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ILLINOIS' ELECTRIC POWER SYSTEM AND THE CLEAN POWER PLAN

The U.S. Environmental Protection Agency (EPA) will soon release the final rule for carbon emissions from existing power plants, called the Clean Power Plan (CPP). The rule represents the next step in the process of carbon regulation that began with the Supreme Court's determination in 2007 that carbon dioxide (CO_2) qualifies as an air pollutant subject to regulation by EPA under the Clean Air Act.[1]

Under Section 111(d) of the Clean Air Act, EPA will set air pollutant standards for each state based on what EPA determines to be the "best system of emission reduction" (BSER). In its proposal, EPA determined the BSER based on state specific potentials for emission reductions from four "Building Blocks" that include both traditional smokestack controls as well as "beyond the fence line" measures, namely improving the efficiency of coal plants, increasing dispatch of existing natural gas plants, deploying renewable and nuclear power generation, and reducing demand by means of energy efficiency.[2]

Although Illinois' emission rate target is set by the Building Blocks, there is no requirement that the state use those specific measures for compliance. Rather, in developing a compliance plan to achieve the interim (2020-2029) and final (2030-2032) targets, the state is free to use other technologies and policy tools. This gives Illinois an opportunity to design a plan that is best suited to the resources and needs of its unique power system.

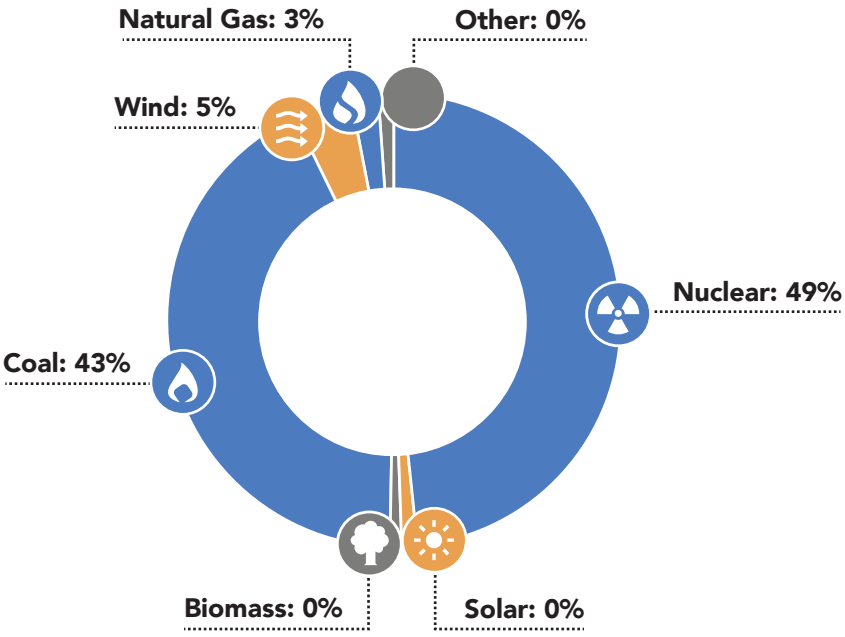
Illinois is uniquely positioned with robust transmission infrastructure across two different Regional Transmission Organizations (RTOs) responsible for transmission services and maintaining reliable electricity in the state: the Midcontinent Independent System Operator (MISO) and PJM Interconnection (PJM).[6] MISO recently conducted an analysis that found a regional approach to the Clean Power Plan within its territory could reduce compliance costs by $3 billion annually.[7]

A Strong Foundation

Illinois has a strong foundation for a compliance plan. Carbon emissions in the state have gone down 8% from 2005 to 2012,[3] and at an average retail price of 8.4 cents/kWh in 2012, electricity in Illinois is cheaper than the national average.[4] Furthermore, Illinois produces more electricity than it needs, with electricity exports totaling nearly 131,000 GWh in 2012.[5]

The state's power sector is dominated by zero-carbon nuclear power, which supplies approximately half of the state's generation.[8] In 2013, the state generated nearly 10,300 GWh of non-hydro renewable energy, mostly from its substantial wind and nascent solar industries. Since the passage of the Illinois Energy Infrastructure Modernization Act (EIMA) in 2011, the state has made investments in grid modernization, energy efficiency and demand-side resources.

Illinois Electricity Generation Mix (2014)



Source: AEE PowerSuite

These investments are already having an effect: Between 2012 and 2013, over 500,000 customer interruptions were avoided, outage duration decreased by 27%, and outage frequency decreased by 15%.[9] Still, more needs to be done. Illinois ranked in the top 10 states for outages over the last three years and ranked seventh in weather related outages between 2008 and 2014.[10] Outages in Illinois in 2014 lasted a total of more than 21 hours and affected 550,000 people. Outages are not only disruptive but also expensive, with an annual estimated cost to the U.S. economy of $150 billion.[11] A storm last year caused a blackout that lasted over an hour and a half, during which an inmate at Vanadalia Correctional Center, a maximum-security facility, attacked a guard.

With a flexible design that allows states to select the technologies and services for compliance to suit the needs of the state, the Clean Power Plan presents Illinois with an opportunity to modernize its electric grid for the benefit of consumers and the economy. In designing its compliance plan, Illinois can further reduce emissions, maintain affordability, and increase reliability. Current discussions around strengthening the RPS and EERS will add more tools the state can use to meet its goals.

Electricity markets were deregulated in Illinois in 2007. The Illinois Power Agency (IPA) oversees procurement for the two largest utilities, Ameren and ComEd, which account for 88% of the state's residential customers. The IPA procures the resources identified in its procurement plan through a competitive market process.[11]

On Track to Achieve 69% of Proposed Reductions

The interim and final emission rate targets for Illinois may change in the final rule, but the options for compliance will largely stay the same. Several of the pathways that the state is already pursuing will help it meet the finalized target emission rates set by EPA.

Proposed Targets for Illinois (from draft Clean Power Plan)			
Adjusted Starting Rate[16]	**Interim Target (average 2020 – 2029)**	**Final Target (2030 – 2032)**	**Total Reduction Required (2032)**
1,894 lbs CO_2/MWh	1,366 lbs CO_2/MWh	1,271 lbs CO_2/MWh	623 lbs CO_2/MWh (33%)

Despite challenges from existing policy barriers, Illinois has already made changes to its power system that will reduce emissions from the 2012 baseline used by EPA. Coal plant retirements already planned will reduce the state's emissions by 12%.[13] In 2013, Illinois generated nearly 2,000 GWh more electricity from renewable energy than in 2012. Merely adding this additional generation to the 2012 baseline will achieve 5% of the state's reductions under the current proposed targets.[14] Current plans to build more renewables will contribute another 7% towards compliance with proposed targets.[15] If the state were to meet its current Energy Efficiency Resource Standard (EERS) annual savings target of 2% through 2020, it would achieve 45% of its total reductions under the currently proposed rule.[17] All of these planned changes already under way would get the state 69% of the way towards meeting its goal in the draft plan, so whatever the final target, Illinois will have a good start.

Illinois is on track to achieve 69% of total proposed reductions simply by what it is already doing, although lifting policy barriers could allow the state to do much more.

Impact of Planned Changes on Illinois' Emission Rate		
Planned Activity	**New Emission Rate (lbs CO_2/MWh)**	**Incremental % of Total Required Reduction Achieved[18]**
Planned Coal Retirements	73	12%
Existing 2013 Renewables	32	5%
Under-construction or Planned Renewables	42	7%
Planned Energy Efficiency (2020)	281	45%
Total	**428**	**69%**

How Advanced Energy Can Help

As Illinois develops its compliance plan, it can consider a host of options provided by advanced energy technologies and services to reduce its carbon emissions and help the state achieve other electric system and economic objectives. Some of these strategies are already being successfully implemented in Illinois, but they could be scaled up to achieve further emission reductions, especially with supportive policy measures.

Over 104,000 Illinois workers were involved in the advanced energy industry last year, two-thirds of which were in energy efficiency.[19]

Some Grid Modernization Technologies	
Demand Response	Illinois' EERS includes annual peak demand reduction targets of 0.1%.[20] Demand response brings down peak load, which can directly reduce emissions by over 1% nationally, and moderates energy prices for everyone.[21]
Advanced Metering Infrastructure (AMI)	Illinois is a national leader in grid modernization, and utilities are already deploying smart meters in their service territories.[22,23] These meters will improve reliability and reduce operating costs for the utility. The data and control provided by AMI enables utilities and consumers to better manage energy use.
Distribution Automation	Distribution automation helps optimize voltage conservation and reactive power (needed for motors and transformers to start up), integrate more distributed generation, and increase energy efficiency throughout the system without action on the part of customers, all of which helps to reduce emissions. This has the added benefit of greater reliability of the grid.[24]
Energy Efficiency	
Utility Energy Efficiency	Driven by the utility efficiency standards that took effect in 2008, the state is on track to catch up to leading states like Rhode Island and Massachusetts in 2016, when it will achieve a 2% annual incremental savings.[25,26] If Illinois maintains and meets its current EERS goals, it will far surpass what EPA assumed was achievable in energy efficiency for the state in setting the proposed target. More energy efficiency gains are possible through the smaller electric utilities, which are responsible for 12% of total electricity sales but are not now subject to the EERS.[27]
Energy Service Company (ESCO) services	The utility figures above do not generally include energy efficiency projects provided by ESCOs in Illinois. The non-utility sponsored efficiency savings from the ESCO market are nearly equal in size to utility programs nationally.[28] A recent report estimates that continued growth in the ESCO market in Illinois could help the state achieve as much as 11% of its total reduction under the draft CPP.[29]
Behavioral Efficiency	Using AMI combined with behavioral efficiency services has been shown to reduce energy usage and drive down prices for everyone. Behavioral efficiency in Illinois can achieve 1% of the state's proposed reductions and save consumers $823 million by 2030.[30]

Energy Efficiency Policies

Illinois ranked 11th nationally in energy efficiency policies last year.[31]

Illinois already has an EERS that requires a 2% annual reduction in energy consumption. If this existing target were met, the state could achieve significant cost-effective emission reductions.[32] However, the state has fallen short of meeting the 2% target because spending on energy efficiency programs is capped.

Illinois also has a statewide Building Energy Code that helps drive efficient choices in new residential and commercial buildings, and the state leads by example with higher standards for public buildings.[33]

Johnson Controls was awarded a $5.8 million performance contract from the Peoria County Board that was funded entirely from energy savings and the avoidance of future capital expenditures.[34]

<table>
<tr><th colspan="3">Renewable Energy and Energy Storage</th></tr>
<tr><td>Wind</td><td>In 2013, Illinois added 1 GW of wind capacity, bringing its total to 3.6 GW of installed wind capacity.[35,36] The state ranks fifth in installed wind capacity nationally. Wind provided 4.7% of the state's energy, or enough to power 886,000 homes.[37] Nevertheless, this is a fraction of the state's technical capacity of approximately 250 GW of wind.[38] If this technical potential were realized, the state could meet its current electricity needs five times over.[39] With a strong manufacturing base, Illinois is home to 36 wind manufacturing facilities. The wind industry supports between 3,000 and 4,000 jobs in the state, and brought the state approximately $7.2 billion in capital investments in 2013, and over $10 million in annual land lease payments.[40]</td><td rowspan="2">Renewable Energy Policies

In 2007, Illinois enacted a Renewable Portfolio Standard (RPS), which requires utilities and retail suppliers to procure 25% of electricity from renewable sources by 2025.[44]

Illinois has some of the strongest wind resources in the PJM Interconnection. This fact, combined with Illinois' existing RPS, has helped drive growth in the state's renewable industry.

Indeed, Illinois' RPS goal is one of the most ambitious in the country. However, the current RPS is hindered from achieving its intended effect by the complexities of Illinois' deregulated energy market. For this reason, the state legislature is considering a proposal to fix the current RPS to drive investment in the renewable industry. A stronger RPS will benefit the state's compliance strategy.

Illinois also has other policies in place helping to drive growth in its renewable industry. The Renewable Energy Resources Trust Fund supports both renewable energy and residential energy efficiency.[45]

Illinois also offers a Solar and Wind Energy Grant Program to residential, commercial, and nonprofit or public sector consumers.[46]</td></tr>
<tr><td>Solar</td><td>Illinois has less than 1 GW of installed utility-scale solar PV (43 MW).[41] With a technical potential of over 5,000 GW, there is plenty of room to grow.[42] Despite accounting for only a small portion of the state's generation, solar nonetheless contributes significantly to the state's economy, with over 2,000 people employed by 227 companies throughout the solar value chain in the state.[43]</td></tr>
<tr><td>Energy Storage</td><td>Energy storage allows higher penetration of variable renewables, offsets emissions from older, dirtier plants for meeting peak demand, and relieves grid congestion when demand is high and transmission and distribution equipment losses are highest.[46]</td><td>Storage Projects

Earlier this year, Invenergy began commercial operation of its 31.5MW Grand Ridge Energy Storage project in Illinois.[47] And RES Americas is currently working on an energy storage project that will store 19.8 MW of power in support of ComEd's grid.[48]</td></tr>
</table>

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ENDNOTES

1. In the landmark 2007 case Massachusetts vs. EPA, the Supreme Court ruled that carbon dioxide is an air pollutant subject to regulation under the Clean Air Act, and EPA is therefore required to administer guidelines for emission reduction, http://www.supremecourt.gov/opinions/06pdf/05-1120.pdf. Since that ruling, the Supreme Court has upheld EPA's authority to regulate carbon emissions on two separate occasions: American Electric Power Company vs. Connecticut and in Utility Air Regulatory Group vs. EPA, which upheld EPA's authority to regulate emissions from stationary sources, http://www.supreme-court.gov/opinions/13pdf/12-1146_4g18.pdf and http://www.nytimes.com/2014/04/30/us/politics/supreme-court-backs-epa-coal-pollution-rules.html.
2. For a more in depth look at how the Building Blocks were established and applied to individual states in the Proposed Rule, see EPA TSD: GHG Abatement Measures. http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-ghg-abatement-measures.pdf
3. U.S. Electric Power Industry Estimated Emissions by State (EIA-767, EIA-906, EIA-920, and EIA-923) http://www.eia.gov/electricity/data/state/
4. http://powersuite.aee.net/portal/states/IL/energy_data
5. http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_sum/html/sum_btu_1.html&sid=US
6. http://www.ferc.gov/market-oversight/mkt-electric/overview.asp
7. http://www.eenews.net/assets/2014/09/18/document_ew_01.pdf
8. Exelon, which owns and operates the state's nuclear fleet, lists 3 of its 6 facilities as being at risk of retirement due to economic conditions; these reactors account for 45% of the state's nuclear generation, or approximately 23% of total generation. http://www.chicagotribune.com/business/ct-exelon-carbon-rule-strategy-0817-biz-20140815-story.html#page=1
9. http://www.eesi.org/files/Anil-Dhawan-061814-original.pdf
10. http://images.electricalsector.eaton.com/Web/EatonElectrical/%7Baa0d93cf-362a-4bd9-9005-bb723dd40d97%7D_USBlackoutTracker2014ReportFinal.pdf
11. http://images.electricalsector.eaton.com/Web/EatonElectrical/%7Baa0d93cf-362a-4bd9-9005-bb723dd40d97%7D_USBlackoutTracker2014ReportFinal.pdf
12. https://www.illinois.gov/ipa/Pages/default.aspx
13. Planned unit-level coal plant retirements are taken from EIA Monthly, http://www.eia.gov/electricity/monthly/pdf/epm.pdf. The capacity factor for each unit was assumed to be the same as the capacity factor for the entire plant in 2012, the baseline year used by EPA. The average emission rate for the state's coal fleet was recalculated without these units and substituted for the starting average coal emission rate in EPA's formula for BSER. Retired coal plant capacity was assumed to be replaced by a combination of energy efficiency and zero-emission resources. For Illinois, this amounted to a total of 3,986 GWh of electricity, replacing ED Edwards Unit 1 and Will County Units 3 and 4.
14. http://www.eia.gov/electricity/monthly/pdf/epm.pdf
15. Under-construction and planned renewable projects are taken from EIA Monthly, http://www.eia.gov/electricity/monthly/pdf/epm.pdf. Estimated capacity factors for Illinois onshore wind turbines are conservatively estimated at 30% (the national average is 33.9%).
16. Includes 5.8% of existing nuclear generation that EPA deems to be at-risk of retirement, and existing 2012 renewable generation.
17. Illinois's EERS applies to 88% of the market in the state. http://aceee.org/sites/default/files/eers-04072015.pdf. Savings depicted here assume the 2% annual incremental savings target is achieved in 2015 and maintained until 2020, yielding 12% cumulative savings (21,064,579 MWh) from the 2008 baseline (199,475,178 MWh) in 2020. This calculation does not account for exports or line losses. http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=022000050K8-103. Because EPA used a different baseline year when calculating cumulative savings, actual energy efficiency savings in the state's implementation plan may be counted differently. It should also be noted that the state does not meet its current targets because spending on energy efficiency is capped.
18. The required reductions referenced here are from the starting adjusted emission rate minus the proposed final target under the proposed Clean Power Plan. The targets are likely to change when the rule is finalized, but percent contributions depicted here are still a good indicator of how big of a contribution the state's already planned activities are likely to make.
19. http://www.cleanjobsillinois.com/2015/#ch/profiles-2
20. http://www.coned.com/energyefficiency/PDF/DemandResponseProgramsDetails.pdf
21. Navigant Consulting, Carbon Dioxide Reductions from Demand Response (Nov. 25, 2014), prepared for the Advanced Energy Management Alliance (AEMA) and included in AEMA's comments to EPA on the Clean Power Plan. http://aem-alliance.org/study-finds-significant-greenhouse-gas-savings-demand-response-group-urges-epa-incorporate-clean-power-plan/
22. http://www.cesa.org/assets/2015-Files/Clean-Energy-Champions.pdf
23. http://powersuite.aee.net/portal/states/IL/utilities
24. https://www.smartgrid.gov/sites/default/files/doc/files/Distribution Reliability Report - Final.pdf
25. http://aceee.org/research-report/u1408
26. http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=022000050K8-103
27. http://aceee.org/sites/default/files/eers-04072015.pdf
28. Up 10% from 2013, the U.S. ESCO market produced approximately $611.2 million in revenue in 2014, not including HVAC equipment ($4 billion nationally). The entire ESCO market is expected to continue growing at a rapid pace, reaching $10.6-$15.3 billion in total revenue by 2020. See Advanced Energy Now 2014 Market Report, http://info.aee.net/advanced-energy-now-2014-market-report

29. ACEEE State and Utility Pollution Reduction (SUPR) Calculator http://aceee.org/state-and-utility-pollution-reduction-supr
30. ACEEE State and Utility Pollution Reduction (SUPR) Calculator http://aceee.org/state-and-utility-pollution-reduction-supr
31. http://aceee.org/files/pdf/state-sheet/illinois.pdf
32. http://powersuite.aee.net/portal/states/IL/energy_policies
33. https://www.energycodes.gov/adoption/states/illinois
34. http://www.johnsoncontrols.com/content/dam/WWW/jci/be/case_studies/peoriacounty.pdf
35. http://www.acore.org/files/pdfs/states/Illinois.pdf
36. http://powersuite.aee.net/portal/states/IL/energy_data
37. http://awea.files.cms-plus.com/FileDownloads/pdfs/Illinois.pdf
38. http://www.nrel.gov/gis/re_potential.html
39. http://awea.files.cms-plus.com/FileDownloads/pdfs/Illinois.pdf
40. http://awea.files.cms-plus.com/FileDownloads/pdfs/Illinois.pdf
41. http://www.acore.org/files/pdfs/states/Illinois.pdf
42. http://www.nrel.gov/gis/re_potential.html
43. http://www.seia.org/state-solar-policy/illinois
44. http://powersuite.aee.net/portal/states/IL/energy_policies
45. http://energy.gov/savings/renewable-energy-resources-trust-fund
46. http://www.illinois.gov/dceo/whyillinois/KeyIndustries/Energy/Pages/01-RERP.aspx
47. http://www.rechargenews.com/wind/1400098/invenergy-opens-315mw-storage-project-in-illinois
48. http://www.bizjournals.com/chicago/news/2014/11/11/res-americas-to-build-big-battery-storage-projects.html