpEx	263	1.315	19.239
Utility ESS Low CapEx	8,076	1.077	49.457
Utility ESS High CapEx	27,443	3.659	168.060
Utility ESS Low OpEx	4,064	0.542	24.886
Utility ESS High OpEx	13,454	1.794	82.394
Distributed Storage Low CapEx	2,030	2.030	93.252
Distributed Storage High CapEx	6,337	6.337	291.069
Distributed Storage Low OpEx	935	0.935	42.937
Distributed Storage High OpEx	3,026	3.026	138.981

Table 10. Comparison of Direct Value Added

Case	Direct Impact		
	$	$/MW	$/TWh
SOO Green HVDC Transmission Link CapEx	$23,716,910	$11,294	$89,289
SOO Green HVDC Transmission Link OpEx	$15,353,148	$7,311	$45,353
Lake Michigan Offshore Wind Low CapEx	$21,531,293	$107,656	$1,575,299
Lake Michigan Offshore Wind High CapEx	$62,120,275	$310,601	$4,544,919
Lake Michigan Offshore Wind Low OpEx	$14,238,944	$71,195	$1,041,767
Lake Michigan Offshore Wind High OpEx	$48,537,436	$242,687	$3,551,155
Utility ESS Low CapEx	$955,222,329	$127,363	$5,849,706
Utility ESS High CapEx	$4,389,417,133	$585,256	$26,880,443
Utility ESS Low OpEx	$468,747,668	$62,500	$2,870,574
Utility ESS High OpEx	$2,138,701,223	$285,160	$13,097,237
Distributed Storage Low CapEx	$247,842,238	$247,842	$11,383,247
Distributed Storage High CapEx	$1,012,083,018	$1,012,083	$46,484,372
Distributed Storage Low OpEx	$107,055,079	$107,055	$4,916,976
Distributed Storage High OpEx	$479,135,618	$479,136	$22,006,415

The total employment and total value added are compared on a unitized basis in Table 11~~Table 11~~ and Table 12~~Table 12~~ below, respectively.

Table 11. Comparison of Total Employment

Case	Total Impact		
	FTE-years	FTE-years/MW	FTE-years/TWh
SOO Green HVDC Transmission Link CapEx	1,990	0.948	7.492
SOO Green HVDC Transmission Link OpEx	1,480	0.705	5.571
Lake Michigan Offshore Wind Low CapEx	484	2.418	35.378
Lake Michigan Offshore Wind High CapEx	1,121	5.603	81.990
Lake Michigan Offshore Wind Low OpEx	281	1.404	20.548
Lake Michigan Offshore Wind High OpEx	772	3.861	56.493
Utility ESS Low CapEx	16,473	2.196	100.877
Utility ESS High CapEx	62,107	8.281	380.338
Utility ESS Low OpEx	9,555	1.274	58.515
Utility ESS High OpEx	31,766	4.235	194.534
Distributed Storage Low CapEx	4,198	4.198	192.807
Distributed Storage High CapEx	14,329	14.329	658.136
Distributed Storage Low OpEx	2,191	2.191	100.608
Distributed Storage High OpEx	7,127	7.127	327.345

Table 12. Comparison of Total Value Added

Case	Total Impact		
	$	$/MW	$/TWh
SOO Green HVDC Transmission Link CapEx	$237,744,695	$113,212	$895,056
SOO Green HVDC Transmission Link OpEx	$176,800,517	$84,190	$665,665
Lake Michigan Offshore Wind Low CapEx	$61,144,172	$305,721	$4,473,504
Lake Michigan Offshore Wind High CapEx	$153,688,671	$768,443	$11,244,358
Lake Michigan Offshore Wind Low OpEx	$36,676,720	$183,384	$2,683,387
Lake Michigan Offshore Wind High OpEx	$111,436,228	$557,181	$8,153,033
Utility ESS Low CapEx	$1,969,419,166	$262,589	$12,060,567
Utility ESS High CapEx	$8,836,463,187	$1,178,195	$54,113,801
Utility ESS Low OpEx	$1,138,331,501	$151,778	$6,971,052
Utility ESS High OpEx	$4,490,941,843	$598,792	$27,502,172
Distributed Storage Low CapEx	$510,450,822	$510,451	$23,444,703
Distributed Storage High CapEx	$2,036,437,850	$2,036,438	$93,532,382
Distributed Storage Low OpEx	$259,859,576	$259,860	$11,935,196
Distributed Storage High OpEx	$1,005,621,973	$1,005,622	$46,187,620

SOO Green HVDC Transmission Link CapEx

The SOO Green HVDC Transmission Link CapEx Case shows a total increase to Illinois state employment of 1,990 FTE-years, value added (GDP) of $238 million dollars and state tax revenues of $14 million. The top three IMPLAN sectors by estimated growth percentage are other communication and energy wire (IMPLAN Sector 336), fabricated structural metal manufacturing (IMPLAN Sector 236) and rail transportation (IMPLAN Sector 415).

Table 13. IMPLAN ~~Output~~ Results for SOO Green HVDC Transmission Link CapEx Case[21]

Impact	Employment	Labor Income	Value Added	Output
Direct	174.20	$15,353,147.61	$23,716,910.10	$49,590,836.88
Indirect	110.77	$9,012,366.48	$14,473,407.70	$26,778,461.57
Induced	1,705.01	$112,770,616.12	$199,554,377.40	$332,198,535.35
Total	1,989.97	$137,136,130.21	$237,744,695.20	$408,567,833.79

SOO Green HVDC Transmission Link OpEx

The SOO Green HVDC Transmission Link OpEx Case shows a total increase to Illinois state employment of 1,480 FTE-years and~~,~~ value added (GDP) of $177 million dollars.

[21] The IPA's IMPLAN results for the direct labor income differ from the results shown in the SER February 2023 report since SER used a different methodological approach that included calculation of the direct labor impacts outside of the IMPLAN model while the IPA's analysis relied on the IMPLAN model without external calculations.

Table 14. IMPLAN ~~Output~~ Results for SOO Green HVDC Transmission Link OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	79.70	$7,024,434.03	$10,851,056.38	$75,534,493.60
Indirect	292.05	$23,761,771.80	$38,160,211.51	$150,462,258.69
Induced	1,175.32	$77,737,024.07	$137,560,332.42	$163,384,247.25
Total	1,479.86	$101,982,249.06	$176,800,516.99	$579,865,720.63

Lake Michigan Offshore Wind CapEx

The Lake Michigan Offshore Wind Low CapEx Case shows a total increase to Illinois state employment of 484 FTE-years, value added (GDP) of $61 million dollars and state tax revenues of $3 million. The top three IMPLAN sectors by estimated growth percentage are water transportation (IMPAN Sector 416), waste management and remediation services (IMPLAN Sector 479) and architectural, engineering, and related services (IMPLAN Sector 457). The Lake Michigan Offshore Wind High CapEx Case shows a total increase to Illinois state employment of 1,121 FTE-years, value added (GDP) of $154 million dollars and state tax revenues of $7 million. The top three IMPLAN sectors by estimated growth percentage are turbine and turbine generator set units manufacturing (IMPLAN Sector 281), power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329) and water transportation (IMPLAN Sector 416).

Table 15. IMPLAN ~~Output~~ Results for Lake Michigan Offshore Wind Low CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	144.69	$15,515,744.96	$21,531,292.97	$50,569,503.05
Indirect	157.95	$13,110,837.18	$18,446,113.63	$33,822,963.74
Induced	180.90	$11,963,381.85	$21,166,765.63	$35,236,396.90
Total	483.54	$40,589,963.99	$61,144,172.23	$119,628,863.69

Table 16. IMPLAN ~~Output~~ Results for Lake Michigan Offshore Wind High CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	361.58	$48,330,391.86	$62,120,274.67	$143,237,036.85
Indirect	325.39	$27,904,256.36	$40,822,808.59	$75,968,821.79
Induced	433.68	$28,680,452.15	$50,745,587.69	$84,476,351.38
Total	1,120.64	$104,915,100.37	$153,688,670.95	$303,682,210.03

Lake Michigan Offshore Wind OpEx

The Lake Michigan Offshore Wind Low OpEx Case shows a total increase to Illinois state employment of 281 FTE-years, value added (GDP) of $37 million dollars and state tax revenues of $2 million. The top three IMPLAN sectors by estimated growth percentage are water transportation (IMPLAN Sector 416), maintenance and repair construction of nonresidential structures (IMPLAN Sector 60) and travel arrangement and reservation services (IMPLAN Sector 474). The Lake Michigan Offshore Wind High OpEx Case shows a total increase to Illinois state employment of 772 FTE-years, value added (GDP) of $111 million dollars and state tax revenues of $6 million. The top three IMPLAN sectors by estimated growth

percentage are turbine and turbine generator set units manufacturing (IMPLAN Sector 281), water transportation (IMPLAN Sector 416) and maintenance and repair construction of nonresidential structures (IMPLAN Sector 60).

Table 17. IMPLAN ~~Output~~ Results for Lake Michigan Offshore Wind Low OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	93.39	$7,760,643.52	$14,238,943.90	$38,293,128.08
Indirect	109.34	$8,722,023.33	$13,301,739.53	$24,468,985.08
Induced	78.12	$5,164,925.55	$9,136,036.95	$15,208,826.97
Total	280.85	$21,647,592.40	$36,676,720.38	$77,970,940.12

Table 18. IMPLAN ~~Output~~ Results for Lake Michigan Offshore Wind High OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	262.97	$35,332,386.44	$48,537,435.97	$118,708,697.05
Indirect	244.29	$20,540,018.63	$31,908,466.21	$59,380,407.76
Induced	264.89	$17,516,826.25	$30,990,325.81	$51,589,739.26
Total	772.15	$73,389,231.32	$111,436,227.99	$229,678,844.07

The proposed 200 MW OSW pilot project is small in comparison to the size of other North American OSW developments, such as those on the East Coast, which involve thousands of MW of turbines. Therefore, the employment impacts associated with this project, especially those that would involve onshore port support facilities, will be limited since the ~~since~~size of the pilot project might~~would~~ not justify significant investment in ~~permanent~~large port facilities to service the project. It is also unlikely that any of the turbine components would be manufactured in-state, unless there are already existing in-state facilities that manufacture parts that will be used in the turbines. IMPLAN, as run for this analysis, does not provide sufficient granularity to break out the employment by trade. Nor does IMPLAN break out the employment that would result from the port service facilities, but the IPA estimates that this employment is likely to involve less than ~~100~~150 FTE-years for 20 years of operation. This estimate is consistent with the port services operations related employment estimated for a 400 MW fixed-bottom OSW project in Lake Erie by the New York State Energy Research and Development Authority (NYSERDA), which when scaled for the 200 MW Lake Michigan OSW pilot project would be 110 FTE-years.[22] If the pilot project proves to be successful and leads to the development of significant OSW capacity in Lake Michigan, then the port facility employment impact would be ~~significant~~increase commensurately.

[22] NYSERDA Report 22-12, "Great Lakes Wind Energy Feasibility Study," December 2022. This report also provided an estimate of the construction related employment effects for the Lake Erie port support facilities. Scaled to the Lake Michigan project, the employment impacts would total 226 FTE-years based on a 3-year construction period for the port facilities. The IPA cautions that this estimate of construction related employment is highly uncertain depending on location specific conditions which are likely to differ considerably between the proposed site of the Lake Erie project and the proposed site of the Lake Michigan project.

Utility ESS CapEx

The Utility ESS Low CapEx Case shows a total increase to Illinois state employment of 16,473 FTE-years, value added (GDP) of $1.969 billion dollars and state tax revenues of $86 million. The top three IMPLAN sectors by estimated growth percentage are power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329), architectural, engineering, and related services (IMPLAN Sector 457) and construction of new highways and streets (IMPLAN Sector 54). The Utility ESS High CapEx Case shows a total increase to Illinois state employment of 62,107 FTE-years, value added (GDP) of $8.836 billion dollars and state tax revenues of $409 million. The top three IMPLAN sectors by estimated growth percentage are storage battery manufacturing (IMPLAN Sector 333), power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329) and architectural, engineering, and related services (IMPLAN Sector 457).

Table 19. IMPLAN ~~Output~~ Results for Utility ESS Low CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	8,076.11	$837,481,685.08	$955,222,329.31	$1,705,086,339.64
Indirect	3,124.57	$268,791,375.86	$397,830,856.26	$724,117,135.20
Induced	5,271.93	$348,510,565.01	$616,365,980.01	$1,026,070,274.62
Total	16,472.60	$1,454,783,625.95	$1,969,419,165.58	$3,455,273,749.46

Table 20. IMPLAN ~~Output~~ Results for Utility ESS High CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	27,443.21	$3,165,002,847.45	$4,389,417,133.32	$10,249,917,820.26
Indirect	13,822.11	$1,226,516,723.75	$2,009,058,471.76	$3,798,077,785.66
Induced	20,841.66	$1,378,125,609.90	$2,437,987,581.67	$4,058,531,371.89
Total	62,106.98	$5,769,645,181.10	$8,836,463,186.76	$18,106,526,977.81

Utility ESS OpEx

The Utility ESS Low OpEx Case shows a total increase to Illinois state employment of 9,555 FTE-years, value added (GDP) of $1.138 billion dollars and state tax revenues of $51 million. The top three IMPLAN sectors by estimated growth percentage are power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329), architectural, engineering, and related services (IMPLAN Sector 457) and construction of new highways and streets (IMPLAN Sector 54). The Utility ESS High OpEx Case shows a total increase to Illinois state employment of 31,766 FTE-years, value added (GDP) of $4.491 billion dollars and state tax revenues of $209 million. The top three IMPLAN sectors by estimated growth percentage are storage battery manufacturing (IMPLAN Sector 333), power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329) and nonferrous metal (excluding aluminum) smelting and refining (IMPLAN Sector 223).

Table 21. IMPLAN ~~Output~~ Results for Utility ESS Low OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	4,063.80	$391,255,425.52	$468,747,668.43	$923,890,505.31
Indirect	1,753.66	$154,743,671.36	$233,268,491.93	$429,994,968.33
Induced	3,737.64	$246,901,839.52	$436,315,340.25	$726,343,079.71
Total	9,555.10	$792,900,936.39	$1,138,331,500.61	$2,080,228,553.35

Table 22. IMPLAN ~~Output~~ Results for Utility ESS High OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	13,454.40	$1,506,958,101.59	$2,138,701,223.42	$5,139,275,338.49
Indirect	7,043.17	$629,821,569.46	$1,034,738,815.79	$1,960,710,865.14
Induced	11,268.62	$744,941,722.65	$1,317,501,804.27	$2,193,257,292.39
Total	31,766.19	$2,881,721,393.70	$4,490,941,843.48	$9,293,243,496.03

Distributed Storage CapEx

The Distributed Storage Low CapEx Case shows a total increase to Illinois state employment of 4,198 FTE-years, value added (GDP) of $510 million dollars and state tax revenues of $22 million. The top three IMPAN sectors by estimated growth percentage are power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329), architectural, engineering, and related services (IMPLAN Sector 457) and construction of new highways and streets (IMPLAN Sector 54). The Distributed Storage High CapEx Case shows a total increase to Illinois state employment of 14,329 FTE-years, value added (GDP) of $2.036 billion dollars and state tax revenues of $94 million. The top three IMPLAN sectors by estimated growth percentage are storage battery manufacturing (IMPLAN Sector 333), power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329) and architectural, engineering, and related services (IMPLAN Sector 457).

Table 23. IMPLAN ~~Output~~ Results for Distributed Storage Low CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	2,030.33	$215,770,787.09	$247,842,238.01	$451,805,293.23
Indirect	807.51	$69,777,932.15	$103,590,227.23	$189,548,851.59
Induced	1,360.06	$89,911,091.45	$159,018,356.44	$264,719,300.07
Total	4,197.89	$375,459,810.68	$510,450,821.67	$906,073,444.89

Table 24. IMPLAN ~~Output~~ Results for Distributed Storage High CapEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	6,337.32	$735,537,106.34	$1,012,083,017.94	$2,347,730,547.62
Indirect	3,165.70	$281,461,142.78	$459,793,593.85	$870,564,777.82
Induced	4,826.28	$319,130,686.79	$564,561,238.15	$939,828,202.97
Total	14,329.30	$1,336,128,935.91	$2,036,437,849.94	$4,158,123,528.40

Distributed Storage OpEx

The Distributed Storage Low OpEx Case shows a total increase to Illinois state employment of 2,191 FTE-years, value added (GDP) of $260 million dollars and state tax revenues of $12 million. The top three IMPLAN sectors by estimated growth percentage are power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329), architectural, engineering, and related services (IMPLAN Sector 457) and construction of new highways and streets (IMPLAN Sector 54). The Distributed Storage High OpEx Case shows a total increase to Illinois state employment of 7,127 FTE-years, value added (GDP) of $1.006 billion dollars and state tax revenues of $47 million. The top three IMPLAN sectors by estimated growth percentage are storage battery manufacturing (IMPLAN Sector 333), power, distribution, and specialty transformer manufacturing (IMPLAN Sector 329) and nonferrous metal (excluding aluminum) smelting and refining (IMPLAN Sector 223).

Table 25. IMPLAN ~~Output~~ Results for Distributed Storage Low OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	934.85	$89,907,375.80	$107,055,079.05	$210,838,681.12
Indirect	412.79	$36,325,231.21	$54,400,387.28	$99,915,704.57
Induced	842.86	$55,681,278.62	$98,404,109.28	$163,815,248.53
Total	2,190.50	$181,913,885.63	$259,859,575.60	$474,569,634.22

Table 26. IMPLAN ~~Output~~ Results for Distributed Storage High OpEx Case

Impact	Employment	Labor Income	Value Added	Output
Direct	3,025.96	$339,556,024.29	$479,135,617.59	$1,146,655,888.06
Indirect	1,579.26	$141,360,822.81	$231,619,665.67	$439,089,582.02
Induced	2,521.90	$166,720,205.05	$294,866,689.93	$490,867,190.80
Total	7,127.13	$647,637,052.15	$1,005,621,973.18	$2,076,612,660.88

Conclusion

The IMPLAN ~~modeling~~ analyses show a range of economic impacts would be associated with the policy proposals. The total employment impacts in terms of FTE-years range from 764 for the low case of the Lake Michigan Offshore Wind project to 93,873 for the high case of the Utility ESS proposal, which assumes all of the battery cells will be manufactured in Illinois. In addition to the employment impacts, the economic impacts, as measured by the total value added, range from $97.8 million for the low case of the Lake Michigan Offshore Wind project to ~~a high of~~ $13.3 billion for the Utility ESS high case. The energy storage cases have the largest impact in terms of value added and employment with the total employment for the Utility ESS and Distributed Storage cases taken together ranging from 32,417 FTE-years to 115,329 FTE-years and the total value added ~~impact~~ ranging from $3.9 billion to $16.3 billion. The larger magnitude of the economic and employment impacts associated with the high CapEx and high OpEx energy storage cases may offer support for policies designed to encourage battery manufacturers to locate new manufacturing and assembly facilities in Illinois.

The other policy proposals would have significantly less employment and total value added impacts, with the SOO Green HVDC Transmission Link involving having an employment impacts of 3,470 FTE-years and total value added impacts of $414.5 million, and the Lake Michigan Offshore Wind project involving having an employment impacts of 764 to 1,893 FTE-years and total value -added impacts of $97.8 million to $265.1 million. However, when the employment and total value -added impacts are considered on a unitedunitized $/MW basis, the Lake Michigan Offshore Wind project provides employment and value -added impacts comparable to the lower end of the range of Utility ESS impacts, 3.82 to 9.47 FTE-years/MW and $0.49 million to $1.33 million/MW for the Lake Michigan Offshore Wind project compared to 3.47 FTE-years/MW and $0.41 million/MW of total value added for the low case of the Utility ESS proposal.

IMPLAN, as run for these analyses, does not provide sufficient granularity to break out the employment by trade. While IMPLAN does not specifically address the way in which the employment and total value added impacts would be distributed around the state, several observations can be drawn from the modeling results. The Utility ESS and Distributed Storage impacts are likely to be spread around the state but would be concentrated in MISO Zone 4 where most of the modeled ESS queue locations are located and in the high cases where the battery cell manufacturing facilities would be located. The employment and economic impacts for the SOO Green HVDC line would primarily impact the counties along the path of the line: Carroll, DeKalb, Kendall, Lee, and Ogle, as well as the location of the converter station and interconnection with the ComEd system near Plano. The employment and total value added impacts of the Lake Michigan Offshore Wind project would likely be in the Chicago area, as it has been proposed as a staging area for the since these are related to construction and operation of the facilityproject, although while the construction of the turbines would probably be occur outside of the state.