ILLINOIS DEPARTMENT OF LABOR

JB PRITZKER
GOVERNOR

JANE R. FLANAGAN
ACTING DIRECTOR

February 2, 2023

To: General Assembly Members and the Honorable Governor Pritzker

The Energy Transition Workforce Commission (Commission) was created within the Department of Commerce and Economic Opportunity through the Energy Community Reinvestment Act as part of Public Act 102-662, commonly referred to as the Climate and Equitable Jobs Act (CEJA). The Commission was charged with producing a report that analyzes the impact on the Illinois workforce of the clean energy transition, including recommendations to address these changes. The Commission, through the hard work of the University of Illinois – Springfield Center for State Policy and Leadership, is happy to submit this Phase I report to you, summarizing its preliminary findings. The Commission acknowledges that additional work remains, and it will need time to conduct further research and analysis, to fully accomplish its goals. The Commission is committed to continuing its work in 2023 and to producing a Phase II report toward the end of the year.

The preliminary report includes the following:
- Uses a basic model of statewide electricity demand to make projections of statewide job losses in the fossil fuel generating sector and job gains in the renewable energy generating sector;
- Examines demographic and job characteristics of the fossil fuel and renewable energy sectors; and
- Analyzes statewide emissions impacts from fossil fuel sector closings.

The Commission intends for its 2023 Phase II report to cover the following:
- Analyze economic and labor market effects at the statewide and regional levels using a fully specified economic model that allows for greater modeling of supply chain impacts and electrical demand at the regional level;
- Model environmental impacts more fully at the statewide and local levels; and
- Provide the Commission's recommendations to address impacts to the Illinois workforce resulting from the transition to clean energy.

Sincerely,

Jason Keller
Acting Chair
Energy Transition Workforce Commission

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CLIMATE AND EQUITABLE JOBS ACT ECONOMIC AND WORKFORCE EFFECTS PRELIMINARY ANALYSIS

Center for State Policy & Leadership
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BACKGROUND

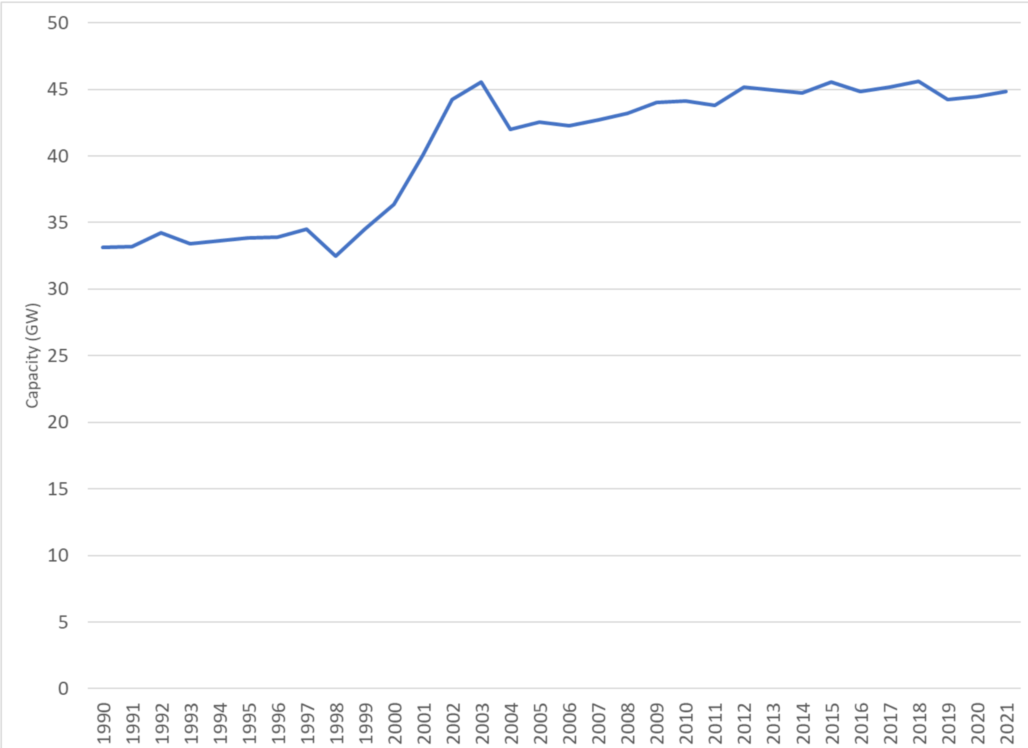
The University of Illinois – Springfield Center for State Policy and Leadership (UIS – CSPL) was engaged by the Department of Commerce and Economic Opportunity in the summer of 2022 to assist the Energy Transition Workforce Commission (ETWC) in assessing the economic and environmental effects of the transition to clean energy production envisioned under Public Act 102-0662 (the portion of the act requiring the study to assess the workforce and economic impacts of the Act's plant closure requirements is the Energy Community Reinvestment Act and the portion that mandates plant closures has been colloquially referred to as the Climate and Equitable Jobs Act – CEJA – this is what we will use to refer to the Act's provisions for plant closures hereafter). As part of this process, the ETWC will be receiving two reports from CSPL on the effects of the clean energy transition. This first report (Phase I) is a broad overview of the economic effects, without considering the effects of changes in energy production on the overall economy. The second report, to be produced by December 2023, will include a full economic model of the effects (Phase II report). Therefore, the estimates in the current report should be taken as preliminary only.

MODELS OF ELECTRIC GENERATION AND EFFECTS OF CEJA

The first step in our analysis was to develop estimates of the effects of CEJA plant closure requirements on electric generation. Understanding these effects puts context around economic and environmental effects. We began by gathering data from the U.S. Energy Information Administration on electric generation and capacity in Illinois. Figures 1 and 2 on the next page show the data on generating capacity and total generation, respectively in Illinois from 1990 to 2021.

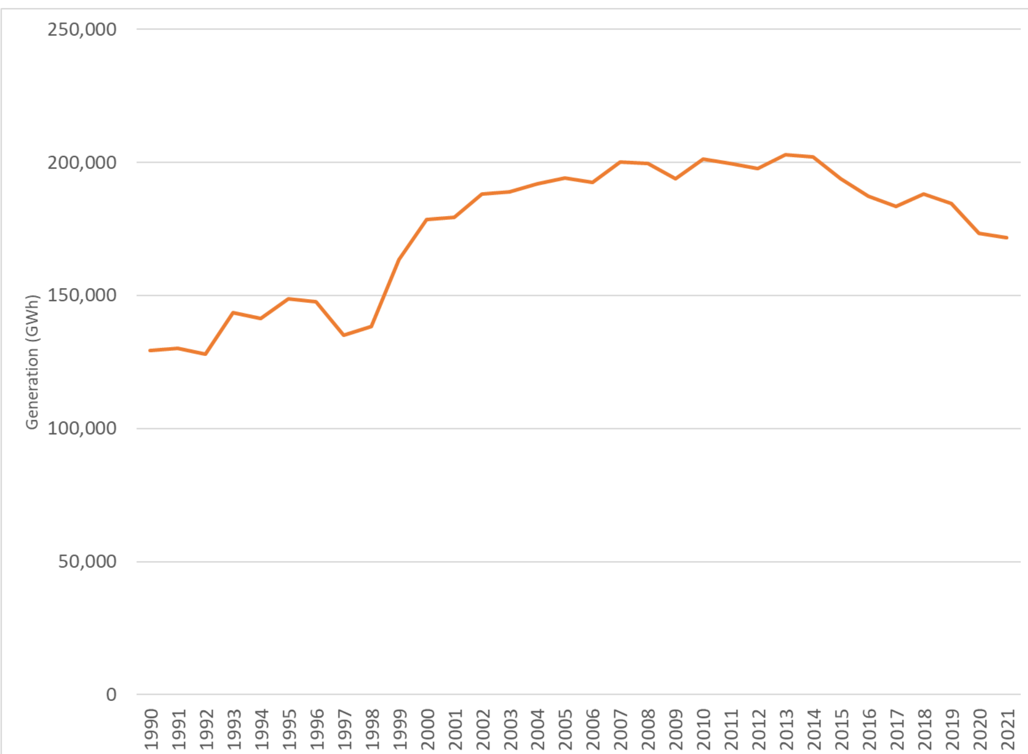
The data suggests that from the late-1990s to mid-2010s, both electrical generation capacity (the available electrical power at a given point in time, usually measured during summer months) and total generation (generation capacity used times the number of hours used) grew steadily, with some periods of faster than average growth. However, a divergence took place in the mid-2010s, with capacity growth slowing somewhat but maintaining its level and generation falling. This could be caused by changes in electrical demand, changes in climate (hotter summers keeping capacity high), or changes in the mix of imported versus locally generated electricity. In this report, we will focus on capacity, as that is the important variable for planning electrical infrastructure (as electricity cannot be easily stored in large amounts, there must be ample capacity in the infrastructure, or one of two things will happen: power

Figure 1. Historical Electrical Generation Capacity, State of Illinois, 1990-2021.



Data Source: U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

Figure 2. Historical Electrical Total Annual Generation, State of Illinois, 1990-2021.

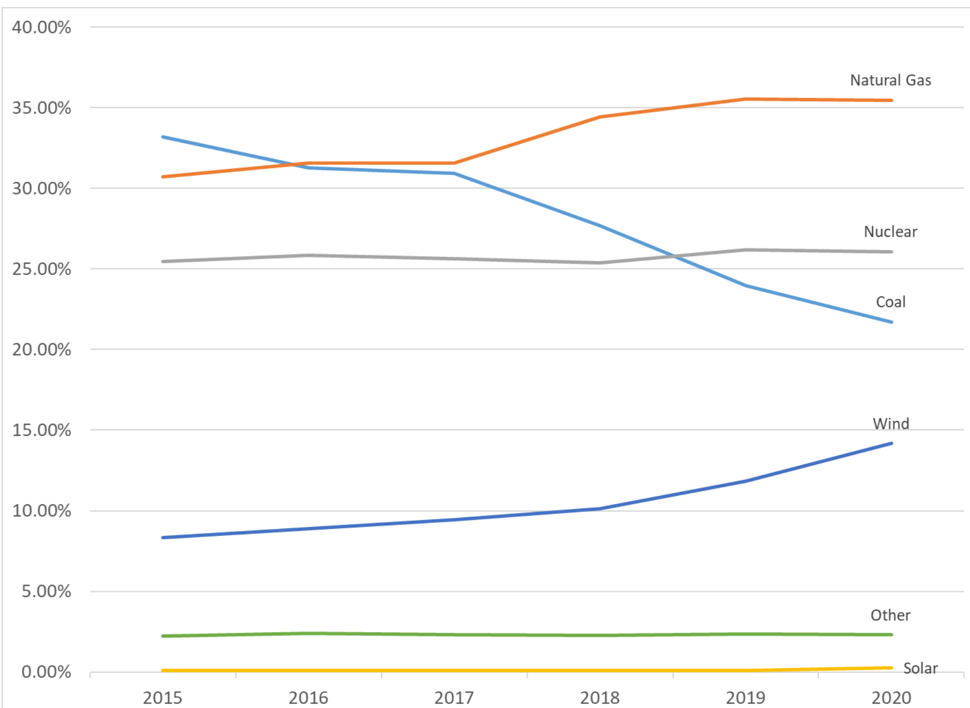


Data Source: U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report and predecessor forms.

interruptions or the use of imported electricity (which tends to be at higher rates than locally generated power). Neither are desirable outcomes.[1]

Within the overall statistics on capacity there has been a fundamental shift in the fuel types powering capacity in the state (Figure 3). In 2015, coal-fired power plants were the leading source of electrical capacity, accounting for over a third of total capacity. By 2020, numerous coal-fired plants had been shuttered, and coal was now the third leading source of capacity, at just under 22 percent. There were two primary fuel sources that replaced coal-fired capacity. The first was natural gas. Due to it being a relatively cheaper source of fuel for power plants, natural gas power grew from just over 30 percent to over 35 percent of capacity. Though this source of fuel for power plants is relatively cleaner than coal, it still generates a significant level of greenhouse and other gases and therefore the Act requires that

Figure 3. Electric Power Industry Capacity by Primary Energy Source, 2015-2020, Illinois.



Data Source: U.S. Energy Information Administration, Form EIA-860. Annual Electric Generator Report.

[1] A commission member pointed out to me in comments on an earlier draft of this report that this is a somewhat limited view of electrical system planning and that meeting peak demand is only one goal, that adequate capacity must be available in the system to meet demand at all times. We recognize that capacity is not the only relevant metric for determining how much electrical generation must be maintained in the state. Capacity factor, found by comparing the actual net generation of a plant with its theoretical optimal (plants running every hour of the year at full nameplate capacity) and availability factor (the ability of a plant to be called into service to meet peak demands) are important measures. However, all of the studies reviewed by the author in preparation for this report relied on generating capacity as their fundamental metric for examining economic and workforce effects and thus we follow the precedent.

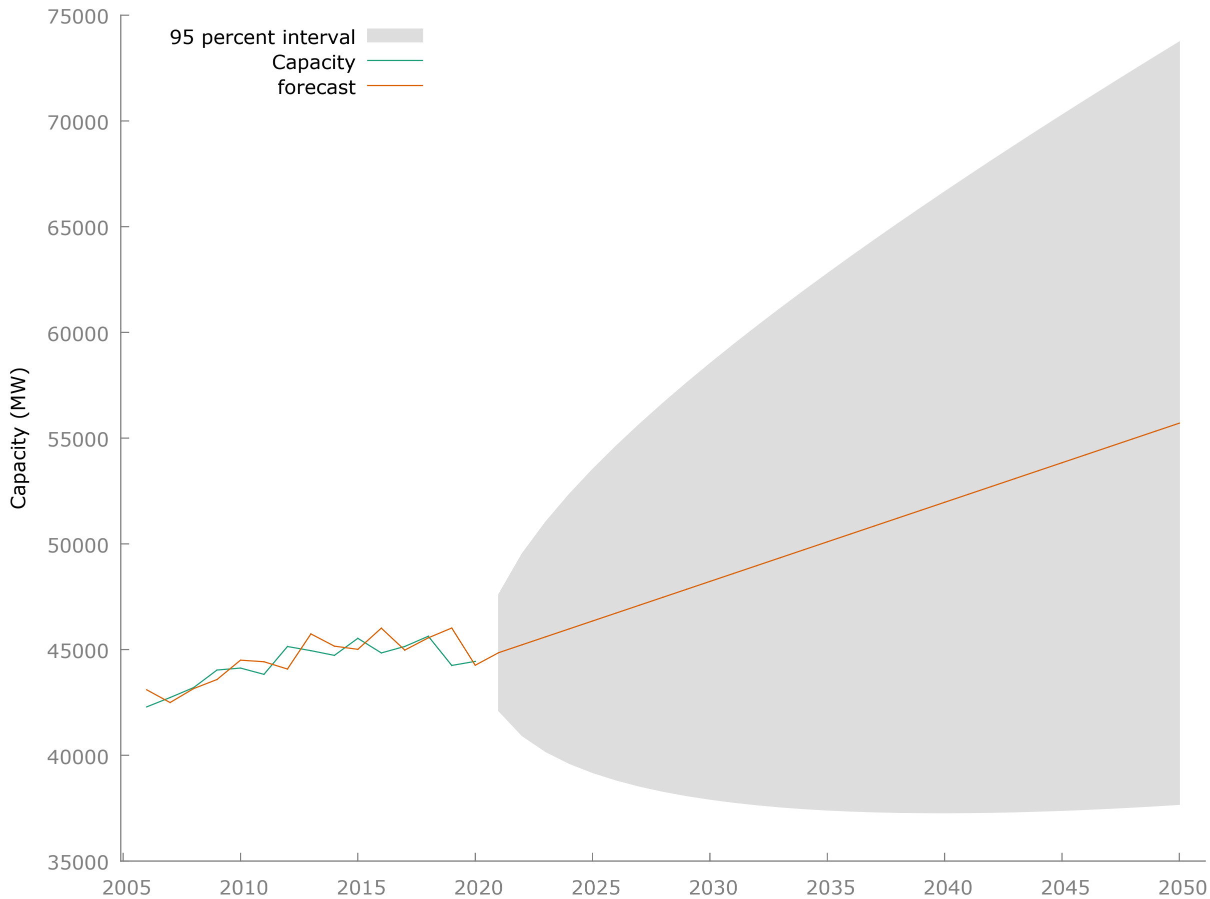
natural gas be phased out as a fuel source for electrical energy provision by 2045. The second source that replaced coal power is wind. Wind generating capacity grew from just over 8 percent of total capacity in 2015 to over 14 percent in 2020. During this period, wind-powered capacity grew by an average of more than 10 percent per year, from 3.8 gigawatts (GW) in 2015 to 6.3 GW in 2020. This presents a significant opportunity for the transition to clean energy provision in the state of Illinois.

We next proceeded to assess the base case for electric capacity growth. One might think of this as a necessary baseline for how much capacity needs to grow over the next several years to meet energy demand. To do this, we forecast capacity growth using techniques from forecasting best practices (Khan and Kriz, 2022). The final model developed was an Autoregressive Integrated Moving Average model (ARIMA) with one moving-average term and one difference of the data (current period value – previous period value). The results of the forecast model are shown graphically in Figure 4. The left side of the figure shows the forecast accuracy within the sample forecast. The model fit is good, explaining over 92 percent of variation in historical values of electrical capacity (the green line is the actual values, and the orange line is the forecast value from the model). The right side of the figure shows the base case forecast value (the orange line) and the 95 percent forecast interval (grey shaded area), which shows the uncertainty surrounding the base case forecast.[2] The base case forecast is equal to an approximate 0.7% annual growth rate during the period 2021 – 2050. This suggests that the state will have to add small amounts of electrical capacity each year to meet demand over the coming decades. However, as shown in the figure, our base case forecast contains much uncertainty. The uncertainty comes from the number of factors that go into capacity demand. To illustrate, during the period 1998 – 2003, capacity grew dramatically. However, it then fell and then grew slowly, not regaining its 2003 levels for almost 10 years. There are many possibilities for the development of capacity going forward and this is reflected in the capacity forecast interval. ETWC members should keep this uncertainty in mind as recommendations are crafted for policy initiatives.[3]

[2] For students of statistics, the standard errors that go into calculations of the forecast interval are "bootstrapped" through Bayesian simulation methods.

[3] One of the comments received on an earlier draft of this report suggests that we are not forecasting demand for electrical generating capacity. We feel that by forecasting capacity, we are indirectly forecasting demand, as in the long-run capacity will only be added when there is sufficient demand, and it will be added in relation to the growth of demand. We also note that these forecasts mirror the projections in the Annual Energy Outlook, produced by the Energy Information Administration. In next year's Phase II update, we will include various electrical demand forecasts specifically in our models of electric capacity needs.

Figure 4. Electric Power Capacity Forecast, 2021-2050, Illinois.



POWER PLANT CLOSURES MANDATED BY CEJA

CEJA requires that all coal-fired electrical generation plants with the exception of Dallman Unit 4 (owned by the City of Springfield) and the Prairie State Generating Station (owned by multiple municipal power agencies and rural electric cooperatives) be retired by 2030, and all natural gas power plants be retired or switch to green hydrogen fuel by 2045. Table 1 shows the plants along with their transmission or distribution systems, the county in which they are located, their estimated closing date, and generating capacity and net generation. Data in this table comes from the EPA eGrid database (EPA, 2022a – for ownership, location, generating capacity and net generation data) and from media reports and the EPA Power Plant retirements database (EPA, 2022b – for scheduled closing dates). The data on generating capacity and net generation was confirmed with the Energy Information Administration Form 860 for capacity and EIA Form 923 for annual net generation. For the two exception plants, the negotiated closing date was 2045, therefore we assume that this assumption will hold throughout our analysis. At this point we note that the state will lose 10.6 GW in nameplate capacity and 30,718.8 GWh in annual net generation until 2045 due to coal plant retirements.

Table 1. Scheduled Coal Plant Closures, Illinois, 2022 - 2045.

Plant Name	Plant transmission or distribution system owner name	County	Scheduled/ Estimated Closing Date	Nameplate Capacity (MW)	Annual Net Generation (MWh)	Average Capacity Factor
Archer Daniels Midland Co	Ameren Illinois Company	Macon	2030	335.00	1,178,599	0.402
Baldwin Energy Complex	Ameren Illinois Company	Randolph	2025	1,259.60	4,060,737	0.368
Dallman	City of Springfield - (IL)	Sangamon	2045	437.40	630,195	0.164
E D Edwards	Ameren Illinois Company	Peoria	2022	644.30	3,105,601	0.550
Joppa Steam	Ameren Illinois Company	Massac	2022	1,099.80	4,109,045	0.427
Kincaid Generating Station	Commonwealth Edison	Christian	2027	1,319.00	1,475,564	0.128
Marion	Southeastern IL Elec Coop	Williamson	2030	99.00	435,405	0.502
Newton	Ameren Illinois Company	Jasper	2027	617.40	2,631,921	0.487
Powerton	Commonwealth Edison	Tazewell	2028	1,785.60	844,778	0.054
Prairie State Generating Station	Ameren Illinois Company	Washington	2045	1,766.00	11,308,063	0.731
SIUC	Ameren Illinois Company	Jackson	2030	3.50	6,621	0.216
Waukegan	Commonwealth Edison	Lake	2022	681.70	623,944	0.104
Will County	Commonwealth Edison	Will	2022	598.40	308,360	0.059
Totals				**10,646.70**	**30,718,833**	**0.333**

Data Sources: Environmental Protection Agency, eGrid Database; Environmental Protection Agency, Power Plant Retirements Database; Media Reports.

Table 2 lists the natural gas plants in operation in the state of Illinois that had positive net generation during 2020. With natural gas plants, the data on planned closures is spotty. We were only able to identify a handful of plants with scheduled closing dates. Instead, as detailed below, we use the provisions outlined in CEJA for mandated gas plant closure dates to estimate generating capacity loss. The state will lose 17.4 GW in generating capacity and 22,871.4 GWh in net generation over the next 23 years as a result of the required retirements.

Table 2. Natural Gas Power Plants in Operation in the State of Illinois.

Plant Name	Plant Transmission or Distribution System Owner	County	Nameplate Capacity (MW)	Annual Net Generation (MWh)	Average Capacity Factor
Princeton (IL)	City of Princeton - (IL)	Bureau	37.9	525	0.002
University of Illinois Abbott Power Plant	Ameren Illinois Company	Champaign	80.3	189,223	0.269
Raccoon Creek Power Plant	Union Electric Co - (MO)	Clay	456.0	5,342	0.001
Winnetka	Village of Winnetka - (IL)	Cook	28.2	3,847	0.016
University of Illinois Cogen Facility	Commonwealth Edison Co	Cook	52.5	101,899	0.222
Calumet Energy Team, LLC	Commonwealth Edison Co	Cook	312.8	14,431	0.005
Loyola University Health Plant	Commonwealth Edison Co	Cook	10.6	980	0.011
Triton East and West Cogen	Commonwealth Edison Co	Cook	3.6	280	0.009
Chicago West Side Energy Center	Commonwealth Edison Co	Cook	3.5	16,061	0.524
Northwest Community Hospital	Commonwealth Edison Co	Cook	4.4	971	0.025
Tuscola Station	Ameren Illinois Company	Douglas	6.0	38,868	0.740
Nalco	City of Naperville - (IL)	DuPage	4.0	16,027	0.457
BP Naperville Cogeneration Facility	City of Naperville - (IL)	DuPage	8.3	67,511	0.929
Aurora	Commonwealth Edison Co	DuPage	1,086.2	768,846	0.081
Argonne National Laboratory CHP	Commonwealth Edison Co	DuPage	6.3	39,072	0.708
Freedom Power Project	Southwestern Electric Coop Inc - (IL)	Fayette	71.0	917	0.001

Gibson City Energy Center, LLC	Ameren Illinois Company	Ford	270.0	203,748	0.086
Morris Cogeneration, LLC	Commonwealth Edison Co	Grundy	218.8	608,815	0.318
Grand Tower Energy Center, LLC	Ameren Illinois Company	Jackson	336.8	619,837	0.210
Hoffer Plastics	Commonwealth Edison Co	Kane	7.2	1,040	0.016
Rocky Road Power, LLC	Commonwealth Edison Co	Kane	415.5	76,813	0.021
Elgin Energy Center, LLC	Commonwealth Edison Co	Kane	540.0	378,234	0.080
Geneva Generation Facility	City of Geneva- (IL)	Kane	29.5	5,642	0.022
CSL Behring LLC	Commonwealth Edison Co	Kankakee	4.2	18,149	0.493
Kendall Energy Facility	Commonwealth Edison Co	Kendall	1,256.0	7,271,182	0.661
Zion Energy Center	Commonwealth Edison Co	Lake	596.7	329,209	0.063
North Chicago Energy Center	Commonwealth Edison Co	Lake	12.4	36,283	0.334
Lake Forest Hospital Central Energy Plant	Commonwealth Edison Co	Lake	3.2	523	0.019
Nelson Energy Center	Commonwealth Edison Co	Lee	627.5	3,825,587	0.696
Lee County Generating Station, LLC	Commonwealth Edison Co	Lee	692.0	257,367	0.042
Venice	Union Electric Co - (MO)	Madison	586.0	64,838	0.013
Kinmundy Power Plant	Union Electric Co - (MO)	Marion	270.0	15,667	0.007
MEPI GT Facility	Electric Energy Inc	Massac	301.5	19,382	0.007
Charter Dura-Bar	Commonwealth Edison Co	McHenry	6.0	6,733	0.128
Waterloo	City of Waterloo - (IL)	Monroe	13.6	327	0.003

North Ninth Street	Rochelle Municipal Utilities	Ogle	14.8	2,108	0.016
South Main Street	Rochelle Municipal Utilities	Ogle	5.0	553	0.013
1515 S Caron Road	Rochelle Municipal Utilities	Ogle	4.2	153	0.004
Archer Daniels Midland Co. - Peoria	Ameren Illinois Company	Peoria	36.0	71,548	0.227
Pinckneyville Power Plant	Ameren Illinois Company	Perry	380.0	71,669	0.022
Goose Creek Power Plant	Ameren Illinois Company	Piatt	684.0	15,165	0.003
Cordova Energy Company	MidAmerican Energy Co	Rock Island	611.2	1,990,983	0.372
Interstate	City of Springfield - (IL)	Sangamon	138.6	28,999	0.024
Alsey Station	Prairie Power, Inc	Scott	173.0	29,764	0.020
Shelby County	Ameren Illinois Company	Shelby	483.0	310,305	0.073
Holland Energy Facility	Ameren Illinois Company	Shelby	702.1	2,269,099	0.369
Milam Gas Recovery	Union Electric Co - (MO)	St Clair	2.4	19,146	0.911
Adkins Energy LLC	Commonwealth Edison Co	Stephenson	6.8	32,974	0.554
Tilton Power Station	Ameren Illinois Company	Vermilion	188.0	110,392	0.067
Joliet 29	Commonwealth Edison Co	Will	1,320.0	1,052,271	0.091
Elwood Energy Facility	Commonwealth Edison Co	Will	1,728.0	392,216	0.026
Lincoln Generating Facility	Commonwealth Edison Co	Will	692.0	3,949	0.001
University Park Energy	Commonwealth Edison Co	Will	353.4	388,647	0.126
Crete Energy Park	Commonwealth Edison Co	Will	356.0	37,942	0.012
LSP University Park, LLC	Commonwealth Edison Co	Will	726.0	827,156	0.130
Rockford Energy Center	Commonwealth Edison Co	Winnebago	316.0	129,247	0.047

Rockford II Energy Center	Commonwealth Edison Co	Winnebago	168.0	82,936	0.056
Total			**17,447**	**22,871,399**	**0.150**

Data Sources: Environmental Protection Agency, eGrid Database; Environmental Protection Agency, Power Plant Retirements Database; Media Reports. Data was confirmed with the Energy Information Administration, Form 860 reports which form the basis for the eGRID data.

COAL MINES

Coal mine closures are not directly mandated in the CEJA legislation. However, it is reasonable to assume that by losing a prime source of coal demand, the mines will have difficulty operating and are likely to close.[4] Table 3 shows the location and ownership of the coal plants operating in the state of Illinois. As with natural gas, there is no sense of when these mines might be closed.

Table 3. Coal Mines Operating in the State of Illinois.

Mine	Owner	County
Eagle River Mine	Eagle River, LLC	Saline
Hamilton #1 Mine	Hamilton County Coal, LLC	Hamilton
Viper Mine	ICG Illinois, LLC	Sangamon
Blackhawk Mine	Knight Hawk Coal, LLC	Perry
Creek Paum Mine	Knight Hawk Coal, LLC	Jackson
Hawkeye Mine	Knight Hawk Coal, LLC	Randolph
Prairie Eagle U/G	Knight Hawk Coal, LLC	Perry
Red Hawk Mine	Knight Hawk Coal, LLC	Perry
Mach #1 Mine	Mach Mining LLC	Williamson
Shay #1 Mine	MaRyan Mining, LLC	Macoupin
MC #1 Mine	M-Class Mining, LLC	Franklin
Deer Run Mine	Patton Mining, LLC	Montgomery
Gateway North Mine	Peabody Midwest Mining	Randolph
Lively Grove Mine	Prairie State Gen. Co. LLC	Washington
Friendsville Mine	Vigo Coal Co.	Wabash

Data Source: State of Illinois, Department of Natural Resources, Office of Mines and Materials. Illinois Coal: 2021 Annual Statistical Report.

[4] Two commission members pointed out in comments on an earlier draft that this assumption may be too strong. They stated that much of Illinois coal is exported for use in other states due to its relatively high sulfur content. We find no recent documentation of this, although there are older reports which allude to this. We also have no idea how the level of exports may affect the potential closure of mines. We maintain this assumption and our estimates based on this assumption in this report and note that the data obtained for the 2023 update of this report (Phase II) will allow us to estimate potential mine closures more definitively.

MODELING ELECTRICAL CAPACITY LOSS

The first task that is required to assess the balance between electrical capacity loss created by shuttering fossil fuel powered plants is to develop a model of the closure of the plants. With respect to coal-powered plants, the estimates are relatively easy. As we saw in Table 1, most coal plants have announced retirement dates, and we can estimate from the law's provisions retirement dates for those plants without announced dates. We apply the nameplate capacity to each retirement date and assume that the plants will operate at the same nameplate capacity over time until the retirement date. This is a necessary simplifying assumption. For natural gas-powered plants, we must make further assumptions given the paucity of data on closures. We assume that plants will be closed according to the requirements set forth in CEJA (415 ILCS 5/9.15(i)-(k)).

The law delineates seven groups with respect to closure dates. Group 1 plants have high pollution emissions rates (greater than 0.12 lbs./MWh of NO_x or 0.006 lbs./MWh of SO_2) and are located within three miles of an environmental justice community (EJC – as designated by the Illinois Power Agency) or a zone designated in the R3 (Restore, Reinvest, Renew) program. Those plants must close by 2030. Group 2 plants also have high emissions rates but are not located within three miles of an EJC or R3 zone. Group 2 plants must close by 2040 but reduce their emissions by 50% by 2035. Group 3 plants must close by 2035 and reduce emissions by 50% by 2030. These plants have emissions rates below the cutoff points noted above but lie within three miles of an EJC or R3 zone. Group 4 plants do not meet designation for one of the first three groups but have a heat output rate greater than 7,000 BTU/kWh. They must close by 2040 with 50% reduction achieved by 2035. Group 5 plants do not meet designation for any of these first categories and must close by 2045. There are also two categories that are not dependent on pollution rates or heat output. These are publicly owned and combined heat/power (cogeneration) facilities. They must close by 2045.

Appendix 1 shows the group designation for natural gas plants under the CEJA rules.[5] We note that within each designation we do not know the exact date of plant closure. We therefore further assume that plant closures will follow a "logistic curve," commonly known as an S-curve.[6] This type of function describes processes well that start slowly, then accelerate at some point, then finish slowly. This type of function seems to fit the logic of plant closures well. As coal-fired plants shut down early in the CEJA timeline, there will be little incentive to close down gas-fired plants, except for the CEJA provisions. In fact, as we will see shortly the state may have a net capacity deficit without extremely strong growth in renewable energy sources. Then as the limits set forth in Act start to approach, we expect to see increasing rates of gas plant closures. What the structure of CEJA produces is a type of "stair step"

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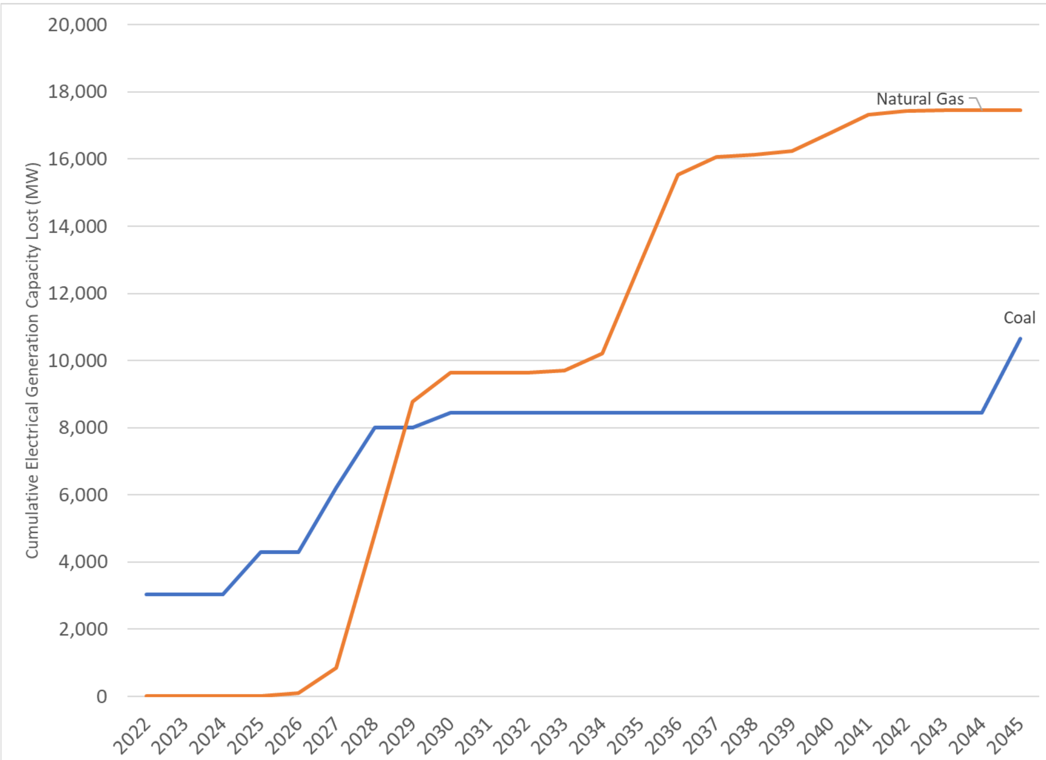
[5] The determination was made through using the eGRID database to determine pollution emission rates, and ArcGIS mapping software to determine distance to environmental justice community/R3 zones.

[6] The formula for the logistic function we used was $Cum\ Loss_t = {Total\ Loss}/{(1 + e^{-s(t-t_0)})}$, where $Cum\ Loss_t$ is the cumulative capacity loss to time t (in years), s is the slope of the function, and t_0 is the midpoint of the cumulative loss function. We set t_0 to the 50% reduction rate point for Groups 2, 3, and 4 as set forth by CEJA, implicitly assuming that half the loss in generating capacity will be realized by then, and s to -2.33, indicating that each year the loss would increase slowly in percentage terms until just before the midpoint, accelerate sharply and then fall off dramatically at the end of the period before closures must be complete.

capacity loss function (Figure 5). This process will likely continue until the early 2040s as the final retirement dates mandated under the Act approach, when the final closures will take place.

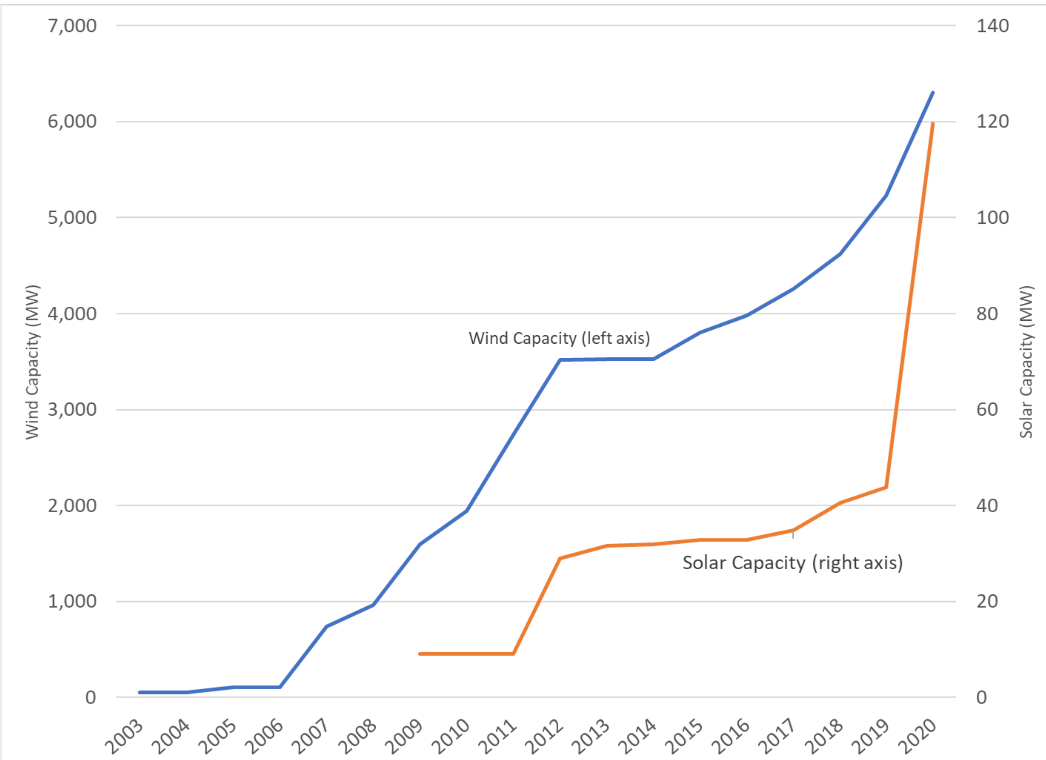
Figure 5. Cumulative Capacity Loss Estimates.



As coal and gas plants are retired there will be negative economic effects from job losses as well as supply chain effects. In the next section of the report, we discuss the projected job losses from the idling of plants. We will not discuss the supply chain effects in this report. This is left for the Phase II report due in 2023. However, we must also account for the likely increase in capacity from increased renewable energy sources. As capacity ramps up in these energy sources, jobs will be created in this sector. As we develop models for this, we will discuss the concept of energy balance and the potential implications for the development of renewable sources and for the economy of the state.

To develop a baseline for our discussion, we use data from the EIA to examine past trends in renewable energy sources (Figure 6) and develop a forecast for baseline growth in renewable power. The first thing to note about the data is that it is available for a much shorter period of time than other sources. Wind power did not start to develop enough capacity to be reported until 2003, and solar did not become a sufficient source of capacity until 2009. The briefness of the data availability hurts our ability to use traditional forecasting methods in developing our models. Further, there appears to be a definite "structural break" in the data in the mid-2010s. For wind, the break seems to have occurred in 2014, with the trend growth increasing at that point. The wind capacity growth curve looks like an exponential curve after that point. Average annual wind capacity growth during this period was 10.15 percent per year. For solar, the obvious break is in 2020. But the slope started changing as early as 2016. Average annual solar capacity growth since 2016 was 38.19%. These breaks could be caused by changes in the relative price of electricity production. However, the state also implemented utility-paid credits for renewable energy during the late 2010s that likely stimulated capacity growth.

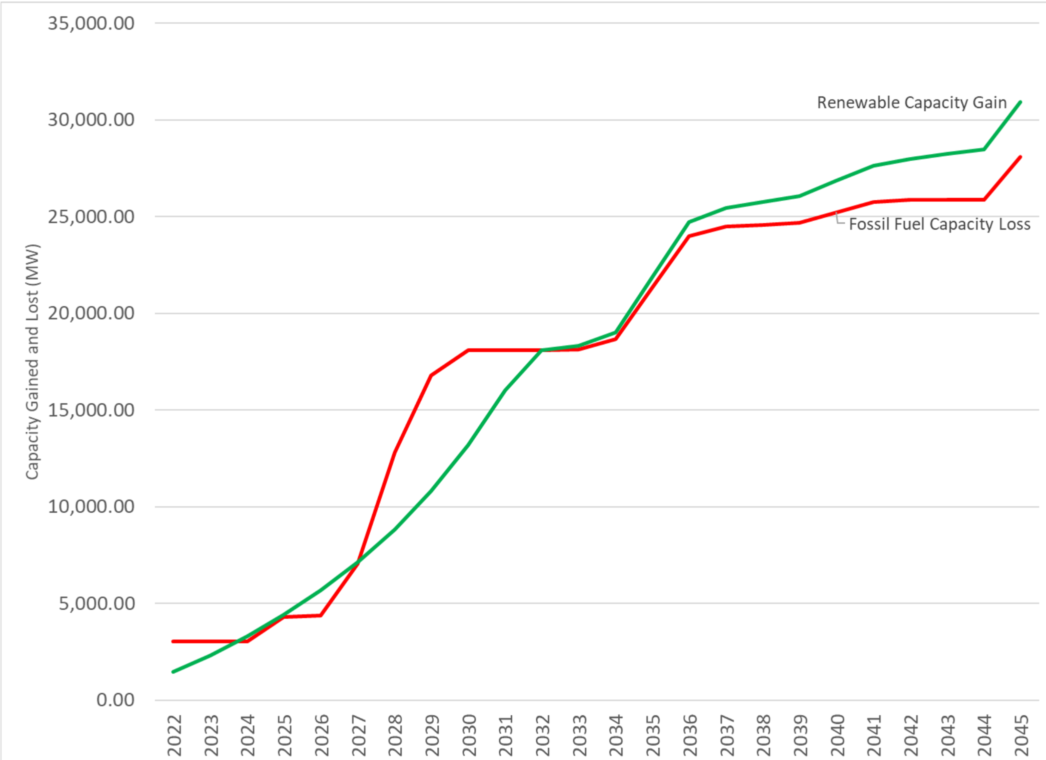
Figure 6. Historical Capacity Growth, Wind & Solar Powered Electrical Generation, Illinois, 2003 - 2020.



Data Source: U.S. Energy Information Administration, Form EIA-860. Annual Electric Generator Report.

Combining the data on capacity loss from existing fossil fuel power plants with projected renewable sources of power generation and making two assumptions, we arrive at a balancing function for fossil fuel losses due to the Act and renewable fuel source gains (Figure 7). Before discussing the assumptions, we examine the left side of Figure 6, the coming years of the policy. Even with robust growth in wind and solar powered electrical capacity, the state will likely have to import electrical capacity from the grid during peak periods. The gain from wind and solar is just not enough to cover the losses from closing coal (especially) and natural gas plants. There are potential economic effects from this importing of capacity, but they are beyond the scope of our preliminary estimates and will be discussed in the full model we are developing for the Phase II report.

Figure 7. Renewable Capacity Gain and Fossil Fuel Capacity Loss Estimates, 2022 - 2045.



By 2032 we estimate that gains from renewable power sources will equal the cumulative losses from fossil fuel sources. We will refer to this as the "crossover" point. From that point forward, there are at least three different paths forward for the transition to renewable sources. The state could continue to develop renewable sources at the same rapid pace and then utilities could sell capacity to the grid. A question though arises to whether any gains from this should be counted as economic gains of the CEJA policy. The goal of the Act was to reduce Illinois' reliance on fossil fuel sources of energy, not to be able to generate excess capacity to be sold. Therefore, our first assumption is that the state will only generate enough energy from renewable sources to cover the losses in fossil fuel generation plus the share of base capacity growth (0.7 percent per year as discussed above)[7] that renewable sources account for. This is the second path forward. The other implicit assumption that we make by doing this is that nuclear energy will not grow over time. Though there is funding for nuclear power generation in the Act it is mainly to extend the life of existing nuclear plants, not to develop new capacity. The last potential path is to continue to stimulate solar and wind capacity development to create a "buffer" against demand spikes. One of the aspects of wind and solar is that the "fuel" for generation may not be available (the wind might be still, and the sun may not shine). For this reason, there is less ability of wind and solar to provide baseload generation. There may need to be relatively greater nameplate capacity developed in renewable sources to meet baseload demand. A factor that may counteract this is the

[7] The new base capacity growth is the reason why there is a slight divergence between renewable gains and fossil fuel losses.

development of battery storage technology. If battery storage develops quickly and the cost falls, it may be used to backup wind and solar generation. As part of developing this report we searched for estimates of both effects but found nothing authoritative on the subject. Therefore, our assumption of baseload replacement plus expected growth in demand seems reasonable for this preliminary report. We will continue to seek estimates of these effects as we move forward next year with the Phase II update.[8]

CHANGES IN EMPLOYMENT

With the results for electrical capacity in hand, we can model changes in employment that are likely to accrue to the state from the transition to renewable energy sources. We start by examining likely job losses in fossil fuel power generation and coal mines. With regard to coal-fired power plants the data is readily available on employment and scheduled closings. Funderburg (2021) examined publicly available data sources from the U.S. Bureau of Labor Statistics and privately available data sources from Walls & Associates (2022 – the National Establishment Time Series) and Reference USA (2022) to develop his estimates. We verified those figures and triangulated them with data from Lightcast (2022 – formerly known as EMSI). For natural gas plants, where there is less data available, we develop a model using data from the U.S. Bureau of Labor Statistics on employment in the Fossil Fuel generation and data from the Energy Information Administration on electrical capacity. Using time series regression statistical analysis, we find that employment in fossil fuel plants is approximately 0.031 per MW of nameplate capacity.[9] For wind and solar employment, we use the same data. However, we are once again constrained by the relatively brief time frame that the data is available for renewables. Therefore, we examine typical ratios of employment to nameplate capacity. We find that on average, wind generation employment is 0.12 worker per MW capacity, with a much higher figure (0.55) for solar.[10] For coal mines, the State of Illinois reports total employment in mines of 2,500 as of 2021. We assume that job

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[8] Additionally, two commission members questioned whether the effects of the state's push toward electrification and simultaneously toward energy conservation may increase (electrification) or decrease (conservation) electricity demand in the state. In next year's Phase II update, we will develop scenarios for both of these, assuming adequate documentation for the figures underlying the scenarios can be generated.

[9] The regression equation fitted to the model is $\Delta Employment = 0.031 * \Delta Capacity, \rho = 0.948, R^2 = 0.89$. The regression model uses the Cochrane-Orcutt correction for serial correlation. The model fit is significant with a strong goodness of fit coefficient.

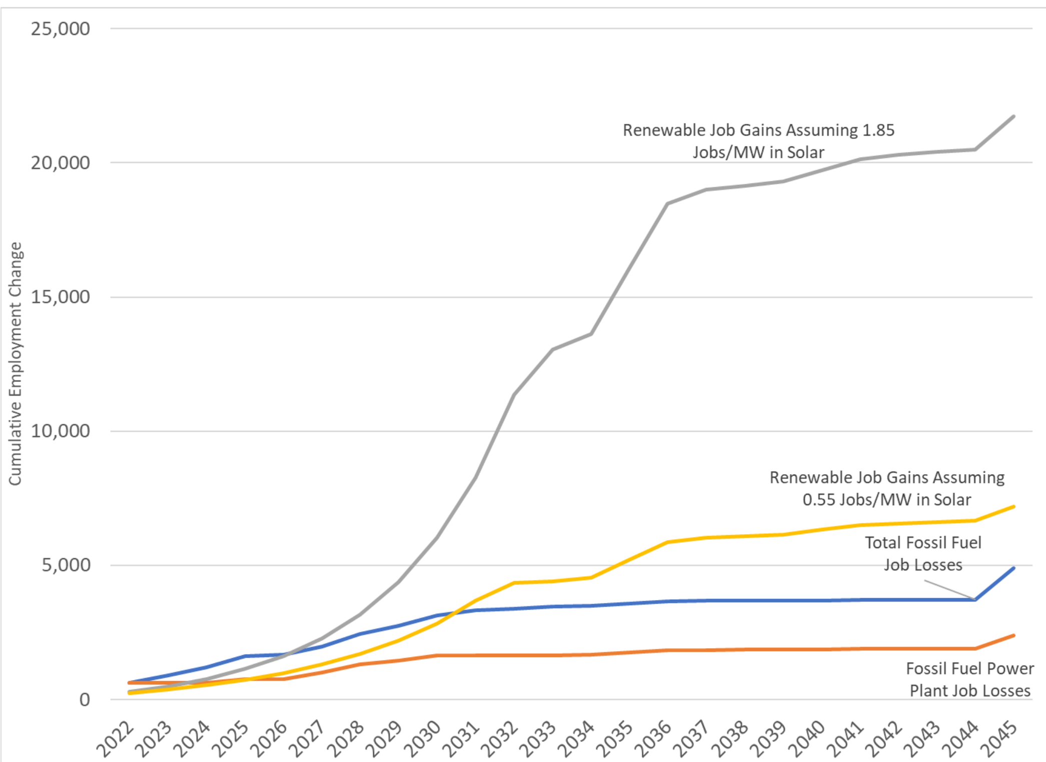
[10] The wind figure is based on the average of 5 years of data ending in 2019 comparing QCEW employment figures to generating capacity (we used 2019 as an end point due to the severe economic downturn in 2020). The figures for wind are relatively similar over different years. For solar, the figures show significantly more variability. The 0.55 worker/MW figure is the lowest figure for the state in the 5-year period. This was chosen as it was the closest to the national average, calculated using the same data for total national employment and capacity (0.096 workers/MW). The median figure for the 5 years ending in 2019 was 1.85 workers/MW hour and is included below in Figure 8 below for comparison. We also note that other studies done locally and nationally attributed greater amounts of employment per unit of electrical output. However, the documentation for these studies is lacking and therefore we present our estimates here. In next year's update, we will be using a full economic model to estimate these figures and therefore they will be much more accurate than previous estimates.

losses in mines will follow the pattern of coal plant closures, with a three-year phase out of jobs (if a plant closes in 2022, we attribute job losses to mines in 2023, 2024, and 2025).

CHANGES IN STATEWIDE EMPLOYMENT

Given those assumptions, Figure 8 shows our estimates of renewable job gains and fossil fuel job losses. Overall, the fossil fuel sector is projected to lose almost 4,900 jobs in Illinois by 2045. 2,500 of these jobs are in coal mines. Against those losses, renewable job gains are expected to be 7,200 with an assumption of 0.55 workers/MW in solar energy production and over 21,000 with the higher assumption noted in the previous section of the report. Therefore, we project a net gain of between 2,300 and 16,000 jobs over the next 23 years from the transition to electric generation from renewable sources. With almost any assumption, there will be a significant gain in jobs from the energy transition. The magnitude of the change depends on the labor intensity of the solar industry, something that is uncertain.[11]

Figure 8. Cumulative Employment Change Estimates from the Energy Transition, 2022 - 2045.



Data Sources: Funderburg (2021) – original data sources: Walls & Associates, National Establishment Time Series and Dun & Bradstreet; Lightcast; U.S. Bureau of Labor Statistics; U.S. Energy Information Administration. Calculations by author.

[11] We also note here that these are full-time equivalent jobs in the electric generation industries only. Temporary construction jobs will also be created as generating infrastructure is added. These jobs have been suggested to account for a sizable portion of the total economic effect of renewable energy. However, previous studies documenting this appear not to have carefully accounted for temporary jobs or made the distinction between jobs created and jobs supported, both of which are essential in estimating construction activity (Clouse, 2022). In the 2023 report we will account for the effects of renewable energy construction jobs on the state economy.

LOCAL EMPLOYMENT LOSSES

As Funderburg (2021) suggests, the effects of job losses and the associated losses in income and property tax revenue that come from plant closing are heavily localized. While the previous section discussed overall statewide job losses, in this section we sketch out regional effects from power plant and coal mine closures. Overall, the job losses are spread throughout the state, with 49 of 102 counties expected to have some job losses from the effects of CEJA (Table 4 & Figure 9). Some counties do fare disproportionately worse than others. Three counties (Washington, Will, and Williamson) are predicted to have 400 or more job losses, while an additional four counties (Franklin, Lawrence, Perry, and Randolph) are estimated to lose 300-400 jobs. Geographically, most of the losses are in the central and southern part of the state, with the exception of Will County, whose job losses are projected to be the second highest in the state.[12]

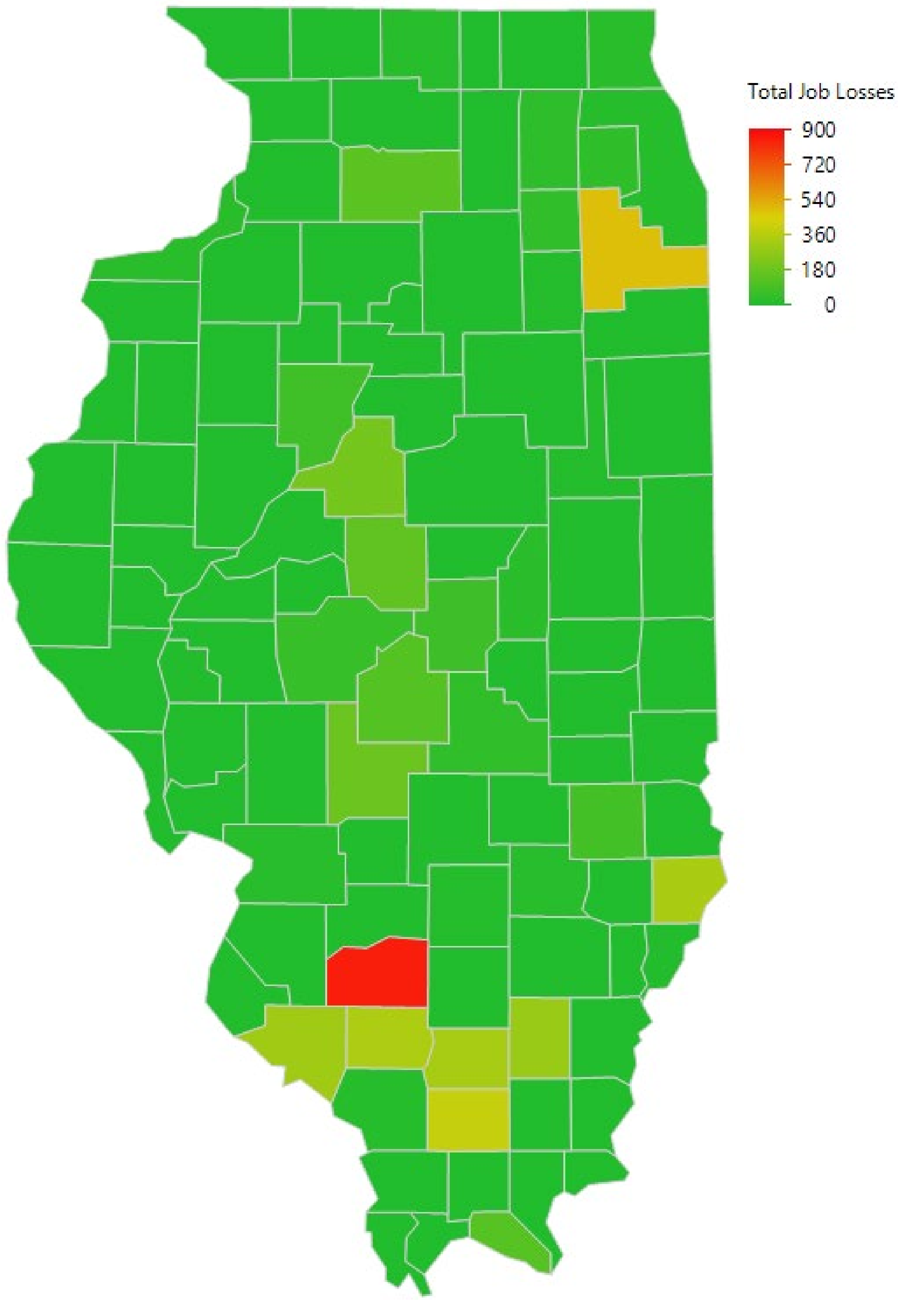
Table 4. Cumulative Job Losses, Fossil Fuel Energy Related Industries, 2022 - 2045.

County	Coal Plant Losses	Gas Plant Losses	Coal Mine Losses	Total Job Losses
Bureau		1		1
Champaign		2		2
Christian	123			123
Clay		14		14
Cook		13		13
DuPage		34		34
Fayette		2		2
Ford		8		8
Franklin			327	327
Grundy		7		7
Hamilton			292	292
Jackson	2	10	1	13
Jasper	82			82
Kane		31		31
Kendall		39		39
Lake		19		19
Lawrence			334	334
Lee	100	41		141
Logan			153	153
Macon	68			68

[12] In his comments, a Commissioner requested more granular analysis of projected job losses to include “an estimate of worker impacts due to scheduled closures, including layoffs, early retirements, salary changes, and other factors the Commission finds relevant” as detailed in CEJA. We attempted to find data about the nature of job losses in order to answer these questions but were unsuccessful. For next year’s Phase II update of this report, we will continue to search for more granular data that will allow us to estimate these details.

Macoupin			2	2
Madison		18		18
Marion		8		8
Massac	121	9		130
Monroe				0
Montgomery			181	181
Ogle		1		1
Peoria	73	1		74
Perry		12	329	341
Piatt		21		21
Randolph	138		172	310
Rock Island		19		19
Saline			2	2
Sangamon	50	4		54
Scott		5		5
Shelby		37		37
Tazewell	205			205
Vermilion		6		6
Wabash			4	4
Washington	450		409	859
Will	331	160		491
Williamson	107		294	401
Winnebago		15		15
Total Job Losses	1,850	537	2,500	4,887

Figure 9. Estimated Total Job Losses in Fossil Fuel Energy Related Industries, 2022 - 2045.



NATURE OF WORK AND EARNINGS ANALYSIS

The nature of work in fossil fuels related industries and renewable energy generation industries is quite different. Table 5 demonstrates this difference. For fossil fuels related industries (here we include mining along with coal and gas power plants) almost 75 percent of all jobs are in the production, operations, and production support categories (Standard Occupation Classification Codes (SOC) starting with 4 or 5). For wind energy generation the figure is just over 60 percent and 45 percent for solar (analysis of the nuclear industry is difficult with respect to these jobs because of the substantial portion of employment reported as “other”). Top management and technical professions (SOCs starting with 1) comprise just 24 percent of fossil fuels industries, 37 percent of wind, 51 percent for solar, and 49 percent for nuclear.

Table 5. Nature of Work, Fossil Fuel and Renewable Sectors, State of Illinois.

Nature of Work	% Of Total Jobs - Fossil Fuel Industries	% Of Total Jobs - Wind	% Of Total Jobs - Solar	% Of Total Jobs - Nuclear
Installation, Maintenance, and Repair Occupations	18.29%	43.60%	10.66%	0.00%
Management Occupations	9.00%	20.59%	23.32%	11.1%
Business and Financial Operations Occupations	6.77%	9.06%	19.87%	9.3%
Office and Administrative Support Occupations	7.33%	6.83%	9.57%	0.00%
Transportation and Material Moving Occupations	5.07%	6.78%	0.60%	0.00%
Architecture and Engineering Occupations	4.55%	5.81%	4.87%	16.1%
Sales and Related Occupations	0.27%	0.53%	9.94%	0.00%
Computer and Mathematical Occupations	3.10%	0.94%	3.15%	0.00%
Life, Physical, and Social Science Occupations	1.04%	0.92%	0.00%	12.1%
Legal Occupations	0.29%	1.38%	1.09%	0.00%
Production Occupations	12.95%	2.20%	1.35%	17.6%
Construction and Extraction Occupations	30.64%	1.35%	12.12%	0.00%
Building and Grounds Cleaning and Maintenance Occupations	0.00%	0.00%	3.45%	0.00%
Protective Service Operations	0.47%	0.00%	0.00%	13.3%
Other Occupations	0.00%	0.00%	0.00%	20.5%

Data Source: Lightcast (formerly known as EMSI). Original data sources: U.S. Bureau of Labor Statistics, Occupational Employment Statistics and National Industry-Occupation Employment Matrix; U.S. Census Bureau, American Community Survey; Illinois Department of Employment Security.

EARNINGS DIFFERENCES BY INDUSTRY

The Quarterly Census of Employment and Wages reports average annual wage figures by industry along with estimates of employment (Table 6). In 2021 for the state of Illinois, nuclear power generation had the highest annual average earnings while solar had the lowest. Part of this difference may be due to the relative recent development of the renewables industries, while part may be due to different occupational mixes as discussed above.

Table 6. Wages by Industry, State of Illinois, 2021.

Industries	Average Annual Earnings per Employee
Fossil Fuels Related	$120,766
Wind	$102,577
Solar	$83,282
Nuclear	$125,783

Data Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

EDUCATIONAL ATTAINMENT DIFFERENCES BY INDUSTRY

Differences in the nature of work also drive differences in educational attainment. As job categories are related to minimum hiring requirements in terms of education as well as experience, we would expect to see differences in educational attainment of workers. We do see those differences – workers in the solar and wind sectors have higher educational attainment on average (Table 7). Nearly half of workers in fossil fuels related industries have a high school diploma or less compared to a third in the wind industry and one-quarter of solar industry workers. These ratios are nearly reversed for those with a bachelor's degree or higher educational levels.

Table 7. Educational Attainment by Industry, State of Illinois.

Industries/Education Level	High School Diploma or Less	Bachelor's Degree or Higher	Master's Degree or Higher
Fossil Fuels Related	45.22%	24.16%	7.56%
Wind	33.80%	32.56%	11.08%
Solar	28.81%	42.12%	14.16%

Data Source: Lightcast (formerly known as EMSI) for employment data by occupation (see Table 5 for original data sourcing). U.S. Bureau of Labor Statistics, Educational Attainment for Workers 25 Years and Older by Detailed Occupation, for educational attainment by occupation. Calculations by author available separately. Note: Data for the Nuclear Industry was not available.

DEMOGRAPHIC ANALYSIS

The demographic structure of the workforce can be expected to differ. Once again, this is driven by job requirements and occupational mix. We analyzed three aspects of the demographic structure of the workforce in fossil fuels and renewable industries affected by CEJA: the age, race/ethnicity, and gender distributions.

AGE DISTRIBUTION BY INDUSTRY

Table 8 shows the age distribution by industry. The renewables industries have a slightly younger workforce overall, but the differences are relatively minor. 23 percent of workers in fossil fuels related industries are younger than 35, the comparable figures for wind, solar, and nuclear are 26.5 percent, 26.6 percent, and 23.1 percent respectively. On the older end of the workforce, 23.3 percent of fossil fuels industry workers are 55 years old or older, while older workers comprise 19.3 percent of the wind industry, 20.8 percent of the solar industry, and 22.1 percent of the nuclear industry.

Table 8. Age Distribution by Industry, State of Illinois.

Industries/Age Distribution	Age 24 and Younger	25-34	35-44	45-54	55-64	Age 65 and Older
Fossil Fuels Related	2.5%	20.5%	29.0%	24.6%	20.3%	3.0%
Wind	1.4%	25.1%	31.3%	22.9%	17.6%	1.7%
Solar	4.8%	21.8%	28.6%	23.9%	19.4%	1.4%
Nuclear	2.5%	20.6%	28.9%	25.9%	19.6%	2.5%

Data Source: Lightcast (formerly known as EMSI – see Table 5 for original data sourcing).

GENDER DISTRIBUTION BY INDUSTRY

Table 9 shows the gender distribution by industry. Differences between industries are more pronounced in terms of gender. Fossil fuels industries have a more pronounced skew toward male workers, with nearly 9 males out of 10 workers. Wind, solar, and nuclear power generation industries are closer to 4 in 5 males. This may be explained by the heavier concentration of construction and operations support occupations, which tend to be male dominated. The U.S. Bureau of Labor Statistics estimates that only 3.9 percent of construction and extraction jobs are held by women, and only 4.3 percent of installation, maintenance, and repair occupations.

Table 9. Gender Distribution by Industry, State of Illinois.

Industries/Gender Distribution	Males	Females
Fossil Fuels Related	87.20%	12.80%
Wind	81.80%	18.20%
Solar	79.40%	20.60%
Nuclear	81.70%	18.30%

Data Source: Lightcast (formerly known as EMSI – see Table 5 for original data sourcing).

RACE/ETHNICITY DISTRIBUTION BY INDUSTRY

There are more opportunities for people of color in renewable energy generation than in fossil fuels related industries (Table 10). African Americans and Hispanic/Latino workers comprise less than 8 percent of fossil fuel industry employees, while the figure for the wind industry is just under 18 percent, just over 23 percent for solar, and 13 percent for nuclear. Some of this may be driven by the occupational mix, while some of it could be driven by the location of generation facilities.

Table 10. Racial and Ethnic Distribution by Industry, State of Illinois.

Industries/Race and Ethnicity Distribution	White	African American	Hispanic/ Latino	Asian	Two or More Races	Other
Fossil Fuels Related	90.20%	4.90%	2.90%	1.10%	0.70%	0.20%
Wind	79.10%	10.20%	7.60%	2.60%	0.50%	0.00%
Solar	72.50%	12.50%	10.60%	3.20%	1.20%	0.00%
Nuclear	81.80%	6.00%	7.50%	3.40%	1.10%	0.10%

Data Source: Lightcast (formerly known as EMSI – see Table 5 for original data sourcing). Note: Other includes the categories American Indian/ Alaska Native and Native Hawaiian/ Other Pacific Islander.

UNION STATUS

Though not strictly speaking a demographic characteristic of the workforce, the Energy Community Reinvestment Act requires us to estimate the percentage of workers who are unionized among those who have or will lose their jobs due to power plant and mine closures. In terms of coal plant closures, we received data from the International Brotherhood of Electrical Workers which suggests that around 60% of workers in those plants that recently closed or are expected to close were union members.[13] This figure is higher than figures gathered by the Illinois Economic Policy Institute on unionization in different occupations in Illinois (Table 11), but of a similar magnitude.

Table 11. Unionization Rates by Selected Occupations, 2021, State of Illinois.

Occupation	Percent Union Members
Protective Service	51.4%
Construction and Extraction	45.3%
Installation, Maintenance, and Repair	32.7%
Transportation and Material Moving	19.5%
Production	15.0%
Building and Grounds Cleaning and Maintenance	14.2%
Office and Administrative Support	10.8%
Architecture and Engineering	10.0%
Life, Physical, and Social Science	9.4%
Sales and Related	4.6%

Data Source: Manzo & Bruno, 2022.

[13] Calculations available separately from the author.

EFFECTS ON COMMUNITIES

The Energy Community Reinvestment Act requires estimates of community effects from plant closures in three areas: (1) environmental effects of plant closures; (2) changes in tax revenues (presumably property tax revenues); and (3) supply chain effects. In this report we present broad estimates for the first two of these areas, while the third will be taken up in the full report in late 2023.

ENVIRONMENTAL EFFECTS OF PLANT CLOSURES

In order to assess the environmental effects of plant closings, we use data from the EPA eGRID database. The database lists unadjusted and adjusted values for carbon dioxide (CO_2), nitrogen oxides (NO_x), sulfur dioxide (SO_2), methane gas (CH_4), and nitrous oxide (N_2O).[14] In this report we will report the adjusted emissions values. The EPA gives two primary reasons for adjusting the emissions data: (1) the plant is a CHP (combined heat and power or cogeneration) facility; and (2) if one of more units in a plant burn biomass or biogas. Since CEJA specifies closure dates for CHP units report the unadjusted values.

Table 12 lists the scheduled and projected coal plant closures along with emissions data from eGRID. We also list statewide emissions estimates for NOx, SO2, and CO2 to give a sense of the scale of how plant closings will impact total emissions. We estimate that closing these 13 coal plants will reduce total statewide emissions of nitrogen oxides by 27 percent, carbon dioxide emissions by about 20 percent, and sulfur dioxide emissions by almost 70 percent. This is a disproportionately strong improvement in our state emissions profile.

Table 12. Emissions Estimates for Coal Plant Closures.

Plant name	Plant county name	Plant annual NOx emissions (tons)	Plant annual SO_2 emissions (tons)	Plant annual CO_2 emissions (tons)	Plant annual CH_4 emissions (lbs.)	Plant annual N_2O emissions (lbs.)
Archer Daniels Midland Co.	Macon	340	14,517	486,846	162,333	23,610
Baldwin Energy Complex	Randolph	1,785	1,475	4,466,152	1,044,757	152,004
Dallman	Sangamon	381	400	946,787	217,755	31,664

[14] From the eGRID Technical Guide: "Carbon dioxide (CO2) is a product of combusting fossil fuels, as well as biogenic and other materials, and is the primary greenhouse gas (GHG) emitted by human activities that is driving global climate change; nitrogen oxides (NOx) are also emitted by electric generating units and are precursorsto the formation of ozone, or smog, and fine particulates (PM2.5), and also contributes to acid rain and other environmental and human health impacts; sulfur dioxide (SO2) is emitted by electric generating units, especially with coal combustion, and is a precursor to acid rain and PM2.5 and is associated with other environmental and human health impacts. Methane (CH4) and nitrous oxide (N2O), two other GHGs emitted by electric generating units, have been included in eGRID since data year 2005 at the plant level. The eGRID emissions data for the three GHGs are used as default factors in a variety of climate protocols (including The Climate Registry, California's Mandatory GHG emissions reporting program (AB 32), and EPA's Climate Leaders) for indirect emissions estimation calculations (TCR, 2019; CARB, 2007; EPA, 2021)."

E D Edwards	Peoria	2,469	6,532	3,432,477	830,142	120,771
Joppa Steam	Massac	2,512	8,243	4,446,866	985,775	142,712
Kincaid Generating Station	Christian	374	733	1,697,765	422,927	61,511
Marion	Williamson	1,080	2,927	1,356,548	266,717	38,794
Newton	Jasper	1,880	4,632	3,019,907	684,583	99,580
Powerton	Tazewell	618	639	1,286,625	273,711	39,809
Prairie State Generating Station	Washington	3,894	9,772	12,988,381	2,577,687	374,897
SIUC	Jackson	10	120	3,962	933	136
Waukegan	Lake	478	417	832,780	176,453	25,651
Will County	Will	207	231	431,772	91,057	13,263
Total		16,028	50,638	35,396,868	7,734,830	1,124,402
Statewide Total Estimates		58,289	73,809	169,900,000		
Percent of Statewide Total Emissions		27.50%	68.61%	20.83%		

Data Source: U.S. Environmental Protection Agency, eGRID database for plant emissions; Illinois Environmental Protection Agency, Illinois Air Quality Report 2020 for statewide NO_x, SO_2 emissions; U.S. Energy Information Administration, State Energy-Related Carbon Dioxide Emissions by Year for statewide CO_2 emissions.

Table 13 lists the data for natural gas-powered electricity plants in the state. The emissions are much lower for natural gas plants than for coal. Still, the state is estimated to save 9.5 percent of NO_x and 7.3 percent of CO_2 emissions by closing natural gas-powered electricity plants.[15]

Table 13. Emissions Estimates for Natural Gas Plant Closures.

Plant Name	County	Plant annual NOx emissions (tons)	Plant annual SO2 emissions (tons)	Plant annual CO2 emissions (tons)	Plant annual CH4 emissions (lbs.)	Plant annual N2O emissions (lbs.)
Princeton (IL)	Bureau	4	0	306	20	3
University of Illinois Abbott Power Plant	Champaign	311	363	182,767	10,286	1,212
Raccoon Creek Power Plant	Clay	1	0	3,974	157	16
Winnetka	Cook	10	0	4,144	169	19

[15] In comments on an earlier draft of this report, a commission member requested an analysis of localized effects of pollution using an EPA hosted tool and an analysis of coal ash impoundments. Unfortunately, there was not enough time to gather and clean the data necessary to perform these analyses. These issues will be taken up in the Phase II report.

University of Illinois Cogen Facility	Cook	451	2	75,270	2,851	287
Calumet Energy Team, LLC	Cook	7	0	9,039	337	34
Loyola University Health Plant	Cook	2	0	903	34	3
Triton East and West Cogen	Cook	1	0	47	2	0
Chicago West Side Energy Center	Cook	41	0	14,844	560	56
Northwest Community Hospital	Cook	16	0	524	20	2
Tuscola Station	Douglas	47	5	178,489	6,733	673
Nalco	DuPage	42	0	13,691	516	52
BP Naperville Cogeneration Facility	DuPage	138	1	52,496	1,980	198
Aurora	DuPage	239	2	461,804	16,873	1,687
Argonne National Laboratory CHP	DuPage	78	1	29,965	1,130	113
Freedom Power Project	Fayette	0	0	549	21	2
Gibson City Energy Center, LLC	Ford	90	1	147,634	5,446	545
Morris Cogeneration, LLC	Grundy	180	2	458,462	17,044	1,704
Grand Tower Energy Center, LLC	Jackson	426	3	676,330	20,118	2,012
Hoffer Plastics	Kane	19	0	785	30	3
Rocky Road Power, LLC	Kane	41	0	55,471	2,067	207
Elgin Energy Center, LLC	Kane	127	1	262,695	9,642	964
Geneva Generation Facility	Kane	69	0	2,828	107	11
CSL Behring LLC	Kankakee	43	0	15,714	593	59
Kendall Energy Facility	Kendall	406	17	3,354,899	122,925	12,292
Zion Energy Center	Lake	103	2	358,081	13,477	1,364

North Chicago Energy Center	Lake	94	1	34,288	1,293	129
Lake Forest Hospital Central Energy Plant	Lake	8	0	345	13	1
Nelson Energy Center	Lee	222	8	1,594,576	62,675	6,267
Lee County Generating Station, LLC	Lee	53	1	201,305	7,443	744
Venice	Madison	16	0	38,990	1,654	165
Kinmundy Power Plant	Marion	8	0	12,371	489	49
MEPI GT Facility	Massac	22	0	20,510	662	66
Charter Dura-Bar	McHenry	139	0	8,124	306	31
Waterloo	Monroe	3	0	346	17	2
North Ninth Street	Ogle	37	1	1,706	76	10
South Main Street	Ogle	28	2	1,281	114	23
1515 S Caron Road	Ogle	0	0	146	5	1
Archer Daniels Midland Co. - Peoria	Peoria	18	3	100,382	3,640	364
Pinckneyville Power Plant	Perry	35	0	45,879	1,761	176
Goose Creek Power Plant	Piatt	3	0	14,423	592	59
Cordova Energy Company	Rock Island	88	4	804,563	29,959	2,996
Interstate	Sangamon	29	0	21,266	81,273	8,129
Alsey Station	Scott	21	0	14,645	788	79
Shelby County	Shelby	152	1	181,123	7,249	725
Holland Energy Facility	Shelby	113	5	1,002,134	36,555	3,656
Milam Gas Recovery	St Clair	285	0	12,035	454	45
Adkins Energy LLC	Stephenson	81	1	38,537	1,454	145
Tilton Power Station	Vermilion	65	0	70,571	2,591	259
Joliet 29	Will	506	3	670,585	23,662	2,366
Elwood Energy Facility	Will	79	1	260,504	9,995	1,000

Lincoln Generating Facility	Will	1	0	3,738	139	14
University Park Energy	Will	399	1	257,489	9,052	905
Crete Energy Park	Will	7	0	29,739	1,101	110
LSP University Park, LLC	Will	69	2	483,948	18,965	1,896
Rockford Energy Center	Winnebago	36	0	82,914	3,052	305
Rockford II Energy Center	Winnebago	22	0	49,039	1,871	187
Total		**5,531**	**434**	**12,419,213**	**542,038**	**54,422**
Statewide Total Estimates		58,289	73,809	169,900,000		
Percent of Statewide Total Emissions		9.49%	0.59%	7.31%		

Data Source: U.S. Environmental Protection Agency, eGRID database for plant emissions; Illinois Environmental Protection Agency, Illinois Air Quality Report 2020 for statewide NO_x, SO_2 emissions; U.S. Energy Information Administration, State Energy-Related Carbon Dioxide Emissions by Year for statewide CO_2 emissions.

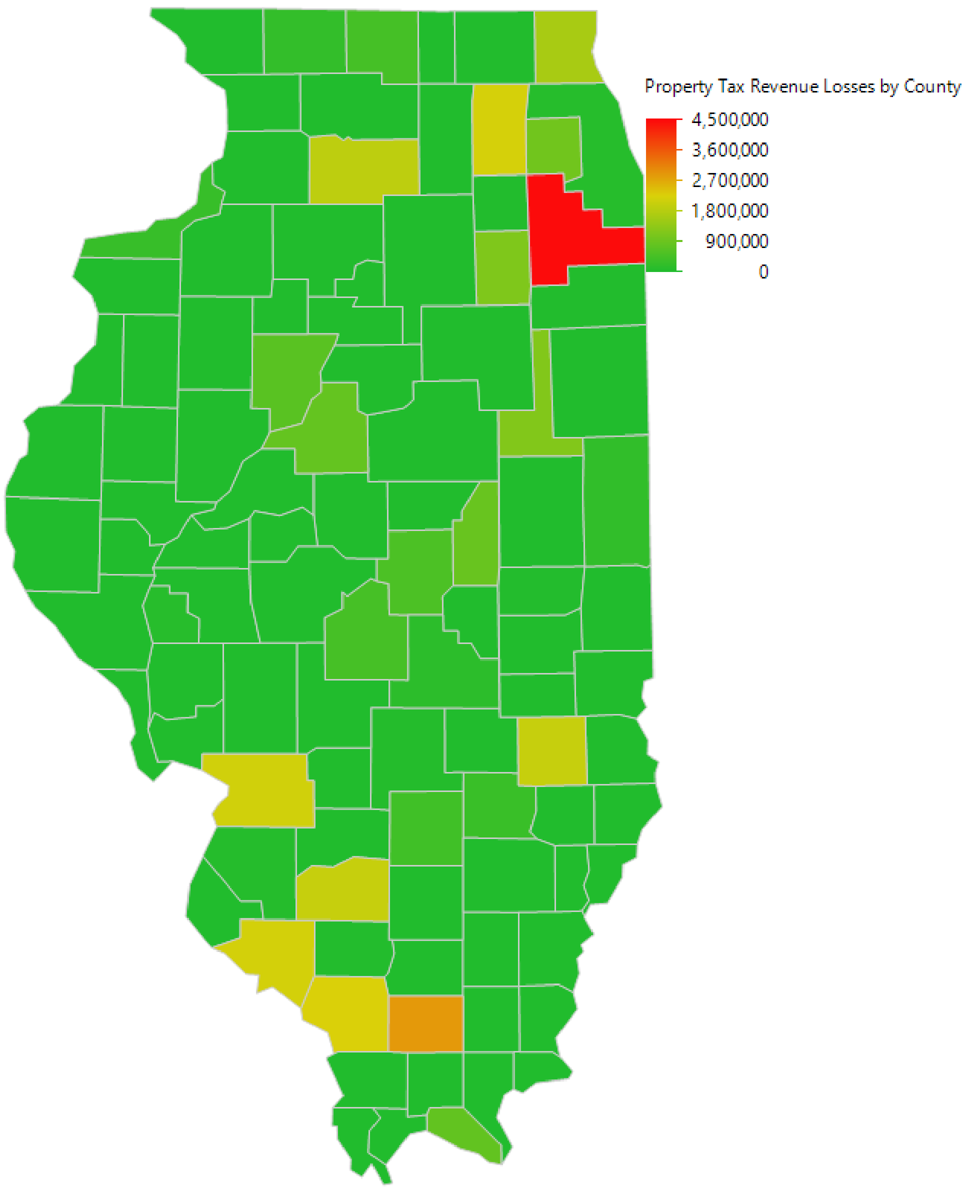
CHANGES IN TAX REVENUES

The primary area where local tax revenues will be affected is the property tax. There are various excise taxes on utility bills, but it is on the distribution and sale of electricity for final use. As long as the demand for electricity use is unaffected by the Act's provisions then there should be no impact on receipts of these amounts. However, property taxes in areas where fossil fuel plants are decommissioned, or new plants built will be affected.

Funderburg (2021) estimated property tax impacts for coal-fired plants that had been closed or were scheduled to be closed by consulting property tax records in the affected jurisdictions. We repeated this methodology for natural gas plants. Based on our analysis, the total property tax revenue loss for Illinois local governments would be $55.4 million per year until 2045, consisting of $21.1 million in losses per year from the remaining coal plants and $34.3 million in losses per year from natural gas plant closures. We then projected revenue gains from new wind and solar plants. To do this, we followed guidance from the Illinois Department of Revenue on the assessment of wind and solar plants (Illinois Department of Revenue 2022a, 2022b). Using the formulas in the references, we calculated the assessed value for the new wind and solar plants, then applied the statewide average tax rate of 8.27% for commercial properties, also published by the Illinois Department of Revenue (2022c). The average property tax gain from wind plants is estimated to be significantly higher than fossil fuel plants, at $177.6 million per year, with solar gains estimated to be $32.1 million per year for a total renewable property tax gain of $209.7 million per year, four times the lost property tax revenue from fossil fuel plant closures.[16]

The geographic concentration of the property tax revenue losses follows the job losses shown earlier – mainly in central and southern Illinois and in Will County (Figure 10). Unfortunately, given the lack of information on future utility-scale wind and solar installations we cannot project revenue gains by county.

Figure 10. Estimated Annual Property Tax Revenue Losses From Fossil-Fuel Plant Closures by County, 2022-2045.



[16] We applied the same baseload growth rate and inflation assumptions to both the streams of revenue. The differences come from the significantly higher assessed values per MW for renewable sources in the new law.

LIMITATIONS OF THIS REPORT

There were some items required by Public Act 102-0662 which we were unable to estimate at this time. We had hoped to get information from private sources on the full-time/part-time status of workers but were unable to get that. We also were not able to gather enough information on the nature of job losses at plants (layoffs, early retirements, and attrition) to develop reliable estimates of the future losses. Further, one Commissioner asked for an analysis of the effects of capacity and job effects across regional transmission organizations (RTOs) in the state and another asked for an analysis of emerging industries in areas which had experienced or will experience plant closures. We will make every effort to include these analyses in next year's Phase II update. Finally, as discussed earlier with the commission we do not have the data on supply chains to estimate those impacts. Those will be developed in detail in next year's report.

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APPENDIX 1: GROUP DESIGNATIONS FOR NATURAL GAS PLANT CLOSURES

As stated in the section on estimating fossil fuel generating capacity losses, we had to estimate closing dates for natural gas plants using the requirements set forth in CEJA (415 ILCS 5/9.15(i)-(k)). We estimated the groups that each plant would be in using data from eGRID for pollution emissions rates and ArcGIS mapping tools to assess distance from environmental justice communities and R3 zones. The group designations we found are shown in the table below.

Table A1. Natural Gas Plant Group Designations for Estimated Closing Dates.

Plant Name	County	Group
Princeton (IL)	Bureau	Public
University of Illinois Abbott Power Plant	Champaign	Combined Heat/Power
Raccoon Creek Power Plant	Clay	Group 2
Winnetka	Cook	Public
University of Illinois Cogen Facility	Cook	Combined Heat/Power
Calumet Energy Team, LLC	Cook	Group 1
Loyola University Health Plant	Cook	Combined Heat/Power
Triton East and West Cogen	Cook	Combined Heat/Power
Chicago West Side Energy Center	Cook	Combined Heat/Power
Northwest Community Hospital	Cook	Combined Heat/Power
Tuscola Station	Douglas	Combined Heat/Power
Nalco	DuPage	Public
BP Naperville Cogeneration Facility	DuPage	Combined Heat/Power
Aurora	DuPage	Group 1
Argonne National Laboratory CHP	DuPage	Combined Heat/Power
Freedom Power Project	Fayette	Group 1
Gibson City Energy Center, LLC	Ford	Group 2
Morris Cogeneration, LLC	Grundy	Combined Heat/Power
Grand Tower Energy Center, LLC	Jackson	Group 2
Hoffer Plastics	Kane	Group 1
Rocky Road Power, LLC	Kane	Group 1
Elgin Energy Center, LLC	Kane	Group 1
Geneva Generation Facility	Kane	Public
CSL Behring LLC	Kankakee	Combined Heat/Power
Kendall Energy Facility	Kendall	Group 4

Zion Energy Center	Lake	Group 1
North Chicago Energy Center	Lake	Combined Heat/Power
Lake Forest Hospital Central Energy Plant	Lake	Group 2
Nelson Energy Center	Lee	Group 4
Lee County Generating Station, LLC	Lee	Group 1
Venice	Madison	Group 1
Kinmundy Power Plant	Marion	Group 2
MEPI GT Facility	Massac	Group 2
Charter Dura-Bar	McHenry	Combined Heat/Power
Waterloo	Monroe	Group 2
North Ninth Street	Ogle	Public
South Main Street	Ogle	Public
1515 S Caron Road	Ogle	Public
Archer Daniels Midland Co. - Peoria	Peoria	Combined Heat/Power
Pinckneyville Power Plant	Perry	Group 2
Goose Creek Power Plant	Piatt	Group 2
Cordova Energy Company	Rock Island	Group 5
Interstate	Sangamon	Public
Alsey Station	Scott	Group 1
Shelby County	Shelby	Group 2
Holland Energy Facility	Shelby	Group 4
Milam Gas Recovery	St Clair	Group 1
Adkins Energy LLC	Stephenson	Combined Heat/Power
Tilton Power Station	Vermilion	Group 1
Joliet 29	Will	Group 1
Elwood Energy Facility	Will	Group 1
Lincoln Generating Facility	Will	Group 2
University Park Energy	Will	Group 1
Crete Energy Park	Will	Group 1
LSP University Park, LLC	Will	Group 1
Rockford Energy Center	Winnebago	Group 1
Rockford II Energy Center	Winnebago	Group 1