

Economic Impacts of Wind Energy Development in Iowa: Four Scenarios

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June, 2015

Introduction

The deployment of additional wind energy capacity in Iowa will yield discernible short-term and longer-term economic impacts for Iowa. The short-term and temporary economic gains are from

- the annual purchases and deliveries of Iowa-supplied wind energy generating equipment like blades, towers, nacelles and other critical components, and
- all construction-related activity associated with erecting and making operational wind energy arrays

The long-term and permanent gains to the Iowa economy are driven by

- the on-going increments to statewide productivity associated with the operation and maintenance of the built wind energy systems, and
- the incremental increase in lease payments made to landowners for siting the wind energy structures

The annual values of the short-term and long-term economic impacts can be measured using an input-output model (I-O) of the Iowa economy. I-O models are highly detailed summaries of transactions among industries in Iowa as well as transactions with households, governments, and other institutions. They allow us to discern the multiplied-through value to the Iowa economy of investment in, construction of, and the ongoing operation of these facilities. The model used for this evaluation is called IMPLAN, which was modified significantly to specifically reflect the characteristics of Iowa's wind energy construction industry and the operation of wind farms as electric utilities.² The state of Iowa was used as the region of analysis as wind energy development affects all quadrants of the state.

This study projects the annual economic impact outcomes to be expected from four development scenarios over an investment and deployment horizon of 15 years.

¹ This study is being conducted as a fee-for-service project by ISU for the Iowa Environmental Council.

² IMPLAN is the most widely-used impact assessment software and industrial-output data source in the U.S. The system is completely transparent and allows for substantial modification of all key components of the data to assure that the scenarios studied align well with reality.

The Scenarios

The four wind energy deployment scenarios evaluated come from Turner and Wind (2015).³

- 1) Wind development to meet the proposed target of 16% reduction in CO₂ emissions by 2030 – 74.13 MW per annum
- 2) Deployment to meet a target of 30% reduction in CO₂ emissions by 2030 – 206.7 MW per annum
- 3) A conservative deployment envisaging an addition of, on average, 500 MW of new wind generation annually from 2016 through 2030
- 4) A moderate deployment scenario which looks at the addition of, on average, 1,000 MW of new wind generation annually over that time frame in growing increments, along with a very modest increase in turbine performance.

Table 1 displays the annual additions under each scenario.

Table 1

	Annual Wind Energy Capacity Additions in MW			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
2016	74.13	206.66	500	400
2017	74.13	206.66	500	500
2018	74.13	206.66	500	600
2019	74.13	206.66	500	700
2020	74.13	206.66	500	800
2021	74.13	206.66	500	900
2022	74.13	206.66	500	1,000
2023	74.13	206.66	500	1,000
2024	74.13	206.66	500	1,000
2025	74.13	206.66	500	1,100
2026	74.13	206.66	500	1,200
2027	74.13	206.66	500	1,300
2028	74.13	206.66	500	1,400
2029	74.13	206.66	500	1,500
2030	74.13	206.66	500	1,600
Total	1,111.95	3,099.90	7,500	15,000

³ Turner, Dan and Thomas A. Wind. Iowa's Wind Potential for Addressing 111(d) Goals: The Potential for Tapping Iowa's Wind Resource to Reduce CO₂ Emissions, Dan Turner, LLC and Wind Utility Consulting P.C. white paper.

Major Assumptions and Other Pertinent Considerations

Economic impact analysis depends greatly on sound cost-of-investment and cost-of-production estimates. Researchers at the Iowa Environmental Council as well as the team of Turner and Wind assisted in producing or clarifying the major cost assumptions applied to the I-O analysis. Other costs of investment or production were gleaned from research and spreadsheets developed by the National Renewable Energy Laboratory (NREL) as part of their Jobs and Economic Development Impact modeling system (JEDI).⁴ JEDI provides spreadsheets containing a full range of production costs which can subsequently be modified substantially to apply to a regional development scenario. This analysis used a large number of NREL assumptions and cost parameters, as modified by the Iowa reviewers, and then translated those assumptions into the impact projection components.

Equipment Procurement Probabilities

Iowa produces many valuable components for the wind energy industry. It has plants that assemble nacelles, and it has plants that produce blades and towers. Currently, the nacelles produced in Iowa are not widely deployed in Iowa, but recent and newly proposed wind deployment relies heavily on Iowa-produced blades and towers. Blades and towers, however, are also produced in neighboring states (Minnesota, South Dakota, and Nebraska). When conducting I-O evaluations, one must consider the probability of cross-hauling of components across borders; accordingly, when modeling equipment purchases associated with the four scenarios, it is reasonable to assume that in-state purchase probabilities will change over time.

Table 2 shows the equipment purchase probabilities used for this analysis. It assumes that Iowa turbine (nacelle) purchases are zero for years one through five, but that they grow to 25 percent after five years. Blade and tower probabilities are also reduced after five years from the existing very high numbers to somewhat lower values to reflect regional supply competition for components. The transportation assumptions remain fixed for the whole 15 year cycle.

Table 2

	Probability of Iowa-Supplied Equipment	
	Years 1-5	Years 6-15
Turbines (excluding blades and towers)	0%	25%
Blades	85%	75%
Towers	100%	85%
Transportation	75%	75%

⁴ JEDI is intended as an elemental, spreadsheet-based state-level impact model for different renewable energy configurations. It is, however, a black box on the impact analysis side of the tool. Its state level multipliers are aggregated and not reviewable or modifiable. Accordingly, it represents at best a crude estimation of potential regional economic gains and should be used cautiously. JEDI, on the other hand, contains highly detailed, research based cost of production and operation inputs, and those inputs are very useful for configuring and modeling renewable energy scenarios.

When conducting I-O analysis, it is important to be mindful of these probabilities as they will determine a huge fraction of the expected economic impacts. If too high, you will over-predict job gains. Too low and you under-predict the economic outcomes. While the estimation allows for 100 percent of towers to be lowa-built in the first five years, for example, it is not reasonable to maintain that probability into the future; hence, the reduction to 85 percent for this very bulky transport item.

Total Costs Per kW of Capacity

This I-O projection assumes that 2,500 kW turbines are erected.⁵ The total pre-tax cost of installation considering all equipment purchases, construction, transmission enhancements, and all other services associated with deployment was set at \$1,440 per kW or 2500 X \$1,440 = \$3.6 million per turbine. According to the briefing material, Mid American’s Wind VIII project estimated costs ranging from \$1.47 million to \$1.58 million per MW installed. Assuming continuous price reductions in installed costs, the use of \$1.44 million per MW installed is warranted to be reflective of the likely average prices to be paid in the very near future. There are taxes, too, to be collected on equipment and construction matériel, the sum of which raises the installed price per kW to \$1,506 for modeling purposes.

Table 3 shows by broad category the breakdown in total costs. Procuring and delivering the electricity generating equipment constitute 72 percent of the total deployment costs.

Table 3

Key Component / Activity Costs as Percentages of Total Costs	
Turbines (excluding blades and towers)	43%
Blades	10%
Towers	11%
Transportation	8%
Construction Labor and Matériel	21%
Other Development Related	3%
Construction & Equipment / Matériel Taxes	4%
Total	100%

⁵ Recently installed Siemens turbines are rated at 2.3 MW, but planned new MidAmerica developments indicate 2.5 MW turbines are planned. Recent Nordex turbine installations can be either 2.4 or 2.5 MW, and Acciona machines were 3 MW. A substantial majority of installed and planned turbines in Iowa are Siemens, so the use of 2.5 MW as the standard is conservative and reasonable.

Construction Assumptions

Relying on Table 3, the expected cost per MW of construction is \$366,949. The IMPLAN model contains a sector that is intended to reflect the construction of new power and communications structures; however, that sector was too broad for this application and required much more labor than would be expected for wind energy deployment. That broadly-defined sector applies to simple electrical lines, conventional power stations, mobile communications towers, electrical substations, and other power and communications infrastructure and superstructure. Accordingly, a new wind energy construction sector was configured in the model containing a much reduced number of workers and appropriately metered labor compensation, plus other broad cost of construction factors per standard unit of output that were derived from the NREL-JEDI construction factors and the other assumptions in this model. Table 4 shows clearly that the original model configuration would have significantly over-predicted the labor required for constructing wind energy systems relative to the total cost of construction. The original sector assumed \$160,500 in construction output (total construction and development costs) per worker. The new construction output per worker, however, is 56 percent higher at \$250,238 per job.

Table 4

	Original Power and Communications Structures Construction Sector	New Wind Construction Sector
	Factors Per Job	
Value Added	\$77,835	\$178,624
Labor Income*	\$62,327	\$64,060
All Other Intermediate & Development Costs	\$82,664	\$71,614
Total Construction Costs	\$160,500	\$250,238

* Labor income is a subset of value added

Operational Characteristics

The total labor required for ongoing maintenance and support of an installed and deployed windfarm involves maintenance technicians, electricians, administrative support, and managers. Relying in the main on NREL-JEDI coefficients, total jobs were set at 3.8 per 100 MWs installed. While the IMPLAN model in fact contains a wind energy generation sector, the values in the modeling system did not reconcile with the researched based costs of operation data derived from NREL-JEDI. Accordingly, a new wind energy operations sector was added to IMPLAN to align with expected gross output (sales of electricity) from the facility, labor costs, and expected value added production.⁶

⁶ Value added represents all payments to labor, investors, land, and indirect tax payments. It signifies the worth of the enterprise annually net of all intermediate production costs.

Table 5 shows the difference between the expected industrial values and the modified values for this analysis. Again, the default model values would have required much more labor than research indicates per million dollars of utility output (sales) than is required for modern wind farms. In addition, the model’s sector listed pay that was substantially (and likely incorrectly) more than NREL-JEDI derivations and separate wage and salary verification of likely Iowa labor costs from Bureau of Labor Statistics summaries would indicate.

Table 5

	Original Wind Energy Utility Sector	New Wind Energy Utility Sector
	Factors Per Job	
Value Added	\$1,210,165	\$2,162,797
Labor Income*	\$93,580	\$66,633
All Other Intermediate	\$294,068	\$581,851
Total Output (Sales)	\$1,697,989	\$2,744,648

* Labor income is a subset of value added

Finally, as to deploying new wind capacity, it was assumed in this evaluation that operations do not begin until the year following deployment. Accordingly, there are no operational impacts for the first year of construction / deployment in 2016.

Landowners Assumptions

The recommended rate of landowner compensation was set at \$6,250 per installed turbine annually. There are a couple of factors that need to be pointed out with this assumption when it comes to modeling. The first is that the payments are made to landowners, not necessarily to “farmers”, as is so often stated or inferred. Farmers can farm without owning any land, and many people who own farmland are not farmers. As these are payments to landowners, they are accumulating to the real estate sector of the rural economy, not agriculture.

Next, as the payments accrue to ownership, an estimate of the fraction of those payments that would stay in Iowa needs to be made. According to the quinquennial ISU Extension report *Farmland Ownership and Tenure in Iowa* (Duffy 2012), 21 percent of Iowa ag land owners are non-residents – 14 percent are full-time nonresidents, and 7 percent are part-time non-residents. For this study, the fraction of land lease payments accruing to residential Iowa landlords was set at 82.5 percent.⁷

⁷ Assumes 100 percent out of state lease payments to the 14 percent of permanent non-residents and 50 percent out of state payments to those that are part-time non-residents.

Other Modeling Assumptions

Input-output models of the kind deployed here are not forecasting models; they are static, present-day models. They assume that input supplies, labor availability, and all other resources are fixed and of infinite supply. They do not adjust for changes in population, prices, technology, the environment, or other dynamic elements. They are called fixed-price models, and they are used to project, given the final configuration of the model, what the economy would look like in some future period given *all of today's assumptions about production*. The projections depicted in this model, therefore, will assume that all monetary transactions reflect 2016 prices, all 2016 production and installation efficiencies, and 2016 inter-industrial transactions.⁸

Over the 15 year deployment period, labor prices will, in fact, rise, all costs of production will change, technology inputs will change, the price per installed kW will likely decline, and land rent costs will increase. That acknowledged, this study projects all outcomes as if they were in constant 2016 dollar amounts.

Input-Output Terminology

I-O models produce an array of information for analysts. For our purposes, however, there are four types of data and four levels of data comprising a typical I-O results table.

The types of economic impact data are

- **Output.** This is the value of industrial productivity over the course of a year. It represents the worth of what was produced whether it was sold or not. In this study, there are four distinct levels of output measured:
 - The procurement of Iowa-produced generating equipment
 - The activity of constructing generating sites and transmission structures, as well as assembling wind turbine equipment
 - The ongoing activity of operating wind energy facilities
 - Ongoing lease payments to landowners.
- **Labor income.** These are wage and salary payments to workers, including employer-provided benefits. Management payments to proprietors are also counted as labor income payments.
- **Value added.** Value added includes all labor income (mentioned above) plus payments to investors (dividends, interests, and rents), and indirect tax payments to governments. Value added is the equivalent of Gross Domestic Product (GDP), which is the standard measure of economic activity across the states and for the nation.
- **Jobs.** There are many kinds of jobs. I-O models measure the annualized job value in different industries. Many industries have mostly full-time jobs, but many others have part-time and seasonal jobs. I-O models do not convert jobs into full-time equivalencies, but they do express

⁸ As previously mentioned, this study allows, after the fifth year of deployment, for there to be purchases from nacelle producers as well as a minor reduction in in-state purchases of blades and towers. These differences are changes in the mix of constructed inputs produced within Iowa, but do not represent any changes in the overall structure of the modeling system.

them as annualized equivalencies. As many people have more than one job, there are always more jobs in an economy than there are employed persons.

The levels of economic impact data are

- **Direct values.** These are the aforementioned data types for the industry that we are evaluating. In this study, the direct values will be driven initially by the aforementioned four output categories: equipment procurement, construction, operations, and land leasing.
- **Indirect values.** All direct firms industrial groups require intermediate inputs into production. They may buy supplies, utilities, other agricultural or manufactured inputs, wholesale goods, transportation, and services, just to name a few.
- **Induced values.** When the workers in the four direct activities measured and those in all of the indirect industries (the supplying sectors) convert their labor incomes into household spending they induce a third round of economic activity. Induced values are also called the household values.
- **Total values.** The sum of direct, indirect, and induced activity constitutes the total economic effect that is being measured. In short it gives us the economic sums of the studied industries, their suppliers, and all affected households within the study region.

Results

For each scenario, this analysis involves four different types of activities (equipment purchases, construction, operational, and land lease payments) across three dimensions (direct, indirect and induced combined, and total) times 15 years of capital outlays. Very detailed results by year are contained in the appendix. Summaries of the total economic activity generated are presented in the following subsections for each scenario.

Scenario 1

In this scenario, Iowa installs approximately 2,320 MW of wind energy to meet its carbon reduction goals. To date, 1,212 MW are under construction. The remaining 1,112 MW are modeled for this scenario. Table 6 summarizes the total expected impacts for years 1 through 15 for all four elements of this analysis. As there are no first year operational impacts, the year 2 direct value (in 2016 \$) of the four levels of activity summed to \$63.8 million, which required 236 jobholders earning \$14.36 million in labor incomes. In that second year of construction, all of the activities generated \$22.93 million in indirect (supplying sectors) and induced (household) spending, which in turn supported 167.5 jobholders earning \$7.33 million in labor incomes. Summed, for that second year of construction, all levels of activity supported \$86.7 million in economic output, and \$47.5 million in value added (or GDP) that was generated by 403.3 total jobholders earning \$21.7 million in labor income.

As there is an in-Iowa equipment purchase adjustment to the model in year 6 of the series, and because incremental additions of capacity increase operational employment and land lease payments, total output grows continually through year 15. In the last year of deployment, this scenario will produce \$215.5 million in total industrial output and \$140.2 million in value added, of which \$30.2 million represents labor incomes paid to 557 jobholders.

Figure 1 shows the contribution of each sector over the deployment period. The vast majority of jobs are supported initially and throughout this scenario in the generating equipment manufacturing sector, followed by construction. While the jobs in operations continue to grow in years 2 through 16, they, combined with the jobs associated with lease payments, will level off in year 17, and all job impacts associated with construction and equipment purchases return to zero in year 16 (2031).

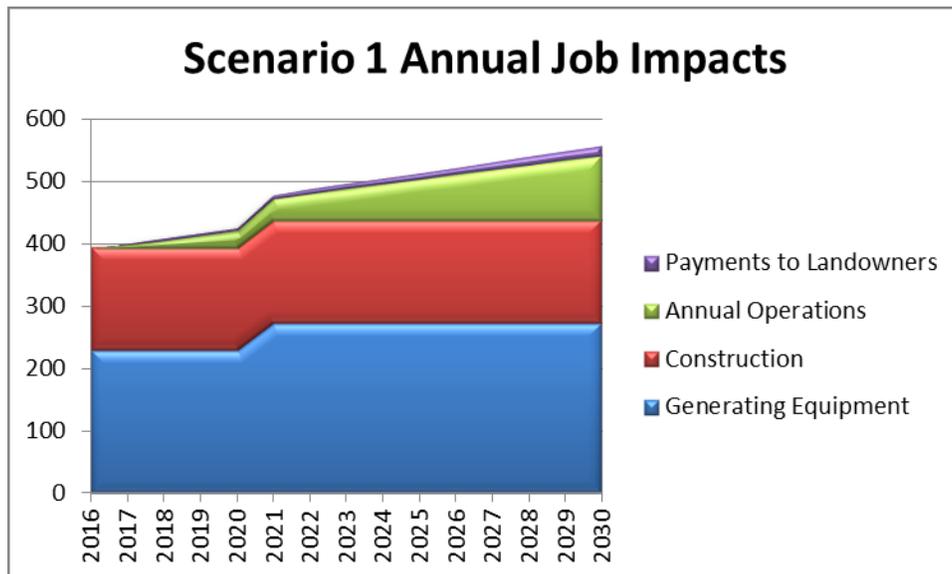


Figure 1

Table 6

Scenario 1: Adding 1,112 MW of New Capacity by 2030

Total Direct					
Year	Jobs	Labor Income	Value Added	Output	
2016	232.2	14,158,813	28,792,551	55,832,348	
2017	235.8	14,362,356	35,204,972	63,777,787	
2018	239.4	14,565,899	41,617,394	71,723,226	
2019	242.9	14,769,443	48,029,815	79,668,664	
2020	246.5	14,972,986	54,442,237	87,614,103	
2021	272.6	16,482,298	62,447,953	104,583,122	
2022	276.1	16,685,841	68,860,374	112,528,561	
2023	279.7	16,889,384	75,272,795	120,474,000	
2024	283.3	17,092,927	81,685,217	128,419,438	
2025	286.8	17,296,470	88,097,638	136,364,877	
2026	290.4	17,500,014	94,510,060	144,310,316	
2027	293.9	17,703,557	100,922,481	152,255,755	
2028	297.5	17,907,100	107,334,903	160,201,193	
2029	301.0	18,110,643	113,747,324	168,146,632	
2030	304.6	18,314,186	120,159,745	176,092,071	
Total Indirect and Induced					
Year	Jobs	Labor Income	Value Added	Output	
2016	162.6	7,062,448	11,832,866	21,917,839	
2017	167.5	7,326,788	12,291,619	22,934,344	
2018	172.5	7,591,127	12,750,373	23,950,849	
2019	177.5	7,855,466	13,209,126	24,967,353	
2020	182.4	8,119,806	13,667,880	25,983,858	
2021	207.9	9,473,916	15,899,806	30,212,747	
2022	212.9	9,738,256	16,358,559	31,229,251	
2023	217.9	10,002,595	16,817,313	32,245,756	
2024	222.8	10,266,935	17,276,066	33,262,261	
2025	227.8	10,531,274	17,734,820	34,278,765	
2026	232.8	10,795,613	18,193,573	35,295,270	
2027	237.7	11,059,953	18,652,327	36,311,775	
2028	242.7	11,324,292	19,111,080	37,328,279	
2029	247.7	11,588,632	19,569,834	38,344,784	
2030	252.6	11,852,971	20,028,587	39,361,289	
Total Effects					
Year	Jobs	Labor Income	Value Added	Output	
2016	394.8	21,221,261	40,625,416	77,750,187	
2017	403.3	21,689,144	47,496,591	86,712,131	
2018	411.9	22,157,026	54,367,766	95,674,074	
2019	420.4	22,624,909	61,238,941	104,636,018	
2020	428.9	23,092,792	68,110,116	113,597,961	
2021	480.5	25,956,214	78,347,758	134,795,869	
2022	489.0	26,424,097	85,218,933	143,757,812	
2023	497.6	26,891,979	92,090,108	152,719,756	
2024	506.1	27,359,862	98,961,283	161,681,699	
2025	514.6	27,827,744	105,832,458	170,643,642	
2026	523.1	28,295,627	112,703,633	179,605,586	
2027	531.7	28,763,510	119,574,808	188,567,529	
2028	540.2	29,231,392	126,445,983	197,529,473	
2029	548.7	29,699,275	133,317,158	206,491,416	
2030	557.2	\$ 30,167,158	\$ 140,188,333	\$ 215,453,359	
Annual Average	483.2	\$ 26,093,466	\$ 90,967,952	\$ 148,641,101	

Scenario 2

This scenario assumes a target of a 30 percent reduction in CO2 emissions by year 2030. Here, the state will add 206.7 MW of capacity annually for a 15 year total of 3,100 MW of installed capacity. Table 7 summarizes the total expected impacts for years 1 through 15 for all four elements of this analysis. As there are no first year operational impacts, the year 2 direct value (in 2016 \$) of the four levels of activity summed to \$177.8 million, which required 657.4 jobholders earning \$40.04 million in labor incomes. In that second year of construction, all of the activities generated \$63.94 million in indirect (supplying sectors) and induced (household) spending, which in turn supported 467 jobholders earning \$20.43 million in labor incomes. Summed, for that second year of construction, all levels of activity supported \$241.7 million in economic output, and \$132.4 million in value added (or GDP) that was generated by 1,124 total jobholders earning \$60.5 million in labor income.

As there is an in-lowa equipment purchase adjustment to the model in year 6 of the series, and because incremental additions of capacity increase operational employment and land lease payments, total output grows continually through year 15. In the last year of deployment, this scenario will produce \$600.6 million in total industrial output and \$390.8 million in value added, of which \$84.1 million represents labor incomes paid to 1,553.5 jobholders.

Figure 2 shows the contribution of each sector over the deployment period . The vast majority of jobs are supported initially and throughout this scenario in the generating equipment manufacturing sector, followed by construction. While the jobs in operations continue to grow in years 2 through 16, they, combined with the jobs associated with lease payments, will level off in year 17, and all job impacts associated with construction and equipment purchases return to zero in year 16 (2031).

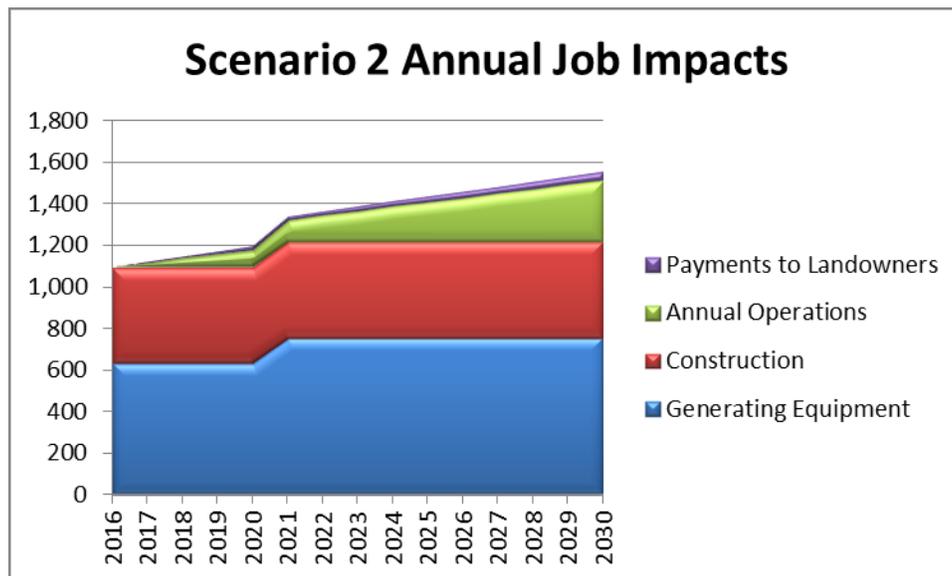


Figure 2

Table 7

Scenario 2: Assuming 30 Percent Reduction in CO2 by 2030

Total Direct				
Year	Jobs	Labor Income	Value Added	Output
2016	647.5	39,472,012	80,268,023	155,649,711
2017	657.4	40,039,451	98,144,605	177,800,047
2018	667.3	40,606,890	116,021,187	199,950,382
2019	677.2	41,174,329	133,897,769	222,100,718
2020	687.1	41,741,768	151,774,351	244,251,053
2021	759.9	45,949,435	174,092,728	291,557,373
2022	769.8	46,516,874	191,969,309	313,707,708
2023	779.7	47,084,313	209,845,891	335,858,043
2024	789.6	47,651,752	227,722,473	358,008,379
2025	799.6	48,219,190	245,599,055	380,158,714
2026	809.5	48,786,629	263,475,637	402,309,050
2027	819.4	49,354,068	281,352,219	424,459,385
2028	829.3	49,921,507	299,228,800	446,609,721
2029	839.2	50,488,945	317,105,382	468,760,056
2030	849.2	51,056,384	334,981,964	490,910,392
Total Indirect and Induced				
Year	Jobs	Labor Income	Value Added	Output
2016	453.2	19,688,730	32,987,724	61,102,666
2017	467.1	20,425,656	34,266,640	63,936,483
2018	480.9	21,162,583	35,545,555	66,770,300
2019	494.7	21,899,510	36,824,471	69,604,117
2020	508.6	22,636,437	38,103,386	72,437,934
2021	579.7	26,411,433	44,325,561	84,227,253
2022	593.5	27,148,360	45,604,476	87,061,070
2023	607.4	27,885,287	46,883,392	89,894,887
2024	621.2	28,622,214	48,162,307	92,728,704
2025	635.1	29,359,141	49,441,223	95,562,521
2026	648.9	30,096,067	50,720,138	98,396,338
2027	662.8	30,832,994	51,999,053	101,230,155
2028	676.6	31,569,921	53,277,969	104,063,972
2029	690.5	32,306,848	54,556,884	106,897,789
2030	704.3	33,043,775	55,835,800	109,731,606
Total Effects				
Year	Jobs	Labor Income	Value Added	Output
2016	1,100.7	59,160,742	113,255,748	216,752,377
2017	1,124.4	60,465,108	132,411,245	241,736,530
2018	1,148.2	61,769,473	151,566,742	266,720,682
2019	1,172.0	63,073,839	170,722,239	291,704,835
2020	1,195.7	64,378,204	189,877,737	316,688,987
2021	1,339.6	72,360,869	218,418,289	375,784,625
2022	1,363.3	73,665,234	237,573,786	400,768,778
2023	1,387.1	74,969,600	256,729,283	425,752,930
2024	1,410.9	76,273,965	275,884,780	450,737,083
2025	1,434.6	77,578,331	295,040,278	475,721,235
2026	1,458.4	78,882,697	314,195,775	500,705,387
2027	1,482.2	80,187,062	333,351,272	525,689,540
2028	1,505.9	81,491,428	352,506,769	550,673,692
2029	1,529.7	82,795,793	371,662,267	575,657,845
2030	1,553.5	\$ 84,100,159	\$ 390,817,764	\$ 600,641,997
Annual Average	1,347.1	\$ 72,743,500	\$ 253,600,932	\$ 414,382,435

Scenario 3

This scenario assumes a substantial increase in investment through year 2030 from the previous scenario. Here, the state will add 500 MW of capacity annually for a 15 year total of 7,500 MW of installed capacity.

Table 8 summarizes the total expected impacts for years 1 through 15 for all four elements of this analysis. As there are no first year operational impacts, the year 2 direct value (in 2016 \$) of the four levels of activity summed to \$430.2 million, which required 1,590.5 jobholders earning 96.9 million in labor incomes. In that second year of construction, all of the activities generated \$154.7 million in indirect (supplying sectors) and induced (household) spending, which in turn 1,130 jobholders earning \$49.4 million in labor incomes. Summed, for that second year of construction, all levels of activity supported \$584.9 million in economic output, and \$320.4 million in value added (or GDP) that was generated by 2,720.5 total jobholders earning \$146.3 million in labor income.

As there is an in-Iowa equipment purchase adjustment to the model in year 6 of the series, and because incremental additions of capacity increase operational employment and land lease payments, total output grows continually through year 15. In the last year of deployment, this scenario will produce \$1.453 billion in total industrial output and \$945.6 million in value added, of which \$203.5 million represents labor incomes paid to 3,758.5 jobholders.

Figure 3 shows the contribution of each sector over the deployment period. The vast majority of jobs are supported initially and throughout this scenario in the generating equipment manufacturing sector, followed by construction. While the jobs in operations continue to grow in years 2 through 16, they, combined with the jobs associated with lease payments, will level off in year 17, and all job impacts associated with construction and equipment purchases return to zero in year 16 (2031).

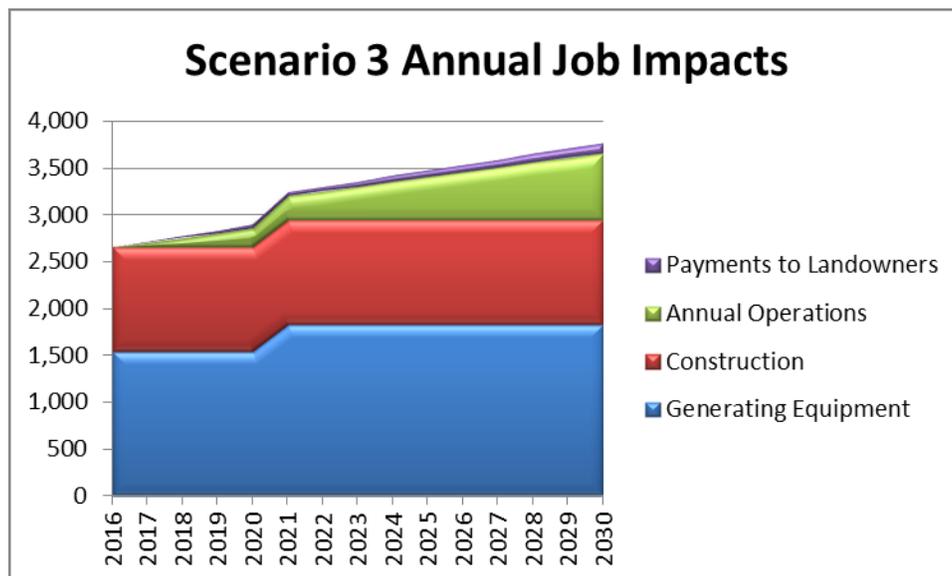


Figure 3

Table 8

Scenario 3: Adding 500 MW of New Capacity Annually

Total Direct				
Year	Jobs	Labor Income	Value Added	Output
2016	1,566.5	95,499,885	194,203,095	376,584,030
2017	1,590.5	96,872,765	237,454,285	430,175,280
2018	1,614.5	98,245,645	280,705,475	483,766,530
2019	1,638.5	99,618,525	323,956,665	537,357,780
2020	1,662.5	100,991,405	367,207,855	590,949,030
2021	1,838.5	111,171,575	421,205,670	705,403,495
2022	1,862.5	112,544,455	464,456,860	758,994,745
2023	1,886.5	113,917,335	507,708,050	812,585,995
2024	1,910.5	115,290,215	550,959,240	866,177,245
2025	1,934.5	116,663,095	594,210,430	919,768,495
2026	1,958.5	118,035,975	637,461,620	973,359,745
2027	1,982.5	119,408,855	680,712,810	1,026,950,995
2028	2,006.5	120,781,735	723,964,000	1,080,542,245
2029	2,030.5	122,154,615	767,215,190	1,134,133,495
2030	2,054.5	123,527,495	810,466,380	1,187,724,745
Total Indirect and Induced				
Year	Jobs	Labor Income	Value Added	Output
2016	1,096.5	47,635,560	79,811,585	147,833,800
2017	1,130.0	49,418,505	82,905,835	154,690,030
2018	1,163.5	51,201,450	86,000,085	161,546,260
2019	1,197.0	52,984,395	89,094,335	168,402,490
2020	1,230.5	54,767,340	92,188,585	175,258,720
2021	1,402.5	63,900,690	107,242,720	203,782,185
2022	1,436.0	65,683,635	110,336,970	210,638,415
2023	1,469.5	67,466,580	113,431,220	217,494,645
2024	1,503.0	69,249,525	116,525,470	224,350,875
2025	1,536.5	71,032,470	119,619,720	231,207,105
2026	1,570.0	72,815,415	122,713,970	238,063,335
2027	1,603.5	74,598,360	125,808,220	244,919,565
2028	1,637.0	76,381,305	128,902,470	251,775,795
2029	1,670.5	78,164,250	131,996,720	258,632,025
2030	1,704.0	79,947,195	135,090,970	265,488,255
Total Effects				
Year	Jobs	Labor Income	Value Added	Output
2016	2,663.0	143,135,445	274,014,680	524,417,830
2017	2,720.5	146,291,270	320,360,120	584,865,310
2018	2,778.0	149,447,095	366,705,560	645,312,790
2019	2,835.5	152,602,920	413,051,000	705,760,270
2020	2,893.0	155,758,745	459,396,440	766,207,750
2021	3,241.0	175,072,265	528,448,390	909,185,680
2022	3,298.5	178,228,090	574,793,830	969,633,160
2023	3,356.0	181,383,915	621,139,270	1,030,080,640
2024	3,413.5	184,539,740	667,484,710	1,090,528,120
2025	3,471.0	187,695,565	713,830,150	1,150,975,600
2026	3,528.5	190,851,390	760,175,590	1,211,423,080
2027	3,586.0	194,007,215	806,521,030	1,271,870,560
2028	3,643.5	197,163,040	852,866,470	1,332,318,040
2029	3,701.0	200,318,865	899,211,910	1,392,765,520
2030	3,758.5	\$ 203,474,690	\$ 945,557,350	\$ 1,453,213,000
Annual Average	3,259.2	\$ 175,998,017	\$ 613,570,433	\$ 1,002,570,490

Scenario 4

This represents a more aggressive, albeit, incrementally growing investment scenario. Here, the state will add an average of 1,000 MW of capacity in growing increments annually for a 15 year total of 15,000 MW of installed capacity. Table 9 summarizes the total expected impacts for years 1 through 15 for all four elements of this analysis. As there are no first year operational impacts, the year 2 direct value (in 2016 \$) of the four levels of activity summed to \$419.5 million, which required 1,586 jobholders earning 96.6 million in labor incomes. In that second year of construction, all of the activities generated \$153.3 million in indirect (supplying sectors) and induced (household) spending, which in turn 1,123 jobholders earning \$49.1 million in labor incomes. Summed, for that second year of construction, all levels of activity supported \$572.8 million in economic output, and \$311.1 million in value added (or GDP) that was generated by 2,709 total jobholders earning \$145.7 million in labor income.

As there is an in-lowa equipment purchase adjustment to the model in year 6 of the series, annual boosts in deployed capacity, and because incremental additions of capacity increase operational employment and land lease payments, total output grows continually through year 15. In the last year of deployment, this scenario will produce \$3.562 billion in total industrial output and \$2.192 billion in value added, of which \$594.3 million represents labor incomes paid to 10,992 jobholders.

Figure 4 shows the contribution of each sector over the deployment period. The vast majority of jobs are supported initially and throughout this scenario in the generating equipment manufacturing sector, followed by construction. While the jobs in operations continue to grow in years 2 through 16, they, combined with the jobs associated with lease payments, will level off in year 17, and all job impacts associated with construction and equipment purchases return to zero in year 16 (2031).

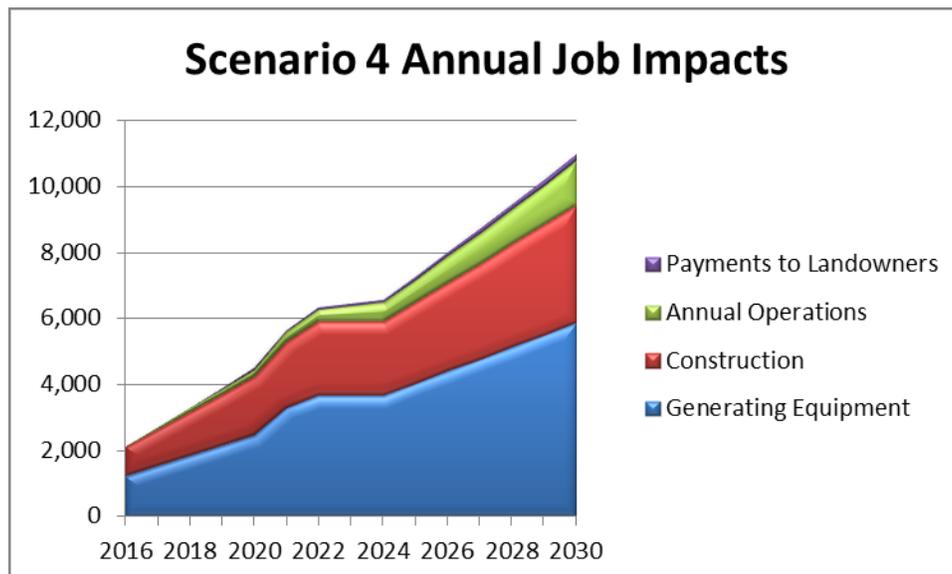


Figure 4

Table 9

Scenario 4: Adding an Average of 1,000 MW Annually in Increasing Increments

Total Direct				
Year	Jobs	Labor Income	Value Added	Output
2016	1,253.2	76,399,908	155,362,476	301,267,224
2017	1,585.7	96,598,189	228,804,047	419,457,030
2018	1,923.0	117,071,046	310,895,856	548,365,086
2019	2,265.1	137,818,479	401,637,903	687,991,392
2020	2,612.0	158,840,488	501,030,188	838,335,948
2021	3,237.3	195,990,195	628,416,636	1,108,952,541
2022	3,624.2	219,322,814	747,258,722	1,292,906,240
2023	3,672.2	222,068,574	833,761,102	1,400,088,740
2024	3,720.2	224,814,334	920,263,482	1,507,271,240
2025	4,111.9	248,421,529	1,047,755,806	1,701,943,189
2026	4,508.4	272,303,300	1,183,898,368	1,907,333,388
2027	4,909.7	296,459,647	1,328,691,168	2,123,441,837
2028	5,315.8	320,890,570	1,482,134,206	2,350,268,536
2029	5,726.7	345,596,069	1,644,227,482	2,587,813,485
2030	6,142.4	370,576,144	1,814,970,996	2,836,076,684
Total Indirect and Induced				
Year	Jobs	Labor Income	Value Added	Output
2016	877.2	38,108,448	63,849,268	118,267,040
2017	1,123.3	49,061,916	82,286,985	153,318,784
2018	1,376.1	60,371,973	101,343,552	189,741,774
2019	1,635.6	72,038,619	121,018,969	227,536,010
2020	1,901.8	84,061,854	141,313,236	266,701,492
2021	2,424.0	109,672,407	183,754,146	346,239,243
2022	2,731.3	123,878,901	207,678,090	392,480,664
2023	2,798.3	127,444,791	213,866,590	406,193,124
2024	2,865.3	131,010,681	220,055,090	419,905,584
2025	3,179.3	145,573,764	244,597,884	467,518,251
2026	3,500.0	160,493,436	269,759,528	516,502,164
2027	3,827.4	175,769,697	295,540,022	566,857,323
2028	4,161.5	191,402,547	321,939,366	618,583,728
2029	4,502.3	207,391,986	348,957,560	671,681,379
2030	4,849.8	223,738,014	376,594,604	726,150,276
Total Effects				
Year	Jobs	Labor Income	Value Added	Output
2016	2,130.4	114,508,356	219,211,744	419,534,264
2017	2,709.0	145,660,105	311,091,032	572,775,814
2018	3,299.1	177,443,019	412,239,408	738,106,860
2019	3,900.7	209,857,098	522,656,872	915,527,402
2020	4,513.8	242,902,342	642,343,424	1,105,037,440
2021	5,661.3	305,662,602	812,170,782	1,455,191,784
2022	6,355.5	343,201,715	954,936,812	1,685,386,904
2023	6,470.5	349,513,365	1,047,627,692	1,806,281,864
2024	6,585.5	355,825,015	1,140,318,572	1,927,176,824
2025	7,291.2	393,995,293	1,292,353,690	2,169,461,440
2026	8,008.4	432,796,736	1,453,657,896	2,423,835,552
2027	8,737.1	472,229,344	1,624,231,190	2,690,299,160
2028	9,477.3	512,293,117	1,804,073,572	2,968,852,264
2029	10,229.0	552,988,055	1,993,185,042	3,259,494,864
2030	10,992.2	\$ 594,314,158	\$ 2,191,565,600	\$ 3,562,226,960
Annual Average	6,424.1	\$ 346,879,355	\$ 1,094,777,555	\$ 1,846,612,626

Cumulative and Ongoing Operational and Land Lease Impacts

During the 15 year deployment schedules described in the four scenarios, the vast majority of the annual job amounts are associated with in-state purchases of generating equipment as well as the process of constructing the sites, assembling the generators, and building out the required transmissions systems. In the 16th year, 2031, all of those values fall to zero, and the remaining ongoing value to the state’s economy will be associated with annual operation expenditures to maintain and manage the systems as well as the ongoing payments to landowners.

Table 10 itemizes the permanent jobs that would be supported in the 16th year and beyond, and Figure 5 shows the long-term trends. Site maintenance and other operational activities would account for 88 percent of all jobs; the remaining would be associated with real estate management of the lease payments. It should be very evident that wind energy deployment is job-intensive during the investment and construction years, but that it is comparatively job-lean after construction is finished.

Table 10

Cumulative Permanent Jobs By Scenario For Wind Farm Operations and Land Leases Year 16 On

	Installed MW	Jobs in Operations	Jobs in Land Leases	Total Jobs
Scenario 1	1,112	112.3	15.6	127.9
Scenario 2	3,100	313.1	43.4	356.5
Scenario 3	7,500	757.5	105.0	862.5
Scenario 4	15,000	1,515.0	210.0	1,725.0

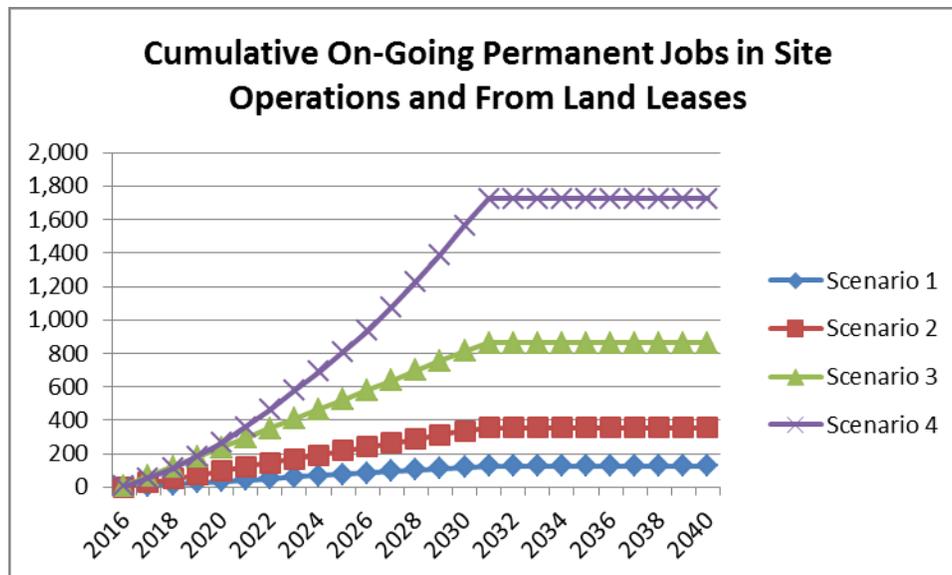


Figure 5

Appendix: Detailed Scenario Results by Type of Activity over Time

Table 11 Scenario 1 Detailed Results

Direct Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	120.9	7,063,897	8,911,780	28,477,535	110.6	7,085,086	19,755,954	27,201,920	-	-	-	-	0.7	9,830	124,817	152,893
2017	120.9	7,063,897	8,911,780	28,477,535	110.6	7,085,086	19,755,954	27,201,920	2.8	193,713	6,287,604	7,792,546	1.5	19,661	249,634	305,786
2018	120.9	7,063,897	8,911,780	28,477,535	110.6	7,085,086	19,755,954	27,201,920	5.6	387,426	12,575,209	15,585,091	2.2	29,491	374,451	458,679
2019	120.9	7,063,897	8,911,780	28,477,535	110.6	7,085,086	19,755,954	27,201,920	8.5	581,138	18,862,813	23,377,637	3.0	39,322	499,269	611,573
2020	120.9	7,063,897	8,911,780	28,477,535	110.6	7,085,086	19,755,954	27,201,920	11.3	774,851	25,150,417	31,170,182	3.7	49,152	624,086	764,466
2021	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	14.1	968,564	31,438,022	38,962,728	4.4	58,982	748,903	917,359
2022	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	16.9	1,162,277	37,725,626	46,755,274	5.2	68,813	873,720	1,070,252
2023	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	19.7	1,355,990	44,013,230	54,547,819	5.9	78,643	998,537	1,223,145
2024	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	22.5	1,549,702	50,300,834	62,340,365	6.7	88,473	1,123,354	1,376,038
2025	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	25.4	1,743,415	56,588,439	70,132,910	7.4	98,304	1,248,171	1,528,931
2026	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	28.2	1,937,128	62,876,043	77,925,456	8.2	108,134	1,372,988	1,681,824
2027	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	31.0	2,130,841	69,163,647	85,718,002	8.9	117,965	1,497,806	1,834,718
2028	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	33.8	2,324,554	75,451,252	93,510,547	9.6	127,795	1,622,623	1,987,611
2029	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	36.6	2,518,267	81,738,856	101,303,093	10.4	137,625	1,747,440	2,140,504
2030	143.4	8,369,665	10,505,074	37,501,115	110.6	7,085,086	19,755,954	27,201,920	39.4	2,711,979	88,026,460	109,095,638	11.1	147,456	1,872,257	2,293,397
2031									42.3	2,905,692	94,314,065	116,888,184				
Indirect and Induced Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	107.5	4,706,851	7,720,324	14,341,410	54.8	2,343,582	4,091,719	7,538,042	-	-	-	-	0.3	12,015	20,822	38,387
2017	107.5	4,706,851	7,720,324	14,341,410	54.8	2,343,582	4,091,719	7,538,042	4.7	252,324	437,931	978,118	0.6	24,030	41,645	76,773
2018	107.5	4,706,851	7,720,324	14,341,410	54.8	2,343,582	4,091,719	7,538,042	9.3	504,649	875,862	1,956,236	0.9	36,045	62,467	115,160
2019	107.5	4,706,851	7,720,324	14,341,410	54.8	2,343,582	4,091,719	7,538,042	14.0	756,973	1,313,793	2,934,354	1.2	48,060	83,290	153,547
2020	107.5	4,706,851	7,720,324	14,341,410	54.8	2,343,582	4,091,719	7,538,042	18.7	1,009,298	1,751,725	3,912,472	1.5	60,075	104,112	191,934
2021	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	23.4	1,261,622	2,189,656	4,890,590	1.8	72,090	126,934	230,320
2022	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	28.0	1,513,947	2,627,587	5,868,708	2.1	84,105	145,577	268,707
2023	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	32.7	1,766,271	3,065,518	6,846,825	2.4	96,120	166,579	307,094
2024	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	37.4	2,018,595	3,503,449	7,824,943	2.7	108,135	187,401	345,481
2025	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	42.0	2,270,920	3,941,380	8,803,061	3.0	120,150	208,224	383,867
2026	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	46.7	2,523,244	4,379,311	9,781,179	3.3	132,165	229,046	422,254
2027	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	51.4	2,775,569	4,817,242	10,759,297	3.6	144,180	249,869	460,641
2028	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	56.0	3,027,893	5,255,174	11,737,415	3.9	156,195	270,691	499,028
2029	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	60.7	3,280,218	5,693,105	12,715,533	4.2	168,210	291,513	537,414
2030	128.0	5,796,622	9,493,497	17,553,794	54.8	2,343,582	4,091,719	7,538,042	65.4	3,532,542	6,131,036	13,693,651	4.4	180,225	312,336	575,801
2031									70.1	3,784,867	6,568,967	14,671,769				
Total Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	228.4	11,770,748	16,632,104	42,818,945	165.4	9,428,668	23,847,673	34,739,963	-	-	-	-	1.0	21,845	145,640	191,280
2017	228.4	11,770,748	16,632,104	42,818,945	165.4	9,428,668	23,847,673	34,739,963	7.5	446,037	6,725,535	8,770,664	2.1	43,691	291,279	382,560
2018	228.4	11,770,748	16,632,104	42,818,945	165.4	9,428,668	23,847,673	34,739,963	15.0	892,074	13,451,071	17,541,327	3.1	65,536	436,919	573,840
2019	228.4	11,770,748	16,632,104	42,818,945	165.4	9,428,668	23,847,673	34,739,963	22.5	1,338,112	20,176,606	26,311,991	4.2	87,381	582,558	765,119
2020	228.4	11,770,748	16,632,104	42,818,945	165.4	9,428,668	23,847,673	34,739,963	29.9	1,784,149	26,902,142	35,082,654	5.2	109,227	728,198	956,399
2021	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	37.4	2,230,186	33,627,677	43,853,318	6.2	131,072	873,837	1,147,679
2022	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	44.9	2,676,223	40,353,213	52,623,981	7.3	152,918	1,019,477	1,338,959
2023	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	52.4	3,122,261	47,078,748	61,394,645	8.3	174,763	1,165,116	1,530,239
2024	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	59.9	3,568,298	53,804,283	70,165,308	9.3	196,608	1,310,756	1,721,519
2025	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	67.4	4,014,335	60,529,819	78,935,972	10.4	218,454	1,456,395	1,912,799
2026	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	74.9	4,460,372	67,255,354	87,706,635	11.4	240,299	1,602,035	2,104,078
2027	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	82.4	4,906,410	73,980,890	96,477,299	12.5	262,144	1,747,674	2,295,358
2028	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	89.8	5,352,447	80,706,425	105,247,962	13.5	283,990	1,893,314	2,486,638
2029	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	97.3	5,798,484	87,431,961	114,018,626	14.5	305,835	2,038,953	2,677,918
2030	271.5	14,166,287	19,998,571	55,054,909	165.4	9,428,668	23,847,673	34,739,963	104.8	6,244,521	94,157,496	122,789,289	15.6	327,681	2,184,593	2,869,198
2031									112.3	6,690,559	100,883,031	131,559,953				

Table 12 Scenario 2 Detailed Results

Direct Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	337.1	19,692,768	24,844,306	79,389,819	308.3	19,751,839	55,075,752	75,833,656	-	-	-	-	2.1	27,405	347,966	426,236
2017	337.1	19,692,768	24,844,306	79,389,819	308.3	19,751,839	55,075,752	75,833,656	7.9	540,034	17,528,616	21,724,099	4.1	54,810	695,932	852,473
2018	337.1	19,692,768	24,844,306	79,389,819	308.3	19,751,839	55,075,752	75,833,656	15.7	1,080,067	35,057,232	43,448,198	6.2	82,216	1,043,863	1,278,709
2019	337.1	19,692,768	24,844,306	79,389,819	308.3	19,751,839	55,075,752	75,833,656	23.6	1,620,101	52,585,848	65,172,298	8.3	109,621	1,391,863	1,704,945
2020	337.1	19,692,768	24,844,306	79,389,819	308.3	19,751,839	55,075,752	75,833,656	31.4	2,160,134	70,114,464	86,896,397	10.3	137,026	1,739,829	2,131,181
2021	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	39.3	2,700,168	87,643,080	108,620,496	12.4	164,431	2,087,795	2,557,418
2022	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	47.1	3,240,201	105,171,696	130,344,595	14.5	191,836	2,435,761	2,983,654
2023	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	55.0	3,780,235	122,700,312	152,068,694	16.5	219,241	2,783,727	3,409,890
2024	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	62.8	4,320,269	140,228,928	173,792,794	18.6	246,647	3,131,693	3,836,126
2025	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	70.7	4,860,302	157,757,544	195,516,893	20.7	274,052	3,479,658	4,262,363
2026	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	78.5	5,400,336	175,286,160	217,240,992	22.7	301,457	3,827,624	4,688,599
2027	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	86.4	5,940,369	192,814,776	238,965,091	24.8	328,862	4,175,590	5,114,835
2028	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	94.2	6,480,403	210,343,392	260,689,190	26.9	356,267	4,523,556	5,541,071
2029	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	102.1	7,020,437	227,872,008	282,413,290	28.9	383,673	4,871,522	5,967,308
2030	399.9	23,332,997	29,286,101	104,545,804	308.3	19,751,839	55,075,752	75,833,656	109.9	7,560,470	245,400,624	304,137,389	31.0	411,078	5,219,488	6,393,544
2031									117.8	8,100,504	262,929,240	325,861,488				
Indirect and Induced Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	299.7	13,121,784	21,522,761	39,981,057	152.7	6,533,451	11,406,915	21,014,594	-	-	-	-	0.8	33,495	58,049	107,015
2017	299.7	13,121,784	21,522,761	39,981,057	152.7	6,533,451	11,406,915	21,014,594	13.0	703,431	1,220,867	2,726,802	1.7	66,991	116,097	214,029
2018	299.7	13,121,784	21,522,761	39,981,057	152.7	6,533,451	11,406,915	21,014,594	26.0	1,406,863	2,441,733	5,453,604	2.5	100,486	174,146	321,044
2019	299.7	13,121,784	21,522,761	39,981,057	152.7	6,533,451	11,406,915	21,014,594	39.1	2,110,294	3,662,600	8,180,407	3.3	133,982	232,195	428,059
2020	299.7	13,121,784	21,522,761	39,981,057	152.7	6,533,451	11,406,915	21,014,594	52.1	2,813,725	4,883,467	10,907,209	4.1	167,477	290,244	535,074
2021	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	65.1	3,517,157	6,104,333	13,634,011	5.0	200,973	348,292	642,088
2022	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	78.1	4,220,588	7,325,200	16,360,813	5.8	234,468	406,341	749,103
2023	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	91.1	4,924,020	8,546,067	19,087,616	6.6	267,964	464,390	856,118
2024	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	104.2	5,627,451	9,766,933	21,814,418	7.4	301,459	522,439	963,133
2025	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	117.2	6,330,882	10,987,800	24,541,220	8.3	334,955	580,487	1,070,147
2026	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	130.2	7,034,314	12,208,667	27,268,022	9.1	368,450	638,536	1,177,162
2027	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	143.2	7,737,745	13,429,534	29,994,825	9.9	401,945	696,585	1,284,177
2028	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	156.2	8,441,176	14,650,400	32,721,627	10.7	435,441	754,633	1,391,192
2029	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	169.3	9,144,608	15,871,267	35,448,429	11.6	468,936	812,682	1,498,206
2030	356.9	16,159,853	26,466,020	48,936,559	152.7	6,533,451	11,406,915	21,014,594	182.3	9,848,039	17,092,134	38,175,231	12.4	502,432	870,731	1,605,221
2031									195.3	10,551,471	18,313,000	40,902,034				
Total Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	636.7	32,814,551	46,367,066	119,370,877	461.1	26,285,290	66,482,667	96,848,250	-	-	-	-	2.9	60,901	406,015	533,251
2017	636.7	32,814,551	46,367,066	119,370,877	461.1	26,285,290	66,482,667	96,848,250	20.9	1,243,465	18,749,483	24,450,901	5.8	121,801	812,029	1,066,502
2018	636.7	32,814,551	46,367,066	119,370,877	461.1	26,285,290	66,482,667	96,848,250	41.7	2,486,930	37,498,965	48,901,803	8.7	182,702	1,218,044	1,599,753
2019	636.7	32,814,551	46,367,066	119,370,877	461.1	26,285,290	66,482,667	96,848,250	62.6	3,730,395	56,248,448	73,352,704	11.6	243,603	1,624,058	2,133,004
2020	636.7	32,814,551	46,367,066	119,370,877	461.1	26,285,290	66,482,667	96,848,250	83.5	4,973,860	74,997,931	97,803,606	14.5	304,503	2,030,073	2,666,255
2021	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	104.4	6,217,325	93,747,413	122,254,507	17.4	365,404	2,436,087	3,199,506
2022	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	125.2	7,460,790	112,496,896	146,705,409	20.3	426,304	2,842,102	3,732,757
2023	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	146.1	8,704,255	131,246,379	171,156,310	23.1	487,205	3,248,117	4,266,008
2024	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	167.0	9,947,720	149,995,862	195,607,211	26.0	548,106	3,654,131	4,799,259
2025	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	187.9	11,191,185	168,745,344	220,058,113	28.9	609,006	4,060,146	5,332,510
2026	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	208.7	12,434,650	187,494,827	244,509,014	31.8	669,907	4,466,160	5,865,761
2027	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	229.6	13,678,114	206,244,310	268,959,916	34.7	730,808	4,872,175	6,399,012
2028	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	250.5	14,921,579	224,993,792	293,410,817	37.6	791,708	5,278,189	6,932,263
2029	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	271.3	16,165,044	243,743,275	317,861,719	40.5	852,609	5,684,204	7,465,514
2030	756.8	39,492,850	55,752,121	153,482,362	461.1	26,285,290	66,482,667	96,848,250	292.2	17,408,509	262,492,758	342,312,620	43.4	913,510	6,090,219	7,998,765
2031									313.1	18,651,974	281,242,240	366,763,522				

Table 13 Scenario 3 Detailed Results

Direct Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	-	-	-	-	5.0	66,305	841,880	1,031,250
2017	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	19.0	1,306,575	42,409,310	52,560,000	10.0	132,610	1,683,760	2,062,500
2018	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	38.0	2,613,150	84,818,620	105,120,000	15.0	198,915	2,525,640	3,093,750
2019	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	57.0	3,919,725	127,227,930	157,680,000	20.0	265,220	3,367,520	4,125,000
2020	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	76.0	5,226,300	169,637,240	210,240,000	25.0	331,525	4,209,400	5,156,250
2021	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	95.0	6,532,875	212,046,550	262,800,000	30.0	397,830	5,051,280	6,187,500
2022	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	114.0	7,839,450	254,455,860	315,360,000	35.0	464,135	5,893,160	7,218,750
2023	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	133.0	9,146,025	296,865,170	367,920,000	40.0	530,440	6,735,040	8,250,000
2024	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	152.0	10,452,600	339,274,480	420,480,000	45.0	596,745	7,576,920	9,281,250
2025	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	171.0	11,759,175	381,683,790	473,040,000	50.0	663,050	8,418,800	10,312,500
2026	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	190.0	13,065,750	424,093,100	525,600,000	55.0	729,355	9,260,680	11,343,750
2027	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	209.0	14,372,325	466,502,410	578,160,000	60.0	795,660	10,102,560	12,375,000
2028	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	228.0	15,678,900	508,911,720	630,720,000	65.0	861,965	10,944,440	13,406,250
2029	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	247.0	16,985,475	551,321,030	683,280,000	70.0	928,270	11,786,320	14,437,500
2030	967.5	56,452,620	70,855,755	252,941,555	746.0	47,788,250	133,252,085	183,474,440	266.0	18,292,050	593,730,340	735,840,000	75.0	994,575	12,628,200	15,468,750
2031									285.0	19,598,625	636,139,650	788,400,000				
Indirect and Induced Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	-	-	-	-	2.0	81,040	140,445	258,915
2017	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	31.5	1,701,905	2,953,805	6,597,315	4.0	162,080	280,890	517,830
2018	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	63.0	3,403,810	5,907,610	13,194,630	6.0	243,120	421,335	776,745
2019	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	94.5	5,105,715	8,861,415	19,791,945	8.0	324,160	561,780	1,035,660
2020	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	126.0	6,807,620	11,815,220	26,389,260	10.0	405,200	702,225	1,294,575
2021	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	157.5	8,509,525	14,769,025	32,986,575	12.0	486,240	842,670	1,553,490
2022	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	189.0	10,211,430	17,722,830	39,583,890	14.0	567,280	983,115	1,812,405
2023	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	220.5	11,913,335	20,676,635	46,181,205	16.0	648,320	1,123,560	2,071,320
2024	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	252.0	13,615,240	23,630,440	52,778,520	18.0	729,360	1,264,005	2,330,235
2025	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	283.5	15,317,145	26,584,245	59,375,835	20.0	810,400	1,404,450	2,589,150
2026	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	315.0	17,019,050	29,538,050	65,973,150	22.0	891,440	1,544,895	2,848,065
2027	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	346.5	18,720,955	32,491,855	72,570,465	24.0	972,480	1,685,340	3,106,980
2028	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	378.0	20,422,860	35,445,660	79,167,780	26.0	1,053,520	1,825,785	3,365,895
2029	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	409.5	22,124,765	38,399,465	85,765,095	28.0	1,134,560	1,966,230	3,624,810
2030	863.5	39,097,680	64,032,760	118,398,720	369.5	15,807,245	27,598,265	50,843,400	441.0	23,826,670	41,353,270	92,362,410	30.0	1,215,600	2,106,675	3,883,725
2031									472.5	25,528,575	44,307,075	98,959,725				
Total Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	-	-	-	-	7.0	147,345	982,325	1,290,165
2017	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	50.5	3,008,480	45,363,115	59,157,315	14.0	294,690	1,964,650	2,580,330
2018	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	101.0	6,016,960	90,726,230	118,314,630	21.0	442,035	2,946,975	3,870,495
2019	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	151.5	9,025,440	136,089,345	177,471,945	28.0	589,380	3,929,300	5,160,660
2020	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	202.0	12,033,920	181,452,460	236,629,260	35.0	736,725	4,911,625	6,450,825
2021	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	252.5	15,042,400	226,815,575	295,786,575	42.0	884,070	5,893,950	7,740,990
2022	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	303.0	18,050,880	272,178,690	354,943,890	49.0	1,031,415	6,876,275	9,031,155
2023	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	353.5	21,059,360	317,541,805	414,101,205	56.0	1,178,760	7,858,600	10,321,320
2024	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	404.0	24,067,840	362,904,920	473,258,520	63.0	1,326,105	8,840,925	11,611,485
2025	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	454.5	27,076,320	408,268,035	532,415,835	70.0	1,473,450	9,823,250	12,901,650
2026	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	505.0	30,084,800	453,631,150	591,573,150	77.0	1,620,795	10,805,575	14,191,815
2027	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	555.5	33,093,280	498,994,265	650,730,465	84.0	1,768,140	11,787,900	15,481,980
2028	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	606.0	36,101,760	544,357,380	709,887,780	91.0	1,915,485	12,770,225	16,772,145
2029	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	656.5	39,110,240	589,720,495	769,045,095	98.0	2,062,830	13,752,550	18,062,310
2030	1,831.0	95,550,300	134,888,515	371,340,275	1,115.5	63,595,495	160,850,350	234,317,840	707.0	42,118,720	635,083,610	828,202,410	105.0	2,210,175	14,734,875	19,352,475
2031									757.5	45,127,200	680,446,725	887,359,725				

Table 14 Scenario 4 Detailed Results

Direct Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	652.4	38,116,264	48,087,304	153,662,672	596.8	38,230,600	106,601,668	146,779,552	-	-	-	-	4.0	53,044.0	673,504.0	825,000.0
2017	815.5	47,645,330	60,109,130	192,078,340	746.0	47,788,250	133,252,085	183,474,440	15.2	1,045,260	33,927,448	42,048,000	9.0	119,349.0	1,515,384.0	1,856,250.0
2018	978.6	57,174,396	72,130,956	230,494,008	895.2	57,345,900	159,902,502	220,169,328	34.2	2,351,835	76,336,758	94,608,000	15.0	198,915.0	2,525,640.0	3,093,750.0
2019	1,141.7	66,703,462	84,152,782	268,909,676	1,044.4	66,903,550	186,552,919	256,864,216	57.0	3,919,725	127,227,930	157,680,000	22.0	291,742.0	3,704,272.0	4,537,500.0
2020	1,304.8	76,232,528	96,174,608	307,325,344	1,193.6	76,461,200	213,203,336	293,559,104	83.6	5,748,930	186,600,964	231,264,000	30.0	397,830.0	5,051,280.0	6,187,500.0
2021	1,741.5	101,614,716	127,540,359	455,294,799	1,342.8	86,018,850	239,853,753	330,253,992	114.0	7,839,450	254,455,860	315,360,000	39.0	517,179.0	6,566,664.0	8,043,750.0
2022	1,935.0	112,905,240	141,711,510	505,883,110	1,492.0	95,576,500	266,504,170	366,948,880	148.2	10,191,285	330,792,618	409,968,000	49.0	649,789.0	8,250,424.0	10,106,250.0
2023	1,935.0	112,905,240	141,711,510	505,883,110	1,492.0	95,576,500	266,504,170	366,948,880	186.2	12,804,435	415,611,238	515,088,000	59.0	782,399.0	9,934,184.0	12,168,750.0
2024	1,935.0	112,905,240	141,711,510	505,883,110	1,492.0	95,576,500	266,504,170	366,948,880	224.2	15,417,585	500,429,858	620,208,000	69.0	915,009.0	11,617,944.0	14,231,250.0
2025	2,128.5	124,195,764	155,882,661	556,471,421	1,641.2	105,134,150	293,154,587	403,643,768	262.2	18,030,735	585,248,478	725,328,000	80.0	1,060,880.0	13,470,080.0	16,500,000.0
2026	2,322.0	135,486,288	170,053,812	607,059,732	1,790.4	114,691,800	319,805,004	440,338,656	304.0	20,905,200	678,548,960	840,960,000	92.0	1,220,012.0	15,490,592.0	18,975,000.0
2027	2,515.5	146,776,812	184,224,963	657,648,043	1,939.6	124,249,450	346,455,421	477,033,544	349.6	24,040,980	780,331,304	967,104,000	105.0	1,392,405.0	17,679,480.0	21,656,250.0
2028	2,709.0	158,067,336	198,396,114	708,236,354	2,088.8	133,807,100	373,105,838	513,728,432	399.0	27,438,075	890,595,510	1,103,760,000	119.0	1,578,059.0	20,036,744.0	24,543,750.0
2029	2,902.5	169,357,860	212,567,265	758,824,665	2,238.0	143,364,750	399,756,255	550,423,320	452.2	31,096,485	1,009,341,578	1,250,928,000	134.0	1,776,974.0	22,562,384.0	27,637,500.0
2030	3,096.0	180,648,384	226,738,416	809,412,976	2,387.2	152,922,400	426,406,672	587,118,208	509.2	35,016,210	1,136,569,508	1,408,608,000	150.0	1,989,150.0	25,256,400.0	30,937,500.0
2031									570.0	39,197,250	1,272,279,300	1,576,800,000				
Indirect and Induced Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	580.0	25,397,820	41,658,300	77,385,188	295.6	12,645,796	22,078,612	40,674,720	-	-	-	-	1.6	64,832	112,356	207,132
2017	725.0	31,747,275	52,072,875	96,731,485	369.5	15,807,245	27,598,265	50,843,400	25.2	1,361,524	2,363,044	5,277,852	3.6	145,872	252,801	466,047
2018	870.0	38,096,730	62,487,450	116,077,782	443.4	18,968,694	33,117,918	61,012,080	56.7	3,063,429	5,316,849	11,875,167	6.0	243,120	421,335	776,745
2019	1,015.0	44,446,185	72,902,025	135,424,079	517.3	22,130,143	38,637,571	71,180,760	94.5	5,105,715	8,861,415	19,791,945	8.8	356,576	617,958	1,139,226
2020	1,160.0	50,795,640	83,316,600	154,770,376	591.2	25,291,592	44,157,224	81,349,440	138.6	7,488,382	12,996,742	29,028,186	12.0	486,240	842,670	1,553,490
2021	1,554.3	70,375,824	115,258,968	213,117,696	665.1	28,453,041	49,676,877	91,518,120	189.0	10,211,430	17,722,830	39,583,890	15.6	632,112	1,095,471	2,019,537
2022	1,727.0	78,195,360	128,065,520	236,797,440	739.0	31,614,490	55,196,530	101,686,800	245.7	13,274,859	23,039,679	51,459,057	19.6	794,192	1,376,361	2,537,367
2023	1,727.0	78,195,360	128,065,520	236,797,440	739.0	31,614,490	55,196,530	101,686,800	308.7	16,678,669	28,947,289	64,653,687	23.6	956,272	1,657,251	3,055,197
2024	1,727.0	78,195,360	128,065,520	236,797,440	739.0	31,614,490	55,196,530	101,686,800	371.7	20,082,479	34,854,899	77,848,317	27.6	1,118,352	1,938,141	3,573,027
2025	1,899.7	86,014,896	140,872,072	260,477,184	812.9	34,775,939	60,716,183	111,855,480	434.7	23,486,289	40,762,509	91,042,947	32.0	1,296,640	2,247,120	4,142,640
2026	2,072.4	93,834,432	153,678,624	284,156,928	886.8	37,937,388	66,235,836	122,024,160	504.0	27,230,480	47,260,880	105,557,040	36.8	1,491,136	2,584,188	4,764,036
2027	2,245.1	101,653,968	166,485,176	307,836,672	960.7	41,098,837	71,755,489	132,192,840	579.6	31,315,052	54,350,012	121,390,596	42.0	1,701,840	2,949,345	5,437,215
2028	2,417.8	109,473,504	179,291,728	331,516,416	1,034.6	44,260,286	77,275,142	142,361,520	661.5	35,740,005	62,029,905	138,543,615	47.6	1,928,752	3,342,591	6,162,177
2029	2,590.5	117,293,040	192,098,280	355,196,160	1,108.5	47,421,735	82,794,795	152,530,200	749.7	40,505,339	70,300,559	157,016,097	53.6	2,171,872	3,763,926	6,938,922
2030	2,763.2	125,112,576	204,904,832	378,875,904	1,182.4	50,583,184	88,314,448	162,698,880	844.2	45,611,054	79,161,974	176,808,042	60.0	2,431,200	4,213,350	7,767,450
2031									945.0	51,057,150	88,614,150	197,919,450				
Total Effects																
Year	Equipment Requirements				Construction				Annual Operation				Payments to Landowners			
	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output	Jobs	Labor Income	Value Added	Output
2016	1,232.4	63,514,084	89,745,604	231,047,860	892.4	50,876,396	128,680,280	187,454,272	892.4	-	-	-	5.6	117,876	785,860	1,032,132
2017	1,540.5	79,392,605	112,182,005	288,809,825	1,115.5	63,595,495	160,850,350	234,317,840	40.4	2,406,784	36,290,492	47,325,852	12.6	265,221	1,768,185	2,322,297
2018	1,848.6	95,271,126	134,618,406	346,571,790	1,338.6	76,314,594	193,020,420	281,181,408	90.9	5,415,264	81,653,607	106,483,167	21.0	442,035	2,946,975	3,870,495
2019	2,156.7	111,149,647	157,054,807	404,333,755	1,561.7	89,033,693	225,190,490	328,044,976	151.5	9,025,440	136,089,345	177,471,945	30.8	648,318	4,322,230	5,676,726
2020	2,464.8	127,028,168	179,491,208	462,095,720	1,784.8	101,752,792	257,360,560	374,908,544	222.2	13,237,312	199,597,706	260,292,186	42.0	884,070	5,893,950	7,740,990
2021	3,295.8	171,990,540	242,799,327	668,412,495	2,079.9	114,471,891	289,530,630	421,772,112	303.0	18,050,880	272,178,690	354,943,890	52.6	1,149,291	7,662,135	10,063,287
2022	3,662.0	191,100,600	269,777,030	742,680,550	2,231.0	127,190,990	321,700,700	468,635,680	393.9	23,466,144	353,832,297	461,427,057	68.6	1,443,981	9,626,785	12,643,617
2023	3,662.0	191,100,600	269,777,030	742,680,550	2,231.0	127,190,990	321,700,700	468,635,680	494.9	29,483,104	444,558,527	579,741,687	82.6	1,738,671	11,591,435	15,223,947
2024	3,662.0	191,100,600	269,777,030	742,680,550	2,231.0	127,190,990	321,700,700	468,635,680	595.9	35,500,064	535,284,757	698,056,317	96.6	2,033,361	13,556,085	17,804,277
2025	4,028.2	210,210,660	296,754,733	816,948,605	2,454.1	139,910,089	353,870,770	515,499,248	696.9	41,517,024	626,010,987	816,370,947	112.0	2,357,520	15,717,200	20,642,640
2026	4,394.4	229,320,720	323,732,436	891,216,660	2,677.2	152,629,188	386,040,840	562,362,816	808.0	48,135,680	725,809,840	946,517,040	128.8	2,711,148	18,074,780	23,739,036
2027	4,760.6	248,430,780	350,710,139	965,484,715	2,900.3	165,348,287	418,210,910	609,226,384	929.2	55,356,032	834,681,316	1,088,494,596	147.0	3,094,245	20,628,825	27,093,465
2028	5,126.8	267,540,840	377,687,842	1,039,752,770	3,123.4	178,067,386	450,380,980	656,089,952	1,060.5	63,178,080	952,625,415	1,242,303,615	166.6	3,506,811	23,379,335	30,705,927
2029	5,493.0	286,650,900	404,665,545	1,114,020,825	3,346.5	190,786,485	482,551,050	702,953,520	1,201.9	71,601,824	1,079,642,137	1,407,944,097	187.6	3,948,846	26,326,310	34,576,422
2030	5,859.2	305,760,960	431,643,248	1,188,288,880	3,569.6	203,505,584	514,721,120	749,817,088	1,353.4	80,627,264	1,215,731,482	1,585,416,042	210.0	4,420,350	29,469,750	38,704,950
2031									1,515.0	90,254,400	1,360,893,450	1,774,719,450				