Illinois Renewable Energy Access Plan

ENABLING AN EQUITABLE, RELIABLE, AND AFFORDABLE TRANSITION TO 100% CLEAN ELECTRICITY FOR ILLINOIS

SECOND DRAFT FOR COMMISSION CONSIDERATION

PREPARED FOR
Illinois Commerce Commission

CO-AUTHORED BY
Illinois Commerce Commission Staff
The Brattle Group
Great Lakes Engineering

December 2022

NOTICES

TIMING AND STATUS OF THE DRAFT RENEWABLE ENERGY ACCESS PLAN

This second draft of the Renewable Energy Access Plan (REAP) was co-authored by staff of the Illinois Commerce Commission (ICC) and The Brattle Group. Consultants from Great Lakes Engineering served as contributing authors focused on land use and renewable energy access zones. The report has been prepared with and for ICC staff but is not an endorsement by the ICC commissioners.

The content and concepts in this second draft of the REAP have been updated relative to the first draft that was published in July 2022 based on analyses and stakeholder input received during the comment period. This second draft has been presented to the Commission in December 2022 for its formal review and investigation. The ICC will adopt the final Illinois REAP after concluding review and specifying any required refinements.

CONTRIBUTING AUTHORS

Staff of the Illinois Commerce Commission

Katharine McCormick, James Zolnierek, Torsten Clausen, Parth Patel, Zachary Callen, Bill VanderLaan, Larry Borum III

The Brattle Group

Kathleen Spees, Samuel A. Newell, Johannes P. Pfeifenberger, Joe DeLosa III, Linquan Bai, Ragini Sreenath, Evan Bennett, Ethan Snyder, Ellery Curtis, Ivy Yang

Great Lakes Engineering

Donald Peterson, Brian Muzingo Ewalt

TABLE OF CONTENTS

Executive Summary iv

I. Tracking Progress Toward Illinois Policy Goals 1

A. Climate and Equitable Jobs Act 1
B. Scope and Purpose of the REAP 4
C. Equity in the REAP 5
D. REAP Findings and Recommendations 6

II. Transitioning to a 100% Clean Electricity Mix 8

A. Current Resource Mix 8
B. Outlook for Renewable Supply Needs 13
C. Policy Interactions 15
  1. Interactions with Nuclear Support 15
  2. Interactions with Fossil Phase Out 17
  3. Interactions with Resource Adequacy Needs 20
  4. Renewable Development for Other States' RPS and Private Goals 22
D. REAP Findings and Recommendations 24

III. Managing Land Use in Renewable Deployment 26

A. Roles of Permitting and Transmission Planning in Renewable Siting 26
B. Criteria and Considerations for Identifying Renewable Energy Zones 30
  1. Resource Potential and Demonstrated Developer Interest 31
  2. Current Land Uses and Crop Productivity 32
  3. Equity and Environmental Justice Communities 33
  4. Locations of Mandated Fossil Retirements 35
C. Candidate Renewable Energy Zones 36
  1. Candidate Renewable Energy Zones 38
  2. Potential for Zone Refinement through Comprehensive Headroom Analysis 39
  3. Potential for Zone Refinement through Weighted Scoring 41
  4. Inclusive Processes for Refining Future REAP Zones 42
D. REAP Findings and Recommendations 43

IV. Effective Transmission Planning & Utilization 45

A. Foundational Reform Concepts 45
B. The RTOs' Generation Interconnection Processes 50
  1. Pace of Illinois Interconnection Queue Throughput 50

2. PJM Interconnection Queue 53
3. MISO Interconnection Queue 56
C. RTO Transmission Planning Processes 58
1. MISO Transmission Expansion Plan (MTEP) 58
2. PJM Regional Transmission Expansion Plan (RTEP) 59
3. PJM State Agreement Approach 62
D. REAP Findings and Recommendations 64
V. Leveraging Regional Electricity Markets & Trade 67
A. The Role of RTO Markets in Clean Grid Transition 67
B. RTO Market Reforms Needed to Align Incentives with Illinois Policy Mandates 68
1. Scope 2 Greenhouse Gas Emissions Accounting 69
2. Fossil Fuel Emissions Cap and Phase Out 71
3. Incentives for Cost-Effective Clean Resource Deployment and Retention 74
4. Maintaining Reliability in Transition to 100% Clean Electricity 76
C. Preliminary Assessment of RTO Market Reforms for Supporting Illinois Policy 77
D. REAP Findings and Recommendations 79
List of Acronyms 82

Executive Summary

In the 2021 Illinois Public Act 102-0662, colloquially referred to as the Climate and Equitable Jobs Act (CEJA), Illinois has solidified its commitment to achieving a 100% clean energy economy by 2050. The law specifies a number of policies and programs for ensuring that the clean energy transition will proceed equitably, reliably, and affordably. Several interim goals further stipulate deadlines for reshaping the electricity mix and power grid serving Illinois consumers, including:

- **A 50% by 2040 renewable portfolio standard** (RPS) applicable to the approximately 85% of Illinois electricity demand served by the electric distribution utilities Commonwealth Edison (ComEd), Ameren Illinois (Ameren), and the portion of MidAmerican Energy Company (MidAmerican) for which procurements are conducted by the Illinois Power Agency (IPA). Qualification standards for the RPS require the resources to be located within Illinois or in states adjacent to Illinois if such facility or facilities will help promote the State's interest in the health, safety, and welfare of Illinois residents based on public interest criteria;
- **A 100% by 2050 clean electricity goal for Illinois**, considering both renewable and nuclear power as contributing resource types; and
- **A requirement to phase out fossil fuel emissions by 2045**, with electric generating units subject to annual greenhouse gas (GHG) emissions caps declining to zero between 2030-2045, depending on resource characteristics.

This Renewable Energy Access Plan (REAP), currently in a second draft form for ICC consideration, is an actionable plan for meeting Illinois' policy requirements for a clean electricity system. As required under CEJA Section 8-512, the ICC must be presented with this second draft of the REAP for an investigation that must be initiated by December 31, 2022. The ICC will then review and formally adopt the final Illinois REAP. The REAP will be subject to a new ICC investigation in 2025 and every two years thereafter.[1] This and future REAP iterations will serve the role of clarifying and quantifying policy requirements and goals; translating these requirements into the volume of renewable and clean resources needed over time; highlighting attractive renewable energy zones within the state across a variety of assessment criteria; identifying and recommending pathways to utilize these zones to inform transmission planning; identifying reforms to transmission interconnection and planning processes needed to ensure that the required resources can be deployed; and identifying potential reforms to regional transmission organization (RTO) markets to reliably and affordably support Illinois' clean electricity transition. On the basis of this investigation, stakeholder input, discussion with RTOs and other Illinois

[1] 220 ILCS 5/8-512.

entities, the REAP makes the following initial findings and recommendations. These recommendations are organized around five strategic elements:

- **Strategic Element 1: Tracking Progress Toward Illinois Policy Goals.** Clarify the outlook for renewable and clean energy supply needs, in order to determine how much renewable access must be created;
- **Strategic Element 2: Transitioning to a 100% Clean Electricity Mix.** Examine the incentives and enforcement mechanisms that may be needed to support competitive investment in a reliable mix of resources throughout transition to 100% clean electricity;
- **Strategic Element 3**: **Managing Land Use in Renewable Deployment.** Identify opportunities to equitably manage land use in renewable deployment and coordination with transmission development, including through the development of REAP zones;
- **Strategic Element 4: Effective Transmission Planning & Utilization.** Develop a strategy for maximizing the use of existing transmission infrastructure and proactively planning around future needs to provide the necessary transmission cost effectively and reduce barriers to renewable development; and
- **Strategic Element 5: Leveraging Regional Electricity Markets & Trade.** Identify opportunities for leveraging regional electricity markets and trade to access the most efficient resources, avoid emissions leakage, and maintain reliability.

In all of these elements, this REAP aims to recognize the legislative, regulatory, and market context, including the reality that consumption and production decisions will be decentralized, occurring in a market environment that leverages competition among supply options. The REAP aims to help guide and facilitate such markets to meet CEJA mandates and goals.

In addition, the development of this REAP has been informed by engagement with PJM and MISO, who have committed to being strategic partners in the achievement of Illinois policy objectives. ICC Staff looks forward to this continued collaboration with the RTOs in the ongoing refinement and implementation of the recommendations contained in this REAP.

STRATEGIC ELEMENT 1: TRACKING PROGRESS TOWARD ILLINOIS POLICY GOALS

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

The pace of renewable deployment needs over the coming five years will need to accelerate significantly to meet CEJA goals and requirements, but the amount of this acceleration is dependent upon the achieved degree of electrification and choices concerning currently-installed in-state resource mix. A more accurate long-term outlook for renewable deployment is needed to most effectively support transmission planning and policy implementation.

This REAP finds significant efforts are required to meet the long-term goal of completely decarbonizing the Illinois economy by 2050. Renewable energy production will have to increase substantially from Illinois' 21 TWh/year today, particularly given that only approximately 16% or 3.3 TWh/year of this supply was dedicated to meeting Illinois RPS while the majority is committed to meeting other states' and private consumers' renewable goals.[2] By 2050, total Illinois renewable production will need to increase to 64 to 450 TWh/year to serve Illinois policy goals. This uncertainty range is associated with the fate of the nuclear fleet and the extent of electrification of non-electric sectors. The low end of this range reflects a 50% RPS mandate applicable to approximately 85% of Illinois electricity demand, with the remainder of the state's clean electricity needs served by nuclear power, and assuming only modest growth in electricity consumption. The high end assumes all Illinois nuclear resources retire and that electricity consumption could increase by 50–200% to partly or fully support the decarbonization of other energy-intensive economic sectors including transportation and space heating.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

1.A **Enhance Reports to Capture Progress Against Goals.** The ICC Staff, in consultation with relevant State agencies, including, but not limited to, the Illinois Environmental Protection Agency (EPA or IL EPA) and the Illinois Power Agency (IPA), PJM Interconnection (PJM), Midcontinent ISO (MISO), utilities, and any other relevant entities or stakeholders can compile information and issue an annual report tracking progress relative to CEJA's goals for clean energy, renewable energy, and economy-wide decarbonization. This information can contribute to fulfillment of the IL EPA, IPA, and ICC's 5-year progress reporting requirement to the state legislature.[3] The report may also identify available strategies and additional policy instruments that could aid Illinois to achieve its clean energy, renewable energy, and economy-wide policy goals, including the timely and equitable achievement of 100% economy-wide decarbonization.

1.B **Develop GHG Accounting Methodology.** To support accurate tracking of GHG emissions obligations in the context of the regional electricity markets, staff of the ICC, in consultation with other Illinois agencies and other decarbonizing states, can develop an accounting methodology for measuring the Scope 2 GHG emissions obligation associated with electricity imported into Illinois from neighboring states (and displaced by electricity exports). The REAP recommends developing a Scope 2 GHG inventory methodology for tracking net GHG emissions that will ensure any GHG emissions embedded within electricity imports for Illinois consumers will be at least offset by clean electricity exports in the eventual demonstration of a 100% GHG-free electricity mix. The methodology should further consider commitments of Illinois resources to sell clean electricity to other states and private consumers, to ensure that claims of emissions abatement are not double-counted. Agency staff can work with PJM and MISO to assist in development and implementation of the identified accounting methodology using granular data on real-time

---

2 Data as of 2021. *See* Section II.C.4.

3 Specifically, the EPA, IPA, and ICC are required to submit to the legislature a report by 2025 and every five years thereafter on progress relative to CEJA goals, the state's reliability needs outlook, identified challenges, and potential solutions. As required in CEJA Section 5/9.15(o).

data of emissions imports and exports in support of Illinois and other states' GHG elimination goals.

STRATEGIC ELEMENT 2: TRANSITIONING TO A 100% CLEAN ELECTRICITY MIX

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Achieving a 100% clean electricity mix for Illinois is likely to require a coordinated set of Illinois policies and market incentives to support the most cost-effective and reliable resource mix throughout the clean energy transition. Historical approaches, if carried forward without innovation, may frustrate efforts to provide access and delay Illinois' decarbonization progress, among other unintended consequences. ICC staff have identified the following gaps under *status quo* approaches that may need to be addressed through further policy and regional market reforms:

- *Requirement Gaps*. After nuclear support payments expire in 2027, decarbonizing the electricity fleet may require significant volumes of clean electricity beyond what the RPS prescribes—particularly to meet Illinois' needs above the 50% RPS and to serve the approximately 15% of Illinois demand not subject to the RPS. While Illinois currently relies on markets, including those administered by PJM and MISO, augmented by incentives to promote clean and renewable energy, there is presently no assurance that existing market constructs are sufficient to ensure that this electricity demand will be served by clean electricity resources.
- ***Competitive Signals for Reliability and Policy Needs*.** A balanced resource mix needed to achieve 100% clean electricity reliably and affordably will likely include a combination of renewable, nuclear, battery, demand response, efficiency, thermal resources utilizing decarbonized fuels, distributed resources, and other new technologies. Attracting and retaining the most advantageous resource mix will require a coordinated and competitively-determined suite of market-oriented policy instruments and regional market incentives, to ensure that private investors have the incentive to support and accelerate reliable, affordable clean energy transition. As discussed further in Section V below, we recommend that RTOs develop rules which would allow entities serving load in the state to reflect the preferences of Illinois' state policies regarding resource mix.
- ***Improving Illinois' Opportunities for Clean Energy Trade and Access to Renewable Power from Other States*.** Illinois' centrally-located position within two RTO regions means that the state has a unique role and opportunity to engage in a coordinated clean energy transition across large interconnected regions. Other states, particularly in PJM, benefit from access to cost-effective renewable resources developed in Illinois, such that in 2021 approximately 17 TWh (or 84% of Illinois' total 21 TWh) of renewable production was not committed to Illinois' RPS, but rather exported to serve other states' RPS requirements or committed for private goals. However Illinois' current geographic requirements for renewable supply eligibility mean that Illinois consumers do not have access to other low-cost renewable supply in other states within the RPS and competitive IPA solicitations. In

the long term, the most cost-effective and balanced 100% clean electricity resource mix will likely need to account for the ability to import clean electricity from other decarbonizing states and export clean energy when Illinois is in surplus. Regional electricity and clean electricity attribute markets, as they evolve to align with clean energy transition, may need to play a substantial role in supporting trade to meet reliability and policy needs among multiple decarbonizing states.

- *GHG Leakage Risks*. Current practice poses the risk of GHG emissions "leakage" relative to the CEJA fossil emissions phase-out. The specific avenues of GHG emissions leakage include the potential for: (a) increases in GHG emissions from the fossil plants that are not subject to emissions caps, which may offset reductions in energy output from emissions-capped and retired plants; (b) increases in GHG emissions from fossil resources outside of Illinois to offset decreases in Illinois fossil production; (c) increased emissions from new fossil resources in Illinois that have not yet established emissions baselines; (d) excess emissions that may be caused if higher-emitting resources operate more than lower-emitting resources under the self-dispatch approach to managing annual emissions caps; and (e) excess emissions if RTOs must frequently utilize reliability backstop procedures to call on resources to operate beyond established emissions limits.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

2.A **Identify Resources and Strategies to Meet CEJA's Economy-wide Decarbonization Goals.** The ICC can conduct a study to understand the economy-wide strategies and pace of electrification required to achieve 100% economy-wide decarbonization, and refine the outlook for renewable and clean energy supply needs that must be achieved. The study can further examine the most cost-effective and reliable electricity resource mix for Illinois throughout the transition to 100% clean electricity under a range of uncertainty scenarios and accounting for neighboring states' various policies that must be simultaneously achieved. The study would assess the most likely cost-effective proportion of alternative technologies, existing and new resources, and in-state vs. out-of-state supply for meeting energy and reliability needs. The study would further assess the alternative policy and wholesale market reforms that together can attract and retain a competitively-determined and reliable clean electricity mix. Based on the outcomes of the economy-wide and electricity sector decarbonization strategy analysis, the ICC can evaluate available options for responsible entities, interim targets, and enforcement mechanisms to support timely achievement of the economy-wide decarbonization goal and 100% clean electricity goal.

2.B **Identify Mechanisms to Limit Leakage.** The ICC, in collaboration with MISO and PJM staff, can conduct a study of potential interventions that may limit and prevent GHG emissions leakage. Potential solutions to be considered in the study may include options such as GHG pricing applied to electricity imports; a state-wide or RTO-managed system for coordinated management of dispatch relative to total fossil plant emissions; application of a state-wide GHG emissions cap to all Illinois resources; and/or incorporation of new Illinois fossil resources within a total state-wide GHG emissions cap.

2.C Encourage Regional Market Reforms. The ICC can work with RTOs, other states, and stakeholders to pursue RTO market reforms that will support the most cost-effective decarbonization pathway (see Strategic Element 5 below).

STRATEGIC ELEMENT 3: MANAGING LAND USE IN RENEWABLE DEPLOYMENT

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Ensuring the transmission system can enable the large volume of needed renewable resources will require coordinated and ongoing review of the locations of likely future renewable generation to serve demand for renewable energy for consumers in Illinois and in other states. Illinois enjoys substantial additional renewable development opportunities for wind and particularly for solar, but fully unlocking that potential poses a trade-off with other land uses, particularly for agriculture. Responsible development further requires consideration of economic benefits to land owners, communities, and protections for local communities.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

3.A Adopt REAP Zone Concepts. The ICC can adopt the concepts of Level 1 Demonstrated Interest Zones and Level 2 Future Potential Zones for guiding participation in RTO interconnection and transmission planning processes. This REAP provides candidate Level 1 and Level 2 zones for ICC consideration, refinement through headroom analysis, and potential use in regional planning processes.

- *Level 1 Demonstrated Interest Zones* would be those where existing transmission headroom, or headroom created by the retirement of fossil resources, could enable public policy resources. Identifying and quantifying available system headroom will be a necessary first step in creating a more expedited process, but regulatory reforms to RTO interconnection processes are also required to expedite resource interconnection in those zones.
- *Level 2 Future Potential Zones* are suitable for future wind or solar development but would require network upgrades to interconnect resources there. Identifying these zones can inform long-term transmission planning conducted by the Regional Transmission Organizations.

3.B Quantify Renewable Interconnection Capability Through a Comprehensive Transmission Headroom Analysis. The ICC can, in close coordination with MISO and PJM, conduct a study to identify headroom that exists on the existing grid to integrate new renewable resources in Illinois. The headroom analysis would determine the volume of renewable supply that could be accommodated within various locations in the state, including those identified as potential Level 1 Headroom Zones in this REAP iteration or other areas with available system capability not identified in this REAP. This headroom study should also consider opportunities for capability to be expanded more easily at low cost through advanced transmission technologies, such as dynamic line ratings, power flow control devices, and topology optimization. The study should review available system capability under: (1) current RTO interconnection processes; (2) new processes that could make full use of headroom that may be created by retiring fossil resources; and (3) potentially reformed processes that better account for the attributes of renewable resources. The headroom analysis should further examine the additional headroom that could be created in either Level 1 or Level 2 zones through upgrades to the transmission system. Based on the outcomes of the headroom study the ICC could adopt Level 1 REAP Zones and advocate for any required enhancements to RTO interconnection processes (see Strategic Element 4 below).

3.C **Adopt Expansion Zones for Transmission Planning Purposes.** The ICC can adopt Level 2 REAP zones after review and refinement of the initially-proposed zones included in this report, and after considering further input from all participating stakeholders. In future REAPs, the Level 2 zones can be further informed by an inclusive process focused on gathering input from all potentially affected communities that may seek to participate in the economic benefits of renewable development or reflect other community priorities.

3.D **Develop a Model Ordinance.** Staff of the ICC, in consultation with IL EPA, Illinois Department of Natural Resources (IDNR), and Illinois Department of Agriculture (IDOA), impacted communities, and other interested stakeholders, can develop a model zoning ordinance to enable responsible renewable development in counties that have not yet adopted an ordinance, or counties looking toward best practice. These model rules should consider decommissioning insurance and bonding requirements; recommended parameters such as setback ranges; and should be developed in coordination with impacted energy equity and rural communities to ensure appropriate protections and enforcement provisions are included for the benefits of the local communities and participating landowners. Provisions of agreements currently entered into between developers and the IDOA should be examined in future REAP updates to ensure optimal achievement of intended environmental and community protection goals.

POTENTIAL ADDITIONAL POLICIES REQUIRING LEGISLATIVE ACTION

3.E **Review and Refine Enforcement Authorities.** Review and refine enforcement authorities to ensure the ability to stipulate and enforce minimum standards for responsible renewable resource development, including requirements such as for decommissioning insurance and comprehensive drainage plans.

STRATEGIC ELEMENT 4: EFFECTIVE TRANSMISSION PLANNING & UTILIZATION

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Current RTO interconnection processes are one of several immediate barriers to achievement of Illinois' CEJA mandates, particularly for resources seeking development in PJM. Though there are opportunities for reform over the medium and long term, PJM queue delays are likely to limit the ability to rapidly deploy resources for Illinois and other PJM states' needs. MISO's maximum annual renewable interconnection is approximately three times' that of PJM, but will also need to increase its pace of interconnection to support anticipated demand. While both RTOs continue to work on reforms to their processes, MISO and PJM should also develop or enhance existing mechanisms for coordinating the redeployment of transmission headroom from retiring fossil resources for new renewables or expedite renewable deployment through the use of Level 1 REAP zones.

Transmission planning processes in MISO are able to incorporate renewable resource and fossil emission phase out requirements in CEJA, and have a process for regularly evaluating these needs through its long-term plan. PJM's planning processes do not regularly evaluate, identify, or incorporate state policy requirements as transmission drivers, though PJM plans to initiate a reform process that aims to achieve a more efficient long-term, scenario-based regional plan that includes consideration of public policies. Level 2 REAP zones adopted by ICC can be submitted to MISO for consideration in its processes, and used to inform ongoing reform advocacy within PJM.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

4.A **Provide Input on Policy Requirements and REAP Zones to MISO Transmission Planning Studies.** ICC staff can continue to provide input into MISO's transmission planning processes, including requesting incorporation of any approved Level 2 zones in future updates to MISO Futures.

4.B **Advocate for Reform in PJM Transmission Planning Processes to Ensure that Illinois and All States Can Cost-Effectively Achieve Decarbonization Goals.** ICC staff can continue supportive efforts, including in PJM stakeholder processes and FERC dockets, to reform the regional pursuit of more cost-effective transmission solutions to wide-scale regional clean energy needs. Immediate efforts can focus on the PJM Master Plan setting out PJM's proposed vision for scenario-based long-term transmission planning, the FERC Notice of Proposed Rulemaking (NOPR) issued in April of 2022, and encouraging PJM's implementation of any requirements of the outcome of the NOPR (including a final rule) in a manner that incorporates and enables achievement of public policy, including as a driver in PJM's Regional Transmission Expansion Plan (RTEP).[4] While the NOPR and Master Plan document are meaningful steps toward requiring portfolio-based transmission planning, the likely timeframe for implementation will not allow these reforms to meaningfully impact the short-term policy needs identified in this second draft of the REAP. ICC staff can also continue participating in related PJM studies and efforts that will inform Illinois and other state policymakers about transmission needs and the most advantageous

4 *Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection*, Notice of Proposed Rulemaking, 179 FERC ¶ 61,028 (2022) (NOPR).

transmission planning reform efforts such as in ongoing Offshore Wind Study Group and Illinois Retirement Study processes.[5]

4.C Advocate for Interconnection Reforms. ICC staff can continue supportive efforts, including in stakeholder processes and FERC dockets, toward improving interconnection processes to ensure that both RTOs have the ability to meet or exceed the queue throughput that will be required to support all state and consumer policy goals. The most immediate focus can be on monitoring and evaluating implementation of recently approved PJM queue reforms.[6] In addition, further reforms in PJM and MISO may be required as a result of any final rule in FERC's ongoing NOPR proceeding on generator interconnection procedures.[7] This could include emphasizing the need for more proactive transmission planning to reduce reliance on the interconnection process as a way to expand the grid, considering the "connect and manage" interconnection concept, and advocating continuing improvements to affected system studies. In addition to monitoring the outcomes of recently approved reforms, ICC staff can seek further reforms to improve and expedite renewable interconnection through the use of Level 1 REAP Zones, the implementation of an improved mechanism to access and redeploy headroom from retiring fossil for renewable resources, or other reforms that may be identified in the headroom analysis under Strategic Element 3 above and are absent from recently approved reform proposals.

4.D Pursue Joint Interconnect Study. Facilitating use of identified Level 1 REAP zones may require PJM-MISO coordination to expedite a joint interconnection study modeled on recent Joint Targeted Interconnection Queue (JTIQ) efforts by MISO and Southwest Power Pool. PJM and MISO should similarly facilitate a joint interconnection study, which could occur outside of the purview of PJM's recently-approved queue reform process. This collaborative interconnection study could further address potential concerns of individual generators facing large-scale transmission needs by identifying more comprehensive solutions to a wider range of likely interconnection needs near the PJM-MISO seam, identify opportunities to expeditiously interconnect the large volume of renewable supply currently seeking interconnection in these locations and that may be delayed by affected system studies, and identify opportunities to coordinate the use of transmission headroom that may be freed up by upcoming fossil retirements. This need for an expedited joint review is heightened given Illinois' location on the PJM-MISO seam, the potential for delays in the interconnection studies of one RTO to impact timing of requests in both regions, and the large number of potential fossil retirements in the same regions.

---

5 *See* PJM, Offshore Wind Transmission Study: Phase 1 Results, (October 19, 2021); PJM, Illinois Generation Retirement Study, (August 3, 2022).

6 FERC Docket No. ER22-2110; 181 FERC ¶ 61,162 (2022).

7 *See Improvements to Generator Interconnection Procedures and Agreements,* Notice of Proposed Rulemaking, 179 FERC ¶ 61,194 (2022) (Generator Interconnection NOPR).

4.E Consider Pursuing Transmission Development Through PJM's State Agreement Approach. ICC staff should continue to explore transmission development through PJM's State Agreement Approach (SAA). This SAA could either be a single-state, or (preferably) multi-state effort, in concert with other PJM States, through the Independent State Agencies Committee or other forums.[8] The SAA process could aim to create and illustrate the most desired, repeatable process for long-term, scenario-based planning to be used to meet region-wide policy goals. At the conclusion of the multi-state SAA process, the effort should at a minimum inform ongoing foundational reforms to PJM's transmission planning processes, and, if the outcomes are broadly accepted, the identified transmission solutions can be approved for cost recovery from participating states. Alternatively, if finding the necessary agreements for a multi-state SAA is not possible, ICC could pursue initial steps toward a single-state SAA, which would, even if no project were selected, provide useful information to Illinois to inform future public policy development, including future REAP updates.

STRATEGIC ELEMENT 5: LEVERAGING REGIONAL ELECTRICITY MARKETS & TRADE

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

RTO market incentives must align with Illinois' and other states' policy requirements, in order to enable a cost-effective and reliable energy system transition. Both PJM and MISO are pursuing a range of market reforms focused on supporting cost-effective, reliable markets and operations throughout this evolution. However, both RTOs indicate that strong support and partnership with policymakers in Illinois and other states will be required to identify and prioritize the required reforms. ICC staff, in collaboration with both RTOs, have identified several beneficial reforms that are already under consideration or that could be considered that may advance Illinois' clean energy transition.

Among the many potentially required reforms, ICC staff highlight MISO's resource adequacy shortfall as the most urgent. Both MISO staff and ICC staff have concluded that MISO's current capacity market design is not adequate to attract and retain competitive investments to meet Illinois reliability needs. MISO and ICC staff further conclude that the present capacity gap in Illinois Zone 4, while it may decline or grow in any particular year, will be further challenged throughout the clean energy transition. Ongoing and proposed reforms including a reliability-based capacity demand curve and seasonal resource accreditation may mitigate the scale of potential capacity shortfalls, but MISO will not be able to offer a comprehensive solution in the near term. In the medium and long term, MISO is committed to defining required reliability attributes and accounting resource commitments including on a forward basis, but is not presently able to confirm whether and when the organization will be able to identify and implement a comprehensive long-term solution that aligns with Illinois policy.

---

8 *See* Independent State Agencies Committee Charter, (October 1, 2020).

The energy transition may introduce similar challenges in PJM in the future, but its capacity market is designed with the goal of attracting and retaining competitive supply resources, with prices rising gradually in the event of a shortfall, somewhat mitigating the urgency of this reliability concern. Even so, a comprehensive approach to reliability is needed in PJM to ensure resource adequacy can be supported throughout fossil emissions phase out and manage the potential retirements that can be anticipated by 2030.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

5.A **Evaluate Options for Maintaining Resource Adequacy in MISO.** The ICC can conduct a study and feasibility assessment of available options for addressing the identified MISO resource adequacy gap. The assessment would review the potential cost, reliability outcomes, fleet transition implications, challenges with addressing locational reliability needs, and potential for the abuse of market power under alternative solution options. The options to consider could include:

- *Supporting and participating in ongoing MISO reform efforts* including advocating for a sloped capacity demand curve, participation in the ongoing reliability attributes examination, and advocating for reforms such as a clean capacity product, enhanced support for capacity trade, and a 2-3-year forward market that may eventually provide a comprehensive solution to the identified gap;
- *Requesting MISO support for Illinois to conduct a 2-3 year forward procurement* for 100% of Illinois capacity requirements for Zone 4 customers, including the potential consideration of a "clean capacity" requirement for a portion of the need. The forward procurement would allow Illinois to require LSE participation, while other states and LSEs could also voluntarily opt-in to a forward procurement mechanism. The requested procurement would result in a formal capacity commitment within MISO's capacity construct and under MISO's accounting requirements;
- *Authorizing the IPA to expand forward capacity procurements* to meet 100% of Zone 4 customer resource adequacy needs, to be coordinated with MISO for the purposes of resource accounting and commitments; and
- *Requesting PJM support to expand its capacity auction to support procurement of Illinois Zone 4 capacity needs* on a forward basis, including accounting for capacity transfer capability between RTOs and across capacity zones. Illinois might meet its reliability need in Illinois Zone 4 using PJM's capacity auction, which is potentially better suited to address capacity needs in a restructured state such as Illinois than is MISO's capacity auction process. If PJM's capacity process is used, capacity procured for Illinois Zone 4 would continue to be tracked relative to MISO's capacity accounting methods.

5.B **Seek GHG Emissions Data from RTOs**. ICC staff can engage with both MISO and PJM to continue the expansion of their GHG accounting data processes in support of Illinois' policy goals and consumers' needs. The additional GHG accounting data that can be provided includes**:**

- Granular data sufficient to build up the calculation for state-wide Scope 2 emissions, separately accounting for in-state direct emissions, emissions embedded within imports, and emissions displaced by clean energy export (See Strategic Element 1). PJM staff have committed to working with Illinois and other participating states to develop and implement the proposed accounting methodology. ICC staff can then seek state and RTO support for implementation of a similar approach in MISO;
- Average emissions produced and allocated to demand system-wide, by energy zone, by node, and by state in each 5-minute dispatch interval, including sufficient information to calculate both total system emissions mix (including clean and fossil supply) and residual system emissions mix (including only fossil supply). If possible, the data should enable Illinois and consumers to understand both the physical operations of the grid, and clarify state-level and consumer-level assessments of GHG emissions and claims of GHG abatement consistent with their policies or REC purchases; and
- Marginal emissions at every node and in every 5-minute dispatch interval (already published by PJM, but not yet provided by MISO).

5.C Contribute to Regional Market Development for Clean Energy Attributes. ICC staff can continue contributing to efforts within the Organization of PJM States, Inc. (OPSI) and PJM's Clean Attribute Procurement Senior Task Force (CAPSTF) to design and implement a new marketplace within which states and consumers can procure clean electricity attributes. PJM staff have committed to modeling scenarios that will assist the ICC in understanding the alternative ways that Illinois could participate in such a market, the results of which can be filed within this REAP investigation. Full ICC and legislative consideration of whether and how to use such a market will be partially dictated by the implementation timeframe. However, based on the assessment of this REAP iteration, the clean attribute market design features that may be most beneficial for consideration in Illinois include:

- New region-wide clean energy products, similar to RECs, ZECs, and CMCs, that could be used by consumers within Illinois to meet their own goals and inform future policy choices in support of Illinois' 100% clean electricity goals, such as to procure a portion of Illinois' renewable energy requirements and/or achieve a competitive retention of nuclear resources after the conclusion of current support payments;
- Improved product definitions for clean energy attributes, such as based on GHG abatement and 24x7 clean energy achievement, that could be used by Illinois, consumers, or municipalities within the state to serve more granularly-defined clean energy and accounting goals; and
- A new "clean capacity" product that Illinois could assess as one option to manage orderly retirement, retrofitting, and replacement of fossil capacity with reliable clean electricity supply resources, particularly if the ICC and RTOs determine that resource adequacy or timely achievement of the fossil phase out could be threatened by retirement cliffs or inadequate representation of emissions-capped fossil resources' reliability value.

5.D Study Reliability and Operational Implications of Fossil Units' Emissions Limits under CEJA. In full coordination with RTOs, the ICC can conduct a modeling study to identify reliability and operational issues that may arise on the basis of future emissions limitations, the timeframe over which these concerns may arise, and identify solutions. The most immediate concerns that should be reviewed include: (1) the potential frequency and severity of reliability events that could be associated with energy limitations (or excess emissions if violating limitations to preserve reliability); (2) the potential for asset owners' self-management of emissions caps to produce reliability events or excess emissions; and (3) whether generators' emissions limits should be reflected as a lower capacity value in the capacity markets. These potential concerns could be quantified over time, to identify the likely timeframe by which a solution should be implemented. Based on the outcome of this study and the analysis of GHG leakage above, ICC staff can pursue RTO market reforms that may support more effective and reliable emissions phase out.

POTENTIAL ADDITIONAL POLICIES REQUIRING LEGISLATIVE ACTION

5.E Authorize Use of Identified Regional Solutions. Based on the findings of the studies above and ongoing developments, provide authorizations for: (1) the ICC to direct or authorize participation in a regional attribute markets to support a portion of Illinois policy goals; (2) fossil resource owners to participate in RTO-supported mechanisms to improve coordinated management of GHG emissions caps, such as relative to a state-wide cap or a common GHG strike price; and/or (3) the ICC to direct or authorize participation in RTO GHG border pricing or any similar mechanism that may become available as a means of mitigating leakage.

I. Tracking Progress Toward Illinois Policy Goals

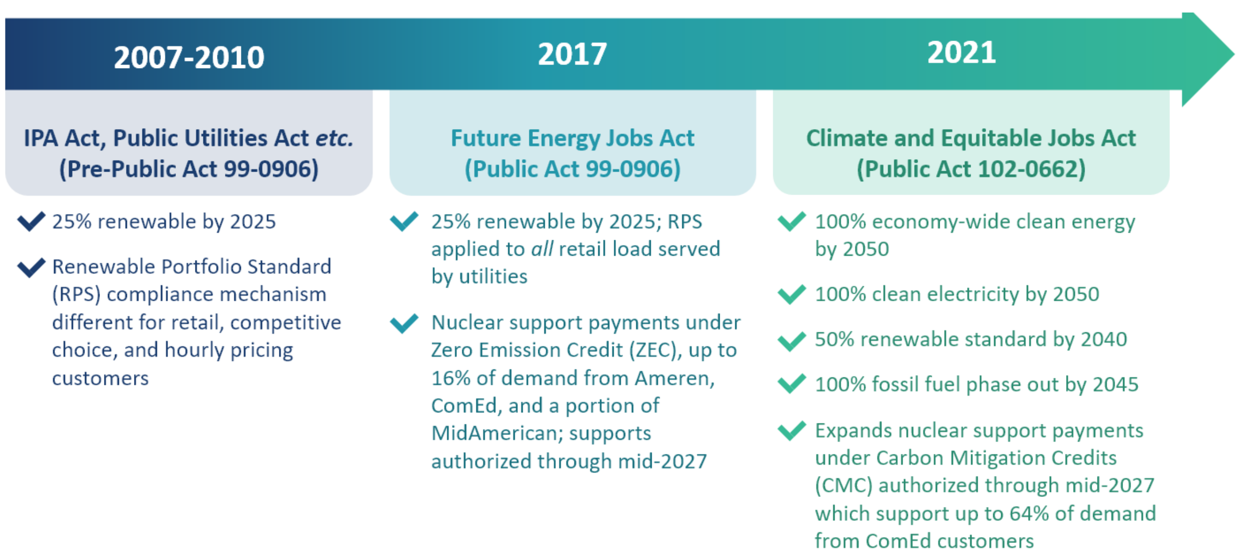
The Climate and Equitable Jobs Act (CEJA) demonstrates Illinois' commitment to decarbonization by putting the state on a path to a 100% clean energy economy by 2050. It provides the initial direction required to meet this goal by setting an intermediate target of 50% renewable electricity by 2040 for most consumers, requiring complete phase out of fossil fuel emissions from electric generating units by 2045, and introducing new forms of support to retain the state's nuclear supply.

The Renewable Energy Access Plan (REAP) seeks to further supplement the goals of the Act by identifying gaps in the current *status quo* and laying out recommendations to efficiently carry out this clean energy transition.

A. Climate and Equitable Jobs Act

The CEJA seeks to further Illinois' decarbonization goals while ensuring that the state's energy needs are met equitably, reliably, and cost-effectively. The act builds on commitments and lessons learned from prior state policies (summarized in Figure 1 below) and mandates longer-term clean energy goals, as well as targeted actions focused on driving equitable clean energy transition.

FIGURE 1: TIMELINE OF KEY CLEAN ENERGY POLICIES IN ILLINOIS



Sources and Notes: 2022 IPA Long-Term Resources Procurement Plan, Climate and Equitable Jobs Act, Future Energy Jobs Act, Illinois Power Agency Act, Public Utilities Act. RPS and nuclear supports are expressed as percentages of demand for the obligated consumers. The RPS program will serve approximately 42% of state-wide demand in 2040 and the ZEC and CMC programs will serve approximately

14% and 38% of present state-wide demand respectively (expressed as a percentage of all state-wide electricity consumption, not just the consumption from consumers obligated to participate in these programs).

The policy mandates and targets embedded in CEJA will be achieved through a variety of economic support mechanisms and enforcement actions, some of which have yet to be fully specified. The primary CEJA goals are as follows (described more fully in Table 1):

- **100% economy-wide clean energy by 2050.** CEJA references the State's intent and goal to transition to 100% clean energy by 2050 in several sections.[9]
- **100% clean electricity by 2050.** CEJA references a target for achieving 100% clean electricity by 2050, with both renewable and nuclear supply eligible. Realization of this target will require an assessment of policy mechanisms to attract and retain the necessary nuclear and renewable supply, as well as an identification of strategies to track and regulate emissions embedded in electricity trade.
- **50% renewable portfolio standard by 2040.**[10] CEJA requires the Illinois Power Agency (IPA) to conduct procurements to meet the new 40% RPS by 2030 and 50% RPS by 2040 for applicable customer segments. As in Public Act 99-0906, these requirements apply to consumers served by Illinois' three major public utilities (Commonwealth Edison, Ameren, and a portion of MidAmerican). Consumers served by competitive retail suppliers are generally subject to the same RPS mandates, but may pursue self-supply to a limited extent. Municipal electric utilities, rural electric cooperatives, and Mount Carmel Public Utility Company are not legally required to comply with the RPS mandate; however, the 100% by 2050 economy-wide and electricity sector targets do apply to these consumers.
- **100% fossil emissions phase out by 2045.**[11] All natural gas-fired electric generating units larger than 25 MW are required to cap GHG emissions levels based on 2018–2020 emissions estimates (except for newer plants for which the estimates will be based on emissions in the first 3 years of operation) and demonstrate compliance based on rolling 12-month average output levels, and all coal and natural gas-fired electric generating units are to reduce GHG emissions by 100% by 2045. Proximity to certain equity zones, forms of ownership, and emissions rates dictate earlier compliance schedules for certain of these facilities. Compliance will be enforced by the Illinois EPA.
- **Expands nuclear support payments through Carbon Mitigation Credits (CMCs) authorized through mid-2027.**[12] The already-existing Zero Emissions Credit (ZEC) program supports 16% of applicable demand (customers of Ameren, ComEd, a portion of MidAmerican); CMCs support 64% of applicable demand (ComEd customers). Together, ZEC and CMC payments support the equivalent of 52% of state-wide demand (considering

---

9 *See* CEJA references in 20 ILCS 3855/1-5(1.5); 415 ILCS 5/9.18; 20 ILCS 3855/1-75(d-10).

10 20 ILCS 3855/1-75(c).

11 415 ILCS 5/9.15.

12 20 ILCS 3855/1-75(d-10).

all consumers, not just those obligated to participate in funding the nuclear support payments).

TABLE 1: KEY CLEAN ENERGY POLICY REQUIREMENTS IN ILLINOIS

Mandate	Implementation Structures
Economy-Wide Targets	**100% Economy-Wide Decarbonization by 2050:** Includes achieving carbon-free electricity and large-scale electrification of all energy systems. **100% Clean Electricity:** This goal would apply to all electricity consumption, including demand from non-RPS obligated consumers, and apply to electricity imports. While 50% of RPS-obligated consumption will be subject to RPS requirements, qualification requirements for the remaining clean energy have not been determined, apart from necessarily being "substantially free (90% or greater) of carbon dioxide emissions." **Electrification Targets:** State must have at least 1 million Electric Vehicles (EVs) by 2030 (around 10% of present vehicle fleet); utilities serving greater than 500,000 customers in the State are required to file a Beneficial Electrification Plan with ICC for programs starting by January 2023.[13] Rebates offered to incentivize EVs and installation of charging infrastructure.[14]
Renewable Supply Requirements	**Renewable Portfolio Standard:** Requires procurement of at least 25% renewables by 2025; increasing by at least 3% every year to at least 40% by 2030, and increasing to 50% by 2040. **Solar and Wind Targets:** At least 10 million Renewable Energy Credits (RECs) to be procured by 2021, increasing to at least 45 million RECs by 2030; At least 45% of these should come from wind; 55% from solar. **Incentives Structure:** Renewable developers earn payments at competitively-determined levels through IPA procurements or through bilateral contracts with retail providers; proposes an Index Pricing Structure. **Achievement Responsibility:** Lies primarily with IPA, but with some self-supply provisions for competitive retail providers. The Illinois Commerce Commission (ICC) approves IPA plans and procurement results.
Fossil Fuel Phase Out	**Coal Phase Out:** Municipal, coal-fired plants above 25 MW in size must reduce emissions by 45% by 2035 and eliminate GHG emissions or retire by 2045. Private coal plants to eliminate GHG emissions by 2030. Coal to Solar Program to incentivize solar development at these sites.[15] **Natural Gas Phase Out:** Municipal, natural gas-fired plants eliminate GHG emissions by 2045 (unless converted to a clean dispatchable technology). For private natural gas fired plants, compliance date is determined by proximity to environmental justice and equity investment eligible communities and NO_X and SO_2 emissions rates (explained in Figure 7 below). Plants must eliminate emissions by 2045 at the latest. **Achievement Responsibility:** Illinois EPA to ensure compliance. When the continued operation of a fossil plant is required to maintain power grid supply and reliability or serve as an emergency backup to operations, RTOs to assess eligibility for exception.
Nuclear Resource Retention	**Support Volumes:** ZECs: All utilities with more than 100,000 customers obligated to support ZECs at 16% of 2014 consumption (applicable to ComEd, Ameren, and a portion of MidAmerican); CMCs: All utilities with more than 3 million customers (ComEd) required to comply. A maximum of 54.5 million CMCs. **Winning Bids:** ZEC: Quad Cities Nuclear Power Station Units 1 and 2; and the Clinton Power Station Unit 1.[16] CMCs: Braidwood Units 1 and 2; Byron Units 1 and 2; and Dresden Units 2 and 3.[17] **Achievement Responsibility:** IPA is responsible for procurements and released the CMC Procurement Plan in September 2021. ZEC supports extend through the mid-2027; CMC supports extend through mid-2027.[18] The ICC approves IPA procurement plans and procurement results.

13 20 ILCS 627/45.

14 415 ILCS 120/27; 20 ILCS 627/55.

15 20 ILCS 3855/1-75(c-5).

16 ICC, Public Notice of Successful Bidders, January, 2018.

17 ICC, Public Notice of Successful Bidders, December, 2021.

18 20 ILCS 3855/1-75(d-10)(C).

B. Scope and Purpose of the REAP

CEJA directs the ICC to develop a REAP for the State of Illinois pursuant to Section 8-512.[19] This REAP provides a comprehensive, actionable plan for supporting an equitable, reliable, and affordable transition to 100% clean energy (including 50–100% renewable electricity) for the state of Illinois in alignment with CEJA mandates. This second draft REAP provides an outlook for the scale of renewable developments required over time (Section II); an assessment of the land use, resource potential, equity aspects, and other factors likely to impact locations of future resource deployment (Section III); a review of resource interconnection and transmission planning protocols, including recommended reforms, that impact the pace of renewable deployment (Section IV); and a suite of actions to incorporate these goals into the regional electricity markets, to guide future advocacy efforts (Section V).

The scope of the REAP must include:[20]

- An actionable plan for achieving CEJA's policy mandates equitably, reliably, and affordably;
- Quantification of the outlook for renewable supply that may be needed to fulfil the 50–100% renewable electricity supply mix, including accounting for increases in electricity demand from electrification and the interactions amongst renewable, nuclear, and fossil supply throughout clean energy transition;
- Assessment of resource potential, land use considerations, and recommendation of renewable energy zones that may offer the most promising opportunities to support large-scale resource deployment equitably and cost-effectively;
- Review of the existing and needed physical transmission infrastructure required to reliably and affordably deliver clean electricity to Illinois consumers, in coordination with the parallel decarbonization goals being pursued by states and consumers across most interconnected regions of the Midcontinent and MidAtlantic;
- Identification of the necessary changes to the transmission planning and interconnection processes conducted by the two RTOs serving Illinois: MISO and PJM;
- Discussion of innovative policy options that could be employed to more equitably, reliably, and affordably promote renewable deployment, fossil emissions phase out, and transition to 100% clean energy supply; and
- Reforms to the RTO wholesale electricity markets that may be required in order to align with and support effective achievement of CEJA policy mandates.

This second draft REAP is issued for the ICC's review and consideration, as part of the investigation that must begin before December 31, 2022. The ICC will initiate a new investigation

[19] 220 ILCS 5/8-512.

[20] 220 ILCS 5/8-512(b).

to review and update the REAP in 2025 and every two years thereafter based on new information, sector developments, and progress made toward CEJA policy mandates.[21]

C. Equity in the REAP

In its efforts to drive clean energy, CEJA prioritizes an equitable transition for environmental justice and other equity investment eligible communities. It requires the expedited phase out of emissions from the highest-emitting fossil fuel plants, creates employment programs for equity investment for eligible communities and business owners, and ensures that new funding will be directed toward disadvantaged populations.

This REAP similarly sought to prioritize equity throughout the analysis, including within the siting of renewable energy access zones and interactions with the phase out of fossil fuel plants. At a minimum, the REAP recognizes areas for future efforts in future updates, as well as areas where equity requirements have been included in this effort:

- **Air quality near environmental justice communities**: CEJA has mandated the closure of fossil-fueled electric generating units according to a timeline that first prioritizes GHG-intensive plants near environmental justice communities.[22] Fossil-fueled electric generation units within three miles of an environmental justice community that are high emissions units must phase out by 2030. All other fossil-fueled electric generating units must phase out by 2045. The REAP reviews the emissions implications of this phase out in Section II, and future REAP updates should continue an ongoing review of these factors in light of resource retirements, the changing Illinois resource mix, and evolving system needs.
- **Land use:** In identifying new renewable energy access zones and reviewing interactions with permitting approaches, the REAP considers the importance of equity in land use in resource development. As discussed in Section III below, renewable energy zone development and mapping included consideration of identified equity zones as well as an evaluation of crop productivity. The REAP further recommends development of model rules for county ordinances that will address inconsistencies, protect land owners, and reflect local community priorities. Additional recommendations for future REAP zone updates include a specified pre-REAP update process for engaging local communities and gathering input for direct use in development of REAP zones in future iterations of the REAP.
- **Equitable access to new jobs, tax revenues, and mitigation of effects from possible job losses**: CEJA aims to promote a transition to renewable energy that will create tens of thousands of jobs in the renewable sector in Illinois and will include the creation of new job training programs for environmental justice communities and other disadvantaged

[21] 220 ILCS 5/8-512(c).

[22] 415 ILCS 5/9.15 (h)-(i)-(1).

populations.[23] Future iterations of the REAP should continue to evaluate employment impacts of RPS compliance and other renewable energy development in Illinois, with a focus on ensuring all disadvantaged populations in Illinois have access to new job opportunities, including in communities impacted by plant closures.

- **Reliable and affordable energy supply**: CEJA's mandated transition to a 100% clean energy supply by 2050 must proceed in a just and equitable way.[24] This REAP seeks to align with CEJA requirements to ensure that Illinois' clean energy transition does not disproportionately impact consumers in environmental justice communities and other disadvantaged populations by emphasizing the implications for reliable energy supply, as detailed in Section II, for all households in the state.

D. REAP Findings and Recommendations

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

The pace of renewable deployment needs over the coming five years will need to accelerate significantly to meet CEJA goals and requirements, but the amount of this acceleration is dependent upon the achieved degree of electrification and choices concerning currently-installed in-state resource mix. A more accurate long-term outlook for renewable deployment is needed to most effectively support transmission planning and policy implementation.

This REAP finds significant efforts are required to meet the long-term goal of completely decarbonizing the Illinois economy by 2050. Renewable energy production will have to increase substantially from Illinois' 21 TWh/year today, particularly given that only, approximately, 16% or 3.3 TWh/year of this supply was dedicated to meeting Illinois RPS while the majority is committed to meeting other states' and private consumers' renewable goals.[25] By 2050, total Illinois renewable production will need to increase to 64 to 450 TWh/year to serve Illinois policy goals. This uncertainty range is associated with the fate of the nuclear fleet and the extent of electrification of non-electric sectors. The low end of this range reflects a 50% RPS mandate applicable to approximately 85% of Illinois electricity demand, with the remainder of the state's clean electricity needs served by nuclear power, and assuming only modest growth in electricity consumption. The high end assumes all Illinois nuclear resources retire and that electricity consumption could increase by 50–200% to partly or fully support the decarbonization of other energy-intensive economic sectors including transportation and space heating.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

1.A **Enhance Reports to Capture Progress Against Goals.** The ICC Staff, in consultation with relevant State agencies, including, but not limited to, the Illinois Environmental Protection Agency (EPA or IL EPA) and the Illinois Power Agency (IPA), PJM Interconnection (PJM),

[23] 220 ILCS 5/8-512 (4).

[24] 20 ILCS 3501/850-10-5.

[25] Data as of 2021. *See* Section II.C.4.

Midcontinent ISO (MISO), utilities, and any other relevant entities or stakeholders can compile information and issue an annual report tracking progress relative to CEJA's goals for clean energy, renewable energy, and economy-wide decarbonization. This information can contribute to fulfillment of the IL EPA, IPA, and ICC's 5-year progress reporting requirement to the state legislature.[26] The report may also identify available strategies and additional policy instruments that could aid Illinois to achieve its clean energy, renewable energy, and economy-wide policy goals, including the timely and equitable achievement of 100% economy-wide decarbonization.

1.B **Develop GHG Accounting Methodology.** To support accurate tracking of GHG emissions obligations in the context of the regional electricity markets, staff of the ICC, in consultation with other Illinois agencies and other decarbonizing states, can develop an accounting methodology for measuring the Scope 2 GHG emissions obligation associated with electricity imported into Illinois from neighboring states (and displaced by electricity exports). The REAP recommends developing a Scope 2 GHG inventory methodology for tracking net GHG emissions that will ensure any GHG emissions embedded within electricity imports for Illinois consumers will be at least offset by clean electricity exports in the eventual demonstration of a 100% GHG-free electricity mix. The methodology should further consider commitments of Illinois resources to sell clean electricity to other states and private consumers, to ensure that claims of emissions abatement are not double-counted. Agency staff can work with PJM and MISO to assist in development and implementation of the identified accounting methodology using granular data on real-time data of emissions imports and exports in support of Illinois and other states' GHG elimination goals.

[26] Specifically, the EPA, IPA, and ICC are required to submit to the legislature a report by 2025 and every five years thereafter on progress relative to CEJA goals, the state's reliability needs outlook, identified challenges, and potential solutions. As required in CEJA Section 5/9.15(o).

II. Transitioning to a 100% Clean Electricity Mix

In order to meet the CEJA goal of 100% economy-wide decarbonization by 2050, Illinois will have to deploy unprecedented volumes of new renewables, ranging anywhere between 64–450 TWh, depending on the scale of electrification-driven demand growth and the amount of nuclear supply retained.

Developing a viable plan for achieving a 100% clean electricity mix must also consider the need to replace the reliability and balancing services that have traditionally been provided by fossil resources. As fossil resources reduce their operations and GHG emissions, and eventually retire, essential grid services will need to be provided by clean electricity resources. Renewable resources can provide half or more of Illinois' clean energy requirements, but offer relatively less contribution to reliability and balancing needs as compared to other clean resources such as nuclear, batteries, and demand response.

A. Current Resource Mix

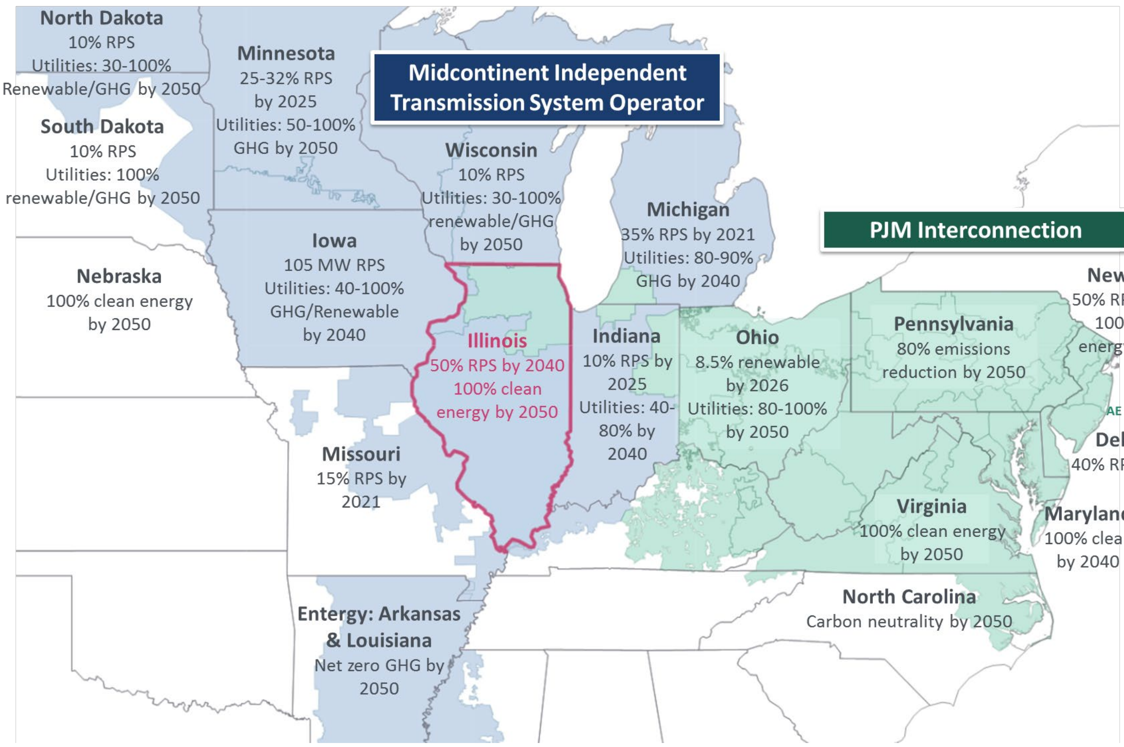
Illinois is centrally located within the Eastern Interconnect power grid and shares the use of extensive transmission infrastructure with states across the Eastern Interconnect. Illinois is served by two RTOs, with the Commonwealth Edison (ComEd) regions around Chicago served by PJM and rest of the state served by MISO. The RTOs play a central role in planning for transmission expansion, renewable interconnection, dispatching generation, and ensuring the reliability of the electricity grid. Illinois' participation within these two RTOs and access to extensive transmission infrastructure will be a substantial asset as Illinois proceeds with large-scale renewable deployment and fossil phase out. Interconnections with much larger interstate regions create more opportunity to balance the system and support reliability needs, enabling excess clean power supplies to be exported to displace fossil power in other states and enabling imports to balance Illinois' energy demand when renewable power output is low.

The pace of decarbonization varies across the most heavily interconnected states neighboring Illinois, with many states and utilities across MISO and PJM making commitments up to 80–100% clean energy by 2050 as summarized in Figure 2. Illinois utilities have adopted their own corporate sustainability targets, with Ameren adopting a net-zero goal of 2045, and Mid-American and ComEd targeting net-zero by 2050.[27] The regions also serve a large number of local

[27] Ameren, *Ameren Missouri updates comprehensive plan to safeguard long-term energy reliability and resiliency for Missourians*, PR Newswire, (June 23, 2022) ("The updated plan accelerates clean energy additions, reduces carbon emissions even further in the short-term and moves up Ameren Corporation's net-zero carbon emissions goal by five years to 2045."); MidAmerican Energy Company, Destination Net Zero—Reaching net-zero greenhouse gas emissions by 2050, (2022) ("At MidAmerican Energy, we are on a mission to reach net-zero greenhouse gas emissions by 2050—all while maintaining the reliability our customers require, at a price they can afford and that technological advances support."); Exelon, Exelon Utilities Announces Goal to Achieve Net-

governments and consumers that increasingly demand access to clean energy supply. The interconnected market and transmission systems operated by the RTOs will need to support the decarbonization pathway of each jurisdiction in parallel and facilitate the ability of states and consumers to share and balance their renewable supplies to leverage resource diversity and reduce overall costs. The RTOs, states, and other industry stakeholders will further need to continue enabling the clean energy states to access power resources in non-decarbonizing regions for the purposes of managing grid reliability needs, while at the same time ensuring that cross-border power flows do not limit Illinois' progress toward eliminating GHG emissions.

FIGURE 2: ILLINOIS RTO REGION MAP



Sources and Notes: Map created with S&P Global Capital IQ. Utility goals reflect a partial representation of the largest utilities across most states. Data derived from publicly announced commitments, articles, and summaries including from National Conference of State Legislatures "State Renewable Portfolio Standards and Goals"; PJM Grid of the Future; and MISO Futures Report.

Illinois engages in substantial energy imports and exports with other states, with the balance of net imports and exports changing dynamically with system conditions across every border in every 5-minute RTO dispatch interval. On balance, Illinois has historically been a net exporter with Illinois generation exceeding Illinois consumer demand by approximately 20%.[28] As summarized in the upper panel of Figure 3, Illinois has historically relied heavily on nuclear and coal as the primary sources of power supply. In recent years coal production has dropped by half, replaced by more economic natural gas power plants and renewables developed under the RPS.

Zero Emissions by 2050, (August 4, 2021) ("Exelon Utilities today announced that it will reduce its operations-driven emissions 50 percent by 2030 and ultimately to net-zero by 2050 as part of its continuing efforts to address the climate crisis.")

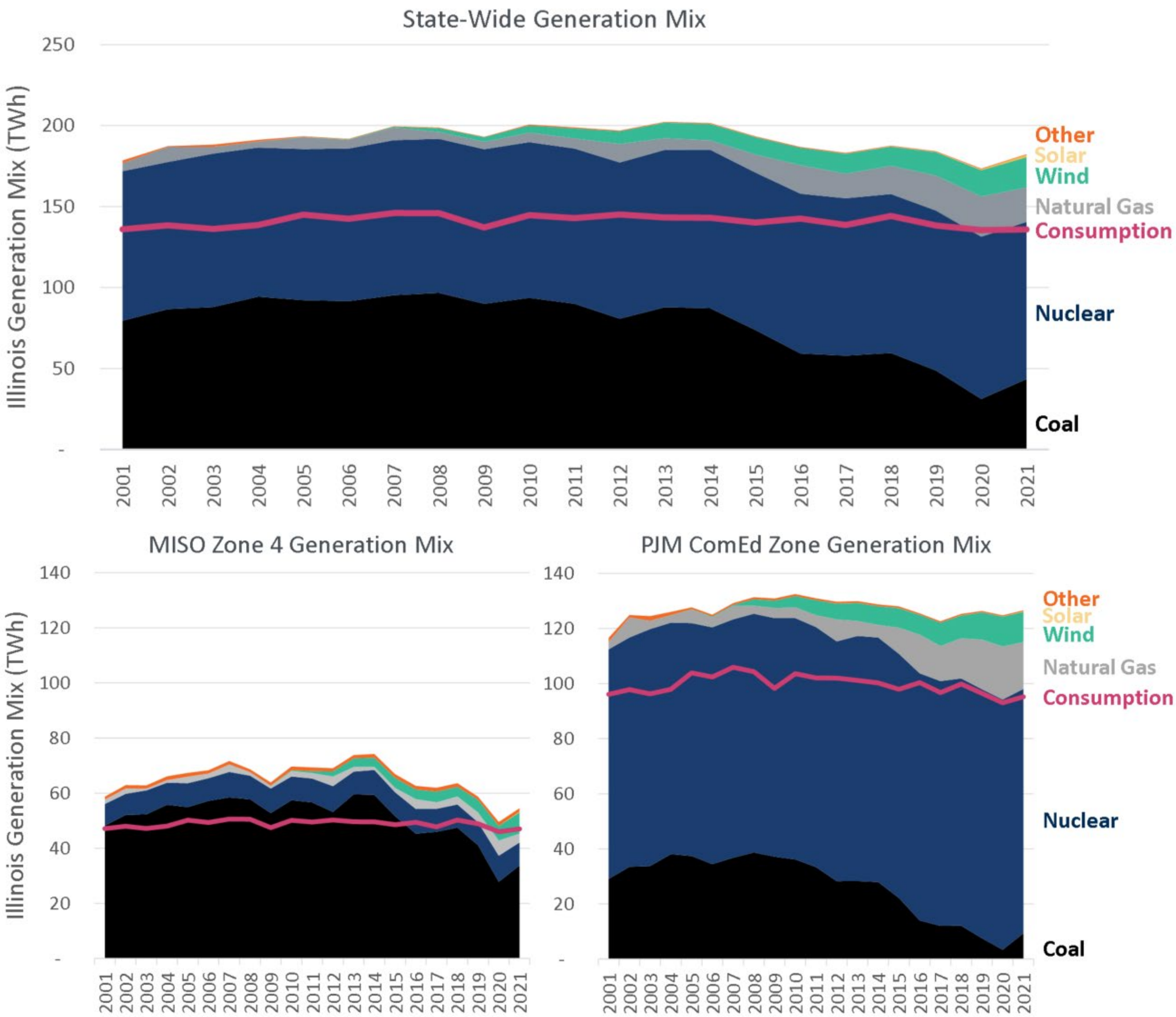
28 US EIA, 2021 Illinois State Profile.

To meet CEJA requirements, generation supplies from coal and gas will need to be phased out, while renewable supply is increased sufficiently to serve total Illinois consumption from clean supply. If nuclear resources retire, then additional renewables will be required to replace the lost clean power production. Illinois has also hosted a substantial quantity of renewable energy supply development in the state that has been used to serve clean energy demand in other states across PJM.

The generation mix differs significantly between the MISO-served and PJM-served portions of the state as summarized in the lower-left and lower-right panels of Figure 3. The PJM-served portion of the state relies heavily on nuclear energy while the MISO-served portion of the state continues to rely heavily on coal production.

The elimination of fossil fuels within Illinois has the potential to change Illinois' position from a net exporter to either having a balance of supply and demand or to potentially becoming a net importer. From an economic perspective, the level of gross and net imports or exports is a reflection of the most cost-effective dispatch of the regional energy system. From an environmental perspective; however, imports and exports of energy across state borders can have substantial implications for GHG emissions and Illinois' attributable share of emissions. Illinois' responsibility for GHG emissions produced outside of state borders is likely increased when considering that the majority of renewable supply within the state has been developed and committed to serve the clean energy needs of consumers in other states. We discuss GHG emissions tracking and mitigation effects further in Section V, and potential emissions implications for Illinois in Section II.C.2.

FIGURE 3: ILLINOIS' HISTORICAL GENERATION MIX



Sources and Notes: [US EIA State Energy Data System](); Velocity Suite via PJM and MISO.

Separate from energy markets (denominated in MWh of production), the RTOs also support capacity markets (denominated in MW of unforced capacity (UCAP MW)). The capacity markets ensure that the total quantity of supply will be sufficient to meet peak demand and reliability needs, such that supply shortfalls would be incurred no more than once in ten years (the "1-in-10" reliability standard).

Figure 4 summarizes the capacity resources serving Illinois across the MISO and PJM regions, as compared to the capacity requirement needed to ensure reliability. The RTOs require sufficient capacity to be available to meet Illinois consumers' needs. A portion of needed capacity must be geographically located within the state, and the remainder can be imported from other regions up to transmission limits. Natural gas, coal, nuclear, demand response, and imports provide the majority of Illinois' current and historical capacity supply. Renewables contribute only a small fraction, given that their intermittent nature discounts their contribution to reliability.

The PJM-served portion of the state presently has excess capacity relative to reliability needs, assuming all available resources clear to provide capacity. In the most recent 2023/24 PJM capacity auction, 3,659 MW of eligible capacity offered into the auction did not clear. The majority of the capacity supply in ComEd is provided by nuclear and natural gas power plants. For several years, a large portion of the nuclear supply failed to clear the capacity auction.[29] The expansion of nuclear CMC payments (reflected only in the most recent auction results) will presumably ensure the retention of those nuclear resource supported by policy payments at least until the payments expire after 2027.

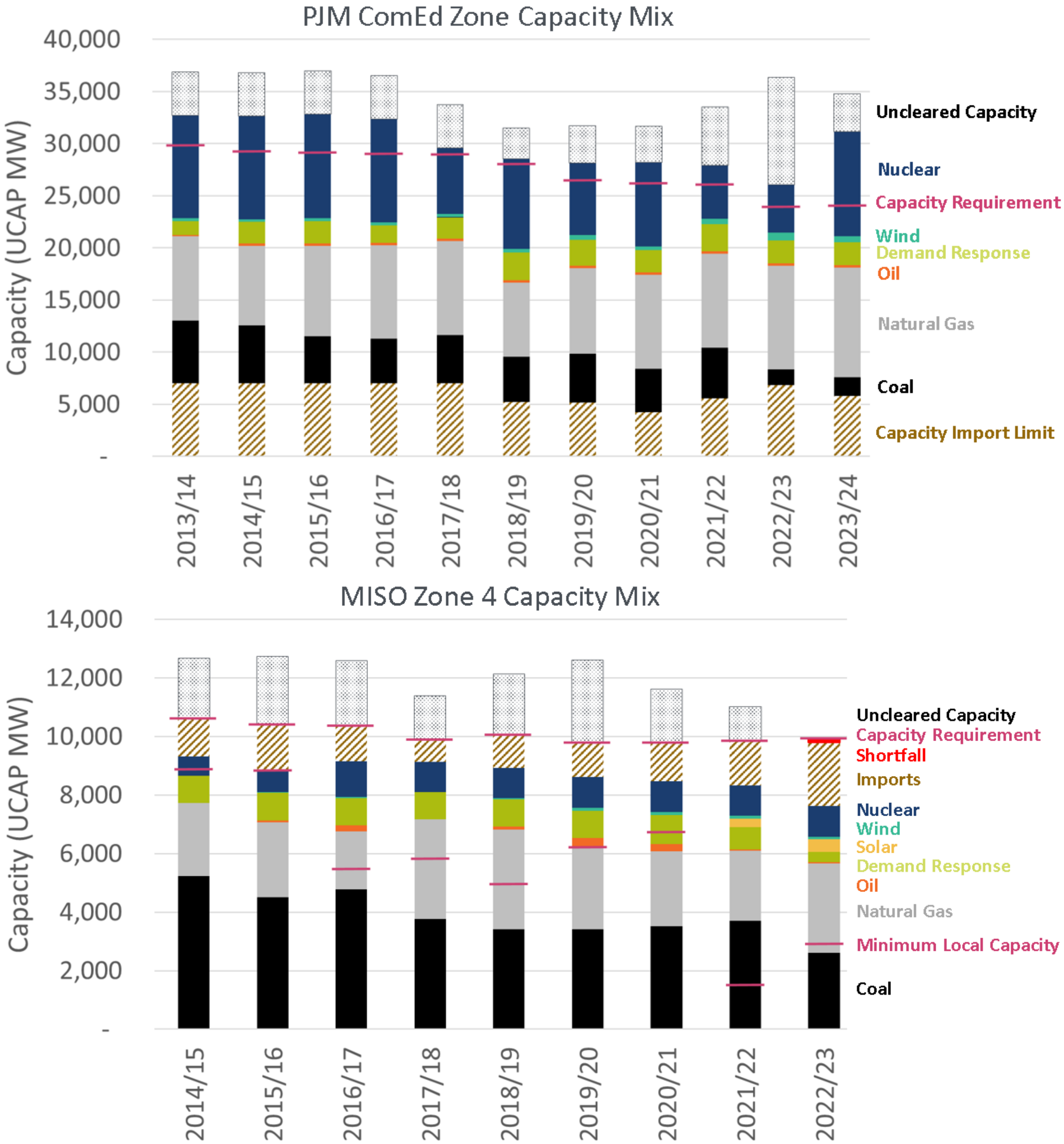
Capacity supply in the MISO-served portion of the state is a larger concern, with total capacity insufficient to meet MISO-identified reliability needs. As shown in Figure 4, total capacity supplies have been declining in Illinois (Zone 4 region in MISO) and across the entire MISO footprint in recent years, as low energy and capacity prices have made certain aging resources uneconomic. In the most recent 2022/23 Planning Resource Auction (PRA), all resources that offered into the auction cleared.[30] Still, the MISO North and Central regions fell short of the regional capacity requirement by 1,230 MW (of which the *pro-rata* Zone 4 Illinois region share is 121 MW). This capacity shortfall in MISO is the subject of ongoing review and reform efforts, and was caused by a combination of factors including resource retirements, modest increases in demand, and underlying challenges in the MISO resource adequacy construct that have not attracted sufficient investment in incremental resources.[31] As discussed further in Section V below, the underlying challenges that have resulted in insufficient capacity supply in the MISO region are not caused by CEJA or other clean energy policies, but will be exacerbated by the fossil phase out unless they are corrected. MISO's capacity market design will need to be modified to ensure that it can attract investment in sufficient quantities of clean capacity to replace retiring fossil resources in alignment with CEJA's goals.

[29] Resources in PJM were subject to a Minimum Offer Price Rule offer floor in PJM's capacity market, which likely impacted their ability to clear during these auctions. *See* 169 FERC ¶ 61,239 (2019).

[30] As a point of precision, some resources in MISO south failed to clear due to transmission constraints that prevented capacity transfer to the majority of the MISO footprint.

[31] *See* ICC, *ICC-MISO Resource Adequacy Policy Session* (May 13, 2022).

FIGURE 4: ILLINOIS CAPACITY MIX IN PJM AND MISO



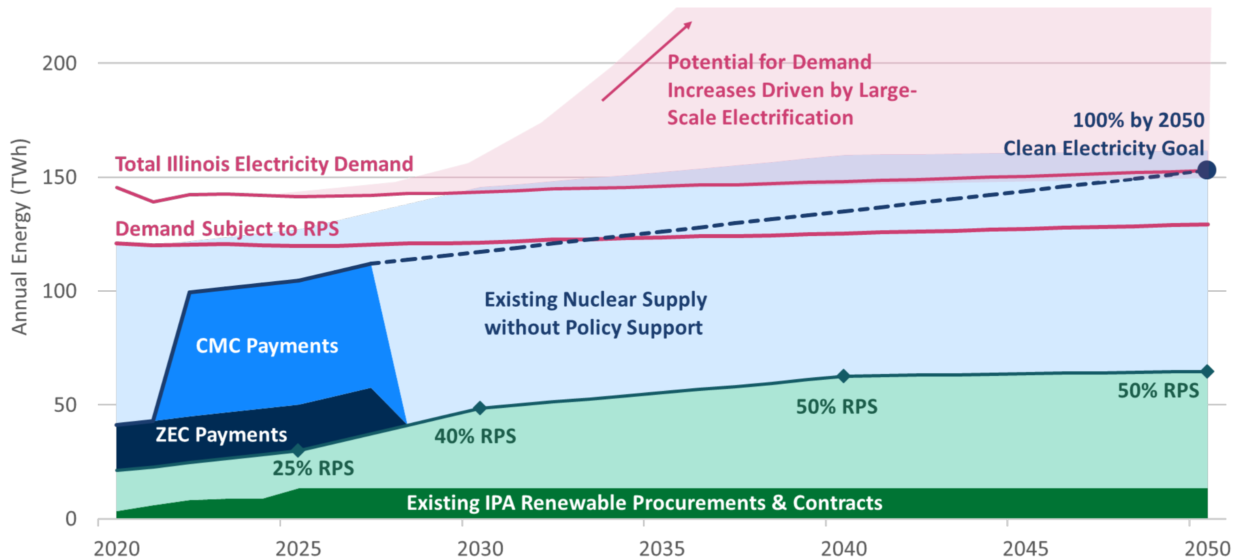
Sources and Notes: PJM Base Residual Auction Results Report; Monitoring Analytics Analysis of the Base Residual Auction; MISO Planning Resource Auction Results; Potomac Economics MISO State of the Market Report. MISO data request.

B. Outlook for Renewable Supply Needs

CEJA mandates that 50% of the retail electricity demand (including Alternative Retail Electric Supplier (ARES) consumers) served by the distribution utilities Ameren, ComEd, and a portion of

MidAmerican, must be met using renewable electricity by 2040.[32] It further expresses the intention of the state to achieve 100% economy-wide decarbonization of the energy supply and electricity sector by 2050. This indicates that 100% of electricity from all providers of state demand will eventually be supplied by clean energy and that the demand for electricity could be substantially higher if clean electricity will be a primary pathway for supporting decarbonization in other energy-intensive sectors. In terms of total energy, this could mean that Illinois will require anywhere between 152–450 TWh of clean electricity in 2050. This compares to the existing total electricity demand of 142 TWh in 2021.

FIGURE 5: OUTLOOK FOR ILLINOIS CLEAN ELECTRICITY SUPPLY AND INCREASES IN CLEAN ELECTRICITY SUPPLY NEEDS



Sources and Notes: 2020–37 Delivery Year Demand from ICC Jurisdictional Utilities based on 2022 IPA Long Term Procurement Plan. Demand beyond 2037 forecasted based on average annual growth rate. Historical Demand from *all* electricity providers based on RTO Forecasts; extended to 2050 based on IPA load growth forecast. Nuclear Generation up to 2021 based on EIA 906/923 Monthly Utility Power Plant Database. Percentage RPS, percentage clean energy goals and limits on CMC and ZEC from CEJA.

Meeting these goals will require rapid deployment of new renewable resources as well as a careful assessment of the role of nuclear energy beyond 2027, when support payments are set to expire. Quantitatively, this has the following implications:

- Renewable deployment within or electrically nearby Illinois will need to rise to a minimum of approximately 62 TWh to achieve the 50% RPS target in 2040. This amounts to a deployment rate of in-state renewable supply of at least 3 TWh per year.[33] Note that this

[32] Mount Carmel Public Utility Company being the exception of one utility that is regulated under ICC jurisdiction but that is not subject to the RPS. For simplicity of discussion, we omit reference to this exception in some cases throughout the REAP.

[33] The presented value takes into account that Illinois is not currently meeting its RPS goal; therefore, it will need to deploy enough renewable generation to catch up the current RPS requirement in addition to the incremental increase in RPS requirement according to the CEJA-mandated schedule. Since the RPS demand increases more rapidly from 2022 to 2030 in comparison to from 2030 to 2040, the annual renewable deployment will need to be approximately 5 TWh per year in order to reach the 2030 RPS target on time.

minimum renewable deployment rate would only be sufficient to meet 50% renewable for the 85% of Illinois energy demand from consumers that are subject to the RPS standard, and does not yet consider the clean electricity needs of non-RPS-obligated consumers nor the additional clean electricity that would be required to serve electrification-driven load growth. It also does not reflect private consumers' renewable purchases. This portion of the renewable supply needed to serve RPS must be in Illinois, or in an adjacent state, and is likely to result in the construction of new renewable resources, based on prevailing RPS requirements.

- To achieve the goal of 100% carbon-free electricity for all Illinois consumers, considering both consumers subject to RPS mandates and other consumers, a total of approximately 152 TWh of clean energy will be needed by 2050. This amounts to approximately 90 TWh of clean energy on top of the 62 TWh required by the RPS. This share of the clean electricity target is not necessarily subject to current RPS qualifications standards and so could be met by nuclear resources, out of state renewables, or existing in-state renewables. If all nuclear supply is retained until 2050, the nuclear plus 50% RPS supply together would be approximately sufficient to meet the 100% clean electricity demand.
- Electrification-driven demand has the potential to further increase the total clean electricity demand by 50–200%, *i.e.*, an additional 75–300 TWh of clean energy could be needed. Given that the state is additionally targeting a 100% clean energy *economy* in 2050, large-scale electrification across all energy sectors could be needed. The range of approximately 50–200% electrification-driven load growth is a rough uncertainty range based on comparisons from other states that have developed comprehensive economy-wide decarbonization strategies.[34] Policies to determine the entities or mechanisms responsible for achieving decarbonization of other sectors and the extent to which electrification will be the means to decarbonize other sectors have not yet been determined.

C. Policy Interactions

1. Interactions with Nuclear Support

CEJA introduces CMC payments to support nuclear plants that are at risk of retirement, with the intention of retaining the state's existing nuclear fleet to contribute to Illinois' clean electricity goals.[35] Combined with the previously-introduced Zero Emission Credits (ZECs), 74.6 TWh of generation (approximately 52% of Illinois' total electricity demand) will now be supported by

[34] *See, e.g.,* Pathways to Deep Decarbonization in New York State, 2019 New Jersey Energy Master Plan.

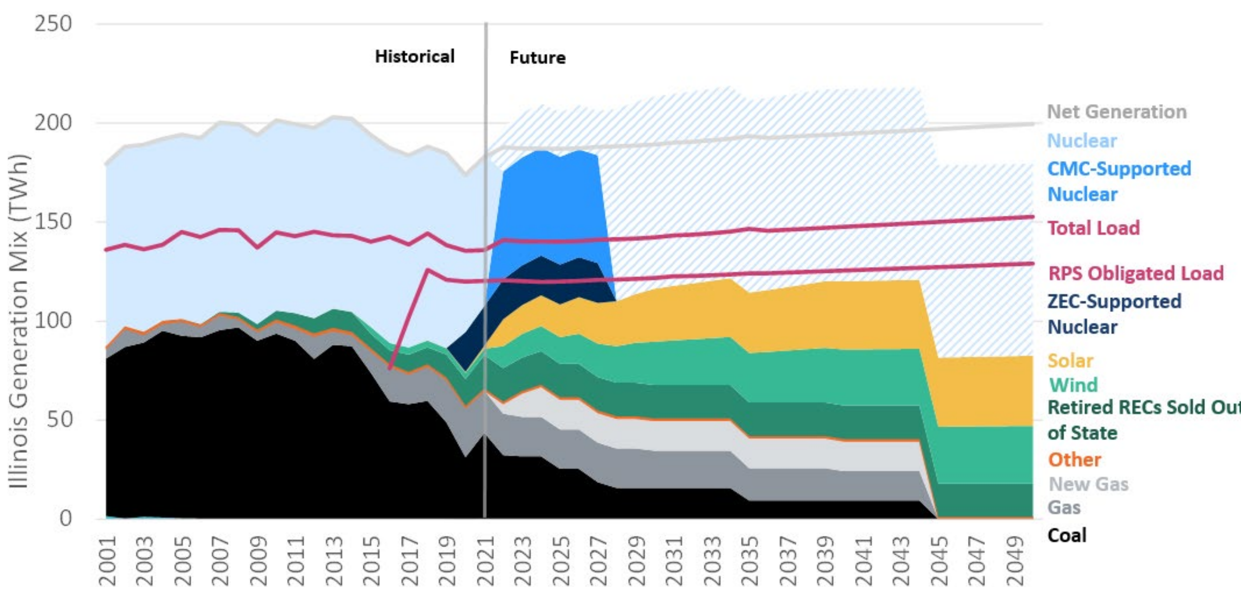
[35] CMCs were introduced in CEJA and can support up to 54.5 TWh of clean generation annually. Only nuclear facilities in the ComEd zone were eligible to receive this type of support, with the winning bids going to the Dresden and Byron Nuclear Plants. *See* 20 ILCS 3855/1-75(d-10)(3-A).

nuclear credit payments annually.[36] The ZEC and CMC support mechanisms are set to expire in 2027. Though CEJA contemplates that nuclear should be considered as a resource that can contribute to meeting the state-wide 100% clean electricity goals, the policy mechanisms by which nuclear supply will be retained past 2027 have not been determined.

Considering the context of the retirements contemplated in the REAP, as shown in

Figure 6 below, the substantial contributions from nuclear supply to serving clean energy needs and providing system capacity and reliability services must be recognized. Policy mechanisms that will balance the share of clean electricity needs served by nuclear, renewables, and other clean resources will need to account for each resources' relative contributions to both reliability needs and policy goals. Each REAP iteration should continue reviewing available and novel policy mechanisms considering the evolving reliability context over time. The importance of accounting for and managing system reliability needs will grow as fossil phase out is implemented, as further detailed in Section V and Section II.C.3 below.

FIGURE 6: STATEWIDE ENERGY SUPPLY AND DEMAND OUTLOOK



Sources and Notes: Historical generation mix, system load, and total generation from US EIA State Energy Data System. Solar and wind include currently generating in Illinois less the RECs retired out of state plus incremental solar and wind additions to meet Illinois RPS targets. REC acquisition data for the PJM from PJM GATS, accessed November 15, 2022. REC acquisition data for MISO from M-RETS, accessed November 15, 2022. Exported RECs are assumed to remain constant. Plant Retirement dates from IL EPA. 2020-2037

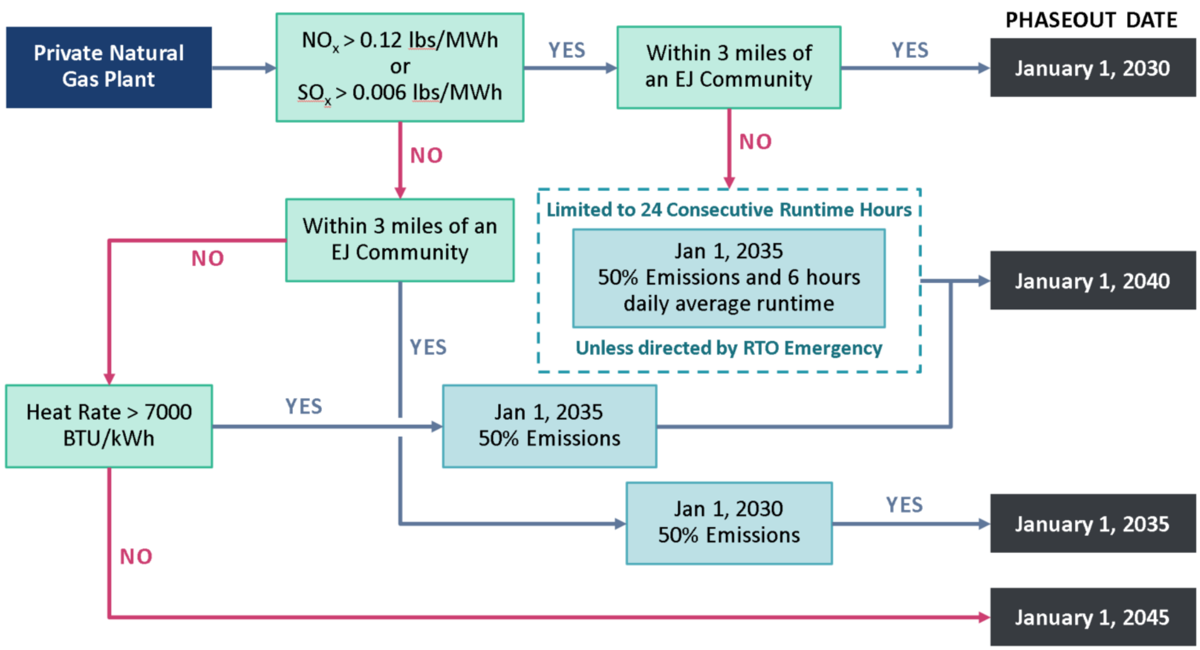
[36] ZECs were enacted in 2016 with the Future Energy Jobs Act, and were eligible to support up to 20.1 TWh of nuclear generation, with Clinton Unit 1 and Quad Cities Unit 1 & 2 emerging as the winning bidders. *See* 20 ILCS 3855/1-75 (d-5)(1). The ZEC payment price is calculated by subtracting the "Price Adjustment" (difference between the average market price and the baseline market price) from the social cost of carbon. If the given value is negative, then the ZEC price will be zero. CMC prices are calculated on a "cost per-megawatt-hour" calculation taking into account energy and capacity prices for carbon-free energy resources at their relevant busbars, and any other subsidies provided to carbon-free resources. The maximum ZEC price is the social cost of carbon; the maximum CMC price is the "baseline costs" of carbon-free energy resources. 20 ILCS 3855/1-75(d-5)(7); IPA, CMC Procurement Plan, at 15.

Demand from ICC Jurisdictional Utilities from 2022 IPA Long-Term Procurement Plan Appendix B2. Demand beyond 2037 forecasted based on average annual growth rate. Percent RPS, percent clean energy goals and limits on CMC and ZEC from CEJA. New gas plant data from CEMS database for two-month period May-June 2022 for the Jackson Generation plant is scaled to estimate annual generation for Jackson Generation and CPV Three Rivers Energy Center.

2. Interactions with Fossil Phase Out

CEJA outlines the structure of the phase out of GHG emissions from fossil resources above 25 MW. All coal and natural gas facilities must eliminate GHG emissions by 2045. Additionally, there are intermediate deadlines based on characteristics of the facilities that stipulate accelerated phase out dates for some plants. Private coal generating facilities must phase out by 2030, while public coal facilities are allowed to continue operation until 2045. Public natural gas facilities must phase out by 2045. The phase out of private natural gas facilities is somewhat more involved so as to expedite the reduction in emissions output and the retirement of resources that produce higher levels of air quality emissions and that are nearer to environmental justice communities. The specifications for the natural gas phase out required by CEJA are illustrated in Figure 7 below.

FIGURE 7: PRIVATE NATURAL GAS PHASE OUT STRUCTURE



Sources and Notes: PJM, Illinois Clean Energy Jobs Act Fossil Fuel Generation Phase Out, (December 2, 2021) at 6.

The phase out of fossil fuel resources will proceed alongside and in parallel to the development of additional renewable supply needed to meet the RPS, though there is not presently a mechanism for managing a balanced volume of fossil resource exit with renewable and clean resource entry. From an energy perspective, it is not strictly necessary to balance renewable supply entry with fossil resource reductions, since the regional market will naturally balance any deviations by changing the volume of energy imports and exports. However, this tendency for the regional markets to balance energy needs has the potential to undermine GHG emissions reductions, to the extent that in-state fossil fuel reductions are replaced by increases in emissions from out-of-state fossil resources, a concept known as "leakage."

Direct emissions from fossil resources in Illinois have been declining as shown in Figure 8. At their peak in 2008, Illinois fossil emitted over 111 short tons of CO_2e, largely from coal plants. In 2021, Illinois emissions fell to approximately 57 million tons alongside a decline in coal generation. As shown in the chart, in-state emissions will continue to fall with each CEJA-mandated emissions reduction milestone, though an absolute reduction is not guaranteed in all cases for several reasons. First, two new gas plants are expected to begin operations in the state—one that has been online since 2022, and one that is under construction and expected to be online in 2023. These two new resources have not yet established emissions baselines and so will face emissions caps associated with their operating levels in the first years of operation. Like other gas plants in the same category, these resources will not be required by CEJA to retire until 2045. Second, only a subset of plants are subject to annual emissions caps, specifically natural gas plants owned by merchant generators. Coal plants, oil facilities, and publically-owned gas plants are not subject to annual emissions caps. Non-emissions-capped plants may increase emissions compared to historical levels in response to reductions from plants affected by phase out mandates. This potential for increased emissions from non-emissions-capped plants is not illustrated in the below chart.

In addition to emissions associated with in-state fossil plants, to proceed toward its 100% clean electricity goals Illinois must understand and assess any Scope 2 emissions obligations associated with fossil generation from out-of-state electricity resources that may be dispatched to serve Illinois consumers.[37] Reductions to in-state fossil emissions will not, by itself, guarantee overall emissions reductions unless the reduction in fossil electricity supply is offset by an increase in clean energy supply. If a gap in energy supply remains, it is likely to be filled by increases in fossil supply dispatched from out-of-state resources. The potential for emissions leakage is illustrated in Figure 8, which adopts the GHG accounting convention of assuming that nuclear and renewable resources committed to serving Illinois consumers contribute GHG-free energy supply, while any gaps in energy supply are assumed to be filled by out-of-state fossil resources. The figure further assumes that renewables committed to consumers in other states and non-supported nuclear supply may retire or commit their clean energy attributes to out-of-state consumers.

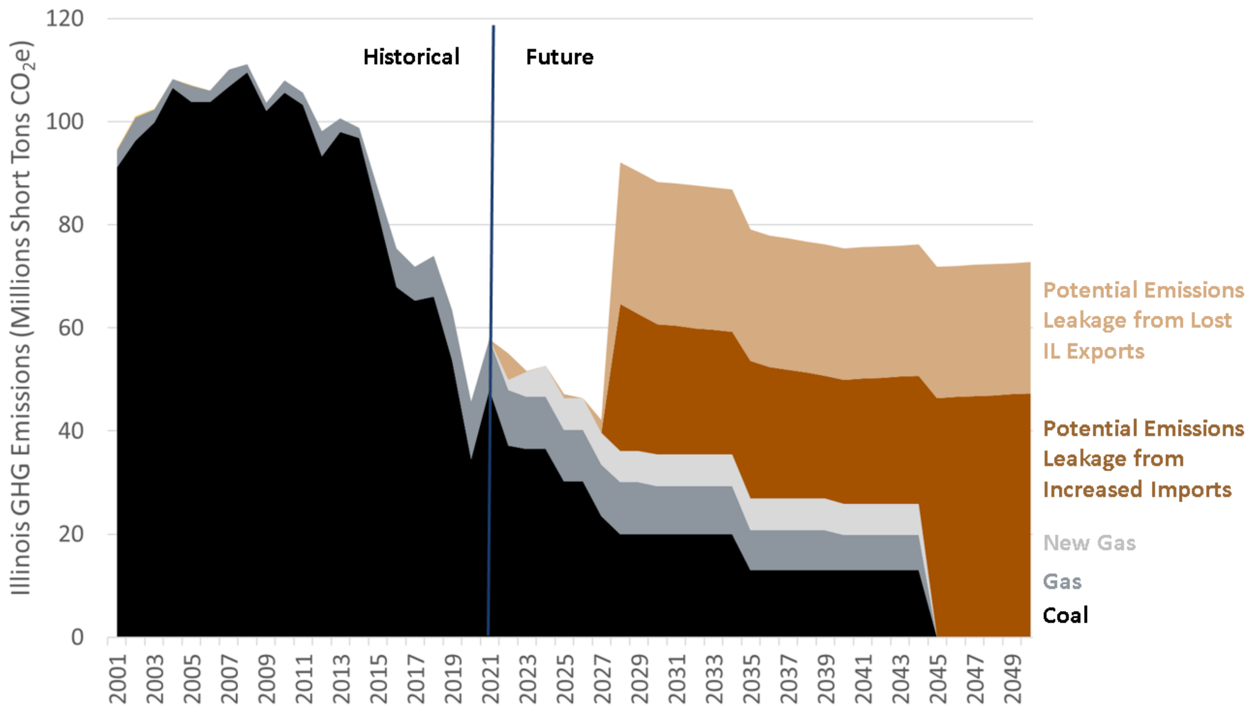
The dark brown bar area illustrates the potential for Illinois energy imports to be provided by out-of-state fossil supply. This chart (and the energy supply chart above) together illustrate that RPS-driven increases in renewable supply should be sufficient to offset fossil resource phase-out as long as Illinois is able to rapidly increase renewable deployment including making up its current deficit relative to the RPS requirement. However, RPS-driven development will not be rapid enough to offset reductions to nuclear supply if there are retirements after policy payments expire. The lighter brown area illustrates the additional emissions increases in other states (but

[37] Scope 2 emissions are "indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling." US EPA, Scope 1 and Scope 2 Inventory Guidance.

not attributable to Illinois consumers) that would be associated with nuclear retirements and a reduction to Illinois' contribution to clean energy exports.

These widely divergent potential emissions outcomes highlight the importance of improving the ability to measure and assess emissions from both in-state and out-of-state fossil resources so that Illinois can track progress relative to policy goals and mandates. The accounting methods should account for the complexities associated with clean energy commitments of Illinois renewable resources to out-of-state consumers so that the state can accurately assess its own GHG emissions obligation and progress toward the 100% clean energy mandate.

FIGURE 8: STATEWIDE EMISSIONS OUTLOOK



Sources and Notes: Retirement dates from IL EPA. Historical emissions from IL EPA for gas plants or otherwise calculated using 2018-2020 CO_2 emissions averages from CEMS database multiplied by the statewide CO_2 to CO_2e ratio by fuel type from MISO Singularity Dashboard. New gas plant data from CEMS database for two-month period May–June 2022 multiplied by IL CO_2e emissions factors and scaled to estimate annual emissions for Jackson Generation and CPV Three Rivers Energy Center. Emissions leakages calculated assuming that all nuclear retires after ZECs and CMCs phase out in 2027. Potential Emissions from increased imports is total load less total supply multiplied by MISO-PJM average CO_2e emissions factor. Potential emissions from lost Illinois exports is total forecasted exports less the potential import leakage multiplied by IL CO_2e emissions factors. Total load and forecasted exports of ICC Jurisdictional Utilities from 2022 IPA Long-Term Procurement Plan Appendix B2. Demand and exports beyond 2037 forecasted based on average annual growth rate. Potential Avoided Emissions from retaining nuclear is calculated using generation in 2021 and IL emissions rates. Generation for renewable resources comes from the US EIA State Energy Data System. REC acquisition data for the PJM from PJM GATS, accessed November 15, 2022. REC acquisition data for MISO from M-RETS, accessed November 15, 2022. Renewable generation that is retired in other states is assumed to be exported to other states; therefore it is not included in the calculation of the increased emissions area.

3. Interactions with Resource Adequacy Needs

Among the most difficult challenges Illinois will face as it transitions to a clean electricity grid is ensuring resource adequacy throughout the transition to a 100% clean electricity mix. While the anticipated resource additions from satisfying the RPS demand and retaining nuclear could likely provide ample energy supply in Illinois, the intermittent nature of renewable resources will introduce challenges in meeting capacity requirements. PJM and MISO have both developed an analysis (called Effective Load Carrying Capability or ELCC) to discount the capacity contributions of renewable resources to reflect the expected contributions of these resources during times of system stress.[38] Traditional fossil resources are generally dispatchable generation and assigned a higher UCAP value as compared to renewable resources, although these capacity values should be revised to reflect emissions limitations, as discussed more fully in Section V.

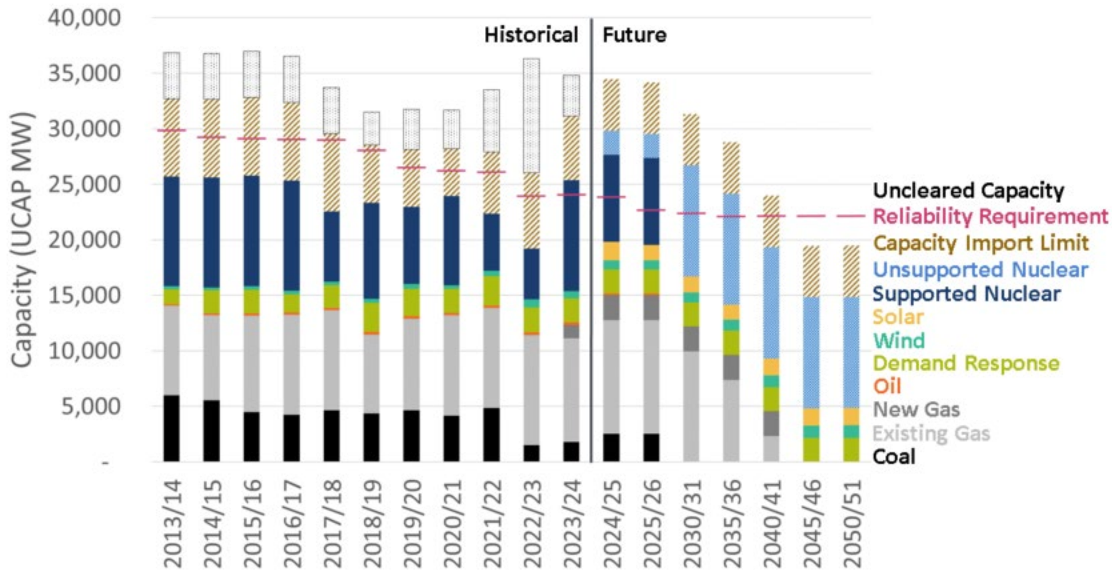
The PJM-served portion of Illinois has been able to meet its capacity market obligation in recent years, with declining clearing prices over the past several auctions. In the 2023/24 PJM Base Residual Auction (BRA), Illinois' ComEd zone did not separate from the broader RTO clearing price of $34/MW-Day. More nuclear supply cleared compared to previous auctions, lowering the clearing price. The 2023/24 BRA also featured newly-instituted offer caps, limiting the flexibility of resource offers and lowering prices.[39]

An outlook of resource adequacy in the ComEd zone is illustrated in Figure 9 below after accounting for the timeframe of potential fossil retirements. The figure illustrates that the ComEd zone could meet its resource adequacy requirements as far out as 2040 even as fossil retirements proceed, even though increases in RPS-driven capacity supply (with low capacity value) do not offset the much larger decreases in capacity supply from fossil retirements (with high capacity value). There are also substantial risks of earlier resource adequacy challenges however, given the potential for nuclear retirements, expedited fossil retirements prior to the 100% phase-out dates, the possibility of PJM capacity supply exporting to MISO, and the possibility of reduced capacity value ratings for both renewables and emissions-capped fossil supply.

[38] PJM, How Effective Load Carrying Capability ("ELCC") Accreditation Works, (April 20, 2021); MISO, Planning Year 2022-2023 Wind and Solar Capacity Credit Report, (January, 2022).

[39] 176 FERC ¶ 61,137 (2021).

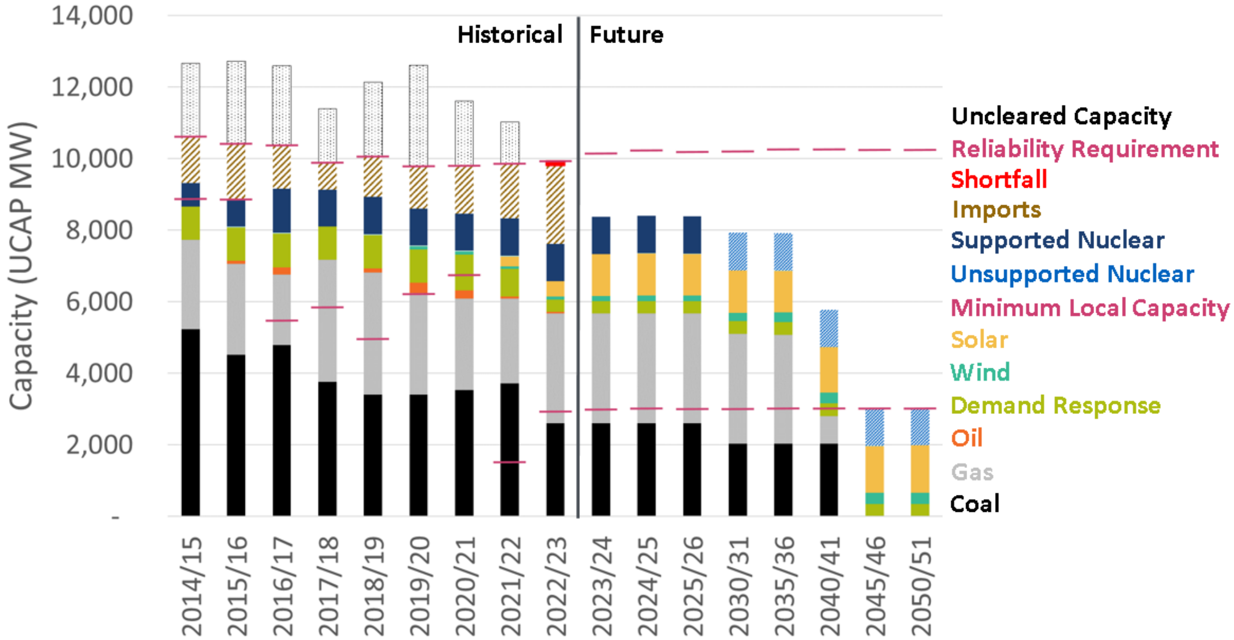
FIGURE 9: PJM CAPACITY GAP WITH FOSSIL PHASEOUT



Sources and Notes: Data for historical capacity mix and parameters from Monitoring Analytics, Review of the Annual Base Residual Auction (2013/14–2023/24 planning years), and the PJM Planning Parameters (2013/14–2023/24 planning years). Plant-level retirement data from IL EPA. Plant-level ICAP from Velocity Suite Generating Unit Capacity dataset. ICAP values are converted to UCAP using a 5% EFORd assumption for thermal units; renewables are converted to UCAP using the wind and solar ELCC forecasts from the PJM Effective Load Carrying Capability Report, (July 1, 2021). Solar and wind shown include currently participating PJM capacity market resources as well as incremental solar and wind needed to meet Illinois RPS targets.

As shown in Figure 10, the MISO-served portion of Illinois (Zone 4) experienced a capacity shortfall in the 2022/23 PRA. These resource adequacy challenges could persist and expand throughout the CEJA-mandated phase out of fossil emissions in Illinois. The figure illustrates that a substantial increase in solar supply (consistent with rapid acceleration to catch up with the current RPS mandate) could mitigate capacity shortfalls in the short term, but only moderately. Capacity imports from the rest of system could assist in addressing Illinois resource adequacy needs, but will require market reforms to the MISO capacity market construct as discussed further in Section V below.

FIGURE 10: MISO CAPACITY GAP WITH FOSSIL PHASEOUT



Sources and Notes: Data for historical capacity mix and parameters from MISO State of the Market Reports (2015–2021) and PRA Results (2014/15–2022/23 planning years). Plant-level retirement data from IL EPA. Plant-level ICAP values from Velocity Suite. ICAP values are converted to UCAP using a 5% EFORd assumption for thermal units, the MISO Wind ELCC Forecast from the MISO Planning Year 2022-2023 Wind and Solar Capacity Credit Report for wind, and the PJM ELCC Forecast from the PJM ELCC Report for solar. Solar and wind shown include currently participating PJM capacity market resources as well as incremental solar and wind needed to meet Illinois RPS targets. "Uncleared Capacity or Unoffered Capacity" reflects all capacity confirmed in MISO Zone 4 that did not clear in the historical PRAs, including resources that offered into the PRA and failed to clear or resources that did not offer into the PRA.

4. Renewable Development for Other States' RPS and Private Goals

In addition to expanding and enhancing Illinois clean energy goals, CEJA refines resources' qualification requirements as reflected by IPA in its annual long-term procurement plan, recently approved by the ICC.[40] These requirements stipulate a desired proportion of solar and wind; require that the procured resources be located within Illinois or electrically nearby; and include a new requirement explaining that IPA shall not comply with RPS targets by procuring RECs that are unlikely to lead to the development of new renewable resources.[41] These new resource requirements mean that a large percentage of existing renewable supply in Illinois is not eligible to be contributed toward the RPS mandate.

These renewable attributes are not without willing buyers. As shown in Figure 11 below, many other state RPS requirements have more relaxed requirements, for instance sourcing RECs from

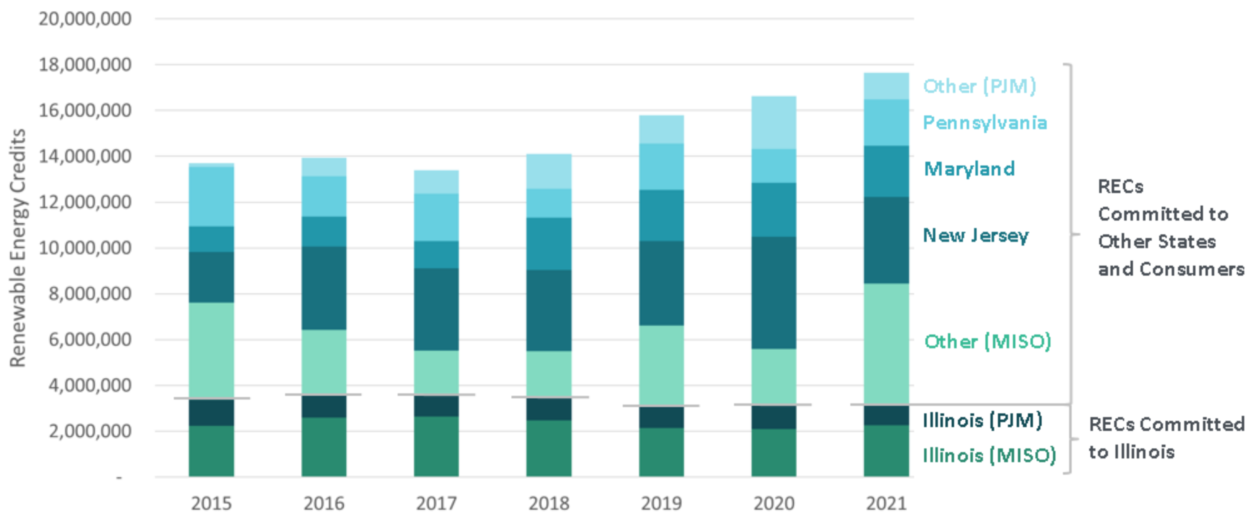
[40] ICC, Final Order in Docket No. 22-0231, (July 14, 2022); *see* IPA, 2022 Final Long Term Procurement Plan, at § 3.4.3.

[41] 20 ILCS 3855/1-75 (c)(1)(A).

any state within PJM (for at least a portion of their RPS goals) of any vintage. Instead of satisfying Illinois policy requirements, as much as 80% of the attributes associated with Illinois' renewable supply are exported to meet the clean energy needs of other states and consumers.

Illinois' role in hosting substantial volumes of clean energy supply that is used for compliance in other states reflects its position as a relatively attractive location for renewable development, particularly compared to other PJM states. This position presents both an opportunity for Illinois as associated with the economic development benefits, and challenges as associated with effectively managing the pace of deployment for meeting both Illinois' own needs and for meeting demand of consumers and other states. Illinois is likely to further face competitive pressures of procuring these renewables at an attractive price given the restrictions on supply being located within or electrically nearby the state, compared to other states that consider a broader regional approach to renewable eligibility. Broadening eligibility requirements to consider resources developed across both PJM and particularly across MISO would substantially increase the pool and potential pace of resource deployment.

FIGURE 11: LOCATION OF RETIREMENT FOR RECS PRODUCED IN ILLNOIS



Sources and Notes: PJM REC acquisition data from PJM GATS, accessed November 15, 2022. MISO REC acquisition data from M-RETS, accessed November 15, 2022. Only retired solar and wind RECs are included for PJM portion of the bars. All RECs are included for the MISO portion of the bars because the public data does not specify the resource type of the RECs—and so includes RECs that do not qualify for the current RPS program in Illinois such as renewable natural gas and hydro. Wind and solar generation that did not result in the issuance of RECs are not included in the figure. The Other (PJM) bar includes RECs bought by other jurisdictions within PJM, voluntary RECs, and unretired RECs. The Other (MISO) bar includes RECs produced in Illinois that have been transferred to other jurisdictions regardless of whether they have been retired or not. The data shown in the table does not align with total renewable generation data because REC data from PJM is reported annually from June-May rather than from January to December, and has been aligned so that June 2020–May 2021 is included in the 2021 category.

D. REAP Findings and Recommendations

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Achieving a 100% clean electricity mix for Illinois is likely to require a coordinated set of Illinois policies and market incentives to support the most cost-effective and reliable resource mix throughout the clean energy transition. Historical approaches, if carried forward without innovation, may frustrate efforts to provide access and delay Illinois' decarbonization progress, among other unintended consequences. ICC staff have identified the following gaps under *status quo* approaches that may need to be addressed through further policy and regional market reforms:

- *Requirement Gaps*. After nuclear support payments expire in 2027, decarbonizing the electricity fleet may require significant volumes of clean electricity beyond what the RPS prescribes—particularly to meet Illinois' needs above the 50% RPS and to serve the approximately 15% of Illinois demand not subject to the RPS. While Illinois currently relies on markets, including those administered by PJM and MISO, augmented by incentives to promote clean and renewable energy, there is presently no assurance that existing market constructs are sufficient to ensure that this electricity demand will be served by clean electricity resources.
- *Competitive Signals for Reliability and Policy Needs***.** A balanced resource mix needed to achieve 100% clean electricity reliably and affordably will likely include a combination of renewable, nuclear, battery, demand response, efficiency, thermal resources utilizing decarbonized fuels, distributed resources, and other new technologies. Attracting and retaining the most advantageous resource mix will require a coordinated and competitively-determined suite of market-oriented policy instruments and regional market incentives, to ensure that private investors have the incentive to support and accelerate reliable, affordable clean energy transition. As discussed further in Section V below, we recommend that RTOs develop rules which would allow entities serving load in the state to reflect the preferences of Illinois' state policies regarding resource mix.
- *Improving Illinois' Opportunities for Clean Energy Trade and Access to Renewable Power from Other States***.** Illinois' centrally-located position within two RTO regions means that the state has a unique role and opportunity to engage in a coordinated clean energy transition across large interconnected regions. Other states, particularly in PJM, benefit from access to cost-effective renewable resources developed in Illinois, such that in 2021 approximately 17 TWh (or 84% of Illinois' total 21 TWh) of renewable production was not committed to Illinois' RPS, but rather exported to serve other states' RPS requirements or committed for private goals. However Illinois' current geographic requirements for renewable supply eligibility mean that Illinois consumers do not have access to other low-cost renewable supply in other states within the RPS and competitive IPA solicitations. In the long term, the most cost-effective and balanced 100% clean electricity resource mix will likely need to account for the ability to import clean electricity from other decarbonizing states and export clean energy when Illinois is in surplus. Regional electricity and clean electricity attribute markets, as they evolve to align with clean energy

transition, may need to play a substantial role in supporting trade to meet reliability and policy needs among multiple decarbonizing states.

- *GHG Leakage Risks*. Current practice poses the risk of GHG emissions "leakage" relative to the CEJA fossil emissions phase-out. The specific avenues of GHG emissions leakage include the potential for: (a) increases in GHG emissions from the fossil plants that are not subject to emissions caps, which may offset reductions in energy output from emissions-capped and retired plants; (b) increases in GHG emissions from fossil resources outside of Illinois to offset decreases in Illinois fossil production; (c) increased emissions from new fossil resources in Illinois that have not yet established emissions baselines; (d) excess emissions that may be caused if higher-emitting resources operate more than lower-emitting resources under the self-dispatch approach to managing annual emissions caps; and (e) excess emissions if RTOs must frequently utilize reliability backstop procedures to call on resources to operate beyond established emissions limits.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

2.A **Identify Resources and Strategies to Meet CEJA's Economy-wide Decarbonization Goals.** The ICC can conduct a study to understand the economy-wide strategies and pace of electrification required to achieve 100% economy-wide decarbonization, and refine the outlook for renewable and clean energy supply needs that must be achieved. The study can further examine the most cost-effective and reliable electricity resource mix for Illinois throughout the transition to 100% clean electricity under a range of uncertainty scenarios and accounting for neighboring states' various policies that must be simultaneously achieved. The study would assess the most likely cost-effective proportion of alternative technologies, existing and new resources, and in-state vs. out-of-state supply for meeting energy and reliability needs. The study would further assess the alternative policy and wholesale market reforms that together can attract and retain a competitively-determined and reliable clean electricity mix. Based on the outcomes of the economy-wide and electricity sector decarbonization strategy analysis, the ICC can evaluate available options for responsible entities, interim targets, and enforcement mechanisms to support timely achievement of the economy-wide decarbonization goal and 100% clean electricity goal.

2.B **Identify Mechanisms to Limit Leakage.** The ICC, in collaboration with MISO and PJM staff, can conduct a study of potential interventions that may limit and prevent GHG emissions leakage. Potential solutions to be considered in the study may include options such as GHG pricing applied to electricity imports; a state-wide or RTO-managed system for coordinated management of dispatch relative to total fossil plant emissions; application of a state-wide GHG emissions cap to all Illinois resources; and/or incorporation of new Illinois fossil resources within a total state-wide GHG emissions cap.

2.C **Encourage Regional Market Reforms.** The ICC can work with RTOs, other states, and stakeholders to pursue RTO market reforms that will support the most cost-effective decarbonization pathway (see Strategic Element 5 below).

III. Managing Land Use in Renewable Deployment

This REAP seeks to provide for ICC review a process for identifying renewable energy zones and incorporating them into regional, local, and distribution system planning to help meet CEJA's goals. The framework set out below concludes by identifying candidate renewable energy zones, designed to be refined through stakeholder feedback within the ICC's REAP proceeding, and re-evaluated in future iterations of the REAP. Development of candidate zones has been informed by input from the University of Illinois Smart Energy Design Assistance Center (SEDAC), Clean Grid Alliance (CGA), and other stakeholders throughout the course of the REAP comment period.[42] This process is intended to serve as a foundation for future REAP updates to holistically consider resource suitability, developer interest, access to transmission, and state public policy.

This REAP recommends adopting the concept of Level 1 Demonstrated Interest, and Level 2 High-Future Potential REAP Zones, discussed further below, to assist in enabling the state's public policy goals:

- **Level 1 Demonstrated Interest Zones** are areas where renewable developers have expressed substantial interest in interconnecting to the transmission system. Areas with retiring fossil generators and many interconnection queue requests were preferred.
- **Level 2 Future Potential Zones** are areas suitable for future wind or solar development, but lack transmission that would make these otherwise suitable areas currently attractive for developers.

A. Roles of Permitting and Transmission Planning in Renewable Siting

Candidate REAP zones are intended to provide a macroscopic perspective of suitable areas for the near term and long term renewable development envisioned by CEJA. The REAP zones are not a substitute for parcel-by-parcel review of site suitability, permitting requirements, and environmental impact mitigation strategies. Most of the economic, environmental, agricultural, community, and equity impact considerations that may influence whether and how to develop a certain site for a renewable project must be evaluated on a granular, project-specific basis by individual developers as well as local and state permitting authorities. Overall, the REAP zones should identify areas of likely interest from developers and land owners and consider

[42] Some, but not all, of the comments considered in this process are provided in the public domain. Among the public comments include: University of Illinois at Urbana–Champaign, SEDAC, Land-use Evolution And Impact Assessment Modeling (LEAM) Laboratory, Land Suitability Analysis for Identifying Solar Development Potential in the State of Illinois, September 2022 (SEDAC Solar Suitability Study); S. R. Brady, CGA, IL: Renewable Energy Access Plan: REAP Background and Siting of Renewable Energy Access Zones, October 6, 2022.

environmental feasibility, but will not require excess resource development in those locations nor preclude development in other locations.

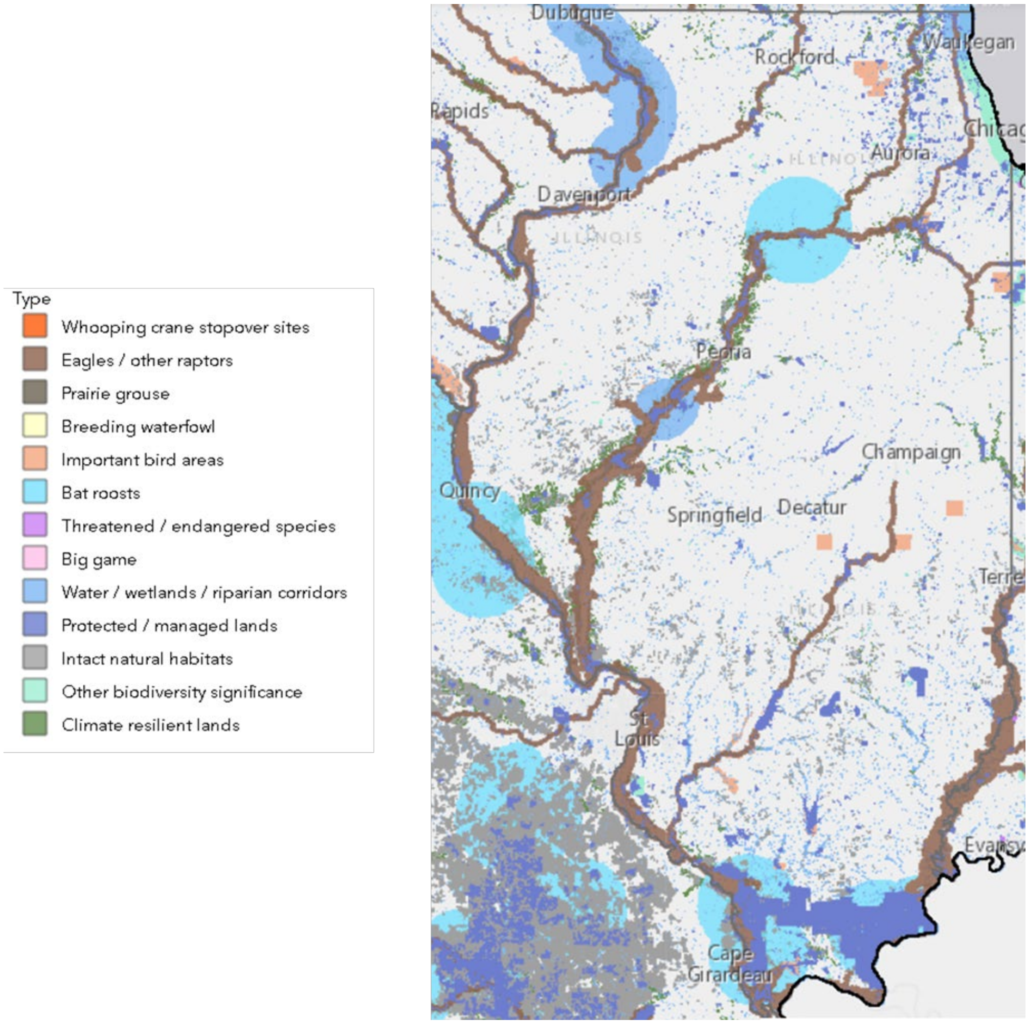
Data provided by the Great Plains Institute and The Nature Conservancy depict areas to be avoided in renewable development, given their importance to natural preservation, as shown in Figure 12. Certain indicated exclusion areas only apply to wind siting decisions, while others are only relevant for solar.[43] As compared to other states, Illinois has a smaller amount of exclusion area identified by The Nature Conservancy, and certain identified map layers do not appear in Illinois at all. Some regions of Illinois, particularly the Shawnee National Forest and protected areas around the Illinois River, cover a broad enough geographic area that they are excluded for consideration as REAP zones. However, many other environmentally sensitive areas are smaller in size and dispersed across Illinois such that they do not preclude REAP zones from being located across most of the state, but do require that effective permitting processes to protect environmentally-sensitive sites from development. In identifying candidate REAP zones, we further utilized land-use data provided by SEDAC, including identification of water bodies, 100-year floodplain, and other protected areas in their identified constraint areas data layer.[44]

---

43 *See* The Nature Conservancy, *Site Renewables Right: Accelerating a Clean and Green Renewable Energy Buildout in the Central United States*, Method Paper (February, 2022) (Noting "key wildlife areas" for wind which include whooping crane stopover sites, eagle and raptor nesting areas, breeding waterfowl habitat, important bird areas, bat roosts, big game habitat, among others; key wildlife areas for solar include whooping crane stopover sites, threatened and endangered species, protected lands, intact natural habitats, and others. *See ibid.* at 5, 7).

44 SEDAC Solar Suitability Study.

FIGURE 12: KEY WILDLIFE AREAS IN ILLINOIS



Sources and Notes: *Site Renewables Right* interactive map, The Nature Conservancy.

Several local and state permitting processes must be followed for a renewable project to be developed. County zoning ordinances have a further role to regulate potential land uses for specific geographic parcels, including elements such as setbacks, decommissioning insurance, size, spacing, parcel area, and other land-use considerations. Many Illinois counties require a special use permit for any wind or solar project proposed in their jurisdiction, which extends the permitting process and enables surrounding landowners an opportunity to object or provide other individualized comment on the proposed development. Renewable siting also needs to be consistent with the Department of Natural Resources’ permitting requirements, which are in place to ensure the preservation of wildlife, endangered species, forests and other forms of natural habitats. Additionally, the Illinois Department of Agriculture (IDOA) requires execution of Agricultural Impact Mitigation Agreements (AIMA) with each landowner, with the goal of providing minimum land-use protections.

Our evaluation of the zoning ordinances and permitting processes in Illinois identified a high degree of variability throughout the state, limiting the amount of widely-applicable conclusions related to siting and zoning that could be drawn for the purposes of developing candidate REAP zones. Most counties have adopted separate ordinances for wind and solar projects, and these ordinances sometimes vary even within a single county as to where a wind or a solar project could be located. Where wind or solar ordinances have not yet been adopted, the county must develop and consider an ordinance in order to enable any renewable project, a process that can delay resource development milestones. Stakeholder outreach conducted during the development of the REAP revealed that some permitting process associated with siting and permitting renewable facilities have room for improvement. Developers see the limitations in some (but not all) county ordinances as too restrictive in some counties or too uncertain in other counties where an ordinance has not yet been adopted. Landowners, which are primarily agricultural, see insufficient protections particularly as related to decommissioning insurance and enforcement of AIMA provisions. Developer and landowner interests agree that individual landowners should maintain the autonomy to determine which sites should be developed or repurposed for renewable development, and that appropriate protections must be in place to ensure responsible stewardship of environmental areas and prime cropland including mitigating any potential impacts on the developed site and any neighboring properties.

To address these concerns, the REAP recommends development of a model statewide wind and solar ordinance that can be adopted as-is or after revision by individual counties. Adoption of the model ordinance would not be mandatory, but could alleviate the time-consuming and contentious process of ordinance development that can serve as a barrier to entry in locations where no ordinances have yet been adopted. Together with interested Illinois stakeholders, either ahead of or as part of the next REAP update, Illinois should review updated county best practices, including counties where renewable development is prevalent, and consider these best practices in proposing and adopting a model ordinance.

Further, in the course of this REAP, stakeholders have raised several other issues to be considered in development of the recommended model ordinance. Any future model ordinance should consider these areas of stakeholder interest including appropriate setbacks, wind turbine hub height, drainage plan requirements (including access roads), consideration and use of agricultural areas, and others developed through additional coordination with stakeholders.[45] As a potential example, Minnesota has adopted a statewide model rule where the Public Utility Commission retains the authority to grant siting permits for solar projects over 50 MW, with local governments having siting authority over smaller projects. It also provides local governments with examples of language that can be used in their ordinances, along with suggestions to tailor this language to local conditions and priorities.[46] To ensure equity is at the core of future REAP updates, stakeholders should include members of equity communities, rural and farming community representatives, as well as developer interests, county officials, and other relevant parties.

One item raised by stakeholders through the course of this REAP are the provisions and optionality contained within the default AIMA. The AIMA is required to be executed by each

---

[45] 20 ILCS 730/5-5.

[46] Great Plains Institute, Minnesota Solar Model Ordinance, (2020).

developer for each project with the State of Illinois through the IDOA and includes certain construction and development guidelines aiming to ensure that the project does not create unreasonable or excessive land impacts. In addition, the AIMA includes requirements that each solar and wind developer produce financial assurances (in a form reasonably acceptable to the county) for project decommissioning within the first eleven years of a project.[47] However, aside from a small number of financial provisions, the vast majority of land and environmental protections in the AIMAs can be modified by negotiation and agreement between the landowner and the developer prior to the start of construction, and often do not therefore provide minimum land-use protections to surrounding landowners or the community.[48] Future REAP updates should review the degree of flexibility afforded to these negotiations to ensure whether optimal protections are being secured, and whether developed projects are observing the precautions envisioned by IDOA's AIMA agreements.

B. Criteria and Considerations for Identifying Renewable Energy Zones

ICC staff have considered several criteria as potential factors that may influence the determination of candidate renewable energy zones. While transmission headroom and resource potential are the most central factors in the selection of zones that can see near-term renewable development, other factors also factor into the identification of areas that have the potential to drive long-term renewable growth, if sufficient new transmission is enabled, and barriers to entry are mitigated. The ICC requested both RTOs to do a headroom analysis but, given the timeline, it was not possible to perform this analysis prior to the completion of this study. Before the next REAP, it is recommended that this analysis be completed in coordination with the RTOs to further inform refinement of REAP zones and future processes for how they are used.

Other jurisdictions have similarly established renewable energy zones to assist in the development of clean energy resources. Recent examples include Texas, which established Competitive Renewable Energy Zones (CREZ) in connection with anticipated buildout of location-constrained renewables; California, which developed renewable energy zones in connection with their Renewable Energy Transmission Initiative 2.0; and member-states of the Western Governor's Association, which established wind energy zones in 2009.[49] Moreover, ongoing efforts are underway in New York to identify adequate transmission for in-state areas of anticipated renewable generation, called renewable energy pockets.[50] While these efforts vary

---

[47] IDOA, Standard AIMA Pertaining to the Construction of a Commercial Wind Energy Facility, at condition B, § 21 (Wind AIMA); IDOA, Standard AIMA Pertaining to the Construction of a Commercial Solar Energy Facility, at condition B, § 17 (Solar AIMA).

[48] Wind AIMA at condition B; Solar AIMA at condition B.

[49] *See* Texas: Public Utility Commission of Texas, CREZ Docket No. 33672, Final Order, (October 6, 2008); California: California Natural Resources Agency, Renewable Energy Transmission Initiative 2.0 Final Planetary Report, (February 23, 2017); Western States: Western Governors' Association and U.S. Department of Energy, Western Renewable Energy Zones—Phase 1 Report, (June, 2009).

[50] NYISO, 2021-2040 System and Resource Outlook, (September 22, 2022) at 14.

in scope, these efforts join this REAP in endorsing the value of proactive planning for minimizing barriers to entry for renewable generation.

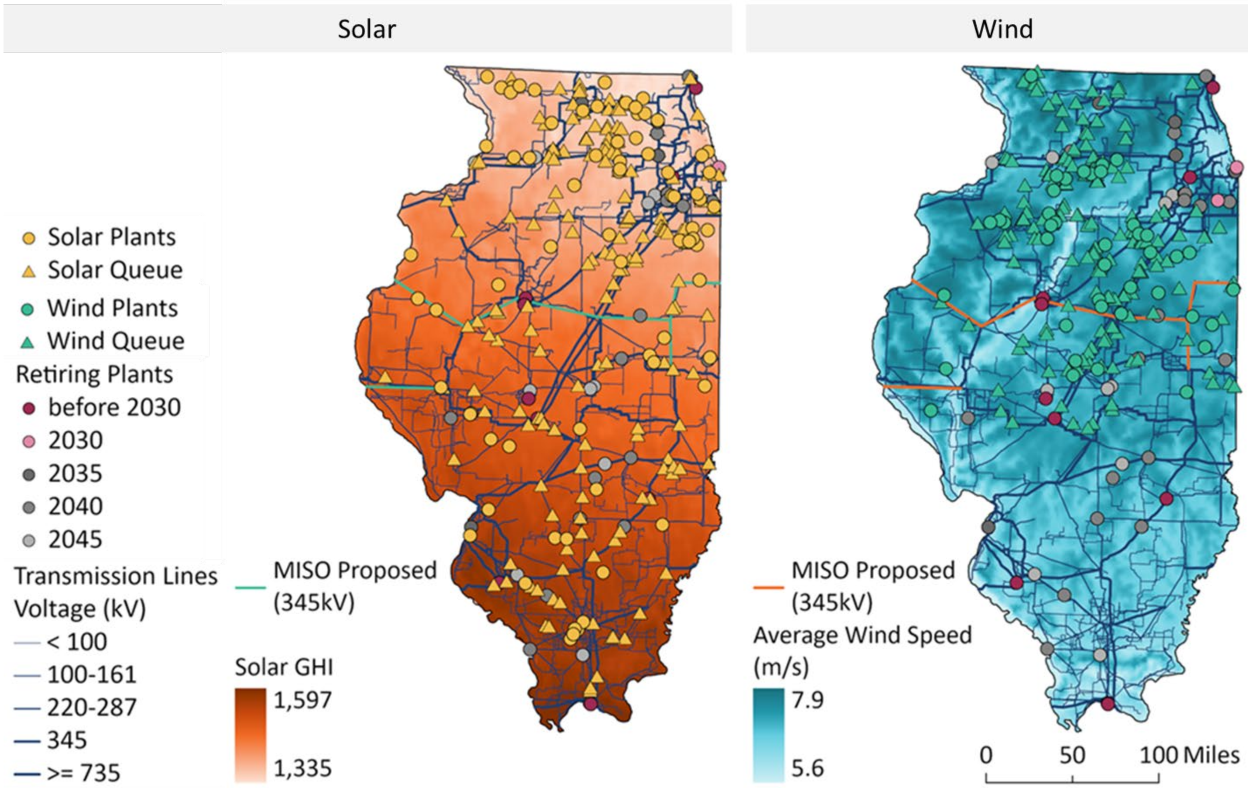
Based on these prior efforts and feedback received from stakeholders, several criteria and datasets were identified that could inform the development of renewable energy zones. We present here the available data and discuss considerations for incorporating this data into potential zones, before presenting initial candidate zones in the subsequent Section III.C.

1. Resource Potential and Demonstrated Developer Interest

A key element to the desirability of a specific geographic location for renewable energy development is the area's resource potential. The REAP proposes to evaluate renewable energy resource potential through analysis of wind and solar attributes across the state of Illinois, as described below.

Illinois has strong resource potential for wind and solar across the state, with wind speeds greater in the north, and solar radiation more broadly dispersed. The state lacks mountainous or other geographic features that concentrate potential, leading some of the factors that more precisely drive development potential in other jurisdictions to be more widely spread in Illinois. Based on feedback received through development of this REAP, wind speeds at hub heights of 100 meters were used to evaluate wind potential, and Global Horizontal Irradiance (GHI) was used as a measure of solar potential. As seen in Figure 13, wind development occurs in the northern areas of the state with higher wind speeds, while solar development occurs statewide, with more solar development identified in PJM despite its lower solar potential.

FIGURE 13: WIND AND SOLAR RESOURCE POTENTIAL



Sources and Notes: Solar GHI data provided in SEDAC Solar Suitability Study; NREL Wind Speed at 100-Meter above Surface Level; HIFLD Electric Power Transmission Lines; MISO LRTP Workshop; EIA Power Plants; MISO Queue; PJM Queue; Fossil Phase out schedule from IL EPA.

2. Current Land Uses and Crop Productivity

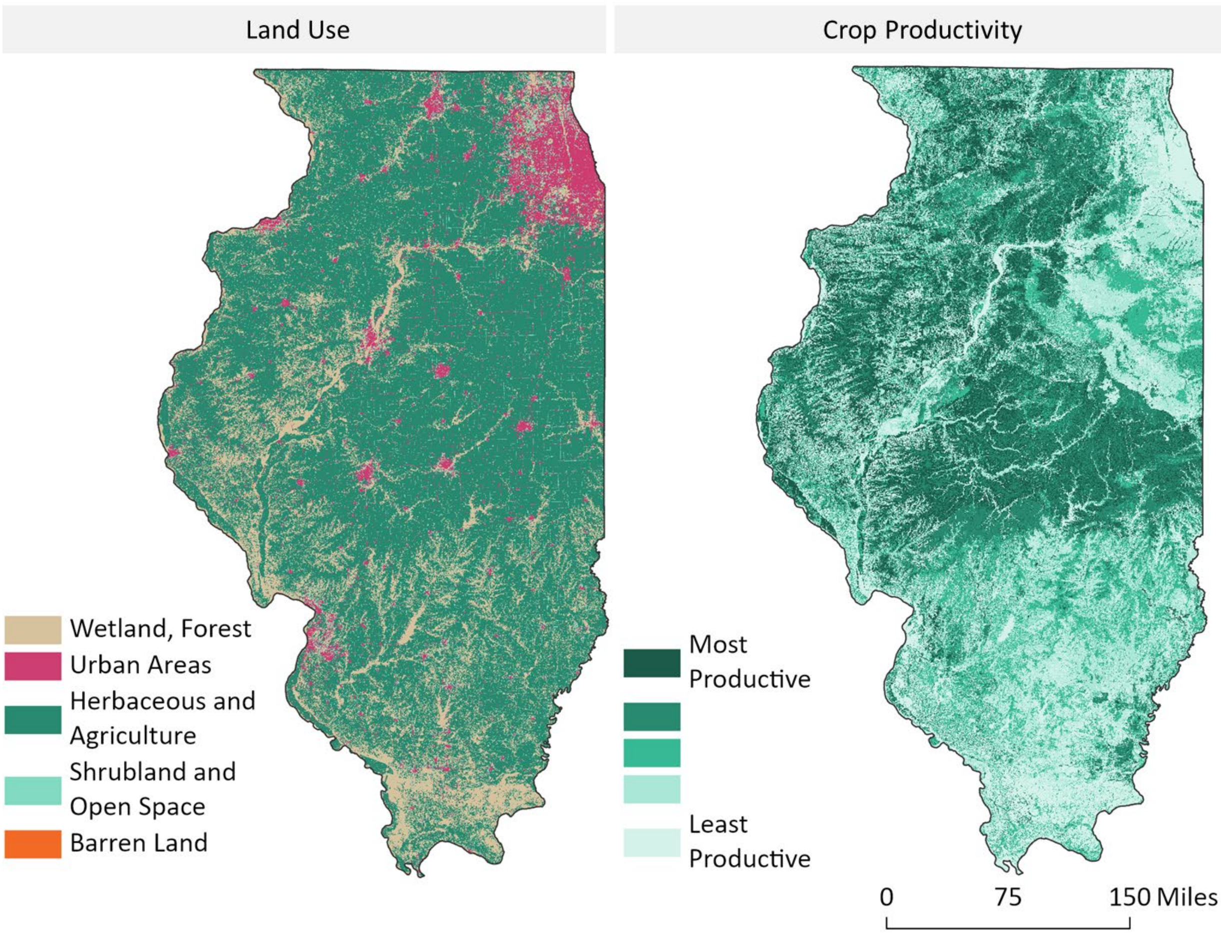
Land use and crop productivity are two additional criteria that some stakeholders have identified as considerations for identifying REAP zones, as illustrated in Figure 14. Consistent with prior work conducted in the SEDAC Solar Suitability Study, the REAP considers water bodies, 100-year flood plains, and ecologically sensitive or protected areas to be "No Development" areas. For some regions of the state, particularly the Shawnee National Forest and along the Illinois River, the protected areas are excluded from consideration as potential candidate REAP zones.[51] REAP zones may include other smaller protected areas, given that siting and permitting processes will ensure that development proceeds only on non-protected lands. Though another goal could be to focus development in "barren" or "open land", Illinois does not have substantial land areas that are not already in productive use. Urban and developed areas pose substantial opportunities for renewable deployment, particularly for distributed solar. However, these areas are not relevant as designated REAP zones as defined here, given that they can be integrated into distribution systems and should not require bulk transmission system upgrades to deploy (a more likely scenario is that distributed resources in urban areas may defer the need for bulk

[51] SEDAC Solar Suitability Study.

transmission upgrades).The majority of all renewable development in Illinois will proceed on agricultural lands, which cover approximately 75% of all land area.[52]

The REAP also considered for the productivity of agricultural land to ensure that candidate REAP zones minimize impacts on prime farmland. Crop productivity was used as a measure of the suitability of particular land for farming, indicating that the south and northeastern regions of the state should be somewhat prioritized according to this criterion (though the majority of the state is highly productive when compared to other states).

FIGURE 14: LAND USE AND CROP PRODUCTIVITY IN ILLINOIS



Sources and Notes: Data provided in SEDAC Solar Suitability Study.

3. Equity and Environmental Justice Communities

The REAP considers equitable access to clean energy as a factor in the selection and prioritization of candidate renewable energy access zones. Consistent with provisions in CEJA, this REAP prioritizes areas near equity zones for development as opportunities to share in tax revenues and economic development benefits, as well as to incrementally displace fossil generation, providing

52 IDOA, Facts About Illinois Agriculture.

associated health benefits. CEJA identifies different zonal characterizations across the state that qualify certain regions for economic incentives and/or other forms of benefits pertaining to the clean energy transition, including:

- **Environmental Justice (EJ) Communities** are designated based on a methodological framework established in the Long-Term Renewable Resources Procurement Plan by the IPA.[53] Holistic scores are assigned to all census blocks in Illinois based on results from the US EPA tool EJ Screen and the top 25% are assigned as EJ Communities and find several mentions in CEJA. First, proximity to these communities hastens the phase out of nearby fossil fuel plants, improving the general air quality in these areas. Second, CEJA directs at least 40% of investment in make-ready infrastructure for electric vehicle charging and 5% of investment in heavy-duty vehicle and bus electrification to these areas.[54] Third, CEJA requires 25% of incentives under the Illinois Solar for All program to be reserved for projects in EJ communities.[55]
- **Equity Investment Eligible Communities** are characterized by CEJA as "geographic areas throughout Illinois which would most benefit from equitable investments by the State designed to combat discrimination."[56] According to the present definition, Restore, Reinvest, and Renew (R3) Areas (pursuant to Section 10-40 of the Cannabis Regulation and Tax Act) and EJ Communities both fall under this characterization. Many incentives available to EJ communities under CEJA are also available to equity investment eligible communities.

---

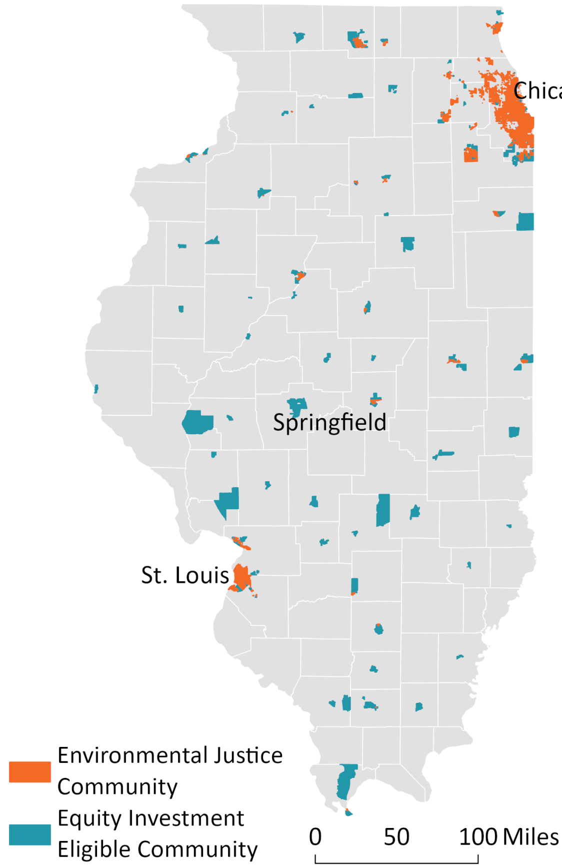
53 IPA, 2022 IPA Long-Term Procurement Plan § 8.12, at 277.

54 *See* 20 ILCS 627/45 ("'Make-ready infrastructure' Means the electrical and construction work necessary between the distribution circuit to the connection point of charging equipment.")

55 20 ILCS 627/45.

56 20 ILCS 730/5-5.

FIGURE 15: ENVIRONMENTAL JUSTICE AND EQUITY INVESTMENT ELIGIBLE COMMUNITIES IN ILLINOIS

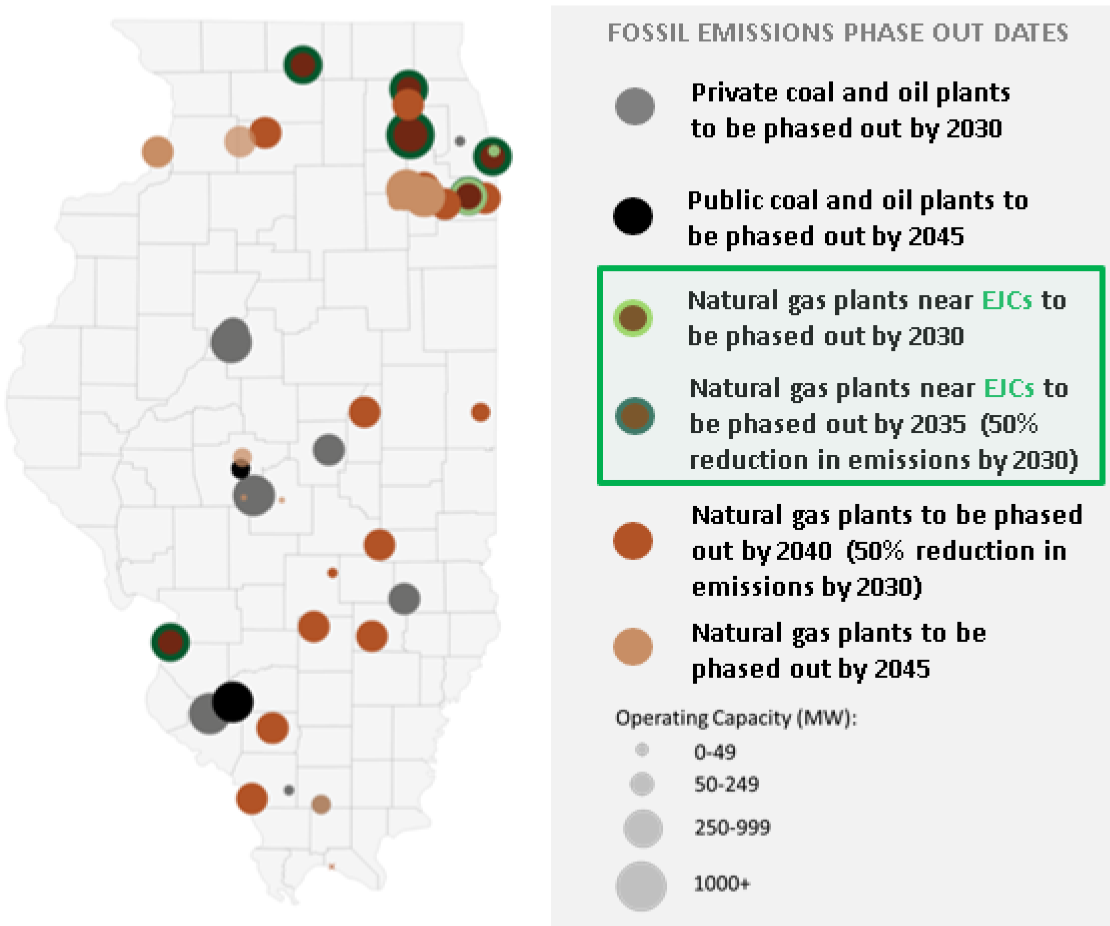


Sources and Notes: Environmental Justice Communities; Equity Investment Eligible Communities; TIGER/Line 2018 Census Block Groups; TIGER/Line 2018 Census Tracts.

4. Locations of Mandated Fossil Retirements

The REAP further considers the feasibility of utilizing interconnection capability associated with fossil fuel generation retiring as a result of economic pressures and environmental policy. The first draft REAP contemplated a headroom study to facilitate understanding of the bulk electric grid in Illinois, including under retirement scenarios, but this analysis was not concluded for the second draft REAP due to timing constraints. Until a complete headroom study is conducted, this REAP will use physical distance from retiring generators as a less accurate proxy for locations that may have incremental headroom available in the near term.

FIGURE 16 : CEJA MANDATED FOSSIL PLANT RETIREMENTS



Sources and Notes: Fossil Phase out schedule from IL EPA. The map (created with the assistance of IL EPA) reflects preliminary estimates and should not be treated as determinative of ICC, IL EPA, or any other state agency decision; EJ Communities & R3 designations, as well as the list of units affected by the proximity to EJ Communities or Equity Investment Eligible Communities is subject to change over time. Map created using S&P Global Capital IQ Mapping Software.

C. Candidate Renewable Energy Zones

The purpose of candidate REAP zones is to facilitate access to the regional transmission system for resources likely able to meet CEJA's policy mandates. To enable such access, zones must be incorporated into regional planning processes that govern large resource interconnections. The RTOs do not yet have processes in place to fully utilize the identified Level 1 and Level 2 REAP zones, so the REAP must not only identify the zones (this Section III.C) but also recommend RTO process reforms to effectively utilize the zones (Section IV below).

Figure 17 explains the concept of Level 1 and Level 2 REAP zones, as well as recommended actions to inform how these zones can be used. Level 1 zones serve to identify areas where immediate creation and reservation of headroom can enable a substantial amount of renewable resources already in interconnection queues. Level 2 zones can be evaluated by RTOs in transmission system planning processes, as an indication of likely locations of future renewable development.

To facilitate resources that make up the basis for Level 1 zones, which are already in the queue, PJM and MISO should facilitate a joint interconnection study (outside of the PJM queue reform process discussed in Section IV below), similar to the Joint Targeted Interconnection Queue (JTIQ) study performed by SPP and MISO.[57] The JTIQ process was intended to alleviate the concern that individual generators were facing large-scale transmission needs, and sought to identify more comprehensive solutions to a wider range of likely interconnection needs near the SPP-MISO seam.[58] The selected JTIQ projects included seven transmission upgrades at a cost of $1.6 billion, enabling the likely interconnection of between 28-53 GW of new resources.[59] The need for an expedited joint review process for Level 1 zones is particularly critical for Illinois, given its location on the seam, and the potential for delays in the interconnection studies of one RTO to impact timing of requests in both regions.

Should these coordinated interconnection studies not materialize, Level 1 zones can be considered alongside Level 2 zones as inputs to the transmission planning process. This REAP found that locations of current queue requests are likely also indicative of future queue locations, as areas that developers believe to be logical sites for development. This approach is mirrored in MISO's development of its likely future scenarios.[60] These recommended actions are summarized in Figure 17.

---

[57] Southwest Power Pool and MISO, Joint Targeted Interconnection Queue Cost Allocation and Affected System Study Process Changes White Paper, (August 17, 2022).

[58] Southwest Power Pool and MISO, Joint Targeted Interconnection Queue Study, Executive Summary, (March, 2022).

[59] *Id.* at 7.

[60] MISO, Futures Report, (Updated December, 2021) at 42.

FIGURE 17: ILLINOIS ACTIONS TOWARD IMPLEMENTATION OF REAP ZONES

	Liberate Headroom	Plan Transmission
Level 1 Demonstrated Interest Zones	• Request or sponsor immediate headroom study • Work with ISOs to develop expedited process for accessing headroom, including from retirements	• Same actions as below, to create additional transmission capacity for resources in zones with demonstrated interest
Level 2 Future Potential Zones	• No action, since little transmission available	• Communicate zones and unmet renewable demand to MISO to incorporate into planning process • Usage of zones in PJM TBD as discussed herein • Request exploration of transmission planning along seam (like JTIQ)

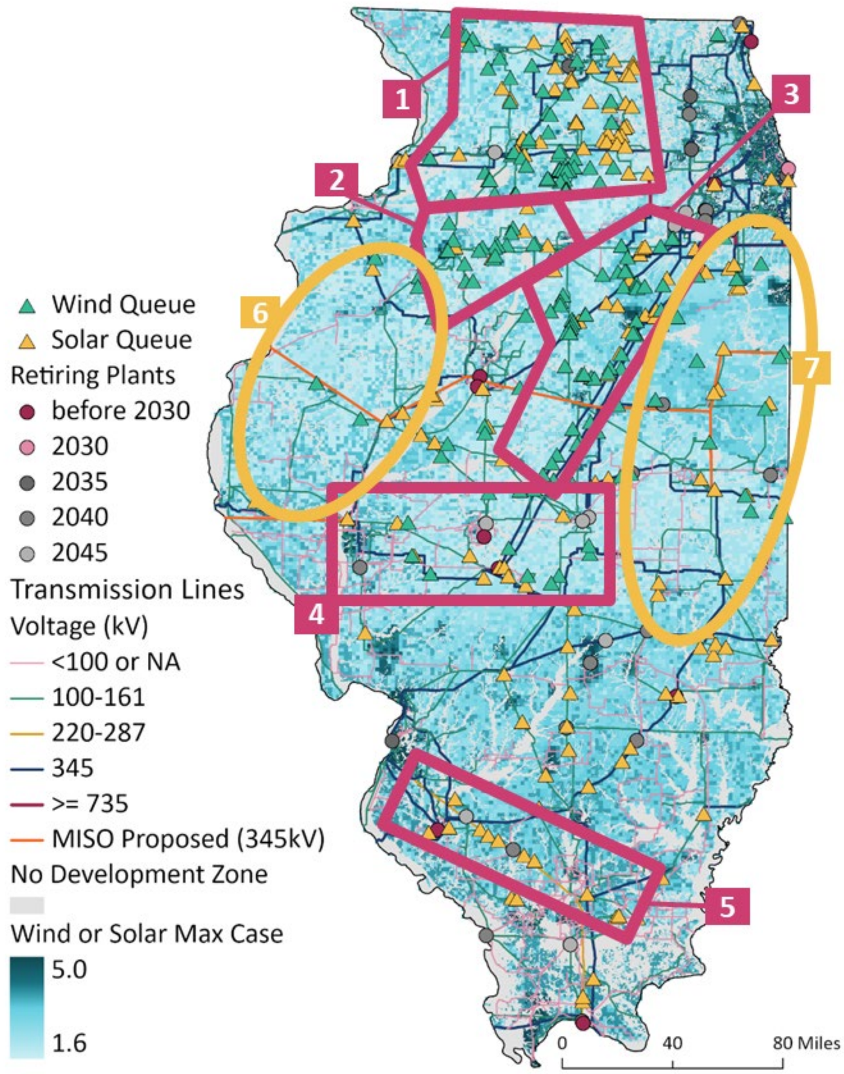
1. Candidate Renewable Energy Zones

Zones developed as part of this REAP are indicative in nature, subject to refinement and approval through the subsequent ICC review and investigation, and informed by future study of statewide headroom. Based on the criteria described above, together with the active PJM and MISO queue as well as the exclusion of regions with a high concentration of "no development" protected areas, the REAP recommends the candidate REAP zones illustrated in Figure 18. Considerations taken into account in selecting the zones include:

- Level 1 Demonstrated Interest Zones:
  - **Zones 1-3:** Many resources in interconnection queue are located in these zones and are likely affected by queue delays and affected system studies. Expediting interconnection may require PJM-MISO coordination to expedite joint study and interconnection (e.g. modeled on MISO-SPP JTIQ effort). Study in coordination with 2030 PJM retirements in ComEd which should create substantial headroom to facilitate entry of these resources.
  - **Zones 4-5:** Regions of MISO with both substantial developer interest (primarily solar) and that include potential retirements by 2030 that could expedite interconnection or reduce interconnection costs if coordinated with new entry.
- Level 2 Future Potential Zones:
  - **Zone 6:** Strong renewable potential, but less transmission access and development. Headroom analysis can examine renewable potential that could be enabled with additional transmission and at what cost.
  - **Zone 7:** Most promising area from several perspectives (proximity to load and EJCs, lower crop productivity, near ComEd locations of early fossil retirement), but overlaps with counties that have placed permitting limits on renewables.

– **Zones 6-7:** MISO's recently approved 345 kV East-Central corridor project may create additional capability by 2029/30 (smaller north/south spurs or lower-voltage substations may enable more interconnection at affordable incremental cost).

FIGURE 18: CANDIDATE RENEWABLE ENERGY ZONES



Sources and Notes: Crop Productivity and Solar GHI data provided in SEDAC Solar Suitability Study; NREL Wind Speed at 100-Meter above Surface Level; HIFLD Electric Power Transmission Lines; MISO LRTP Workshop; MISO Queue; PJM Queue; Environmental Justice Communities; Equity Investment Eligible Communities; TIGER/Line 2018 Census Block Groups; TIGER/Line 2018 Census Tracts; Fossil Phase out schedule from IL EPA.

2. Potential for Zone Refinement through Comprehensive Headroom Analysis

The ICC can, in close coordination with MISO and PJM, conduct a study to identify headroom that exists on the existing grid to integrate new renewable resources in Illinois. The headroom analysis would determine the volume of renewable supply that could be accommodated within various locations in the state, including those identified as potential Level 1 Headroom Zones in this REAP iteration or other areas with available system capability not identified in this REAP.[61] The study should review available system capability under: (1) current RTO interconnection processes; (2) new processes that could make full use of headroom that may be created by retiring fossil resources; and (3) potentially reformed processes that better account for the attributes of renewable resources. The headroom analysis should further examine the additional headroom that could be created in either Level 1 or Level 2 zones through upgrades to the transmission system, and at what cost.

This headroom study should also consider opportunities for capability to be expanded more easily at low cost through advanced transmission technologies, such as dynamic line ratings, power flow control devices, and topology optimization. While capacity injection capability is important from a resource adequacy and overall grid reliability perspective, utilization of the available energy headroom of the grid will play a larger role in achieving clean energy goals and doing so cost-effectively. Headroom for renewable energy already exists at existing fossil plant locations (prior to their retirement), particularly since many of the aging plants are rarely dispatched and, when operating, would be dispatched down during periods of high renewable generation.

It is likely that projects in MISO's Tranche 1 Futures portfolio, located in areas that could provide new system access to identified Candidate Level 2 zones, will also create headroom. The headroom study should therefore be broadly structured and should not be limited to identifying headroom in any certain areas of the state, and to the extent possible should consider the impact of new transmission additions approved by RTO boards. In addition, if headroom is identified in areas outside of candidate REAP zones, this information will serve as valuable input to future updates of the REAP. Based on the outcomes of the headroom study, the ICC could utilize processes identified in Section IV below to incorporate these identified locations into regional plans, and advocate for required enhancements to RTO interconnection processes.

The headroom analysis overseen by ICC staff should be mutually informed by separate analyses that have been or will be conducted by both MISO and PJM, with the ultimate goal of identifying opportunities to expedite interconnection of renewable resources and utilize capability associated with fossil retirements (Level 1 Zones) and identifying low-cost opportunities to enable the development of new renewable resources (Level 2 Zones). The additional information

---

[61] Capacity headroom is focused on "firm" or "capacity" injection rights, which are usually evaluated for several hours of challenging reliability conditions (such as summer peak, winter peak, or low-load conditions). In contrast, energy headroom is defined by the (non-firm) capability of the transmission grid to accommodate renewable energy during all hours of the year (including many hours that are not characterized by reliability challenges) which, for renewable generation resources with a higher proportion of energy-to-capacity output, tends to significantly exceed the capacity headroom of the grid. Considering these differences, the New York Public Service Commission recently required that the owners of local transmission and distribution system provide estimates of both the energy and capacity headroom for different locations on their grid. *See* NYPSC Case 20-E-0197 materials available here, including: *Utilities' August 2022 Revised Headroom Calculations* (August 1, 2022); *Addendum to Staff Straw Proposal for Conducting Energy Headroom Assessments* (June 8, 2021); *Staff Straw Proposal for Conducting Headroom Assessments*, (March 16, 2021).

created by the headroom study can assist the ICC in advocating for regulatory reforms that would maximize efficient use of available headroom and identify the most advantageous headroom expansion opportunities—particularly at grid locations of rarely dispatched or about-to-be retired fossil generating plants.

3. Potential for Zone Refinement through Weighted Scoring

In 2021, as part of its Solar Suitability Study, SEDAC developed a method for identifying the most suitable locations for solar resource development based on mapping and weighting various criteria. To execute this analysis, SEDAC employed a Multi-Criteria Decision Analysis (MCDA) approach, and several different scenarios, as discussed in the Solar Suitability Study.[62] For the purposes of this second draft of the REAP, we have extended the methodology to apply to both wind and solar data and expanded on the underlying geographic information system (GIS) mapping data provided by SEDAC as an input to this analysis. In this second draft REAP, the candidate REAP zones are only loosely informed by this weighted scoring analysis given that an initial scores-based approach did not reveal sufficient differentiation across regions that were not already revealed through examination of the other assessment criteria described in Section III.B above. However, we present initial scores-based maps here and the generalized methodology here as an option for consideration in future REAP zone refinement, which could utilize alternative scoring metrics and weights.

Table 2 and Figure 19 provide four illustrative maps employing varying weights through the MCDA approach adapted from the SEDAC solar siting study methodology. In all four maps, the suitability as Level 2 renewable zones is shown as a darker color or higher score for locations that are more desirable. Higher scores are awarded to locations nearer to defined equity zones, with lower crop productivity, or with higher renewable resource potential. The four maps differ in how wind and solar resource potential is considered showing, from left to right with: (1) wind and solar potential considered equally on average; (2) the maximum of wind or solar potential is considered; (3) only solar potential considered; and (4) only wind potential considered. In all cases, environmentally protected areas score zero. The resulting maps show some variability in suitability across the state, but do not reveal sufficiently concentrated differences to suggest redrawing the candidate zones described above. However, alternative approaches to scoring using different criteria or different weights might reveal more variability and could be considered as one option for further refining the REAP zones.

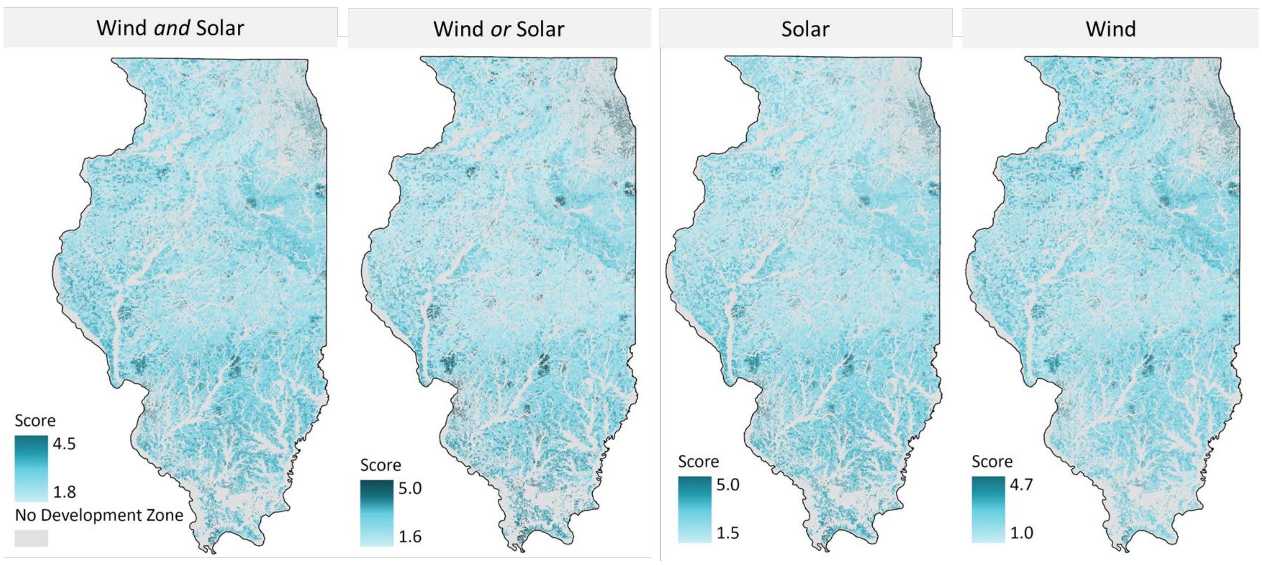
62 *See* SEDAC Solar Suitability Study at 3-5.

TABLE 2: WEIGHTED SCORES FOR DEVELOPING INDICATIVE LEVEL 2 REAP ZONES

		Proximity to Equity Zones	Solar Potential	Wind Potential	Crop Productivity
Scoring		Scored on a continuous 1-5 scale based on distance to equity zones, where 1 is greater than 3 miles away, and 5 is within the zone	Scored on a continuous 1-5 scale based on Solar GHI	Scored on a continuous 1-5 scale based on 100m wind speed	Scored on a 1-5 scale based on quantiles, with 1 being most productive and 5 being least productive
Weights	Wind or Solar	33%	33% **Maximum**	33%	33%
	Wind and Solar	25%	25%	25%	25%
	Wind only	33%	0%	33%	33%
	Solar only	33%	33%	0%	33%

Sources and Notes: Crop Productivity and Solar GHI Data Provided in SEDAC Solar Suitability Study; NREL Wind Speed at 100-Meter above Surface Level; Environmental Justice Communities; Equity Investment Eligible Communities; TIGER/Line 2018 Census Block Groups; TIGER/Line 2018 Census Tracts.

FIGURE 19: WEIGHTED SUITABILITY SCORES FOR LEVEL 2 ZONES



Sources and Notes: Crop Productivity and Solar GHI Data Provided in SEDAC Solar Suitability Study; NREL Wind Speed at 100-Meter above Surface Level; Environmental Justice Communities; Equity Investment Eligible Communities; TIGER/Line 2018 Census Block Groups; TIGER/Line 2018 Census Tracts.

4. Inclusive Processes for Refining Future REAP Zones

The process described herein for developing candidate energy zones, particularly Level 2 zones, may be modified in the future based on stakeholder input. Namely, both the weighting and the inclusion of specific criteria, either identified in this iteration of the REAP or through a future stakeholder process, can be altered to meet the priorities of the ICC and stakeholders. Enabling communities to participate in the prioritization of areas and development of criteria provides the ability to directly incorporate equity into future updates to REAP zones. Certain stakeholders have developed principles in collaboration with impacted communities that can provide additional guidance in future REAP iterations.[63]

For future REAPs to have the opportunity to thoroughly engage stakeholders, ICC may seek to begin a community outreach program in advance of the REAP update. ICC could develop and issue a survey that would assist subsequent REAP updates in identification and prioritization of criteria for development of Level 2 zones. These efforts could reach out to counties, townships, equity communities, and rural communities, to ensure that a broad swath of perspectives are represented. The output of such a survey could serve as valuable input to future iterations of the REAP in identifying weights for identifying candidate Level 2 zones.

D. REAP Findings and Recommendations

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Ensuring the transmission system can enable the large volume of needed renewable resources will require coordinated and ongoing review of the locations of likely future renewable generation to serve demand for renewable energy for consumers in Illinois and in other states. Illinois enjoys substantial additional renewable development opportunities for wind and particularly for solar, but fully unlocking that potential poses a trade-off with other land uses, particularly for agriculture. Responsible development further requires consideration of economic benefits to land owners, communities, and protections for local communities.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

3.A **Adopt REAP Zone Concepts.** The ICC can adopt the concepts of Level 1 Demonstrated Interest Zones and Level 2 Future Potential Zones for guiding participation in RTO interconnection and transmission planning processes. This REAP provides candidate Level 1 and Level 2 zones for ICC consideration, refinement through headroom analysis, and potential use in regional planning processes.

- *Level 1 Demonstrated Interest Zones* would be those where existing transmission headroom, or headroom created by the retirement of fossil resources, could enable public policy resources. Identifying and quantifying available system headroom will be a necessary first step in creating a more expedited process, but regulatory reforms to RTO interconnection processes are also required to expedite resource interconnection in those zones.
- *Level 2 Future Potential Zones* are suitable for future wind or solar development but would require network upgrades to interconnect resources there. Identifying these zones can inform long-term transmission planning conducted by the Regional Transmission Organizations.

[63] *See* Hunter, M., A. Sorensen, T. Nogeire-McRae, S. Beck, S. Shutts, R. Murphy, Farms Under Threat 2040: Choosing an Abundant Future, 2022, American Farmland Trust.

3.B Quantify Renewable Interconnection Capability Through a Comprehensive Transmission Headroom Analysis. The ICC can, in close coordination with MISO and PJM, conduct a study to identify headroom that exists on the existing grid to integrate new renewable resources in Illinois. The headroom analysis would determine the volume of renewable supply that could be accommodated within various locations in the state, including those identified as potential Level 1 Headroom Zones in this REAP iteration or other areas with available system capability not identified in this REAP. This headroom study should also consider opportunities for capability to be expanded more easily at low cost through advanced transmission technologies, such as dynamic line ratings, power flow control devices, and topology optimization. The study should review available system capability under: (1) current RTO interconnection processes; (2) new processes that could make full use of headroom that may be created by retiring fossil resources; and (3) potentially reformed processes that better account for the attributes of renewable resources. The headroom analysis should further examine the additional headroom that could be created in either Level 1 or Level 2 zones through upgrades to the transmission system. Based on the outcomes of the headroom study the ICC could adopt Level 1 REAP Zones and advocate for any required enhancements to RTO interconnection processes (see Strategic Element 4 below).

3.C Adopt Expansion Zones for Transmission Planning Purposes. The ICC can adopt Level 2 REAP zones after review and refinement of the initially-proposed zones included in this report, and after considering further input from all participating stakeholders. In future REAPs, the Level 2 zones can be further informed by an inclusive process focused on gathering input from all potentially affected communities that may seek to participate in the economic benefits of renewable development or reflect other community priorities.

3.D Develop a Model Ordinance. Staff of the ICC, in consultation with IL EPA, Illinois Department of Natural Resources (IDNR), and Illinois Department of Agriculture (IDOA), impacted communities, and other interested stakeholders, can develop a model zoning ordinance to enable responsible renewable development in counties that have not yet adopted an ordinance, or counties looking toward best practice. These model rules should consider decommissioning insurance and bonding requirements; recommended parameters such as setback ranges; and should be developed in coordination with impacted energy equity and rural communities to ensure appropriate protections and enforcement provisions are included for the benefits of the local communities and participating landowners. Provisions of agreements currently entered into between developers and the IDOA should be examined in future REAP updates to ensure optimal achievement of intended environmental and community protection goals.

POTENTIAL ADDITIONAL POLICIES REQUIRING LEGISLATIVE ACTION

3.E Review and Refine Enforcement Authorities. Review and refine enforcement authorities to ensure the ability to stipulate and enforce minimum standards for responsible renewable resource development, including requirements such as for decommissioning insurance and comprehensive drainage plans.

IV. Effective Transmission Planning & Utilization

The development of the regional grid occurs through the RTO transmission planning and interconnection processes. These two processes have been slow to evolve and are not yet well aligned with Illinois' policy goals. Future pursuit of the transmission upgrades necessary to enable Illinois' growing policy goals under CEJA, including any use of developed REAP zones described above, will require reforms and closer coordination with and participation in RTO processes.

The following section presents foundational reform concepts, then offers analyses of current transmission planning processes, interconnection processes (and queue delays), and creative solutions employed in other states.

Based on the findings, this second draft REAP makes several recommendations to improve planning and interconnection processes and the ICC's participation in those processes. It provides a blueprint for potential immediate actions alongside those that would require legislative reform. Several of these recommendations relate to reform processes already underway at the RTOs, and should be updated in future REAPs as these processes conclude.

A. Foundational Reform Concepts

Before analyzing the details of existing interconnection queues and planning processes, it is helpful to introduce four concepts that help frame everything else: (1) proactive transmission planning is more effective than the generation interconnection process to cost-effectively address the region's renewable generation needs; (2) proactive planning has to incorporate policy goals and consider multiple value streams over a range of future scenarios to identify the most cost-effective, most beneficial grid solutions; (3) grid-enhancing technologies can expand transmission beyond planning new wires and cost-effectively increase the headroom necessary to integrate renewable generation; and (4) cost allocation has to be addressed for public policy and multi-driver transmission investments, particularly in PJM.

PROACTIVE TRANSMISSION PLANNING IS MORE EFFECTIVE THAN THE GENERATION INTERCONNECTION PROCESS

Proactive transmission planning will lead to substantially more cost-effective and efficient transmission solutions than relying on the slow, piecemeal interconnection process to expand the grid. Consider the relative costs-per-kW of integrated renewable capacity through proactive planning, as estimated in PJM's Offshore Wind Transmission Study Phase 1 (OTSG), compared with interconnection costs estimated from publicly-available queue data. PJM found that proactive transmission planning could integrate 12.4 GW of offshore wind resources along with 14.5 GW of onshore wind, 45.6 GW of solar, and 7.2 GW of storage, which is sufficient renewable capacity to meet every state's then-applicable RPS goal, for just $2.2 billion.[64] In contrast, developing transmission through the interconnection process costs multiples more: Brattle analysis of PJM independently planned queue positions has found $1.3 billion in total identified transmission upgrades for integrating 5.6 GW of PJM offshore wind resources alone.[65] Other analyses found that integrating 15.5 GW of offshore wind under today's rules would lead to $6.4 billion in upgrades.[66] These analyses indicate a range of $236/kW to $415/kW in transmission upgrades to integrate renewables into PJM using the traditional interconnection process. PJM's OTSG study results show resource integration at a much lower cost, $27/kW, for interconnecting various types of renewable resources including offshore wind on a system-side basis through a proactive and forward-looking approach.

The PJM study further concludes that Illinois' previous RPS goal, 25% by 2025, could be met with only moderate upgrades to bulk transmission facilities (above 100kV) in the ComEd zone, when accounting for the achievement of all regional goals.[67] In Illinois, the study adds 7,329 MW of onshore wind, 2,406 MW of solar, and 1,080 MW of storage, and identifies only $53 million of upgrades in the ComEd zone across scenarios, in addition to upgrades identified throughout PJM.[68]

Similarly, in a proactive planning effort in New Jersey focused on future achievement of offshore wind policy goals, a competitive solicitation conducted by PJM under its State Agreement Approach resulted in selections of onshore transmission upgrades that save New Jersey ratepayers approximately $1 billion for 6,400 MW of additional offshore wind, a two-thirds reduction relative to the costs identified in PJM studies when relying on the traditional interconnection process.[69] By addressing the incremental need more holistically (*i.e.*, for an additional 6,400 MW of offshore wind rather than one project at a time) and relying on competitive solicitations for some of the identified needs, the selected solutions are significantly more cost-effective than what would otherwise be available through generators seeking interconnection to PJM.[70] Similarly, the recently-completed proactive Joint Transmission Interconnection Queue (JTIQ) study by MISO and SPP similarly showed that proactive transmission planning efforts for five year's worth of interconnection requests on both sides of

---

64 PJM, Offshore Transmission Study Group Phase 1 Results, (August 10, 2021) at 16, Scenario 6 (OTSG Phase 1).

65 J. Pfeifenberger, J. M. Hagerty, *et al.*, New Jersey State Agreement Approach for Offshore Wind Transmission: Evaluation Report, (October 26, 2022) at Table A-2 (SAA Evaluation Report). This interconnection cost estimate is included in the baseline scenario cost estimates of the report.

66 Burke and Goggin, Offshore Wind Transmission Whitepaper, (October, 2020) at 40.

67 OTSG Phase 1 at 16. Neither the specific upgrades nor the locations of the modeled renewables are identified in the results.

68 *Id.* at 11–18.

69 SAA Evaluation Report at Figure 4.

70 *Id.* at § IV.A, § V.

the MISO-SPP seam reduced interconnection-related transmission costs by over 50% while simultaneously providing additional cost savings through congestion relief.[71]

The greater efficiency of proactive planning is not surprising, since it co-optimizes the combination of points-of-interconnection and the upgrades needed to accommodate the entire known need of renewable generation, minimizing total cost of network upgrades necessary to support a large number of resources. In contrast, the interconnection process incrementally evaluates reliability violations for much smaller sets of individual resource additions that are likely not placed at the optimal injection points, and requires upgrades to solve incrementally each set of violations identified along the way (that may not even be violations after later resources are added). This does not yield cost-effective transmission solutions. The incremental nature of the process is exceedingly time consuming and must be repeated not only for each resource in PJM's interconnection queue but also whenever projects earlier in the queue drop out.

However, these types of proactive planning processes are not yet fully developed or leveraged. The gaps and opportunities for improvements are discussed below.

PROACTIVE PLANNING SHOULD INCORPORATE POLICY GOALS AND CONSIDER MULTIPLE VALUE STREAMS OVER A RANGE OF FUTURE SCENARIOS

Proactive long-term transmission planning can identify and pursue least-regrets transmission projects that will cost-effectively and efficiently meet reliability and policy objectives such as CEJA, for a wide range of plausible future scenarios that reflect long-term uncertainties. MISO already utilizes such a framework in its Long-Range Transmission Planning (LRTP) and Multi-Value Project (MVP) planning processes, as discussed below. PJM's proactive planning framework is less developed and does not currently provide a regular forum for identifying, incorporating, or considering these public policy needs in its planning process (although it does offer some mechanisms to address state goals, as discussed below). However, PJM has identified needed revisions to its long-term plan through its Master Planning document, which has identified the potential for longer-term scenario based planning incorporating a wider variety of system and policy needs.[72] PJM's Master Plan envisions potential policy inputs, including achievement of policy goals, resource retirements, and generation queue needs.[73] In addition, FERC has been pursuing many of these same objectives through its NOPR on long-term transmission planning. This NOPR proposes requiring transmission plans to consider reliability, economic, and policy objectives across a range of long-term (at least 20-year) scenarios evaluated using a broad range of benefits to identify cost-effective, least-regrets solutions for multiple long-term transmission

[71] *See* Pfeifenberger, *Generation Interconnection and Transmission Planning*, ESIG Workshop Presentation, (August 9, 2022) at 9.

[72] PJM, Enhanced 15-year Long-Term Planning (Master Plan) White Paper, (May 10, 2022) (Master Plan).

[73] *Id.* at v.

needs.[74] Policy objectives would include resource needs driven by state objectives, such as those established by CEJA. Scenario analysis accounts for the inherent uncertainty of planning large-scale transmission but identifies upgrades that would be advantageous across a range of futures.[75] And the broad range of benefits recognize the multi-value nature of transmission.

Among other elements, the transmission planning NOPR further proposes that these long-term processes consider transmission needs identified in several generation queue studies.[76] It specifies categories of transmission benefits that it recommended, but did not require, to consider when evaluating candidate facilities or portfolios of facilities identified in the long-term plan. While the NOPR did not revise existing cost allocation principles, FERC did set out a proposed requirement that long-term transmission cost responsibility rules reflect (to the extent possible) the agreement of states.[77] Other proposed reforms reinstate elements of federal rights-of-first-refusal for incumbent transmission owners, enhance transparency of local plans, and revise long-term interregional planning.[78]

While implementing the NOPR or PJM's Master Plan would be a meaningful start toward requiring proactive, portfolio-based, long-term, and multi-benefit transmission planning, the time it will take to implement these reforms will not allow PJM to meaningfully address the near-term policy needs identified in this iteration of the REAP.[79] Any compliance process resulting from the NOPR, or other stakeholder implementation, may take several years to refine, implement, and result in meaningful updates to the RTO planning processes. Because the NOPR does not propose to change current planning processes accepted by Order 1000, targeted recommendations to integrate CEJA's requirements into regional planning processes necessarily must be based largely on existing planning processes, at least to satisfy Illinois' substantial short-term goals.[80]

MISO's process already employs much of the preferred approach envisioning in the NOPR and is described here as a model, then is reviewed in more detail in Section IV.C.1 below. MISO evaluates portfolios of potential Multi-Value Projects and considers multiple sources of value over a range of scenarios. Its LRTP tranche 1 includes an approximately $10 billion portfolio of MVPs that are estimated to support the integration of 53 GW of renewable resources and reduce other costs by $37–70 billion.[81] Benefits included in this analysis include congestion savings,

---

74 *Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection,* Notice of Proposed Rulemaking, 179 FERC ¶ 61,028 (2022) (NOPR).

75 J. Pfeifenberger and J. DeLosa, *Proactive, Scenario-Based, Multi-Value Transmission Planning*, presented to PJM Long-term Transmission Planning Workshop, (June 7, 2022) at 13.

76 NOPR at PP 166–174.

77 NOPR at PP 302–303.

78 NOPR at PP 365–383 (right-of-first-refusal), 400–416 (local planning), 426–430 (interregional coordination).

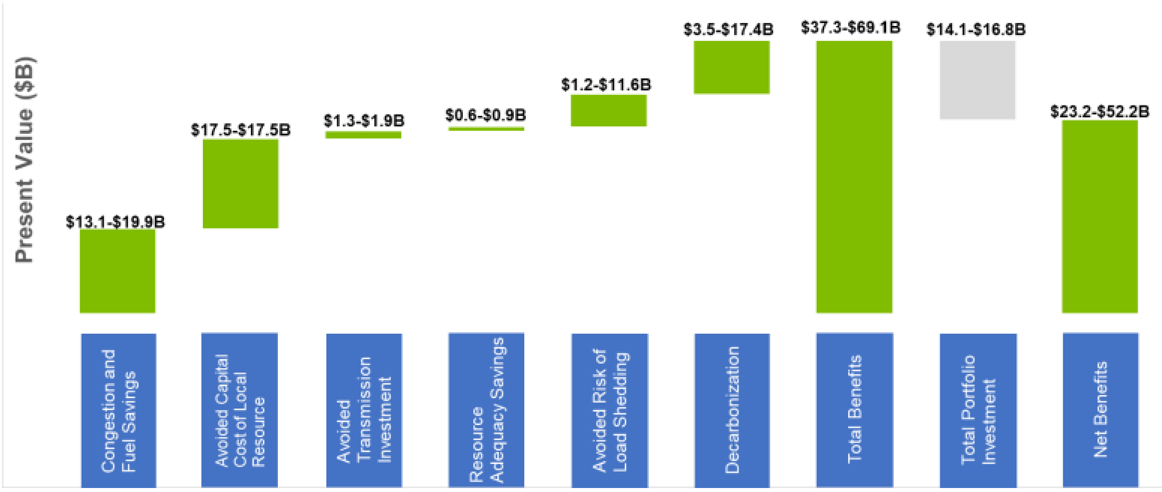
79 Future REAP updates should review processes implemented on compliance with the requirements of the NOPR.

80 NOPR at P 3 ("We do not propose in this NOPR to change Order No. 1000's requirements for public utility transmission providers with respect to existing reliability and economic planning requirements.").

81 *Id.*, and MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, (March 29, 2022).

avoided capital costs of local resource investments, avoided risk of load shedding, and others illustrated by MISO in Figure 20.

FIGURE 20: MISO CALCULATION OF LRTP TRANCHE 1 MVP BENEFITS AND COSTS



Sources and Notes: Pfeifenberger and J. DeLosa, Proactive, Scenario-Based, Multi-Value Transmission Planning, presented to PJM Long-term Transmission Planning Workshop, (June 7, 2022); MISO, LRTP Tranche 1 Portfolio Detailed Business Case, (June 25, 2022).

GRID-ENHANCING TECHNOLOGIES CAN INCREASE TRANSMISSION CAPACITY MORE QUICKLY AND COST-EFFECTIVELY

Transmission planning often focuses on large-scale additions of high-voltage lines, transformers, and sub-stations. But these processes sometime overlook grid-enhancing technologies that can quickly and cost-effectively debottleneck transmission constraints, reduce congestion costs, and help integrate renewable resources. These technologies, which can also be used to increase the capability and value of new transmission projects, include dynamic line ratings (to utilize the capability of transmission lines more fully and reliably using new line monitoring devices); topology control (using new technologies to identify reliable reconfigurations to avoid overloads and reduce congestion); power flow control devices (to re-route power flows away from constrained facilities to portions of the grid with surplus capacity); and strategically-placed energy storage facilities (to reduce peak flow and provide grid support services).[82]

[82] *See* New York Department of Public Service Staff, NYSERDA, The Brattle Group, and Pterra Consulting, *Initial Report on the New York Power Grid Study*, prepared for New York State Public Service Commission, (January 19, 2021), at Section III (New York Power Grid Study); *see also* NYPSC Order, in Case 20-E-197, (January 20, 2022), available here (recognizing that "advanced transmission technologies can offer significant benefits by increasing the transfer capabilities and associated renewable generation integration headroom of both existing grid facilities and new transmission investments," that "many of these technologies can be implemented more quickly than traditional transmission upgrades," and that certain technologies are already sufficiently well developed to warrant requiring the state's utilities to consider them in addressing transmission needs. The order directed the state's utilities and Commission Staff to address the challenge of identifying and removing barriers to the deployment of new technologies.")

COST ALLOCATION MUST BE ADDRESSED

In order to create a feasible path forward for developing new transmission to support public policies, cost allocation will have to be addressed. Any recommendations to improve or create new avenues for regional planning requires consideration of allocation of costs among beneficiaries.

Today's methods of allocating costs of public policy projects may prove insufficient for distributing the costs of the grid development needed to meet Illinois goals. Today, by virtue of the generation interconnection process, the costs of upgrading the system for interconnecting resources are almost exclusively borne by those resources seeking interconnection. In evaluating the potential to proactively plan for public policy and other transmission needs, some measure of those costs may need be allocated more broadly to transmission users and beneficiaries of the transmission investments. While the REAP does not take a position on the appropriate allocation of these transmission costs, it should be noted that resources receiving REC support likely recover their interconnection costs from ratepayers, who, in any event, ultimately pay all system costs. Unfortunately, this *status quo* process is not able to identify more-efficient, larger-scale transmission upgrades that could help achieving CEJA policy goals at lower total costs to ratepayers.

B. The RTOs' Generation Interconnection Processes

Illinois will need to significantly increase its rate of renewable development in order to meet its RPS requirements and CEJA's ultimate goals. To facilitate this transition, Illinois will rely on the interconnection queue of the RTOs to enable procured generators access to the wholesale electric grid.

1. Pace of Illinois Interconnection Queue Throughput

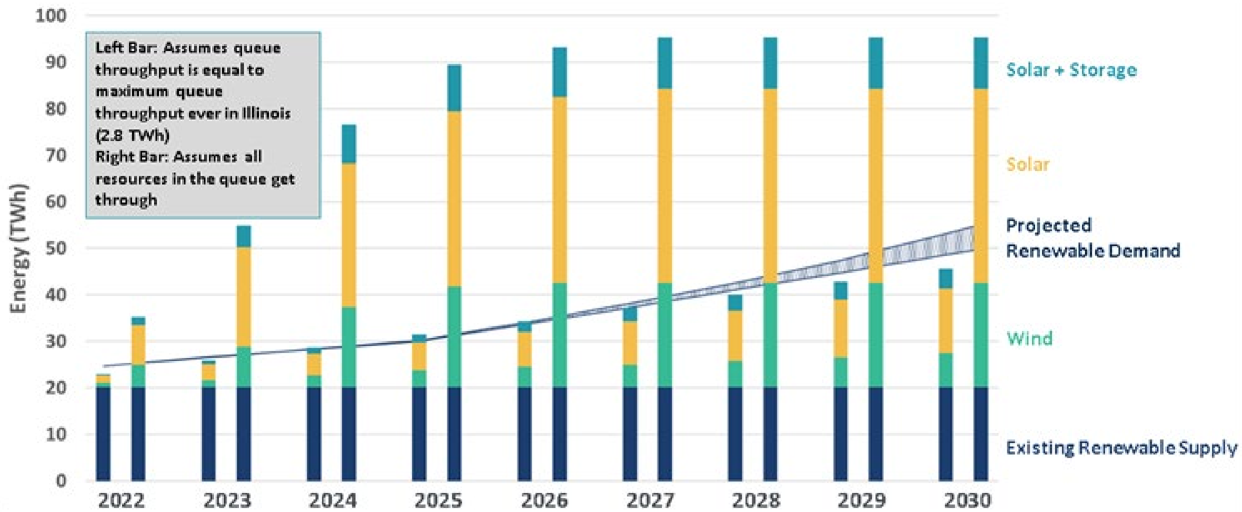
On the basis of historical throughput, Illinois is likely to be able to meet its renewable energy needs in the short term without significant changes to the pace of the queue in the state. Over time, as renewable needs grow, the pace of queue throughput will fall just short of anticipated renewable demand. This shortfall in interconnected resources could be heightened by future scenarios featuring higher levels of electrification.

Across both RTOs in Illinois, the maximum historical queue throughput for any single year occurred in 2020, and is estimated at 2.8 TWh of renewable energy.[83] Figure 21 below projects

[83] The referenced 2.8 TWh maximum renewable throughput value is calculated using interconnection queue data from the PJM New Services Queue and the MISO GI Interactive Queue. In particular, the maximum annual historical queue throughput was reached in 2020 where 299 MW of solar and 831 MW of wind was put into service. These capacity values were converted to energy values assuming a 30% capacity factor for wind and a 25% capacity factor for solar as utilized in the PJM Offshore Wind Transmission Study.

annual renewable additions of this amount persisting into the future, compared against Illinois' renewable demand forecasted under CEJA. The bar on the right quantifies potential renewable resources available in the queue as measured by their requested in-service dates, although this likely overstates the available projects considering that only 21% of the requested queue capacity ultimately reaches commercial operation PJM.[84] As indicated in the figure, Illinois is projected to be slightly short of meeting projected renewable demand if queue throughput is not accelerated beyond the historical record pace of 2.8 TWh.[85]

FIGURE 21: INTERACTION BETWEEN QUEUE THROUGHPUT AND RENEWABLE DEMAND IN ILLINOIS



Sources and Notes: PJM queue throughput data from PJM Interconnection, New Services Queue, accessed August, 2022. MISO queue throughput data from MISO, GI Interactive Queue, accessed August, 2022. Projected Renewable Demand from CEJA and the applicable load forecast from the IPA Procurement Plan. The range of Renewable Demand from the base IPA load forecast ("low" scenario) and a load forecast taking into account expected load increases due to increased electrification of vehicles and buildings ("high" scenario). Existing Renewable Supply from the total wind and solar generation in 2021 as measured by the US EIA State Energy Data System.

Figure 21 above depicts the necessary queue throughput accounting for all renewable resources sited in Illinois, as compared against the RPS requirement. However, as discussed in Section II.C.4, the majority of the RECs produced in Illinois are not used to satisfy the state's RPS. Despite the production of approximately 21 TWh of generation from wind and solar resources in 2021, compared to an RPS requirement of 23 million RECs (or 23 TWh of generation), Illinois had claim to only approximately 3 million of the RECs produced there.[86] This disparity has implications for the assessment of the capability of the interconnection queue.

In order to meet its RPS requirements under these standards, Illinois will need to procure eligible new resources in quantities that do not account for a large portion of in-state renewable generation. Namely, as shown in Figure 22 below, when excluding renewable generation not

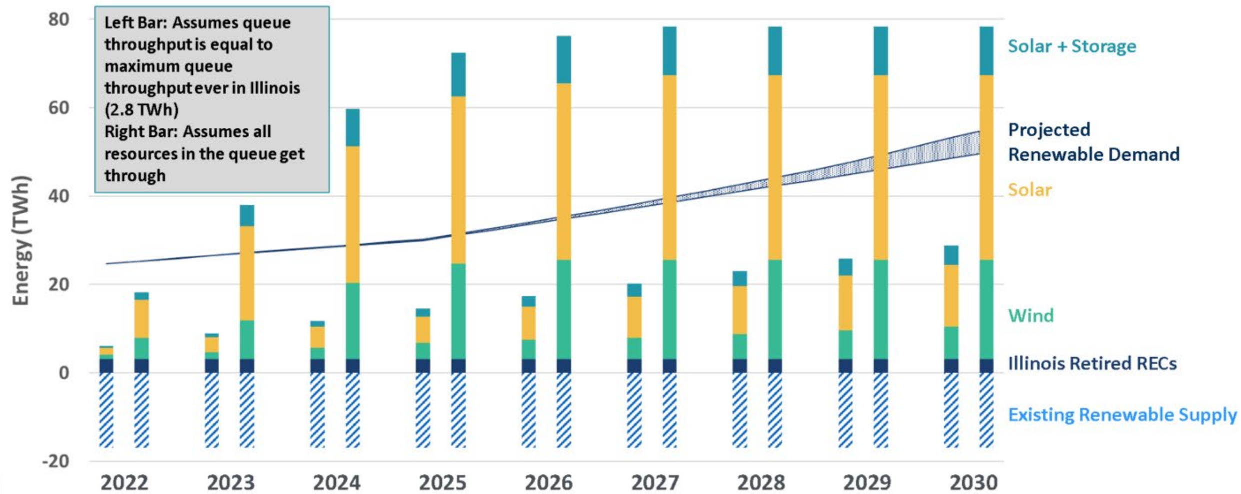
[84] PJM, 2021 RTEP, at 92.

[85] In particular, Illinois is projected to be short of its RPS goals by 2.8 TWh using the "low demand" scenario and 7.5 TWh using the "high demand" scenario.

[86] *See* Figure 11.

retired for compliance with the state's RPS goal, the required queue throughput increases substantially. If renewable throughput within Illinois continues at the historical rate of 2.8 TWh/yr, even assuming the entirety of these incremental additions are retired for RPS purposes, Illinois will fall 20–24 TWh short of RPS requirements in 2030.

FIGURE 22: ILLINIOIS QUEUE THROUGHPUT ACCOUNTING FOR RPS-INELIGIBLE RECS



Sources and Notes: PJM queue throughput data from PJM Interconnection, New Services Queue, accessed August, 2022. MISO queue throughput data from MISO, GI Interactive Queue, accessed August, 2022. Projected Renewable Demand from CEJA and applicable load forecast from IPA Procurement Plan. The range of Renewable Demand comes from the base IPA load forecast ("low" scenario) and a load forecast taking into account expected load increases due to increased electrification of vehicles and buildings ("high" scenario). Existing renewable generation from the total wind and solar generation in 2021 as measured by the US EIA State Energy Data System. REC acquisition data for PJM from PJM GATS, accessed November 15, 2022. REC acquisition data for MISO from M-RETS Certificate Statistics Public Report, accessed November 15, 2022. The amount of Retired RECs in Illinois is as for June 2020 to May 2021 for the PJM-served portion of the state and for June to December, 2021 for the MISO-served portion of the state.

One source of potential queue delays raised through the REAP analysis is the lack of coordination of studies with neighboring RTOs who may also be impacted by interconnection requests. These studies are called "affected system studies," and the issues with these studies are "well-established" including lack of consistency between ISOs, lack of timeliness, and unclear specification of the rules and assumptions surrounding these studies.[87] Reforms are currently ongoing to affected system study processes as part of FERC's generator interconnection NOPR, which proposes to implement a standardized affected system study process between ISOs, including requirements related to timing, data provision, scheduling, a "first-ready, first-served" approach, and construction agreements.[88]

In addition to or in the absence of FERC reform, PJM and MISO could emulate the MISO-SPP JTIQ process, which sought to "address the significant transmission limitations restricting the

[87] *See Improvements to Generator Interconnection Procedures and Agreements*, Notice of Proposed Rulemaking, 179 FERC ¶ 61,194 at PP 167, 179–181 (2022).

[88] *Id.* at PP 184–191.

opportunity to interconnect new generating resources near the MISO-SPP seam."[89] The JTIQ identified a seven-project portfolio, enabling interconnection of 28–53 GW of additional resources at less than half the cost that what be incurred under the RTOs' individual generation interconnection processes.[90] Illinois should continue evaluating revisions and updates to affected system studies, including through FERC's NOPR process, to improve the efficiency of interconnection studies near the PJM-MISO border.

2. PJM Interconnection Queue

Significant increases in queue activity have stressed many aspects of the Interconnection Queue Study Process in PJM, threatening the achievement of region-wide clean energy goals. Existing complexities and delays are the focus of an ongoing reform effort targeted at revising PJM's current sequential queue study process, and minimizing the repeat studies created by this framework. Under the current process, PJM often revises queue studies to account for project withdrawals and the required re-studies. The convergence of these factors has created a substantial queue backlog in PJM, challenging the rapid deployment of the clean energy resources seeking system access.

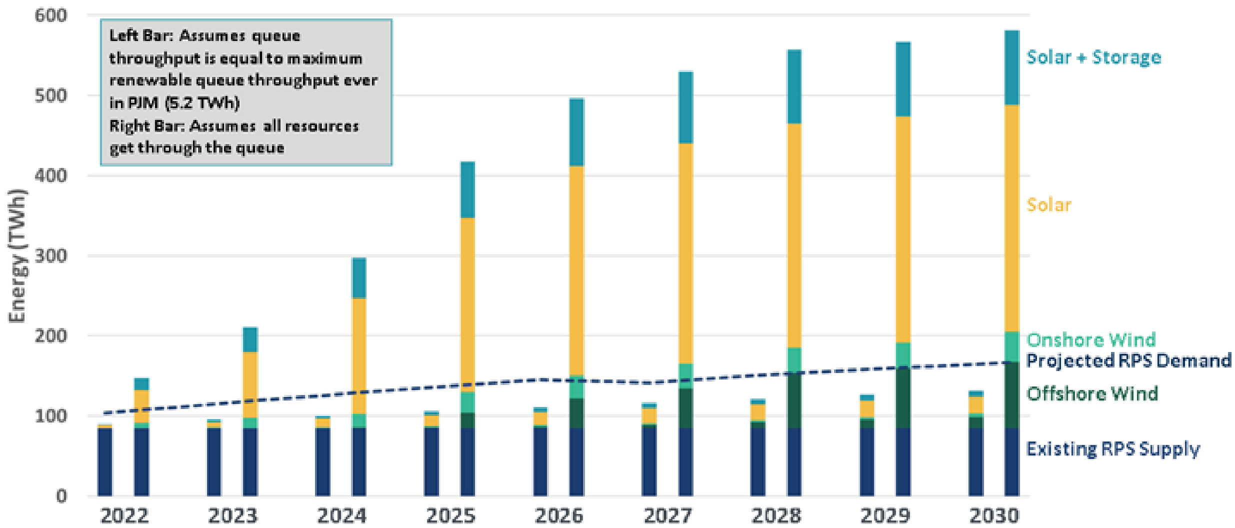
Figure 23 overlays the projected renewable throughput in PJM compared to the demand for clean resources as measured by RPS obligations throughout the region. The bar on the left for each year sets queue throughput at the level of the maximum historical renewable throughput in PJM. In 2021, PJM approved the equivalent of 5.2 TWh of renewable resources for interconnection through the queue.[91] The bar on the right for each year shows the capacity of renewable resources in the queue with an in-service date on or before the year of interest. As shown in the figure, the annual integration of 5.2 TWh of renewable energy will not be sufficient for the member states within PJM to meet their RPS goals. PJM is projected to be 33 TWh short of its RPS demand by 2030 if the queue throughput stays at current levels.

[89] Southwest Power Pool and MISO, Joint Targeted Interconnection Queue Study, Executive Summary, (March, 2022); Pfeifenberger, *Generation Interconnection and Transmission Planning*, ESIG Workshop Presentation, (August 9, 2022) at 9.

[90] *Ibid.*

[91] This comes from 1,175 MW of solar and 1,009 MW of wind. Capacity values are converted to energy values using a 30% capacity factor for wind and a 25% capacity factor for solar as utilized in the PJM Offshore Wind Transmission Study.

FIGURE 23: COMPARISON BETWEEN QUEUE THROUGHPUT AND RENEWABLE DEMAND IN PJM



Sources and Notes: Queue throughput data from PJM Interconnection, New Services Queue, accessed August, 2022. Projected RPS Demand from PJM Interconnection, Energy Transition in PJM: Frameworks for Analysis Addendum, (December 15, 2021) at 2. RPS Demand is increased to account for the updated RPS goals in Illinois as a result of CEJA. Existing RPS Supply includes capacity of solar and wind resources in PJM in 2021 from the 2021 PJM State of the Market Report, along with quantity of retired RECs from other RPS-eligible resources from the PJM-GATS .

Partially in response to these concerns, as well as others detailed in the first draft REAP, PJM is pursuing substantial reforms to its interconnection study process.[92] PJM's proposed process is cluster-based, and conducted on a "first-ready, first-served" basis rather than on a "first-come, first-served" basis, with the readiness of applicants determined by the achievement of certain site control measures and confirmed by increasingly stringent financial commitments.[93] In addition, PJM proposes financial readiness deposits, pre-defined withdrawal timelines, and inter-queue cost allocation to mitigate issues causing delay under the *status quo*.[94] These proposed revisions were approved in November, 2022, and have not yet been implemented.[95]

However, the PJM interconnection queue continues to accrue a backlog of existing queue requests that will need to be reviewed prior to initiation of any improved interconnection process for new queue requests. As shown in Figure 24, no projects that entered the queue in 2021 or later have completed a single queue study, and projects from 2017 have still yet to complete the Facilities Study. As contemplated in PJM's reform proposal, these resources will be studied under a series of transition study cycles, which may extend well into 2026.[96]

92 *See* first draft REAP at 44–46.

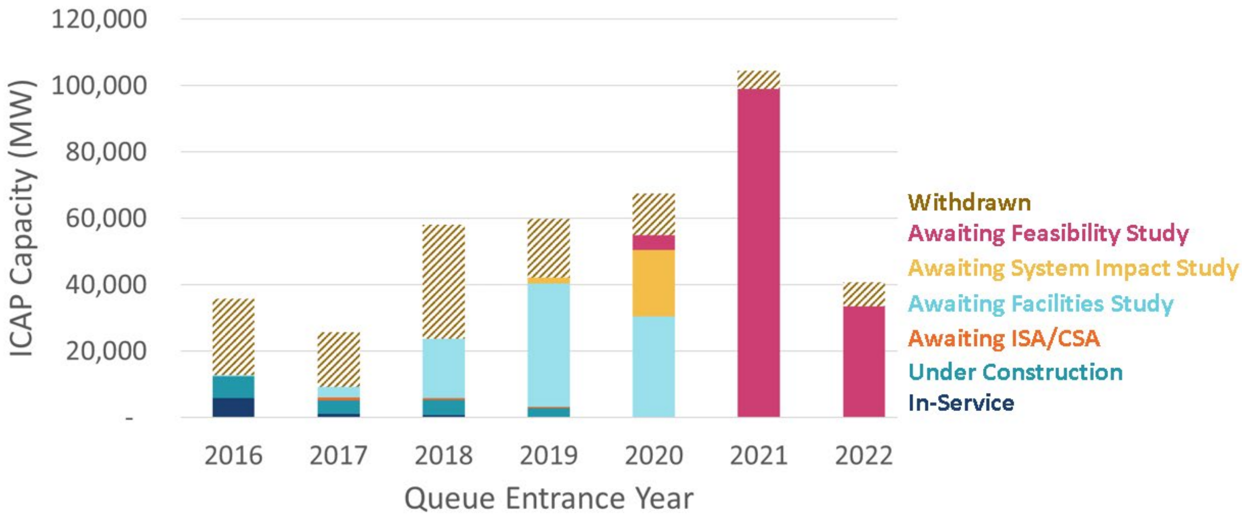
93 PJM, Interconnection Process Reform, (April 27, 2022) at 5.

94 *See* first draft REAP at 44–46.

95 181 FERC ¶ 61,162 (2022).

96 *See* PJM, Transmittal letter, FERC Docket No. ER22-2110, Tariff Revisions for Interconnection Process Reform, (June 14, 2022).

FIGURE 24: PJM INTERCONNECTION QUEUE BACKLOG BY STUDY PHASE



Sources and Notes: Data from the PJM New Services Queue, accessed August, 2018.

The ongoing reforms to PJM's queue process introduce a high degree of uncertainty about the effectiveness of PJM's new process approved by FERC. Accordingly, while this iteration of the REAP can identify the likely shortcomings of the PJM queue to meet regional clean energy needs, specific recommendations would be premature at this time. Illinois should continue monitoring the approval and implementation of PJM's now-approved interconnection process reforms, and future REAP updates should provide more specific recommendations once the reformed process is underway.

Another avenue for potentially improving the availability and utilization of system capability is by making the unused portion of an existing interconnection customer's interconnection service (so-called "surplus interconnection service" available to interconnect new resources. This "surplus" is the still-available energy or capacity at the points of interconnection of existing generators, many of which are scheduled to retire. PJM currently provides only very limited ability to use surplus interconnection service, and no ability to use this service to enable transfer of the interconnection capability of retiring generators to new resources. Surplus interconnection service in PJM is only available for resources that do not create any "material impacts on the transmission system."[97] PJM provides a list of use-cases that are presumed to create material adverse impacts without further consideration or analysis, which limits the sharing of energy or capacity interconnection capability between aging fossil plants that are rarely dispatched (or dispatched only during low renewable generation levels) and renewable generation or storage resources.[98] PJM rules also specifically prohibit the use of this service if the existing generator plans to retire prior to installation of the resource seeking to utilize the surplus capability.

[97] PJM Manual 14G at § 1.9 (iii).

[98] *Id.* at § 1.9.

Further, the facility using surplus capability can only operate for up to one year after any existing facility goes out of service.[99]

While PJM rules were designed for capacity rights associated with existing generators to return to the system after a resource is retired, there is also the ability for retiring resources to sell their interconnection capability (known as Capacity Interconnection Rights or CIRs) once the unit retires.[100] These processes are not necessarily designed to make headroom from retiring resources, or from resources anticipated to retire with low usage rates, available for priority use of resources meeting Illinois' policy goals. MISO and PJM should therefore develop or enhance existing mechanisms for coordinating the redeployment of transmission headroom from retiring fossil resources for new renewables or expedite renewable deployment through the use of Level 1 REAP zones.

3. MISO Interconnection Queue

The MISO interconnection queue has responded to its increased interconnection requests somewhat more effectively than PJM. This is likely in part due to past interconnection queue reforms that were implemented in 2012 and 2016.[101] These reforms sought to address queue delays, backlogs, and project cancellations. Similar to PJM's most recent proposal, MISO shifted application processing from "first-come, first-served" toward a "first-ready, first-served" approach. The reforms were effective in 2016 to reduce the process timelines, but increasing queue volume pushed the duration to increase again over the last few years.[102] The upcoming transition to a clean electricity grid across MISO-served territory will necessitate the interconnection queue to be able to respond to increased requests at a similar rate, if not a faster rate, compared to historical levels.

Figure 25 below illustrates the demand for renewable resources, in particular solar and wind, along with the projected queue throughput of these renewable resources. The bars on the left for each year illustrate projected queue throughput as set to the maximum renewable energy to historically get through the queue in a single year.[103] The bars on the right for each year illustrate the total energy capability of all renewable resources that have entered the queue with a requested in-service date in or before the year of interest. The range for renewable demand

[99] *Id.* at § 1.9.2.

[100] *Id.* at § 4.4.

[101] FERC Docket No. ER12-309, ER16-471.

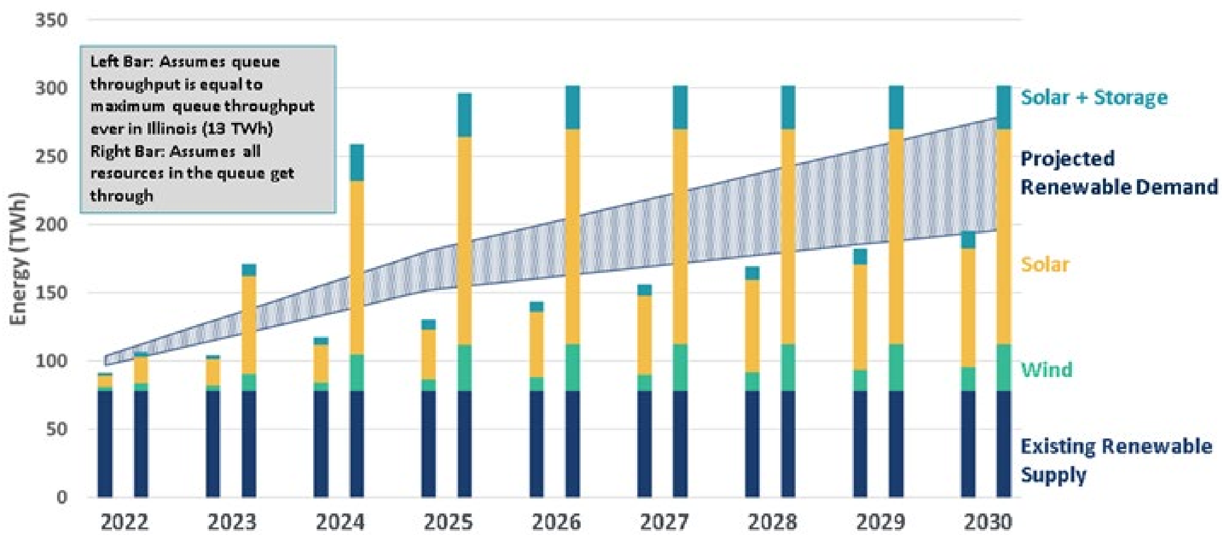
[102] J. Rand, W. Gorman, D. Millstein, *et al*., Lawrence Berkeley National Laboratory, Queued Up v2: Extended Analysis on Power Plants Seeking Transmission Interconnection as of the End of 2020, (February, 2022).

[103] This is set at 13 TWh coming from 1,008 MW of solar and 4,118 MW of wind which passed through the queue in 2020. These capacity values were translated into units of energy using a capacity factor of 30% for wind and 25% for solar.

comes from the demand for wind and solar in the MISO futures report for the "Future 2" and "Future 3" scenarios.[104]

Developer interest in MISO is sufficient to meet its renewable energy demand in the whole range of renewable demand needs, and historical annual renewable throughput, which reached a maximum of 13 TWh in 2020, indicates queue performance is likely not a major barrier to achieving renewable penetration targets across MISO. In addition, MISO's queue throughput is impacted in part by delays in PJM, where anticipated improvements could assist the timeliness of the MISO queue studies. Although the historical queue throughput rate may not be sufficient to meet the high end of the renewable demand range, minimal modifications will likely be required in MISO in order to adequately process renewable interconnection requests in the coming years. Further, although not directly impacting the pace of the interconnection queue, MISO's approved LRTP projects are anticipated to facilitate the interconnection of 53 GW of new renewables, which may improve study timelines by providing additional system availability.

FIGURE 25: COMPARISON BETWEEN QUEUE THROUGHPUT AND RENEWABLE DEMAND IN MISO



Sources and Notes: Queue Throughput data comes from the MISO GI Interactive Queue (accessed August 2022). Renewable Demand is derived from the MISO Futures Report as described above. Existing Renewable Supply is derived from the 2021 MISO State of the Market Report. Capacity Values of 30% for wind resources and 25% for solar resources are used to convert capacity values to energy values.

Similar to PJM, MISO provides processes for use of surplus interconnection service, but does so with a higher degree of flexibility. While MISO (like PJM) also requires facilities seeking surplus

[104] MISO, Futures Report, (December, 2021) at 68–69 and 80–81. The capacity values presented in the MISO Futures Report are converted to units of energy using a 30% capacity factor for wind resources and a 25% capacity factor for solar resources. The "Future 2" Scenario assumes 1) all state and utility-level RPS/IRP goals are met, 2) electrification leads to a 1.1% annual energy growth rate and 3) a 60% carbon dioxide reduction. The "Future 3" Scenario assumes 1) all state and utility-level RPS/IRP goals are met, 2) electrification leads to a 1.7% annual energy growth rate, 3) an 80% carbon dioxide reduction, and 4) a minimum penetration of 50% for solar and wind resources. For more information on the assumptions used in the MISO Futures Report, *see Ibid*. at 3.

interconnection service to have no material impact on the transmission system,[105] MISO will study to ensure there are no material system impacts (rather than presume such impacts). "Energy displacement agreements" between existing generators and proposed new resources to jointly use existing generation interconnection capability are used to ensure that the total amount of interconnection service utilized at the point of interconnection remains the same. MISO allows generators to proceed through a replacement request process analogous to a generation owner re-using CIRs in PJM.[106] MISO has recently adopted revisions allowing more flexibility in the timing of surplus requests, which was noted by FERC in its recent generator interconnection NOPR.[107]

FERC is likely to propose additional revisions to surplus interconnection service as part of this interconnection NOPR proceeding.[108] Understanding the significant potential for beneficial use of headroom from retiring or low-capacity-factor units under emissions limitations, this REAP recommends continuing to advocate for processes that would maximize the availability of this headroom for policy resources, as explained further below.

C. RTO Transmission Planning Processes

Section IV.A above discussed the ideals for proactive transmission planning to help meet policy goals and other transmission needs, and identified MISO's LRTP and MVP process as a model. As noted, PJM's transmission planning process is less developed when it comes to proactive, long-term, and multi-value planning. The sections below describe each RTO's process further and provides observations about opportunities to improve or better leverage these processes.

1. MISO Transmission Expansion Plan (MTEP)

MISO plans expansions and enhancements to the regional transmission grid through the MISO Transmission Expansion Plan (MTEP). The MTEP includes analysis of several criteria that can drive transmission projects, including reliability, market efficiency, and LRTP and MVP processes. As discussed above, MISO's LRTP is a multi-value process that incorporates applicable public policies, including an assessment of the public policy resource additions needed in the future. Use of candidate renewable energy zones provides an additional source of inputs to assist MISO in developing the MTEP and LRTP plans.

MISO's planning process focuses on development of several "Futures" (or scenarios) to "align with the ongoing rapid transition" and "better incorporate the plans of MISO's members and

[105] MISO Tariff attachment X at § 3.2.3.

[106] *Id.* at 3.7.

[107] *See* Improvements to Generator Interconnection Procedures and Agreements, Notice of Proposed Rulemaking, 179 FERC ¶ 61,194 at P 260 (2022).

[108] *Id.* at P 264.

states."[109] Development of these Futures also creates opportunities for MISO's multi-value-based approach to planning MVPs. MISO's LRTP process evaluates a broad range of benefits of MVPs, holistically evaluating costs against benefits to create a net beneficial portfolio of projects for the region, with net benefits that provide for overall cost reductions and reliability improvements. In early 2022, MISO released "Tranche 1" of its LRTP-based MVP portfolio, which provides a benefit-to-cost ratio of 2.6 to 3.9 across the entire MISO footprint. These multi-value projects were developed in response to MISO's *Futures Report*, which created detailed long-term scenarios of likely resource development throughout the footprint.[110] The portfolio developed as part of LRTP Scenario 1 addresses Future 1, which sought to capture MISO states' current policy requirements, meeting then-applicable RPS targets when added to existing capacity and existing headroom.[111]

MISO's approach to multi-value transmission planning is often viewed as a model for other regions.[112] Consistent with the initial REAP's recommendations of considering additional refinements of Future scenarios, MISO is reviewing changed public policies and other changed circumstances in a pending Futures update. This futures update process provides a ready-made venue for REAP zones to be considered and acted upon in MISO's regional transmission planning process. However, the selection of Tranche 1 projects to address public-policy needs is the first MISO MVP portfolio in approximately a decade, and only the second portfolio since the approval of the first MVP portfolio of projects in 2011. While we understand that MISO is already in the process of evaluating the a second tranche of MVPs, MISO should ensure that future updates to the scenario planning process do not result in a similar delay before the selection of the next tranche of multi-value projects. We recommend that the proactive multi-value planning framework not be limited just to MVPs, but be applied more broadly to MISO's other transmission planning and generation interconnection processes, such as has been done in the JTIQ study process with SPP (which proactively evaluated both generation interconnection- and congestion-related benefits).

2. PJM Regional Transmission Expansion Plan (RTEP)

PJM plans expansions and enhancements to its regional transmission grid through the RTEP process. The RTEP includes separate analyses of several drivers of transmission projects, including regional reliability, market efficiency, and local reliability needs. While the RTEP includes certain provisions allowing for the consideration and evaluation of public policies, these avenues have largely remained dormant. In addition, there is very limited overlap between the RTEP and the PJM interconnection processes, with only resources having received signed

[109] MISO, 2021 MTEP at 47.

[110] MISO, MISO Futures Report, (December, 2021) at 44; MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, (March 29, 2022) at 12.

[111] MISO, 2021 MTEP at § 3.2.

[112] J. Pfeifenberger and J. DeLosa, Proactive, Scenario-Based, Multi-Value Transmission Planning, presented to PJM Long-term Transmission Planning Workshop, (June 7, 2022); MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, (March 29, 2022).

Interconnection Services Agreements (ISAs) being included in PJM's reliability planning assumptions.

In addition to solving reliability needs, the RTEP includes other drivers of system expansion including Market Efficiency, Transmission Owner Criteria, and Supplemental Projects. PJM's Market Efficiency analysis seeks to improve system operations by solving areas of persistently high congestion, but only assumes limited future resource additions, by only including resources with executed ISAs in RTEP assumptions.[113] Transmission Owners develop their own criteria (mostly reliability criteria) as filed with FERC under Form 715, which yields baseline transmission needs that are included in the RTEP.[114] As discussed further below, public policy needs are not directly identified through the RTEP, unless a state independently requests specific policies to be included, and accepts associated cost responsibility through the State Agreement Approach (SAA).

Any need identified by a Transmission Owner not required to comply with any of these other criteria is addressed through a Supplemental Project.[115] For example, in 2020 ComEd developed $327 million of Supplemental Projects to address ComEd's local reliability criteria, while PJM approved only $0.3 million in regional "baseline" projects within the ComEd zone.[116] Since 2010, ComEd has developed $1.8 billion of these Supplemental Projects and recovered the costs from Illinois ratepayers alone.[117] This divergence of (local) supplemental and (regional) baseline projects raises the concern that the supplemental projects approved by PJM's local transmission owners with little PJM review may pre-empt more cost-effective regional or multi-value solutions. Similarly, little analysis is done as to the extent to which interregional solutions (*e.g.*, jointly with MISO) would offer more cost-effective solutions to transmission and generation interconnection needs.

PUBLIC POLICY PLANNING

PJM's governing transmission planning documents provide several little-used provisions that potentially enable the consideration of public-policy needs in the existing regional planning process. Despite the existence of these potential avenues, the RTEP process has not been used to consider public policy without the specific initiation of a state, and does not enable PJM to identify on its own any public policy needs that could be solved through the RTEP.

In 2011, FERC's Order 1000 required RTOs to "describe procedures that provide for the consideration of transmission needs driven by Public Policy Requirements in the regional transmission planning processes."[118] In response, PJM added provisions to its RTEP enabling the

---

[113] *See* PJM Manual 14B at § 2.6.

[114] *See id.* at § 1.4.1.4.

[115] *See* PJM Tariff, Attachment M-3.

[116] *See* PJM 2020 RTEP, Book 1 at 262.

[117] *Id.* at 261.

[118] Order No. 1000, 136 FERC ¶ 61,051 at P 203 (2011).

consideration of Public Policy Requirements and Public Policy Objectives in February of 2012.[119] Specifically, the updated process focused on an initial assumptions meeting, where states along with other stakeholders could submit public policies into the assumptions phase of the planning process.[120] In approving these revisions in 2012, FERC explained that it was providing "PJM the ability to look at potential future Public Policy Objectives when evaluating existing (non-public policy) projects in the regional transmission plan."[121] Unfortunately, these initial meetings have not been particularly successful in gathering actionable assumptions about regional public policy needs. PJM's RTEP planning Manual only has a single reference to this initial meeting and provides no clear process for submission of public policy assumptions for use in its RTEP process.[122]

Shortly thereafter, PJM states created the Independent State Agencies Committee (ISAC), which consists of state agencies throughout the PJM footprint. The ISAC Charter sets out its responsibility for providing input to PJM, but formal ISAC meetings typically focus on existing PJM regional reliability planning efforts, instead of evaluation of any state public policies.[123] Importantly, PJM has noted that its revisions for considering needs based on public policy assumptions do not include frameworks for acting upon these needs.[124] Language in PJM's Operating Agreement casts doubt on whether pathways exist for the approval of transmission projects that would be driven, primarily or in part, by public policy needs.[125]

Despite FERC's desire to enable the integration of policy needs into regional transmission planning, there has only been one meaningful PJM planning effort that was targeted to the development and potential implementation of transmission projects in response to public policy. This process was initiated in November of 2020, when New Jersey requested that PJM initiate the SAA in response to their offshore wind goals.[126] This effort concluded in October of 2022,

---

[119] 139 FERC ¶ 61,080 (2012). ("Public Policy Requirements" shall refer to policies pursued by state or federal entities, where such policies are reflected in enacted statutes or regulations, including but not limited to, state renewable portfolio standards and requirements under Environmental Protection Agency regulations. "Public Policy Objectives" shall refer to Public Policy Requirements, as well as public policy initiatives of state or federal entities that have not been codified into law or regulation but which nonetheless may have important impacts on long term planning considerations. *Id.* at n.4.)(April 2012 Order).

[120] PJM Operating Agreement Schedule 6 § 1.5.6(b).

[121] 139 FERC ¶ 61,080 at P 19 (2012).

[122] PJM Manual 14B at 50.

[123] *See* ISAC Charter. *See* PJM ISAC Webpage.

[124] April 2012 Order at n. 36 ("PJM explains that: '[it] is not proposing to include any decisional frameworks in this filing that would describe the procedures by which transmission needs driven by Public Policy Requirements would be identified or acted upon. Any such decision frameworks addressing transmission needs driven by Public Policy Requirements are still being discussed in the stakeholder process and, if endorsed, would be included in a subsequent filing.'")

[125] *See* PJM Operating Agreement Schedule 6 § 1.5.10(b) ("A Multi-Driver Project may contain an enhancement or expansion that addresses a state Public Policy Requirement component only if it meets the requirements set forth in the Operating Agreement, Schedule 6, section 1.5.9(a) [describing the State Agreement Approach]").

[126] *In the Matter of Offshore Wind Transmission*, Order, NJ BPU Docket No. QO20100630 (November 18, 2020).

resulting in the selection of a suite of upgrades to the existing PJM grid to enable interconnection of an additional 6,400 MW of offshore wind resources, reducing generation-interconnection costs by approximately two-thirds and saving New Jersey ratepayers over $900 million in offshore-wind-related transmission costs.[127]

Through the course of this REAP investigation, it was confirmed that PJM's Order 1000 Compliance filing does not allow for the inclusion of any PJM-identified public-policy needs in the regional transmission plan without a state (or group of states) first agreeing to bear 100% of the costs of such upgrades through the State Agreement Approach. Accordingly, the avenues set out by PJM for consideration of state public policy requirements will not result in an efficient regional planning process and grid expansion, and will fail to address public policy needs without the express written request and assumed cost responsibility by a state. Accordingly, until the NOPR reforms result in improvements to PJM's planning process that enable inclusion of public policy needs as a transmission driver, this iteration of the REAP must detail and explore the only currently-available pathway for addressing public policy needs in PJM: the SAA.

3. PJM State Agreement Approach

Unlike holistic public policy planning, which would provide for the submission and consideration of planning assumptions by PJM, the SAA allows for states to lead the evaluation and selection of specific transmission projects to address their public policy needs. In exchange, the sponsoring state is responsible for all costs of the selected SAA projects.[128]

The New Jersey Board of Public Utilities recently completed PJM's first SAA to plan transmission for integrating an additional 6,400 MW of offshore wind. This experience has provided insight into how the SAA can be used and its potential benefits. For example, an initial interim step taken in the SAA process clarified many outstanding regulatory questions, including how to reserve interconnection capability at a selected location for priority use by the state's selected generating resources.[129] Use of this reserved "SAA Capability" requires close coordination between the state and PJM, to ensure that incremental transmission headroom created with SAA investments for this purpose is efficiently allocated pursuant to the state's public policy.

In addition, the SAA provides an avenue for interested states to identify more cost-effective holistic transmission solutions and accelerate the overall timeline of renewable development, by sponsoring portfolios of transmission projects directly in the regional plan. State selection of any SAA project allows that project to begin the years-long process of siting, engineering, and construction associated with high-voltage transmission. Advancing construction timelines may improve overall project and generation interconnection timelines; even though generators need to advance through the PJM queue, upgrades can begin once any SAA project is approved, and generators assigned SAA capability may be eligible to use PJM's fast-track interconnection

---

[127] *In the Matter of Declaring Transmission to Support Offshore Wind a Public Policy of the State of New Jersey*, Order, NJ BPU Docket No. QO20100630 (October 26, 2022), at 61–62 (SAA Order); SAA Evaluation Report at 90.

[128] PJM Operating Agreement Schedule 6 § 1.5.9(a).

[129] 179 FERC ¶ 61,024 at P 46 (2022).

process included in PJM's queue reform proposal. In the midst of delays forecasted for PJM's interconnection reform process, described above, the SAA may thus have several advantages including accelerating achievement of Illinois state policy or feasibility of candidate renewable energy zones in the short term.

While there are timing, cost-effectiveness, and certainty benefits to pursuing needed transmission under the SAA, there are also material challenges. Initially, it is unclear whether there is legislative authority in Illinois to authorize initiation of an SAA and pursue specific transmission projects under the PJM SAA.[130] Further, any single-state SAA requires that state to fund the entire costs of any associated projects—including any upgrades that PJM may identify in other states. A single-state SAA does not provide any benefits of incorporating the public policy needs of other states, thereby limiting the economies of scale and consideration of countervailing flows that would be major benefits and sources of cost reduction of a coordinated public policy planning process.

Larger difficulties must be addressed before considering a multi-state SAA, but discussion of this potential avenue has been contemplated, including by New Jersey.[131] The benefits of such a multi-state SAA are clear, with PJM's OTSG study demonstrating significant interconnection-related cost reductions from evaluating a larger suite of public policy interconnection needs across several states. However, any multi-state SAA would require a large degree of regulatory coordination at each step of the process, both within the participating states, and between those states and PJM. It is likely that each state would need to specify, on its own, its individual desire to participate in the SAA, and detail the specific public policy objectives to be planned for by PJM, along with their willingness to accept cost allocation. Once a group of participating states signals such interest, it is anticipated that an agreement on cost-allocation, evaluation and selection process, and other details would be needed amongst the participating states. These details include agreement on issues such as SAA scope, solicitation structure and timing, evaluation criteria and process, selection (threshold) criteria, cost allocation provisions, use of and rights to any selected facilities, and others.

Although this second draft REAP does not specifically recommend Illinois begin an SAA process, there may be substantial benefits in coordinating the headroom study, identified in Section III above, with PJM. As detailed by the NJ BPU, PJM performed a headroom study ahead of New Jersey's initiation of the SAA, to assist BPU staff with identification of the potential benefits of an SAA, and the necessary specifics underlying the eventual New Jersey request.[132] This process should be similarly available to Illinois. In addition, ICC staff should continue to pursue discussions with other interested states, including by providing the potential options for multi-state implementation described above.

[130] New Jersey specifically passed legislation authorizing the New Jersey Board of Public Utilities (Board) to conduct a transmission solicitation for offshore wind. *See* L. 2019, c. 440 (January 21, 2020); N.J.S.A. 48:3–87.1(e).

[131] SAA Order at 67–68, 73.

[132] SAA Order at 21–22.

Despite falling short of a true regional public policy planning process, with the potential for needs centrally identified and solved in the most cost-effective manner, this REAP finds that both a Illinois-only SAA and a multi-state SAA are beneficial pathways currently available under approved PJM market rules should Illinois aim to capture the efficiencies of incorporating SAA benefits and several states' public policies into a single planning effort. Unlike an Illinois-only SAA, a multi-state SAA, however, introduces much uncertainty related to the many aspects of the process, including conducting the solicitation window, sharing costs, retaining transmission rights, and evaluating submitted proposals.

In comparison, a single-state SAA provides Illinois a higher degree of control over the procurement, selection, and outcomes of public policy transmission projects designed uniquely for Illinois' identified policy needs, but its narrower scope would limit available efficiency benefits and require Illinois to bear all associated costs. While ICC staff should continue advocating for a more optimal holistic regional transmission planning process (*e.g.*, one similar to MISO's LRTP and MVP process), even initial pursuit of a single- or multi-state SAA has informational benefits to ICC staff, including identifying locations where headroom should be available on the PJM grid in Illinois. These initial studies do not obligate the ICC to proceed with a project solicitation or selection, but will lay the groundwork for capturing any potential benefits identified by the studies.

D. REAP Findings and Recommendations

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

Current RTO interconnection processes are one of several immediate barriers to achievement of Illinois' CEJA mandates, particularly for resources seeking development in PJM. Though there are opportunities for reform over the medium and long term, PJM queue delays are likely to limit the ability to rapidly deploy resources for Illinois and other PJM states' needs. MISO's maximum annual renewable interconnection is approximately three times' that of PJM, but will also need to increase its pace of interconnection to support anticipated demand. While both RTOs continue to work on reforms to their processes, MISO and PJM should also develop or enhance existing mechanisms for coordinating the redeployment of transmission headroom from retiring fossil resources for new renewables or expedite renewable deployment through the use of Level 1 REAP zones.

Transmission planning processes in MISO are able to incorporate renewable resource and fossil emission phase out requirements in CEJA, and have a process for regularly evaluating these needs through its long-term plan. PJM's planning processes do not regularly evaluate, identify, or incorporate state policy requirements as transmission drivers, though PJM plans to initiate a reform process that aims to achieve a more efficient long-term, scenario-based regional plan that includes consideration of public policies. Level 2 REAP zones adopted by ICC can be submitted to MISO for consideration in its processes, and used to inform ongoing reform advocacy within PJM.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

4.A Provide Input on Policy Requirements and REAP Zones to MISO Transmission Planning Studies. ICC staff can continue to provide input into MISO's transmission planning processes, including requesting incorporation of any approved Level 2 zones in future updates to MISO Futures.

4.B Advocate for Reform in PJM Transmission Planning Processes to Ensure that Illinois and All States Can Cost-Effectively Achieve Decarbonization Goals. ICC staff can continue supportive efforts, including in PJM stakeholder processes and FERC dockets, to reform the regional pursuit of more cost-effective transmission solutions to wide-scale regional clean energy needs. Immediate efforts can focus on the PJM Master Plan setting out PJM's proposed vision for scenario-based long-term transmission planning, the FERC Notice of Proposed Rulemaking (NOPR) issued in April of 2022, and encouraging PJM's implementation of any requirements of the outcome of the NOPR (including a final rule) in a manner that incorporates and enables achievement of public policy, including as a driver in PJM's Regional Transmission Expansion Plan (RTEP).[133] While the NOPR and Master Plan document are meaningful steps toward requiring portfolio-based transmission planning, the likely timeframe for implementation will not allow these reforms to meaningfully impact the short-term policy needs identified in this second draft of the REAP. ICC staff can also continue participating in related PJM studies and efforts that will inform Illinois and other state policymakers about transmission needs and the most advantageous transmission planning reform efforts such as in ongoing Offshore Wind Study Group and Illinois Retirement Study processes.[134]

4.C Advocate for Interconnection Reforms. ICC staff can continue supportive efforts, including in stakeholder processes and FERC dockets, toward improving interconnection processes to ensure that both RTOs have the ability to meet or exceed the queue throughput that will be required to support all state and consumer policy goals. The most immediate focus can be on monitoring and evaluating implementation of recently approved PJM queue reforms.[135] In addition, further reforms in PJM and MISO may be required as a result of any final rule in FERC's ongoing NOPR proceeding on generator interconnection procedures.[136] This could include emphasizing the need for more proactive transmission planning to reduce reliance on the interconnection process as a way to expand the grid, considering the "connect and manage" interconnection concept, and advocating continuing improvements to affected system studies. In addition to monitoring the outcomes of recently approved reforms, ICC staff can seek further reforms to improve and expedite

---

133 *Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection*, Notice of Proposed Rulemaking, 179 FERC ¶ 61,028 (2022) (NOPR).

134 *See* PJM, Offshore Wind Transmission Study: Phase 1 Results, (October 19, 2021); PJM, Illinois Generation Retirement Study, (August 3, 2022).

135 FERC Docket No. ER22-2110; 181 FERC ¶ 61,162 (2022).

136 *See Improvements to Generator Interconnection Procedures and Agreements,* Notice of Proposed Rulemaking, 179 FERC ¶ 61,194 (2022) (Generator Interconnection NOPR).

renewable interconnection through the use of Level 1 REAP Zones, the implementation of an improved mechanism to access and redeploy headroom from retiring fossil for renewable resources, or other reforms that may be identified in the headroom analysis under Strategic Element 3 above and are absent from recently approved reform proposals.

4.D **Pursue Joint Interconnect Study.** Facilitating use of identified Level 1 REAP zones may require PJM-MISO coordination to expedite a joint interconnection study modeled on recent Joint Targeted Interconnection Queue (JTIQ) efforts by MISO and Southwest Power Pool. PJM and MISO should similarly facilitate a joint interconnection study, which could occur outside of the purview of PJM's recently-approved queue reform process. This collaborative interconnection study could further address potential concerns of individual generators facing large-scale transmission needs by identifying more comprehensive solutions to a wider range of likely interconnection needs near the PJM-MISO seam, identify opportunities to expeditiously interconnect the large volume of renewable supply currently seeking interconnection in these locations and that may be delayed by affected system studies, and identify opportunities to coordinate the use of transmission headroom that may be freed up by upcoming fossil retirements. This need for an expedited joint review is heightened given Illinois' location on the PJM-MISO seam, the potential for delays in the interconnection studies of one RTO to impact timing of requests in both regions, and the large number of potential fossil retirements in the same regions.

4.E **Consider Pursuing Transmission Development Through PJM's State Agreement Approach.** ICC staff should continue to explore transmission development through PJM's State Agreement Approach (SAA). This SAA could either be a single-state, or (preferably) multi-state effort, in concert with other PJM States, through the Independent State Agencies Committee or other forums.[137] The SAA process could aim to create and illustrate the most desired, repeatable process for long-term, scenario-based planning to be used to meet region-wide policy goals. At the conclusion of the multi-state SAA process, the effort should at a minimum inform ongoing foundational reforms to PJM's transmission planning processes, and, if the outcomes are broadly accepted, the identified transmission solutions can be approved for cost recovery from participating states. Alternatively, if finding the necessary agreements for a multi-state SAA is not possible, ICC could pursue initial steps toward a single-state SAA, which would, even if no project were selected, provide useful information to Illinois to inform future public policy development, including future REAP updates.

[137] *See* Independent State Agencies Committee Charter, (October 1, 2020).

V. Leveraging Regional Electricity Markets & Trade

Another critical element of a viable plan for 100% clean electricity grid is the system of RTO electricity markets that establishes the rules and incentives among which most electricity resource investment and operational decisions are made. There are three general categories of RTO markets: energy, ancillary services, and capacity. Each of these markets will need to be enhanced in order to reliably deliver power at affordable prices as Illinois, other states, and consumers pursue the clean energy transition. In addition to these traditional power markets, states and stakeholders in the PJM region have recently initiated discussions surrounding the potential to introduce a new platform to support cost-effective clean resource procurements.

Some of the RTO market reforms that will advance Illinois' clean energy transition are already in progress, others are proposed, and yet others will be identified over time. In many cases, the reforms needed to support Illinois policy will be needed equally by other states and consumers across both MISO and PJM to enable the clean energy transition. In certain other circumstances, such as those related to the fossil generation phase-out, Illinois faces a unique challenge with respect to how CEJA and other state policies could interact with existing RTO market structures.

The REAP analysis assessed the areas of RTO market enhancement that may be needed to equitably, reliably, and cost-effectively manage transition to a 100% clean grid for Illinois consumers.

A. The Role of RTO Markets in Clean Grid Transition

The two RTOs that serve Illinois, MISO and PJM, play a critical role in the determination of how renewable power can be delivered to Illinois consumers reliably and affordably. In addition to planning the development of the transmission system, the RTOs are responsible for setting and implementing reliability standards for the power grid, ensuring sufficient resources will be available to meet reliability needs, and scheduling power plant operations. The RTOs utilize competitive markets to dispatch the most cost-effective set of resources for delivering power reliably to consumers in Illinois and 25 other states across the Midcontinent and MidAtlantic regions, subject to transmission system limits.[138]

For the past decade, the MISO and PJM markets have offered a relatively robust platform to enable and integrate growing levels of renewable and other clean energy supplies, and have pursued a wide range of market enhancements for doing so reliably and affordably. Looking

[138] Other states include Delaware, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, the District of Columbia, Arkansas, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Montana, North Dakota, South Dakota, Texas, and Wisconsin. *See* Market Information: MISO and PJM.

ahead however, the RTO markets will need to undertake a faster pace of reforms and expand their support for meeting policy requirements to support Illinois' transition to 100% clean electricity. Both MISO and PJM have undertaken a number of studies and reform processes that aim to address many components of the clean energy transition, with both MISO and PJM identifying support for state policies and decarbonization as central to their strategic priorities.[139]

This REAP provides an initial assessment of the RTO market enhancements that will be needed to most effectively support Illinois' policy mandates. PJM and MISO are the entities that will need to take primary responsibility for further defining and implementing all of the reforms discussed here (with the possible exception of the regional clean attribute market). Though the state of Illinois does not have an agency with direct authority to approve and implement these essential reforms to these broad regional markets (which are governed under FERC-jurisdictional authority), the ICC and other Illinois state agencies do play a substantial role in shaping the RTOs' organizational priorities and market reforms efforts. Illinois, like other states, can influence and lead the direction of these RTO reform efforts through participation in the Organization of PJM States, Inc. (OPSI) and the Organization of MISO States (OMS); by participating in individual RTO stakeholder committees and task forces; by filing formal comments in FERC dockets; through informal communications with RTO staff; through public agency investigations; and by participating as a voting member under stakeholder governance rules in MISO.[140]

The role of the 2022 Illinois REAP and future updates to the REAP will be to identify RTO market reforms that could enhance the alignment of the RTO markets with Illinois policy. The REAP will aim to identify outstanding analysis that must be conducted by the RTOs or Illinois agencies to fully inform the ICC and future REAP updates; clarify the ICC's understanding of roles, responsibilities, and authorities to implement certain reform activities; and identify authorities that may benefit from clarification by the Legislature.

B. RTO Market Reforms Needed to Align Incentives with Illinois Policy Mandates

Transitioning to a 100% clean electricity grid will be achieved through a number of interrelated policies, some of which have yet to be fully developed and implemented. Several of these policies will interact heavily with the incentives and operations of RTO markets. In many cases, the core functions of the RTO markets to support reliability and economic efficiency will naturally complement Illinois policy requirements, such that ongoing reform activities support higher levels of renewable and clean energy resources in both RTOs. Such reforms can be expected to achieve the required end state as long as the reforms are pursued diligently and proactively. However, in other cases, RTO market incentives will require some more foundational reforms, namely to reconsider the historical practice of remaining indifferent to GHG emissions. This

[139] For example, *see* "MISO Forward" and "PJM Strategy—Powering Our Future" strategic visioning documents for both RTOs.

[140] *See* MISO, Stakeholder Governance Guide; PJM, PJM Governance & Stakeholder Process.

historical practice, if it remains unaltered, will tend to undermine Illinois progress toward GHG elimination (causing increases in reliance on fossil resources outside of state borders, even as Illinois reduces in-state fossil emissions). To prevent such outcomes, Illinois policy will need to be more formally incorporated into the structure of certain RTO markets.

The areas identified in this REAP that may require the greatest level of coordination and reform include: GHG accounting; the phase out of fossil fuels; supporting cost-effective clean resource retention and deployments; and maintaining reliability throughout the clean energy transition.

1. Scope 2 Greenhouse Gas Emissions Accounting

CEJA targets achievement of a 100% economy-wide clean energy economy by 2050, a 100% clean electricity supply by 2050, and a 100% fossil fuel emissions phase out by 2045. To date, Illinois has used aggregated information from the U.S. Energy Information Administration to measure GHG emissions progress.[141] A more accurate and detailed GHG accounting system is likely to be required for several of Illinois' economic sectors in order to fully track and enforce progress.[142]

Accurate accounting of GHG emissions in the electricity sector poses some unique challenges as compared to other sectors. One component of emissions that is relatively straightforward to assess is associated with the Scope 1, or direct, GHG emissions of in-state fossil resources. Scope 1 emissions can be tabulated based on the operations of the fossil plants in question and are the emissions that will be capped under CEJA via the GHG baselines.[143] The Illinois EPA will monitor these emissions and the compliance of resources with the emissions cap through Continuous Emissions Monitoring System (CEMS), emissions testing or fuel usage.[144] This accounting framework is already in place and supports the needs of the Illinois EPA for the purposes of tracking the Scope 1 GHG emissions of the fossil resources subject to the emissions baseline and caps.

A second and more complex component of the Illinois emissions obligation is the Scope 2 upstream, GHG emissions associated with fossil fuel resources that are dispatched within other states in order to serve the electricity consumption needs of Illinois consumers, as shown above in Figure 8. Accurately measuring the emissions obligations embedded within electricity imports will likely require assistance from both MISO and PJM to track the coincidence of energy consumption, emissions rates of the fossil resources dispatched to serve that consumption, and the influence of transmission constraints and transmission losses on the GHG emissions caused by that consumption. An additional complexity relates to the role of cross-border clean energy

---

[141] *See* IL EPA, Climate Change in Illinois—Climate.

[142] For a broad discussion of best practices and accounting methods for GHG tracking *see* F. Palma, G. Michor, G. Doucette, On the Comparison of Greenhouse Gas (GHG) Emissions Estimation Standards, Screaming Power Inc.

[143] Resources' GHG baselines are set based on average emissions over 2018-2020 (except for new plants whose baseline will be determined by the emissions in their first 3 years of full operation); the emissions caps will be enforced on a rolling 12-month average basis.

[144] IL EPA, Guidance Document Private Gas Facility Requirements in SB 2408/P.A. 102-662, at 4.

commitments, particularly given that the majority of Illinois' renewable resources are committed and claimed for supporting the clean energy needs of consumers in other states. PJM interconnection is already publishing a portion of the data that likely will be needed for this purpose, the five-minute nodal locational marginal emissions that measure the incremental GHG emissions caused by consumption at each point in the grid (or avoided by injecting clean energy supply at that point in the grid).[145] Illinois has joined the other OPSI states to request that PJM expand its emissions accounting support to State agencies and consumers, and PJM staff have committed to working with states to implement such an accounting system.[146] MISO has not yet begun publishing similar data, but has begun exploring solutions for tracking emissions data for market transactions by time and location.[147]

The RTOs have the detailed operational data necessary to identify and track all physical emissions in the grid and coincident with Illinois energy consumption. As part of the REAP, ICC staff and consultants have reached out to RTO staff to begin the process of identifying the most valuable GHG accounting data that Illinois can then use to track electricity sector Scope 2 GHG emissions. The data, at a minimum, likely will need to allow Illinois to determine:

- Average emissions produced system-wide, by energy zone, and by state in each 5-minute dispatch interval;
- Marginal emissions at every node and in every 5-minute dispatch interval (noting these data are already published by PJM but are not yet published by MISO);
- Granular data sufficient to build up the calculation for Scope 2 emissions, separately accounting for in-state direct emissions, emissions embedded within imports, and emissions displaced by clean energy exports;
- Apportionment of emissions obligations and avoided emissions to Illinois consumers and consumer classes (particularly to ICC-jurisdictional and non-ICC-jurisdictional consumers) after accounting for clean energy attribute allocations;
- GHG emissions displacement attributable to in-state clean energy resources, particularly to the extent that the associated GHG displacements should be allocated to a subset of Illinois consumer classes or out-of-state buyers that have funded the development or retention of the relevant clean energy resources; and
- Net electricity sector GHG emissions attributable to Illinois consumers and consumer classes.

Throughout the process of collecting and examining what data are available or can be made available by the RTOs, ICC staff will aim to identify accounting practices that can be followed consistently by both RTOs to best support Illinois' policy needs and in alignment with all states across each region in a self-consistent fashion. Separately, CEJA has authorized the creation of

---

145 PJM, Marginal Emission Rate—A Primer.

146 Letter from H. Gray (Organization of PJM States, Inc.) to PJM Board of Managers, January 8, 2021. (OPSI letter)

147 MISO, Energy Ecosystem Evolution, 2021.

carbon-pricing commissions that will investigate the impacts of a sector-based or statewide regional carbon pricing program that could be used to regulate Scope 2 emissions.[148]

2. Fossil Fuel Emissions Cap and Phase Out

As discussed in Section II above, Illinois will impose the phase out of fossil fuel resources over a staged timeframe that will impose a cap on individual fossil resources' GHG emissions. The structure of the fossil phase-out presents several challenges in terms of how it could interact with RTO market structures, as follows.

CHALLENGES WITH INDIVIDUAL ASSET OWNERS' SELF-MANAGEMENT OF GHG CAPS

As of now, individual resource owners that are subject to emissions caps must manage their own GHG emissions output throughout the course of the year, and can do so by making higher energy offer prices to limit dispatch and GHG emissions. The asset owners are subject to substantial uncertainties with respect to the economic conditions that would otherwise drive their generation and emissions, which may cause them to manage their emissions caps inefficiently. The independent market monitors (IMMs) will make a prudency review of whether the energy offers are "too" high (though the review is subject to the same uncertainties as the asset owners' own projections). This system could produce several challenging outcomes such as: (a) asset owners that operate too much early on, thus using up their emissions cap early and potentially inducing RTOs to call "emergency dispatch" later on; (b) inconsistent beliefs and practices that can cause higher-GHG-emitting resources to be dispatched before lower-GHG-emitting resources within Illinois; and (c) the possibility that higher-GHG-emitting resources will be dispatched before lower-GHG-emitting resources because some higher-emitting plants, particularly coal plants, are not subject to such caps even while lower-emitting gas plants are limited.

Overall, self-management of the GHG emissions cap has the potential to increase costs and aggregate GHG emissions as compared to a more coordinated approach that continues to rely more meaningfully on dispatch through the RTO energy markets. The application of a state-wide GHG cap or equivalent dispatch signal through a common GHG emissions price could address these challenges. The RTOs, in coordination with states and other industry stakeholders, could offer such a system to Illinois fossil resources as a means to manage efficiently and reliably their GHG emissions caps over time (under an opt-in or perhaps a mandated participation approach), but the mechanism would need to be reviewed and approved by the Illinois EPA and possibly the Legislature.

ILLINOIS GHG EMISSIONS REDUCTIONS MAY BE OFFSET BY INCREASES IN OTHER STATES

In-state fossil resources subject to an emissions cap will maintain or reduce their GHG emissions, but it is possible that these reductions will be offset by increases in GHG emissions in other states. Reductions in in-state fossil production will (over time) be replaced by increases in renewable supply, but there is presently not a mechanism to align the timing and pace of displacement. If

[148] 415 ILCS 5/9.18.

any gap arises in energy supply, out-of-state fossil resources are the primary resources that the RTO markets will identify as available to increase production immediately as in-state fossil resources reduce output.

As an option that Illinois could evaluate and consider to prevent such "leakage" of GHG from in-state to out-of-state fossil resources, the RTOs could impose a GHG price at the state border so as to place internal and external fossil resources on common economic footing with respect to their GHG emissions. Proceeds from any carbon charges imposed on internal and imported fossil resources would be returned to Illinois consumers. The mechanics of a GHG border price are already in place in California, and have previously been studied in PJM and New York.[149] These prior efforts have illustrated a number of benefits from such a carbon pricing scheme, including increased incentives to attract and retain clean energy resources (particularly renewables, nuclear, and batteries) and reduced aggregate GHG emissions. However, these prior efforts have illustrated the complexity in proper implementation. If Illinois were to consider participating in such options, they should be evaluated in a fashion that considers other related alternatives, implications for internal and external leakage, other alternatives such as participation in other existing interstate GHG pricing mechanisms, and alignment with Illinois and other states' broader policy goals.

RELIABLE CAPACITY MARKET SUPPLY THROUGHOUT FOSSIL PHASE OUT

Fossil resources that are subject to declining GHG (and therefore, energy production) caps will have lower capacity value that will need to be accounted for in capacity market accreditations. The RTOs do not yet have mechanisms for incorporating the reductions in capacity value as associated with these operational limits, but these can be developed and updated over time. The declining reliability contributions of fossil resources will mean that other resources will need to be procured in replacement to maintain reliability.

A greater reliability challenge in fossil phase out is the aggregate volume of fossil resources that will need to be retired and replaced. A portion of that challenge is associated with the pace and timing of retirement and entry that will be required; the retirements may be manageable if they proceed at a predictable and measured pace but could be more challenging in the large steps associated with key CEJA retirement deadlines or if some plants accelerate retirement in an uncoordinated fashion. PJM's market has demonstrated the ability to provide economic incentives needed to attract new resources as aging resources retire across its broader footprint, but has not yet examined the implications of the pace and localized concentration of fossil retirements anticipated in Illinois.

MISO's capacity market has not demonstrated the capability to offer a sufficient investment signal for resource replacement, and in fact produced a shortfall in the 2022/23 capacity auction.[150] These underlying design limitations in the MISO capacity auction construct that

[149] PJM, PJM Study of Carbon Pricing & Potential Leakage Mitigation Mechanisms, 2021.

[150] MISO, 2022/2023 Planning Resource Auction (PRA) Results, 2022.

resulted in this shortfall have been understood for many years and were not caused by CEJA mandates. These design limitations will become more problematic as the need for an effective investment signal becomes urgent throughout the fossil phase out and clean energy transition.[151] The most effective remedies to the MISO capacity auction shortfall will likely include: (a) transition to a 2–3 year forward auction; (b) introduction of a downward-sloping capacity market demand curve (a reform that is already being pursued by MISO with the majority of regional states' in support); (c) tightened capacity must offer rules and tightened review of non-price retirements; and (d) enhanced coordination to support capacity trade (particularly between the PJM and MISO systems that have extensive levels of interconnection capability that can be used to better support Illinois consumers across each RTO border). These solutions to addressing the challenges with MISO's resource adequacy construct have been examined in prior years but have not been implemented for a variety of contextual reasons, such as the differences among MISO states' regulatory models. However, the urgency to address these challenges quickly for the MISO region, or at least for Illinois, has been substantially elevated by the combination of the most recent capacity shortfall and the outlook for growing supply needs as the fossil phase out proceeds.

Finally, neither PJM's nor MISO's capacity markets, in their present form, have a mechanism to ensure that retiring fossil supply will be replaced with clean capacity supply. The nature of this challenge is somewhat different when considering the outlook for in-state and out-of-state capacity supply. Clean capacity *will* necessarily be relied upon for the portion of the capacity need that must be served by in-state resources to manage transmission limits. For these in-state capacity needs, GHG-emitting fossil resources will be less economically attractive (and eventually impossible) to develop and so capacity prices will rise to the levels needed to attract and retain the clean capacity resources (such as demand response and batteries) needed for reliability. However, the capacity markets in their present form will create incentives to shift toward greater reliance on out-of-state resources that may or may not be clean. In fact, predominant market incentives indicate that retiring fossil supply in Illinois would be replaced by either new gas plants located outside of state borders, or the retention of aging fossil supply in other states that otherwise would have retired. In response to requests by Illinois and other OPSI states, PJM is already in the process of reviewing options for a regional clean resource procurement market; one of the options under consideration would offer Illinois the ability to stipulate "clean capacity" requirements that could address this problem.[152]

To address this set of concerns, both MISO's and PJM's capacity markets may need to be enhanced to:

- Account for GHG emissions caps in fossil resource accreditation;

---

[151] The challenges with the MISO resource adequacy construct have been understood for many years, *see* MISO Competitive Retail Solution Filing, Docket No. ER17-284-000, filed Nov. 1, 2016; 170 FERC ¶ 61,215 (2020); ICC, Resource Adequacy in MISO Zone 4, 2017.

[152] *See* Organization of PJM States, Inc., OPSI Competitive Policy Achievement Staff Working Group Guiding Principles, (October, 2021); K. Spees, W. Graf, and S. Newell, Integrated Clean Capacity Market: A Design Option for Aligning Investment Incentives to Achieve Regional Reliability and Clean Energy Mandates, presented to PJM Capacity Market Workshop, Session 3: Market Design Proposals, (March 12, 2021).

- Project a manageable glide path for aggregate fossil retirement and clean resource entry that can be followed without triggering out-of-market reliability interventions;
- Enable Illinois policymakers to determine the share of total capacity (including imports) that must be derived from clean capacity resources (and what residual share can be derived from fossil plants), with that proportion accounted for within the capacity market; and
- For MISO, proceed with broader reforms necessary to provide an adequate investment signal for incremental clean capacity needs.

Given their central role in maintaining reliability and resource adequacy, the RTOs will need to take responsibility for implementing such capacity market enhancements particularly as they relate to the markets' reliability and transmission parameters. The ICC, in coordination with other agencies and stakeholders, would need to determine the clean capacity or other policy requirements to be reflected within such reforms.

3. Incentives for Cost-Effective Clean Resource Deployment and Retention

In alignment with its competitive electricity sector, Illinois relies primarily on RTO capacity, energy, and ancillary market signals to drive the majority of resource investment and retention decisions, consistent with Illinois' regulatory model serving approximately 90% of Illinois consumers that relies on competitive wholesale and retail markets. Municipal and cooperative distribution utilities serving the remaining 10% of consumers also have the option to rely more or less heavily on these wholesale market signals for driving or informing their generation supply choices. For renewable and nuclear resources, investment and retirement decisions are increasingly driven by RPS contracts and nuclear support payments.

The historical link between RTO market prices and investment decisions has been, and will continue to be, a critical element of ensuring reliable and cost-effective clean energy transition. These prices are the reflection of system reliability and balancing needs at every point in time and at every location across the grid. As such, these prices will help inform the most advantageous mix of renewables, nuclear, storage, demand response, and other clean technologies. However, these RTO market signals have historically been established in ways that presume indifference to GHG emissions and clean energy transition, and so will need to be refined and augmented if they are to better inform the reliability needs and associated resource mix for a 100% clean electricity grid. Incorporating Illinois policy requirements into RTO markets (as described in the specific examples above of exploring GHG border pricing and clean capacity requirements) will help to ensure that the market's signals for reliability needs are reinforcing and aligning with policy needs.

Another promising opportunity to align investment signals with Illinois policy goals may become available through the ongoing effort to develop a PJM regional clean energy attribute market. The ICC, along with the other PJM states, has requested that PJM develop a market for state agencies and consumers to procure clean resource attributes (such as RECs or clean capacity) through a regional RTO market platform. There are multiple opportunities presented by such a platform that can be explored to further enable the Illinois clean energy transition. These options include whether and how an RTO clean resource procurement platform could be used to:

- **Express clean capacity requirements** over time on behalf of Illinois consumers, so as to provide a predictable and orderly transition toward increasing reliance on clean capacity resources as the fossil phase out proceeds. Reliance on this mechanism will provide competitive signals to attract and retain clean resources such as batteries, demand response, nuclear resources, and fossil plants retrofitted to run on non-GHG-emitting fuels that will be needed to ensure reliability during and after fossil phase out.
- **Provide a voluntary platform for procuring clean energy supplies** that will be available to ARES providers, utilities, the IPA, municipalities, cooperatives, and other end-use consumers. As discussed above, the ICC and IPA already have developed or are developing mechanisms to track and support achievement of the 50% by 2040 RPS. However, mechanisms are not yet in place to track and enable achievement of the 100% clean electricity standard for non-RPS-obligated consumers or for the above-RPS clean electricity needs of RPS-obligated consumers.
- **Enable cost-effective retention of nuclear supply after current support payments expire.** Procuring clean energy and/or clean capacity attributes of nuclear resources through a competitive regional platform offers an opportunity to retain these clean energy resources beyond the timeframe of current support payments, while at the same time introducing a greater level of competition and cost discipline particularly if a wide range of resource types are qualified to participate. The relative pricing levels awarded to clean energy and clean capacity may help guide the most cost-effective mix and locations of nuclear, wind, solar, batteries, and demand response for Illinois.
- **Support coordination of clean energy needs and cost-effective trade with other states.** Illinois has historically been a large exporter of clean energy including both nuclear supply (which has not otherwise been supported by policy or other payments from consumers in other states) and renewable supply (the majority of which is committed to meet the clean energy demand of other states and consumers). Participation in a regional marketplace for clean energy may create opportunities to coordinate with other aligned states' policy goals to jointly support the clean resources needed for transition. Nuclear and renewable resources may then have access to incremental revenue to support the retention and development of clean resources in Illinois, and Illinois would have the option to procure clean energy and capacity resources across a broader pool of resources in other states if aligned with policy goals.

Though the timing of development for the proposed PJM procurement platform extends beyond the timeframe available for developing this REAP, Illinois should continue to explore fully the benefits and opportunities presented by such a platform. To date, MISO has not yet initiated a similar effort to support a regional clean resource market; however, exploration of similar opportunities may prove necessary as MISO works to identify a satisfactory solution for providing adequate investment signals for reliability in its capacity market.

4. Maintaining Reliability in Transition to 100% Clean Electricity

The transition that Illinois, other states, and consumers are making toward a 100% clean electricity mix will test the RTOs' capabilities to support system reliability in a number of ways, and will require a number of enhancements to all RTO markets to proactively maintain and support reliability throughout the transition.

The Illinois REAP will not be a primary venue through which such reliability needs are identified and managed, except to the extent that the concerns are uniquely associated with Illinois' policy needs (rather than being associated with broader trends across the RTO systems). Still, it will be important for Illinois policymakers to provide guidance to both MISO and PJM on the outlook for the reliability needs and resource mix that the RTO markets must be able to support reliably. The RTO markets must evolve to ensure reliability in both the investment and operational timeframes, while continuously transitioning to increased (and eventually exclusive) reliance on clean electricity resources. The timeframe and pace of market and operational enhancements should be proactive rather than reactive, so that any potential reliability challenges can be predicted, characterized, and prevented. Further, the solutions to identified reliability challenges should focus on the long-term transition to 100% clean energy. The RTOs will need to engage in continuous innovation with respect to their capabilities to integrate and rely on the capabilities of emerging clean technologies such as batteries, demand response, hybrid resources, electric vehicles, and aggregated resources. While CEJA does include backstop provisions that would allow the RTOs to retain and deploy fossil resources beyond the statutory limits in the face of system reliability emergencies, the use of such emergency mechanisms should be proactively avoided and prevented if at all possible.

Improvements to the energy and ancillary services markets will likely need to include proactive assessments addressing the outlook for emerging system needs and new ancillary services. Both PJM and MISO have a track record of developing and implementing successful enhancements to better integrate intermittent resources and renewables, and several such efforts are ongoing in both markets. These efforts will need to continue, or even redouble, to keep pace with the resource transition required for Illinois and other states. Both RTO markets will likely need to characterize the need for much larger quantities of balancing reserves to manage growing system uncertainties, such as to meet 10–15 minute ramping needs and 2–3 hour ramping needs.[153] The operating reserve demand curve (ORDC) used to price and procure these ramping reserves would be developed in alignment with reliability value, the avoided cost of out-of-market resource dispatch, and the value of limiting renewable curtailments. Other new ancillary service products may be needed, such as inertia or fast frequency response.[154]

---

[153] K. Spees and S. Newell, Modernizing Electricity Market Design—Efficiently Managing Net Load Variability in High-Renewable Systems: Designing Ramping Products to Attract and Leverage Flexible Resources, FERC filing, Docket No. AD21-10-000.

[154] *See* MarketWise Solution, Inertia Ancillary Service Market Options; AEMC, Fast frequency response market ancillary service; J. Matevosyan, Fast Frequency Response in the Texas Power System.

Any new products developed should be developed in ways that can fully utilize the capabilities of the clean energy technologies that will increasingly dominate Illinois' resource mix, which may require more extensive reliance on pilot testing programs to enhance the RTO market and control room capabilities for communication, control, and reliance on emerging technologies.

In the capacity markets, the definition, accounting, and enforcement of reliability needs will need to be refined. Both MISO and PJM are in the progress of improving these accounting methods, with core features including: (a) improved reliability modeling that accounts for weather extremes, fuel limitations, changing load patterns, and changing resource mix; (b) seasonally-defined capacity and reliability requirements; (c) improved accounting of resources' reliability contributions, including the use of ELCC and historical performance assessments during short supply conditions, including applying these concepts to fossil resources (such as fossil resources subject to CEJA GHG limits); and (d) enhanced resource obligations and penalty structures to incentivize resource performance.

This high-level survey of RTO market reforms for reliability in clean energy transition is not intended to be a comprehensive or detailed in all respects, but rather to provide guidance to both MISO and PJM on the substantial scope of reforms that likely will be needed to reliably operate the system as Illinois transitions to a 100% clean electricity mix.

C. Preliminary Assessment of RTO Market Reforms for Supporting Illinois Policy

Both MISO and PJM will need to substantially enhance their existing markets and expand their activities to effectively support implementation of Illinois' clean electricity policy. Current markets, if left unaltered, will not produce the most cost-effective and reliable clean energy transition, and may in some cases produce economic incentives that conflict with Illinois policy mandates. The RTO markets are already in the process of evolving to better align with the needs of the clean energy transition across the footprint, but the pace and scope of market enhancements will require dedicated focus by the RTOs and stakeholders to keep pace with the scale of renewable deployment required by Illinois policy. Table 3 provides a preliminary assessment of the RTO market reforms that may be needed to support Illinois' transition to 100% clean electricity. Some of the reform concepts described will require substantial analysis, refinement, and further study in order to determine the most effective implementation plan.

For the most part, the implementation of these necessary reforms will be the responsibility of MISO and PJM, though several of the reforms would require active coordination between the RTOs and Illinois state agencies to develop the most effective solution after fully assessing available options.

TABLE 3: POTENTIAL RTO MARKET ENHANCEMENTS TO SUPPORT ILLINOIS POLICY ACHIEVEMENT

	RTO Market Reforms to Support Illinois' 100% Clean Energy Transition
Energy and Ancillary Service Markets	• **Large-scale ramping products** focused on managing system balancing needs between timescales of ten minutes to three hours, including the ability to transition to primary or exclusive reliance on clean energy resources including batteries; aggregated and non-aggregated demand resources; electric vehicles; hybrid resources; distributed energy resources; and other non-emitting technologies to provide balancing services to Illinois consumers • **Regularized process to project future ancillary service needs** such as a ten-year outlook conducted every two years, to implement adjustments to existing ancillary services or identify new ancillary services (*e.g.*, inertia, fast frequency response) that may be needed to maintain reliability throughout clean energy transition • **Systematic sandbox or pilot program** to improve processes, communications, dispatch processes, and visibility for large-scale integration of emerging clean technologies to eliminate barriers to market entry; to facilitate full participation in all RTO markets; and to continuously build RTO control room capabilities to rely primarily or exclusively on clean energy technologies for all grid reliability services
Capacity Markets	• **Improved reliability modeling and resource accounting** that accounts for emerging reliability concerns including winter reliability needs, correlated thermal resources, limitations of correlated and use-limited resources, and availability limitations of slow-responding resources. • **Forward projections of future resource adequacy needs and technology ELCC ratings** to be provided to Illinois policymakers and to the public in support of policy planning and investment decisions, including application of these methods to fossil fuel resources (such as Illinois resources subject to GHG limits). • **Seasonal resource accounting and capacity markets,** a reform that is already in progress in MISO and in early consideration stages in PJM. • **Enhanced resource obligations, tracking, and performance incentives** for capacity resources that fail to deliver energy or ancillary services during tight supply and shortfall conditions. • **Clean capacity constraints in the capacity market** that can be used to coordinate the retention of nuclear, entry of reliable clean capacity, and phase-out of fossil resources in a cost-effective fashion that will maintain reliability at each stage of transition.
Support for Implementation of Illinois Policy	• **Granular GHG accounting** to support the calculation of Illinois electricity system emissions and achievement of policy requirements. The data provided would need to be sufficient for the RTOs to calculate or allow Illinois policymakers to calculate: (a) average emissions produced system-wide, by energy zone, and by state in each 5-minute dispatch interval; (b) marginal emissions at every node and in every 5-minute dispatch interval (noting these data are already published by PJM but are not yet published by MISO); (c) in-state emissions, emissions embedded within imports, emissions displaced by clean energy export; (d) apportionment of emissions obligations and avoided emissions to Illinois consumers after accounting for clean energy attribute allocations; and (e) net electricity sector GHG emissions attributable to Illinois consumers. • **Regional clean energy and capacity** market platform that can be used by the IPA, Illinois retail providers, or other state-directed entities to procure Illinois RECs, clean capacity, and any new renewable attribute products that may be required under Illinois policy. • **Examination of opportunities for the RTOs to support effective implementation of fossil resource dispatch within GHG emissions limits** • **Carbon border pricing** that could be utilized to coordinate the cost-effective application of carbon emissions caps on Illinois internal fossil resources and limit GHG imports to the state as consistent with Illinois GHG accounting requirements

D. REAP Findings and Recommendations

FINDINGS OF ICC STAFF AND CONSULTANTS AT THE BRATTLE GROUP

RTO market incentives must align with Illinois' and other states' policy requirements, in order to enable a cost-effective and reliable energy system transition. Both PJM and MISO are pursuing a range of market reforms focused on supporting cost-effective, reliable markets and operations throughout this evolution. However, both RTOs indicate that strong support and partnership with policymakers in Illinois and other states will be required to identify and prioritize the required reforms. ICC staff, in collaboration with both RTOs, have identified several beneficial reforms that are already under consideration or that could be considered that may advance Illinois' clean energy transition.

Among the many potentially required reforms, ICC staff highlight MISO's resource adequacy shortfall as the most urgent. Both MISO staff and ICC staff have concluded that MISO's current capacity market design is not adequate to attract and retain competitive investments to meet Illinois reliability needs. MISO and ICC staff further conclude that the present capacity gap in Illinois Zone 4, while it may decline or grow in any particular year, will be further challenged throughout the clean energy transition. Ongoing and proposed reforms including a reliability-based capacity demand curve and seasonal resource accreditation may mitigate the scale of potential capacity shortfalls, but MISO will not be able to offer a comprehensive solution in the near term. In the medium and long term, MISO is committed to defining required reliability attributes and accounting resource commitments including on a forward basis, but is not presently able to confirm whether and when the organization will be able to identify and implement a comprehensive long-term solution that aligns with Illinois policy.

The energy transition may introduce similar challenges in PJM in the future, but its capacity market is designed with the goal of attracting and retaining competitive supply resources, with prices rising gradually in the event of a shortfall, somewhat mitigating the urgency of this reliability concern. Even so, a comprehensive approach to reliability is needed in PJM to ensure resource adequacy can be supported throughout fossil emissions phase out and manage the potential retirements that can be anticipated by 2030.

POLICIES THAT ILLINOIS CAN IMPLEMENT NOW, UNDER EXISTING AUTHORITIES

5.A **Evaluate Options for Maintaining Resource Adequacy in MISO.** The ICC can conduct a study and feasibility assessment of available options for addressing the identified MISO resource adequacy gap. The assessment would review the potential cost, reliability outcomes, fleet transition implications, challenges with addressing locational reliability needs, and potential for the abuse of market power under alternative solution options. The options to consider could include:

- *Supporting and participating in ongoing MISO reform efforts* including advocating for a sloped capacity demand curve, participation in the ongoing reliability attributes examination, and advocating for reforms such as a clean capacity product, enhanced support for capacity trade, and a 2-3-year forward market that may eventually provide a comprehensive solution to the identified gap;

- *Requesting MISO support for Illinois to conduct a 2-3 year forward procurement* for 100% of Illinois capacity requirements for Zone 4 customers, including the potential consideration of a "clean capacity" requirement for a portion of the need. The forward procurement would allow Illinois to require LSE participation, while other states and LSEs could also voluntarily opt-in to a forward procurement mechanism. The requested procurement would result in a formal capacity commitment within MISO's capacity construct and under MISO's accounting requirements;
- *Authorizing the IPA to expand forward capacity procurements* to meet 100% of Zone 4 customer resource adequacy needs, to be coordinated with MISO for the purposes of resource accounting and commitments; and
- *Requesting PJM support to expand its capacity auction to support procurement of Illinois Zone 4 capacity needs* on a forward basis, including accounting for capacity transfer capability between RTOs and across capacity zones. Illinois might meet its reliability need in Illinois Zone 4 using PJM's capacity auction, which is potentially better suited to address capacity needs in a restructured state such as Illinois than is MISO's capacity auction process. If PJM's capacity process is used, capacity procured for Illinois Zone 4 would continue to be tracked relative to MISO's capacity accounting methods.

5.B **Seek GHG Emissions Data from RTOs**. ICC staff can engage with both MISO and PJM to continue the expansion of their GHG accounting data processes in support of Illinois' policy goals and consumers' needs. The additional GHG accounting data that can be provided includes**:**

- Granular data sufficient to build up the calculation for state-wide Scope 2 emissions, separately accounting for in-state direct emissions, emissions embedded within imports, and emissions displaced by clean energy export (See Strategic Element 1). PJM staff have committed to working with Illinois and other participating states to develop and implement the proposed accounting methodology. ICC staff can then seek state and RTO support for implementation of a similar approach in MISO;
- Average emissions produced and allocated to demand system-wide, by energy zone, by node, and by state in each 5-minute dispatch interval, including sufficient information to calculate both total system emissions mix (including clean and fossil supply) and residual system emissions mix (including only fossil supply). If possible, the data should enable Illinois and consumers to understand both the physical operations of the grid, and clarify state-level and consumer-level assessments of GHG emissions and claims of GHG abatement consistent with their policies or REC purchases; and
- Marginal emissions at every node and in every 5-minute dispatch interval (already published by PJM, but not yet provided by MISO).

5.C **Contribute to Regional Market Development for Clean Energy Attributes.** ICC staff can continue contributing to efforts within the Organization of PJM States, Inc. (OPSI) and PJM's Clean Attribute Procurement Senior Task Force (CAPSTF) to design and implement a new marketplace within which states and consumers can procure clean electricity attributes.

PJM staff have committed to modeling scenarios that will assist the ICC in understanding the alternative ways that Illinois could participate in such a market, the results of which can be filed within this REAP investigation. Full ICC and legislative consideration of whether and how to use such a market will be partially dictated by the implementation timeframe. However, based on the assessment of this REAP iteration, the clean attribute market design features that may be most beneficial for consideration in Illinois include:

- New region-wide clean energy products, similar to RECs, ZECs, and CMCs, that could be used by consumers within Illinois to meet their own goals and inform future policy choices in support of Illinois' 100% clean electricity goals, such as to procure a portion of Illinois' renewable energy requirements and/or achieve a competitive retention of nuclear resources after the conclusion of current support payments;
- Improved product definitions for clean energy attributes, such as based on GHG abatement and 24x7 clean energy achievement, that could be used by Illinois, consumers, or municipalities within the state to serve more granularly-defined clean energy and accounting goals; and
- A new "clean capacity" product that Illinois could assess as one option to manage orderly retirement, retrofitting, and replacement of fossil capacity with reliable clean electricity supply resources, particularly if the ICC and RTOs determine that resource adequacy or timely achievement of the fossil phase out could be threatened by retirement cliffs or inadequate representation of emissions-capped fossil resources' reliability value.

5.D Study Reliability and Operational Implications of Fossil Units' Emissions Limits under CEJA. In full coordination with RTOs, the ICC can conduct a modeling study to identify reliability and operational issues that may arise on the basis of future emissions limitations, the timeframe over which these concerns may arise, and identify solutions. The most immediate concerns that should be reviewed include: (1) the potential frequency and severity of reliability events that could be associated with energy limitations (or excess emissions if violating limitations to preserve reliability); (2) the potential for asset owners' self-management of emissions caps to produce reliability events or excess emissions; and (3) whether generators' emissions limits should be reflected as a lower capacity value in the capacity markets. These potential concerns could be quantified over time, to identify the likely timeframe by which a solution should be implemented. Based on the outcome of this study and the analysis of GHG leakage above, ICC staff can pursue RTO market reforms that may support more effective and reliable emissions phase out.

POTENTIAL ADDITIONAL POLICIES REQUIRING LEGISLATIVE ACTION

5.E Authorize Use of Identified Regional Solutions. Based on the findings of the studies above and ongoing developments, provide authorizations for: (1) the ICC to direct or authorize participation in regional attribute markets to support a portion of Illinois policy goals; (2) fossil resource owners to participate in RTO-supported mechanisms to improve coordinated management of GHG emissions caps, such as relative to a state-wide cap or a common GHG strike price; and/or (3) the ICC to direct or authorize participation in RTO GHG border pricing or any similar mechanism that may become available as a means of mitigating leakage.

List of Acronyms

ARES	Alternative Retail Electric Suppliers
BRA	Base Residual Auction
BRP	Baseline Reliability Project
BTU	British Thermal Unit
CEJA	Climate and Equitable Jobs Act
CEMS	Continuous Emissions Monitoring System
CMC	Carbon Mitigation Credit
CO_2	Carbon Dioxide
ComEd	Commonwealth Edison
DER	Distributed Energy Resource
EGU	Electric Generating Unit
EJ	Environmental Justice
ELCC	Effective Load Carrying Capacity
EPA	Environmental Protection Agency
EV	Electric Vehicle
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GHI	Global Horizontal Irradiance
GIP	Generator Interconnection Project
GW	Gigawatt
ICAP	Installed Capacity
ICC	Illinois Commerce Commission
IDNR	Illinois Department of Natural Resources
IMM	Independent Market Monitor
IPA	Illinois Power Agency
ISA	Interconnection Service Agreement
ISAC	Independent State Agencies Committee
ISO	Independent System Operator
kV	Kilovolt
kWh	Kilowatt Hour
LME	Locational Marginal Emissions
LRTP	Long Range Transmission Planning
LSE	Load-Serving Entity
MEC	MidAmerican Energy Company
MEP	Market Efficiency Project
MISO	Midcontinent Independent System Operator
MTEP	MISO Transmission Expansion Plan

MVP	**Multi-Value Transmission Project**
MW	**Megawatt**
MWh	**Megawatt Hour**
NERC	**North American Electric Reliability Corporation**
NO_X	**Nitrogen Oxide**
NOPR	**Notice of Proposed Rulemaking**
NREL	**National Renewable Energy Laboratory**
OMS	**Organization of MISO States**
OPSI	**Organization of PJM States, Inc.**
ORDC	**Operating Reserve Demand Curve**
OTSG	**Offshore Wind Transmission Study Group**
PJM	**PJM Interconnection**
POI	**Point of Interconnection**
REAP	**Renewable Energy Access Plan**
REC	**Renewable Energy Credit**
RTEP	**Regional Transmission Expansion Plan**
RTO	**Regional Transmission Organization**
SAA	**State Agreement Approach**
SEDAC	**Smart Energy Design Assistance Center**
SGIP	**Small Generator Interconnection Procedures**
SO	**Sulfur Oxide/Sulfur Monoxide**
SO_2	**Sulfur Dioxide**
SPP	**Southwest Power Pool**
UCAP	**Unforced Capacity**
USEIA	**United States Energy Information Administration**
ZEC	**Zero Emissions Credit**