Illinois Renewable Energy Access Plan

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

FIRST DRAFT FOR PUBLIC COMMENT

PREPARED FOR
Illinois Commerce Commission

CO-AUTHORED BY
Illinois Commerce Commission Staff
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NOTICES

TIMING AND STATUS OF THE DRAFT RENEWABLE ENERGY ACCESS PLAN

This 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.

This is a *draft* plan that will be open for stakeholder review and comment. The content and concepts in this draft report are subject to change, as ongoing analyses and opinions will be updated to incorporate stakeholder input received during the comment period. A second draft will be presented to the Commission by December 2022 for investigation. The ICC will then review and formally adopt the final Illinois REAP.

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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 (MEC or 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 first draft form, 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 a 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] The REAP will serve as a document for clarifying and quantifying policy requirements; 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. The REAP will serve to provide guidance on both the long-term trajectory of the Illinois electricity system and actions that could be prioritized in the near-term.

[1] 220 ILCS 5/8-512.

Though the ICC is tasked by the legislature with developing and adopting the REAP, many of the policies, programs, and activities identified within the plan are not limited to programs that are within the ICC's direct implementation authority. Developing and implementing the REAP will require multilateral coordination among Illinois state agencies including the ICC, the Illinois Environmental Protection Agency (Illinois EPA or IEPA), the Illinois Department of Natural Resources (DNR), and the Illinois Power Agency (IPA). The ICC will further need to coordinate with and rely on the two Regional Transmission Organizations (RTOs) serving Illinois, the Midcontinent Independent System Operator (MISO) and PJM Interconnection (PJM), to support the development and implementation of substantial portions of the REAP. Staff of the ICC have begun the process of coordinating with these organizations so that the REAP can document and build on efforts that are in progress, as well as identify any potential information and policy gaps that need to be filled. The REAP will recommend innovative policies and programs to address any identified gaps. Recommended policies and programs identified in the REAP will reflect the ICC's understanding of the roles and responsibilities of Illinois agencies or others for implementation. In some cases, the REAP may identify areas where additional clarity or authorities could be granted by the Illinois Legislature in order for an agency to implement CEJA goals that are not yet subject to explicit enforcement mechanisms.

This draft version of the Illinois REAP identifies the following strategic elements of the overall plan for ensuring clean electricity supply to the state:

STRATEGIC ELEMENT 1: Renewable electricity supply needs in Illinois are large and subject to high uncertainty, ranging from 64 TWh to 450 TWh by 2050, compared to approximately 21 TWh of in-state renewable generation in 2021. The minimum of this range is dictated by the 50% RPS mandate applicable to approximately 85% of Illinois electricity demand. This low end implicitly assumes that the remainder of the state's clean electricity needs will be served by nuclear power and that growth in electricity consumption will be modest. The high end of this range 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. The pace of renewable deployment needs is less uncertain over the coming five years, before nuclear support payments expire and before large-scale electrification could be implemented. However, a more accurate long-term outlook is needed to most effectively support transmission planning and policy implementation.

STRATEGIC ELEMENT 2: Clarification of certain policy instruments and enforcement authorities will enable more accurate determination of the scale of clean energy needed and the reforms necessary to implement CEJA policies. This draft REAP includes an initial assessment of policies that are already in place or under development, versus those that have yet to be more fully specified. Policies that would provide more clarity to the REAP include:

- **Establishment of an economy-wide energy decarbonization strategy**, including identification of responsible entities, interim targets, and enforcement mechanisms within transportation and natural gas sectors, which will improve the ability of the ICC, REAP, distribution utilities, and RTOs to determine the level of electrification-driven demand growth that must be served by clean electricity.

- **Refinement of GHG accounting methods** in alignment with the economy-wide decarbonization strategy. For the purposes of the REAP, we focus primarily on the accounting of electricity sector Scope 1 emissions from Illinois fossil plants and Scope 2 emissions from out-of-state fossil resources that operate to serve Illinois consumers. An initial recommendation of the REAP is to develop 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.
- **Identification of innovative policy mechanisms to achieve 100% clean electricity goals** considering the volumes of clean electricity that will be needed through the transition. After nuclear support payments expire in 2027, significant volumes of clean electricity will be required to meet Illinois' needs above the 50% RPS standard, as well as to serve the approximately 15% of Illinois demand not subject to the RPS standard. The initial recommendation of the draft REAP is that, for clean electricity needs beyond the 50% RPS: (a) all non-GHG-emitting technologies (including renewables, nuclear, batteries, demand response, and other emerging clean technologies) will be eligible to serve the 100% clean electricity requirements; (b) out-of-state resources will be considered eligible to supply clean electricity needs as long as that supply is deliverable to Illinois consumers via the RTO markets; (c) any surpluses of clean energy produced within Illinois will be made available for export to support GHG and clean electricity goals of other states and out-of-state consumers; and (d) mechanisms for supporting 100% clean electricity transition will aim to secure the most cost-efficient resource mix that maintains grid reliability and aligns with CEJA's equity objectives.
- **Identification of aligned RTO market reforms and Illinois policy mechanisms** for mitigating GHG emissions leakage, ensuring reliability, and maintaining affordability throughout clean energy transition. The identified mechanisms will need to balance system reliability needs (as quantified primarily through RTO markets) and policy requirements (as established under Illinois policy) in ways that increasingly rely on clean energy resources to provide all grid balancing and reliability services. The identified mechanisms should help to ensure a steady transition toward a balanced mix of clean technologies including renewables (which can provide affordable clean energy, but whose intermittent nature offers little toward reliability and balancing needs); nuclear (which provides high volumes of clean energy and capacity value, but less balancing value); and more flexible clean technologies such as batteries and demand response. Developing a coordinated set of incentives to drive this outcome will require close coordination between ICC staff and the RTOs as discussed further below.

STRATEGIC ELEMENT 3: Identification of renewable energy access zones should enable a repeatable process allowing Illinois to provide regular input to RTO transmission planning. Using criteria that indicate resource potential, zoning regulations, land area, and any other criteria identified by stakeholders, the final REAP will highlight attractive areas for resource development. Renewable zones will also fully consider the potential equity impacts of CEJA including prioritized fossil fuel resource retirements and renewable resource development in equity areas. If insufficient resource potential exists in identified suitable locations to serve the state's renewable demand, the REAP will recommend innovative regulatory solutions to decrease barriers to development. The exact form and elements of the identified renewable energy zones will be determined together with Illinois agencies and RTOs to facilitate optimal use of the REAP.

STRATEGIC ELEMENT 4: Existing transmission infrastructure should be optimized to support renewable resource deployment. Together with the RTOs and utilities, the REAP will analyze Illinois' available bulk system, onramp, and distributed energy headroom and aim to identify recommendations to best use this existing capability. Options exist to potentially reserve this transmission capability for preferred use of policy resources. Identified renewable energy zones will serve as inputs to this analysis, allowing priority review of renewable energy zone areas that are currently available for interconnection. Drawing on existing studies and through additional collaboration, the REAP will make recommendations to improve existing headroom analyses enabling ongoing identifications of areas with suitable headroom for interconnection.

STRATEGIC ELEMENT 5: Proactive planning of new transmission—with consideration of public policy needs—is superior to relying on interconnection processes to reach CEJA's goals. Forward-looking planning processes using future scenarios and incorporating public policy goals through renewable energy zones can identify cost-effective transmission enhancements that would be overlooked by existing processes. However, improving transmission planning processes may take many years, despite recent proposals by FERC to initiate reforms. The final REAP will therefore not only highlight meaningful reforms, but also evaluate likely reform timelines, and aim to harness existing processes to the extent possible.

- **Interconnection process improvements must continue** if they are to enable the rapid and continuing increase in interconnection requests across Illinois. An alternative "connect and manage" framework with optimized study criteria, particularly for energy-only requests, could help existing queue cycle processes produce timely interconnections. The final REAP will explain and recommend key elements of queue reforms necessary to enable CEJA's goals, including improved coordination between the interconnection queue and regional planning, and expanded use of advanced technologies to enable new resources.
- **Enhance transmission planning processes to more fully account for Illinois' policy goals.** While MISO's long-term planning process incorporates state policy goals in identifying long-term system upgrades, PJM planning relies on the submission of assumptions from its stakeholders and does not otherwise incorporate public policy goals. The final REAP will recommend improvements to regional planning processes, highlighting elements of proposed reforms that will enable CEJA's goals. Where regulatory roadblocks are identified as part of this effort, the final REAP will recommend process improvements to ensure ongoing and repeatable incorporation of public policy in regional transmission plans.

- **In the meantime, existing planning processes can be harnessed to pursue immediate integration of policy considerations.** The final REAP seeks to develop renewable energy zones capable of immediate use and integration into regional planning processes upon approval of the ICC. MISO's Tranche 2 Long Range Transmission Planning (LTRP) evaluation and PJM's Regional Transmission Expansion Plan (RTEP) cycle provide a potential venue for such consideration at the end of 2022. PJM's State Agreement Approach provides another innovative approach. The final REAP will evaluate and recommend a process utilizing one or more existing pathways to enable immediate incorporation of policy goals.

STRATEGIC ELEMENT 6: RTO markets will require enhancements to support effective, reliable, and affordable implementation of CEJA policies. Throughout the development of the REAP, ICC staff will seek engagement and support from MISO and PJM staff to identify enhancements to each RTO's market design to ensure alignment and achievement of CEJA mandates. The final REAP will recommend solutions to address the following identified implementation gaps:

- **Providing granular system GHG data** to support the development of accurate Scope 2 emissions accounting (including emissions embedded within imports and emissions offset by excess clean energy exports) in alignment with the accounting methods recommended within the REAP.
- **Quantifying and mitigating GHG "leakage" as fossil-fired generation is phased out,** to ensure that reductions to in-state emissions within Illinois will not be replaced by increases in emissions from out-of-state fossil resources.
- **Ensuring sufficient capacity is available as fossil-fired generation is phased out,** accounting for the declining cap on each resource's annual emissions and generation, associated reductions to those resources' reliability and capacity value, the potential need for a capacity "glide path" if either RTO is unable to accommodate the anticipated volume of retirements in any one year, and mechanisms to support steady increases in the reliance on clean capacity resources to replace retiring fossil.
- **In MISO, addressing the underlying concerns with the resource adequacy construct** that have not provided sufficient incentives to support capacity investments and maintain reliability. Though the underlying concerns have been understood and documented for many years and are not caused by CEJA policies, it is likely that the underlying problems will worsen as the need for new capacity grows throughout the fossil emissions phase-out. Across both MISO and PJM, going-forward investment incentives will need to support investment and retention of clean capacity as the state transitions away from reliance on fossil resources.
- **Proactively improving both RTOs' capability to rely increasingly, and eventually exclusively, on clean resources** to provide all energy, capacity, and ancillary service needs. Though the Illinois REAP will provide only high-level recommendations in this

respect, it will stress the centrality and importance of enhancing RTO ancillary service markets and operational capabilities to manage an entirely clean electricity system.

- **Providing a platform for the procurement of cost-effective clean energy resources** such as the regional attribute market that Illinois and other PJM states have requested that PJM and stakeholders examine. For the purposes of the REAP, the usefulness of such a platform will be reviewed from the perspective of aligning incentives for: (a) cost-effective retention of nuclear supply after current support mechanisms expire; (b) supporting clean capacity investment and retention throughout fossil emissions phase out; (c) providing a procurement option or platform for RPS-obligated consumers to meet up to 100% clean electricity mandates (beyond the 50% RPS mandates that IPA will separately support); and (d) providing a procurement option or platform for non-RPS-obligated consumers to meet clean electricity goals and mandates.

These elements of the 2022 REAP are provided in preliminary and draft form for the purpose of public review and commentary. A revised and refined plan will be developed by ICC staff and consultants based on stakeholder comments provided and based on continued coordination with Illinois agencies and RTO staff. A second draft of the REAP will be presented to the ICC commission members for investigation in December 2022, for the ICC's review and eventual adoption.

I. 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

2007–2010	2016	2021
IPA Act, Public Utilities Act etc. (Pre-Public Act 99-0906)	**Future Energy Jobs Act (Public Act 99-0906)**	**Climate and Equitable Jobs Act (Public Act 102-0662)**
✓ 25% renewable by 2025 ✓ Renewable Portfolio Standard (RPS) compliance mechanism different for retail, competitive choice, and hourly pricing customers	✓ 25% renewable by 2025; RPS applied to *all* retail load served by utilities ✓ Nuclear support payments under Zero Emissions Credit (ZEC), up to 16% of demand from Ameren, ComEd and a portion of MidAmerican; supports authorized through 2027	✓ 100% economy-wide clean energy by 2050 ✓ 100% clean electricity by 2050 ✓ 50% renewable standard by 2040 ✓ 100% fossil fuel phase out by 2045 ✓ Expands nuclear support payments under Carbon Mitigation Credits (CMC) authorized through mid-2027 which supports up to 64% of demand from ComEd customers

Source and Notes: 2022 IPA Long-Term 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.[2]
- **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.**[3] 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 private 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.**[4] All natural gas-fired electric generating units larger than 25 MW are required to cap GHG emissions 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 (CMC) authorized through mid-2027.**[5] The already-existing Zero Emissions Credit (ZEC) program supports 16% of demand for 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 all consumers, not just those obligated to participate in funding the nuclear support payments).

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

[3] 20 ILCS 3855/1-75(c).

[4] 415 ILCS 5/9.15.

[5] 20 ILCS 3855/1-75(d-10).

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 required to file a Beneficial Electrification Plan with ICC for programs starting by January 2023.[6] Rebates offered to incentivize EVs and installation of charging infrastructure.[7]
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.[8] **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 6 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.[9] CMCs: Braidwood Units 1 and 2; Byron Units 1 and 2; and Dresden Units 2 and 3.[10] **Achievement Responsibility:** IPA is responsible for procurements and released the CMC Procurement Plan in September 2021. ZEC supports extend through the end of 2027; CMC supports extend through mid-2027.[11] The ICC approves IPA procurement plans and procurement results.

6 20 ILCS 627/45.

7 415 ILCS 120/27; 20 ILCS 627/55.

8 20 ILCS 3855/1-75(c-5).

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

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

11 20 ILCS 3855/1-75(d-10)(C).

B. Scope and Purpose of the Renewable Energy Access Plan

The CEJA directs the ICC to develop a REAP for the State of Illinois pursuant to Section 8-512.[12] The REAP will provide 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. The final REAP will need to provide an outlook for the scale of renewable developments required over time; assess the physical transmission infrastructure needed to integrate and deliver clean electricity to consumers; propose a viable policy pathway for achieving the necessary resource deployment; identify actions that will need to be taken by the ICC or others to implement the plan; and determine whether any additional clarifications or legislative authorities could provide clarity in furtherance of CEJA goals.

This first draft of the REAP is issued for public comment in July 2022; a second draft will be submitted to the ICC in Fall 2022 and serve as an input to the ICC investigation that must begin before December 31, 2022 and support the eventual adoption of a final REAP. The ICC will initiate a new investigation 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.[13]

The scope of the REAP must include:[14]

- 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 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 necessary changes to the transmission planning and interconnection processes conducted by the two RTOs serving Illinois: MISO and PJM;

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12 220 ILCS 5/8-512.

13 220 ILCS 5/8-512(c).

14 220 ILCS 5/8-512(b).

- 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 that may be required to the RTO wholesale electricity markets in order to align with and support effective achievement of CEJA policy mandates.

The body of this report provides an initial assessment of these key topic areas, which will be revised and refined before a second draft of the REAP is presented to the ICC for consideration an investigation before December 31, 2022.

C. Equity in the Renewable Energy Access Plan

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 eligible communities, equity-eligible business owners, and other equity-focused populations, and ensures that new funding will be directed toward disadvantaged populations.

The REAP must similarly prioritize equity throughout clean energy transition, including within the siting of renewable energy access zones and interactions with the phase out of fossil fuel plants. At a minimum, the REAP must incorporate consideration of the following equity requirements to align with CEJA programs and policy objectives:

- **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.[15] 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 will align with this prioritization of phase-out of fossil units to improve air quality for those most impacted by pollution in Illinois.
- **Land use:** In identifying new renewable energy access zones, the REAP will incorporate the importance of equity in land use. This includes recognizing landowners' rights to decide their own land use; ensuring local communities have equitable consideration in any permitting, zoning, or other land use determinations; avoiding overburdening local governments as renewable deployment and associated permitting processes requirements expand; and ensuring other local land use and environmental considerations can be addressed.
- **Equitable access to new jobs and 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

[15] 415 ILCS 5/9.15 (h)-(i)-(1).

justice communities and other disadvantaged populations.[16] The REAP will support a diverse supply of renewable energy and transmission construction in Illinois to ensure 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.[17] The REAP will align with CEJA requirements to ensure that Illinois' clean energy transition does not disproportionately impact consumers in environmental justice communities and other disadvantaged populations and will provide reliable supply of electricity for all households in the state.
- **Equitable access to policy and support programs:** In Illinois' goal to put one million electric vehicles on the roads by 2030 and electrify other sectors of the Illinois economy, CEJA requires the state's transition to highlight equity.[18] The REAP will align with CEJA requirements to ensure future renewable energy additions to the state allow environmental justice communities and other disadvantaged populations equal access to the benefits of electrification by providing a reliable and affordable supply of clean electricity.

[16] 220 ILCS 5/8-512 (4).

[17] 20 ILCS 3501/850-10-5.

[18] 20 ILCS 3501/850-15 (1).

II. Illinois Resources and Capabilities

In order to meet the CEJA requirement 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.

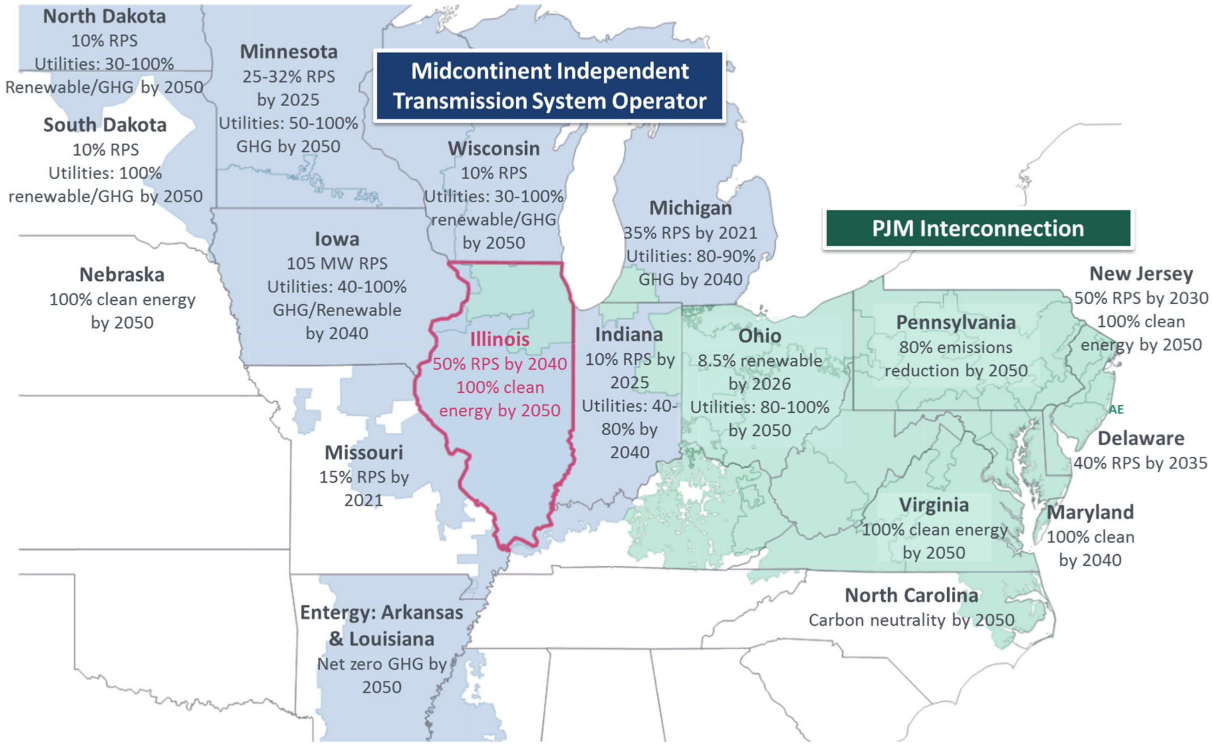
Developing a viable plan for achieving a 100% clean electricity mix must also consider the need to replace the reliability and balancing services that have traditionally been provided by fossil resources. As fossil resources reduce their operations, GHG emissions, and eventually retire, essential grid 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. System reliability and balancing needs will need to be accounted for, alongside the total energy needs, in the REAP.

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 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 creates 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. The regions also serve a large number of local 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 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.

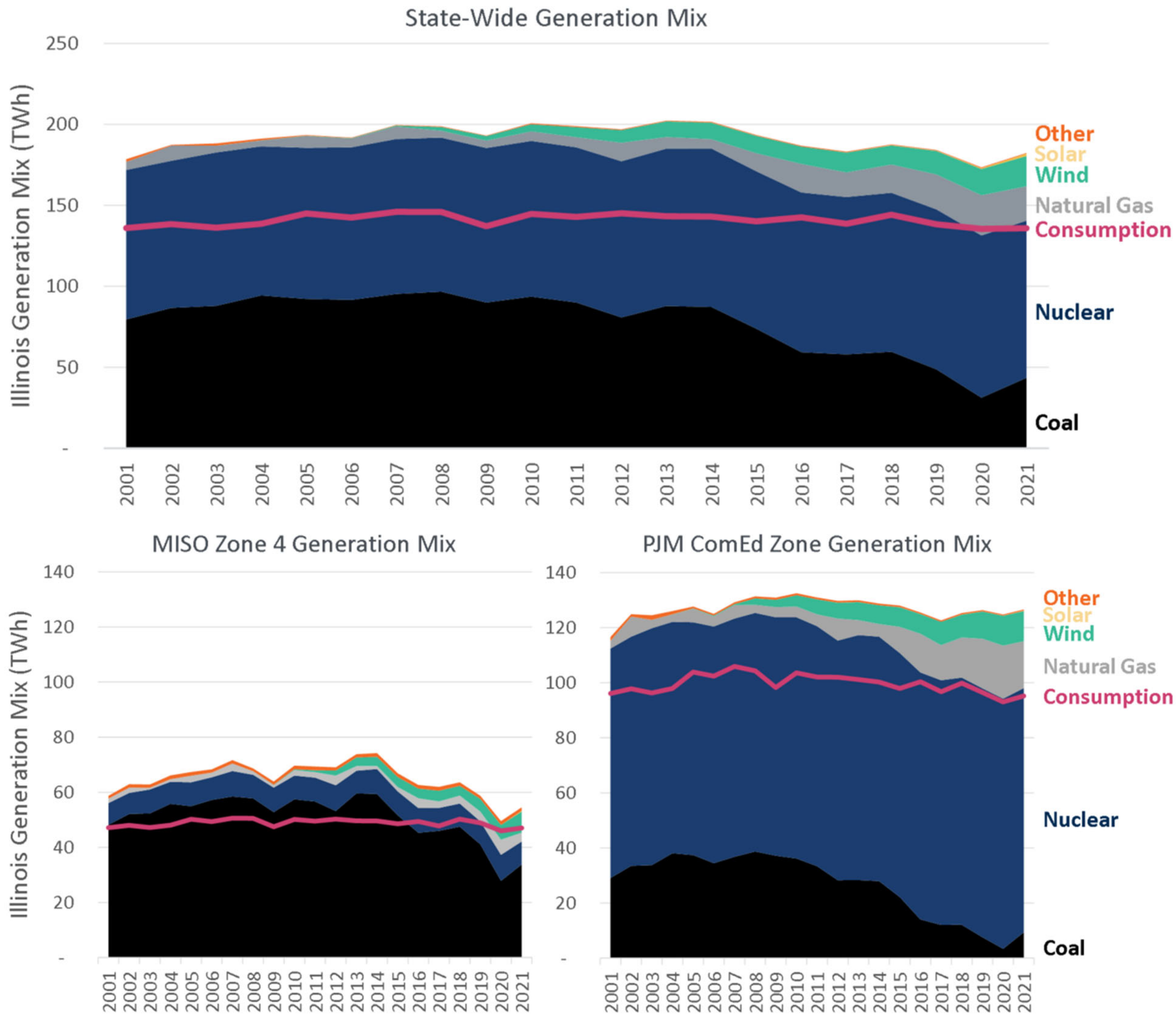
Illinois engages in substantial energy imports and exports with other states, with the balance of net imports and exports changing dynamically with system conditions across every border in every 5-minute RTO dispatch interval. On balance, Illinois has historically been a net exporter with Illinois generation exceeding Illinois consumer demand by approximately 20%.[19] 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. 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.

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.

[19] US EIA 2021 Illinois State Profile.

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 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 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. We discuss GHG emissions tracking and mitigation effects further in Section VI below.

FIGURE 3: ILLINOIS' HISTORICAL GENERATION MIX



Source: [US Energy Information Administration State Energy Data System](); Velocity Suite via PJM Interconnection and Midcontinent Independent System Operator.

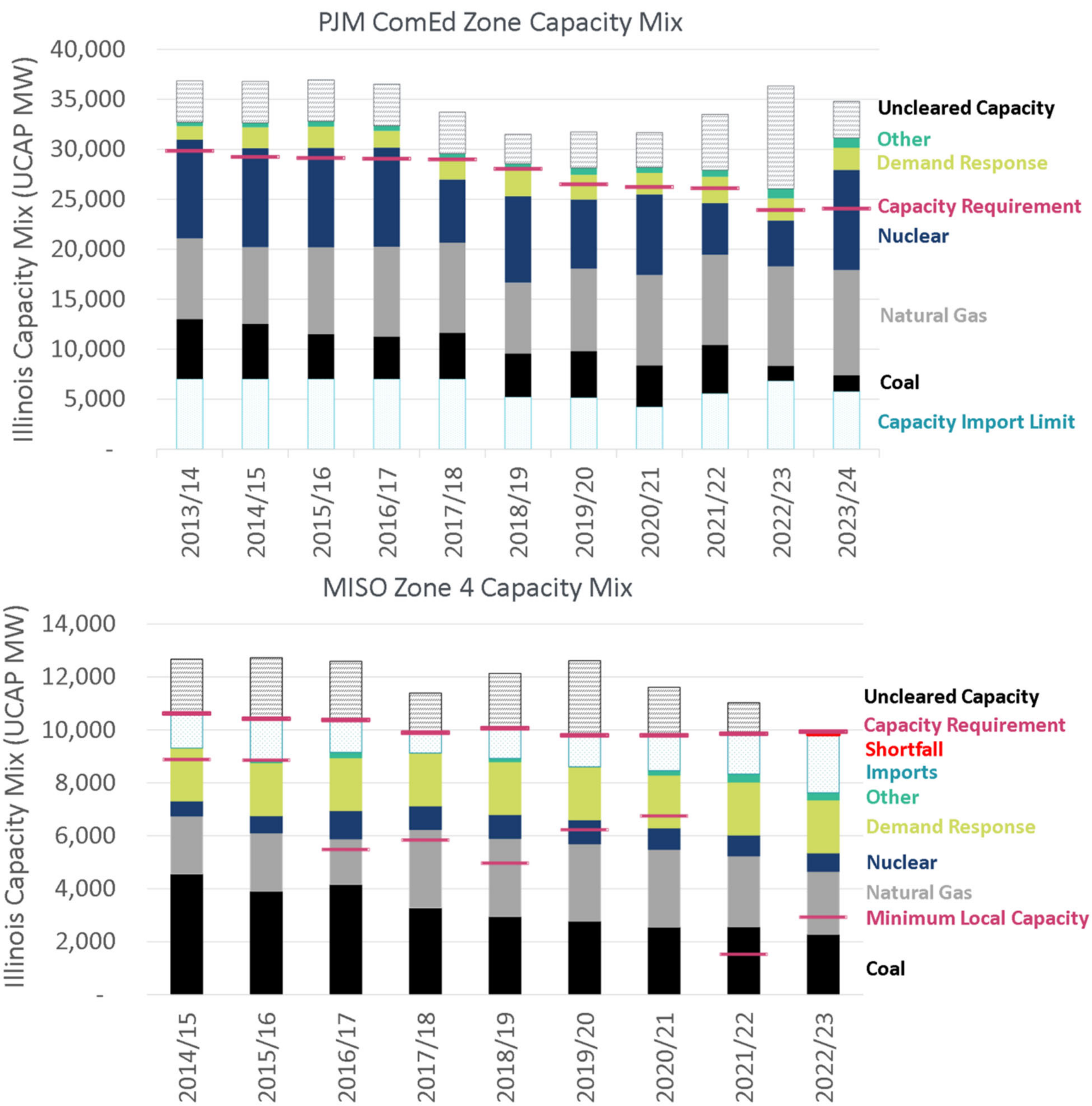
Separate from energy markets (denominated in MWh of production), the RTOs also support capacity markets (denominated in MW of unforced capacity (UCAP MW)). The capacity markets ensure that the total quantity of supply will be sufficient to meet peak demand and reliability needs, such that supply shortfalls would be incurred no more than once in ten years ("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 (pink lines). The RTOs require that sufficient capacity will be available to meet Illinois consumers' needs; a portion of the needed capacity must be geographically located within the state, while the remainder can be imported from other regions up to the prevailing transmission limits. Natural gas, coal, nuclear, demand response, and imports provide the majority of Illinois' capacity supply. Renewables contribute only a small fraction, given that their intermittent nature makes them less suitable for meeting reliability needs in an on-demand fashion.

The PJM-served portion of the state in the ComEd region presently has excess capacity relative to reliability needs. In the most recent 2023/24 PJM capacity auction, 3,659 MW of eligible capacity offered into the auction but 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 had failed to clear the capacity auction, which can be a concern with respect to CEJA goals if it signals that the resources are at risk of retirement. The expansion of nuclear CMC payments (reflected only in the most recent auction results) will presumably ensure their retention at least until the payments expire after 2027.

The MISO-served portion of the state has less capacity available. 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 signalled that many resources (particularly aging coal plants) have become uneconomic to continue operating. In the 2022/23 planning auction, all resources that offered into the auction cleared. 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 ICC investigation, 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. As discussed further in Section VI 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.

FIGURE 4: ILLINOIS CAPACITY MIX IN PJM (TOP) AND MISO (BOTTOM)

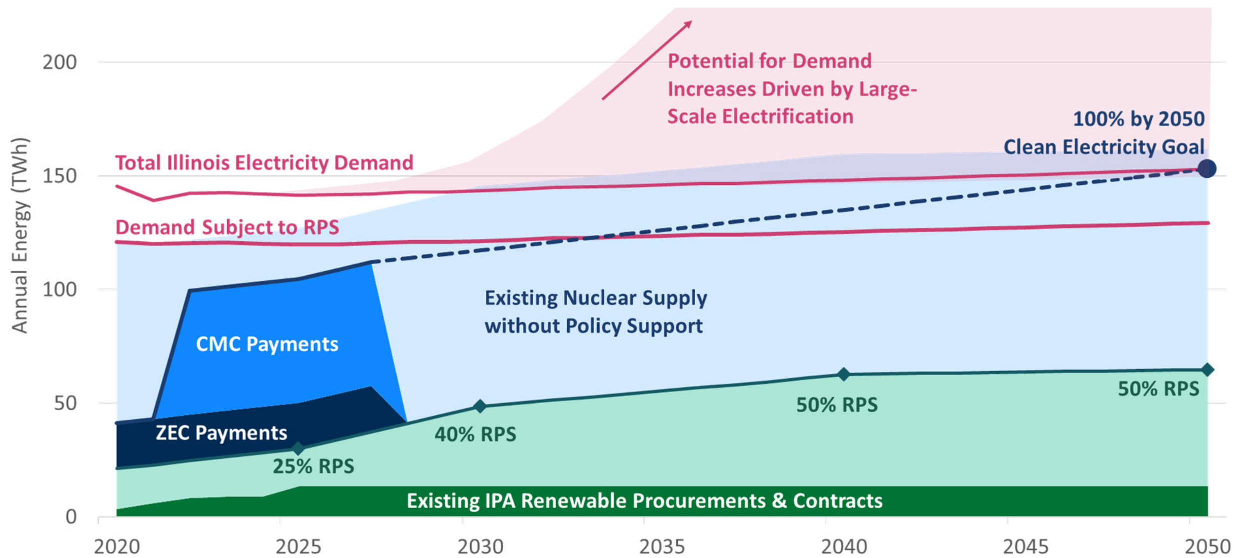


Source: PJM Interconnection Base Residual Auction Results Report; Monitoring Analytics Analysis of the Base Residual Auction; Midcontinent Independent System Operator Planning Resource Auction Results; Potomac Economics Midcontinent Independent System Operator State of the Market Report. We assume that MISO Zone 4 has 2,000 MW of load-modifying resources committed in the Planning Resource Auction.

B. Outlook for Renewable Supply Needs

CEJA mandates that 50% of the electricity demand from consumers served by retail customers (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.[20] 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



Notes and Sources: 2020–37 Delivery Year Demand from ICC Jurisdictional Utilities based on 2022 IPA Long-Term Procurement Plan Appendix B2; 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. % RPS, % 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 3 TWh per year of in-state renewable supply. Note that this 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

[20] 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 this exception in some cases throughout the REAP.

purchases. This portion of the renewable supply needed to serve RPS must be in Illinois, or in an adjacent state, based on prevailing RPS qualification 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 and out of 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.[21] 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. 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.[22] Combined with the previously-introduced Zero Emission Credits (ZECs),[23] 74.6 TWh of generation (approximately 52% of Illinois' total electricity demand) will now be supported by nuclear credit payments annually.[24] The ZEC and CMC support mechanisms are set to expire by the end of 2027 and mid-2027 respectively.

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

22 CMCs were introduced in CEJA and can support up to 54.5TWh 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).

23 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* SB 2814 20 ILCS 3855/1-75 (d-5)(1).

24 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

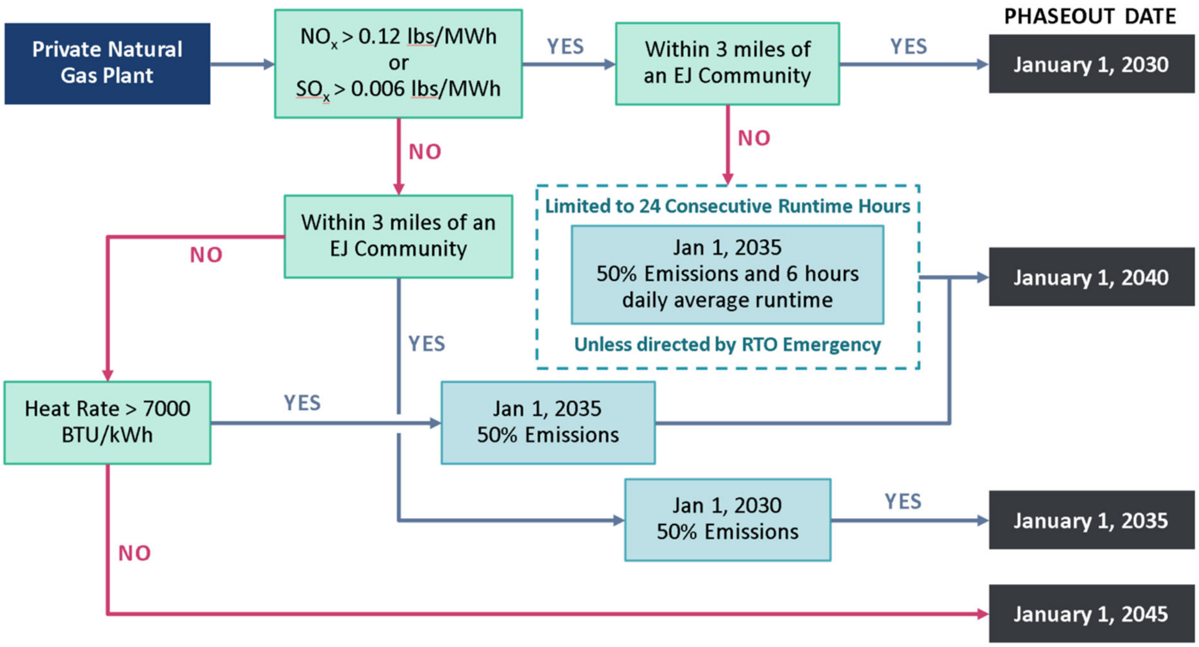
Though CEJA contemplates that nuclear should be considered as a resource that can contribute to meeting the state-wide 100% clean electricity goals, the policy mechanisms by which nuclear supply will be retained past 2027 have not been determined. Considering nuclear supply in the context of the REAP, we also consider the substantial contributions that nuclear supply makes not only to serving clean energy needs but to providing system capacity and reliability services. 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. The importance of accounting for and managing system reliability needs will grow as fossil phase out is implemented; we discuss options for accounting for these needs in Section VI below.

D. Interactions with Fossil Phase Out

CEJA outlines the structure of the phase out of GHG emissions from fossil resources above 25 MW. All natural gas facilities must eliminate GHG emissions by 2045 and all coal facilities must eliminate emissions by 2035. 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 2035. 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 fossil phase out required by CEJA are illustrated in Figure 6 below.

CMC price is the "baseline costs" of carbon-free energy resources. SB 2814 20 ILCS 3855/1-75(d-5)(7); IPA, Carbon Mitigation Credit Procurement Plan, at 15.

FIGURE 6: PRIVATE NATURAL GAS PHASE OUT STRUCTURE



Source: PJM Interconnection Illinois Clean Energy Jobs Act Fossil Fuel Generation Phase Out, p. 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 possibility we discuss further in Section VI.B.2 below.

Fossil phase out will also test both markets' ability to support system reliability and capacity throughout clean energy transition. Currently only 48% of the local cleared capacity in the PJM-served portion of Illinois and 36% in MISO-served portion of Illinois come from clean resources, the majority of that clean capacity supply is nuclear.[25] Phasing out fossil capacity will require that the supply be replaced by increases in capacity from other sources in a strict balance each year, to avoid any reliability shortfalls. Increases in renewable power will contribute only a relatively small portion of the needed capacity, given the intermittent nature of those resources. The remainder of the increase in capacity will need to come from either imports from other regions of the grid (which may or may not be fossil resources), or else from incremental clean capacity resources such as batteries and demand response. Opportunities to manage capacity needs in transition are more fully discussed in Section VI.B.2 below.

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[25] PJM Interconnection Base Residual Auction Results Report; Monitoring Analytics Analysis of the Base Residual Auction; Midcontinent Independent System Operator Planning Resource Auction Results; Potomac Economics Midcontinent Independent System Operator State of the Market Report.

III. Renewable Development and Land Use

The final REAP will establish a process for identifying renewable energy zones and incorporating them into regional, local, and distribution system planning to help meet CEJA's goals. The draft process set out below provides an initial framework, to be refined through stakeholder input, further analysis, and coordination with utilities and RTOs. The final REAP will also incorporate input from the University of Illinois Smart Energy Design Assistance Center (SEDAC), leveraging their existing site analysis tools to develop and refine data, methods, and criteria. If effective, this process can serve as a repeatable model for future REAP updates to develop planning inputs that holistically consider resource suitability and state public policy.

A. Criteria for Identifying Renewable Energy Zones

Identification of areas with attractive characteristics for becoming candidate renewable energy zones will consider locational suitability for projects based on several key criteria. The analysis in this chapter focuses only on non-electrical factors of geographical areas; below, the plan will consider electrical feasibility in refining these candidate zones, including review of headroom availability and incorporation into identified planning processes.

The preliminary criteria for identifying renewable energy zones are listed below, and the process for analyzing and developing each of these criteria is detailed in the following sections. The final REAP will consider stakeholder input on additional criteria and associated data sources.[26]

- Renewable Energy Resource Potential
- Zoning and Permitting Processes
- Current Land Uses
- Locational Marginal Emissions
- Equity Considerations
- Locations of Mandated Fossil Retirements

[26] For example, the 2022 Illinois Farm Bureau Policy Book explains support for "efforts to locate solar energy projects on marginal or underused lands, including brownfield sites, highway right-of-ways, rest areas, welcome centers, embankments, and on IDNR non-tillable properties…" (at 10). Stakeholders are invited to comment on the data and methods that would allow consideration of these property types as criteria for identifying candidate energy zones.

B. Assessment of Suitability for Renewable Deployment

1. Resource Potential

The REAP proposes to evaluate renewable energy resource potential through analysis of wind and solar attributes across the state of Illinois. Through ongoing collaboration with SEDAC, these analytical frameworks are subject to further evaluation and improvement. Stakeholders should provide comment on the methods and approach set out below, with the goal of offering actionable improvements to the identification of candidate renewable energy zones in the final REAP.

WIND ENERGY

The conversion of wind energy into electricity occurs by way of large wind turbines, each requiring sizeable areas with adequate amounts of wind speed and year-round availability of wind. The final REAP will incorporate industry experience regarding the average and minimum wind speeds needed to facilitate development of a utility-scale wind project, land requirements for wind farm development, as well as other criteria used to determine if a project is viable. The REAP proposes to examine the wind potential throughout the state to help identify attractive locations. Various sources for wind speed potential will be evaluated, and stakeholders should identify any particularly robust resources in their comments.

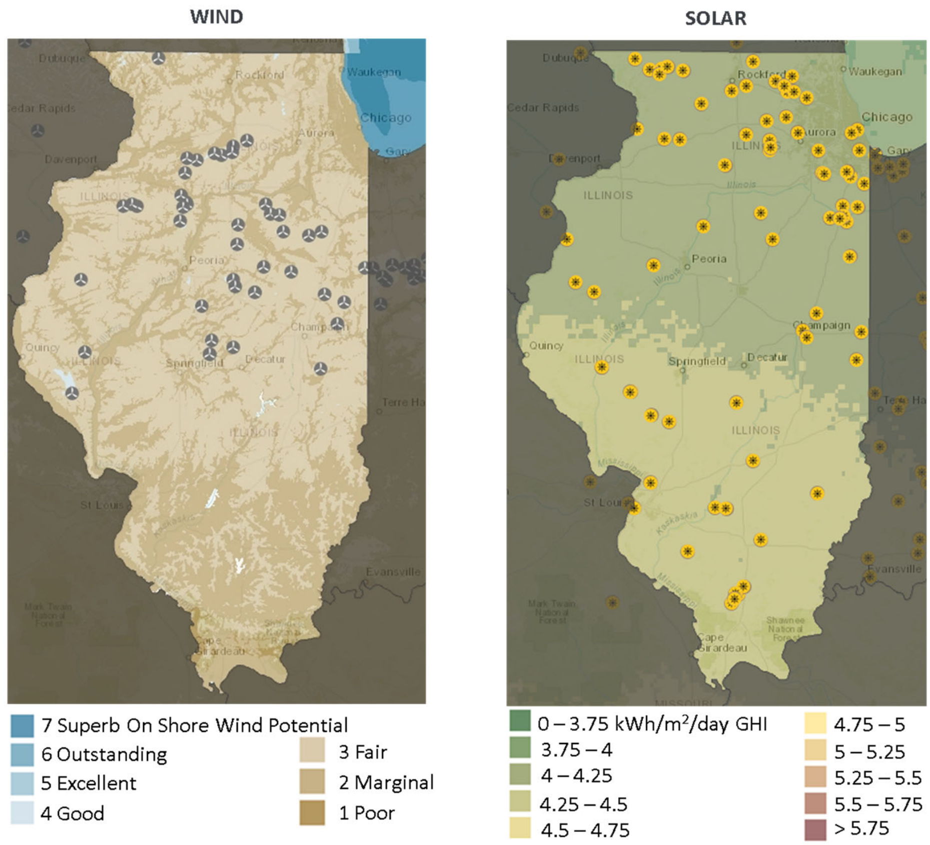
On the basis of this analysis, the final REAP will evaluate the total wind energy potential available in Illinois, including the amount currently operating and the amount anticipated for construction. The final REAP will seek to prioritize areas with the greatest potential for wind energy resources, and to identify candidate renewable energy zones with the potential to be addressed in the near-term.

SOLAR ENERGY

Similar to wind resources, solar panels rely on adequate areas with direct access to sunlight and minimal obstructions. The final REAP will incorporate industry experience regarding the average and minimum solar irradiation needed to facilitate development of a solar project, as well as other criteria used to determine if a project is viable. The REAP proposes to examine the solar potential throughout the state to help identify attractive locations. Various data sources for solar potential will be evaluated, and stakeholders should identify any additional data sources in their comments.

The final REAP will evaluate the total potential solar energy available in Illinois, including the amount currently operating and the amount anticipated for construction. Based on ongoing refinements from stakeholder and Illinois agency engagement, the final REAP will present areas with sufficient potential for development of solar energy resources, as an input to candidate renewable energy zone determinations.

FIGURE 7: WIND AND SOLAR RESOURCE POTENTIAL



Source and Notes: US Energy Information Administration GIS map.

2. Zoning and Permitting Processes

Zoning ordinances define the potential land uses for specific geographic parcels, limiting the available land for renewable development. They regulate elements including building form, placement, size, spacing, parcel area, width, depth, and other land-use considerations. Zoning maps depict the governing authority's geographic area and dictate the permissible construction and development activities throughout the area.

The final REAP proposes to contact each of the IL counties to compile details on relevant ordinances and zoning considerations that dictate land available for renewable energy development. Several counties throughout the state have not adopted zoning ordinances on land use and are therefore designated as "unincorporated." In addition, numerous Illinois counties require a special use permit for any wind or solar project proposed in their jurisdiction. The process for the issuance of these special use permits, and their impact on the suitability of candidate renewable energy zones, will be evaluated in the final REAP. The REAP proposes to investigate the existence, requirements, and potential impacts of wind and solar ordinances on potential candidate renewable energy zones. Namely, the final REAP will evaluate which counties:

- Allow renewable energy development in Agricultural Zones

- Allow renewable energy development in Industrial Zones
- Allow renewable energy development in Commercial/Business Zones
- Allow renewable energy development in Residential Zones areas
- Have yet to adopt wind energy conversion ordinances.

Using the survey responses received from each of the counties, setting out their ordinances and zoning maps as available, the final REAP will highlight areas particularly suitable for renewable energy development. This analysis will allow calculation of land usage in Illinois where ordinances allow the siting of renewable energy to inform areas eligible for candidate renewable energy zones.

3. Current Land Uses

Renewable energy facilities must consider a wide array of land-use constraints when locating and initiating development. Based on initial discussions and experience in development of this initial REAP, certain highlighted constraints became evident candidates for further study. Through further refinement, analysis, stakeholder comment, and coordination with Illinois agencies, the final REAP will select key land uses for consideration in candidate renewable energy zones. Stakeholders should comment on the following list of land uses currently under consideration for analysis and incorporation in the final REAP:

- Topography
- County ordinances, including overly restrictive rules or the lack of any process
- Escrow or bonds for decommissioning
- Endangered/threatened species of flora and fauna
- Agricultural uses
- Noise pollution created by the system
- Aesthetic pollution commonly referred to as the "Not in My Backyard" affect
- Distance from POI

4. Locational Marginal Emissions

The REAP aims to recognize that some parts of the grid have higher marginal emissions than others, due to the combination of generation fleet characteristics and transmission constraints. Adding renewable energy in the areas with higher marginal emissions will displace more CO_2 per MWh, and these areas could be prioritized for renewable development. The challenge is identifying such areas, which the REAP will aim to do by using locational marginal emissions (LME) data. LME data measures emissions at different locations throughout the regional footprint, based on the emissions rates of the generators that would have their output adjusted by the grid operator to meet changing loads in that area. Unlike data of individual plant emissions, LME paints a granular picture of specific emissions profiles within regions, based on real-time system conditions. Studies have demonstrated that renewable resources sited on the basis of LMEs can mitigate more than double the amount of CO_2 as a similar resource in an unfavorable location.[27] Utilizing LME data in the formation of candidate renewable energy zones therefore may materially improve the carbon abatement outcomes of even existing renewable energy procurement volumes.

Marginal emissions data exist at five-minute intervals by node in PJM from 2020 onwards, accessible through their Data Miner and through ReSurety's private datasets. PJM calculates this LME data from the emissions rate for the marginal units for each node for each pricing interval. While PJM cautions that the data is not predictive of future behavior, LME data provides a snapshot into how changes in behavior by generators or consumers, at a particular location, could affect electricity emissions. MISO does not yet provide this data, despite the impact it could have on public or developer siting decisions for renewable energy projects.

5. Equity

The final REAP will ensure that equitable access to clean energy is an important factor in the selection and prioritization of candidate renewable energy access zones. Both CEJA and the state of Illinois have identified 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. These unique equity identifications are discussed below, and stakeholders should highlight suggestions for efficiently and robustly incorporating these equity considerations into the final REAP.

ENVIRONMENTAL JUSTICE COMMUNITIES

Environmental Justice (EJ) Communities are designated based on a methodological framework established in the Long-Term Renewable Resources Procurement Plan by the IPA.[28] 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.

These communities find several mentions in CEJA. First, as explained in Section II.D., 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

[27] D.L. Oates and K. Spees, Locational Marginal Emissions: A Force Multiplier for the Carbon Impact of Clean Energy Programs, REsurety and The Brattle Group, August 2021, at Figure 2.

[28] IPA, 2022 IPA Long-Term Procurement Plan § 8.12, at 273.

electrification to these areas.[29] Third, CEJA requires 25% of incentives under the Illinois Solar for All program to be reserved for projects in EJ communities.[30]

EQUITY INVESTMENT ELIGIBLE COMMUNITIES

CEJA characterizes Equity Investment Eligible communities as "geographic areas throughout Illinois which would most benefit from equitable investments by the State designed to combat discrimination."[31] According to the present definition, 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.

ILLINOIS ENTERPRISE ZONES

Illinois has an Enterprise Zone program to stimulate economic growth in economically depressed neighborhoods. Under the program, the state provides tax incentives and exemptions to businesses in the neighborhood. CEJA amends the Illinois Enterprise Zone Act to further incentivize solar and wind projects in these areas.

ENERGY TRANSITION COMMUNITIES

CEJA establishes an Energy Transition Community Grant program to promote further economic development in eligible communities. Communities eligible for this grant include areas wherein a fossil or nuclear plant has retired or been decommissioned in the last 6 years and areas wherein a coal mine has closed or significantly reduced operations in the last 6 years.[32] CEJA also requires REC procurements to be optimized for utility-scale projects located in Energy Transition Communities.[33] The IPA has proposed granting a 10% downward adjustment for eligible projects in accordance with this provision.[34]

6. Locations of Mandated Fossil Retirements

In addition to land-use, equity, and other factors submitted by stakeholders, the final REAP will consider the feasibility of utilizing interconnection capability associated with fossil fuel generation retiring as a result of economic pressures, IL EPA regulations, or CEJA. In collaboration with Illinois agencies, the final REAP will gather available data to analyze anticipated resource retirements. If the final REAP gathers sufficient data, it may be incorporated into the

[29] *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.").

[30] 20 ILCS 627/45.

[31] 20 ILCS 730/5-5

[32] 20 ILCS 735/10-20.

[33] 20 ILCS 3855/1-75(c)(1)-(P).

[34] IPA, 2022 IPA Long-Term Procurement Plan § 5.4.3, at 117.

identification of candidate renewable energy zones, or otherwise incorporated in regional planning.

Stakeholder discussions ahead of this initial REAP revealed that many of the sites of potentially retiring fossil fuel generation may already be oversubscribed in existing interconnection queues. Stakeholders should comment on whether additional processes to transfer interconnection capability from retiring generators to policy resources would assist additional renewable development or efficient achievement of policy goals. In the alternative, stakeholders should discuss Illinois' existing renewable marketplace, including whether Points of Interconnection POIs associated with retiring fossil fuel generators are already well-utilized by potential policy resources.

In addition, the final REAP may examine best practices regarding implementation of Federal Energy Regulatory Commission (FERC) Order 845's requirement for utilization of surplus interconnection service.[35] Certain RTOs already permit this type of coordination between existing plant owners and other resources seeking system interconnection.[36] Coordination with PJM and MISO on existing practices will inform any related recommendations in the final REAP.

At least one RTO is currently performing planning analysis considering retirement of impacted fossil fuel resources in Illinois impacted by CEJA. Through its Planning Committee, PJM initiated a study focusing on near-term (study year 2030) and longer-term (after 2035) impacts, using parameters similar to its generation deactivation studies.[37] Draft study results are expected in summer of 2022, potentially providing another source of input to the final REAP. Ongoing collaboration with PJM is likely to be mutually beneficial, allowing PJM to refine study results, and Illinois to understand further the assumptions utilized in PJM's study. Ongoing collaboration with MISO will determine the extent of any currently ongoing studies of fossil fuel impacts resulting from CEJA. The final REAP will aim to expand any existing analysis or discuss the scope of studies needed to further understand expected future impacts in MISO, as well as the required timeline for these additional analyses.

C. Candidate Renewable Energy Zones

Beyond the criteria identified above, the final REAP may propose additional criteria based on stakeholder feedback. Stakeholders may suggest additional criteria and provide any input on the relative importance of the various criteria in prioritizing zones with particularly high value for resource development. Stakeholders may also highlight any necessary conditions or threshold issues associated with any criteria.

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35 Order No. 845-A, 166 FERC ¶ 61,137, at PP 119-129 (2019).

36 SPP Tariff, Attachment V § 3.3; MISO Tariff, Attachment X § 3.2.3.

37 PJM, PJM Study—Illinois Clean Energy Jobs Act, March 2022, at 2.

The full set of non-electrical criteria will be used to evaluate all counties for their attractiveness for renewable energy development and for consideration in later parts of the plan regarding transmission access.[38] The exact format of the evaluation will be designed through collaboration with Illinois agencies and RTOs. It will also determine whether the most appropriate outputs are qualitative descriptions, quantitative scoring, mapping, a combination, or some other potential format. If additional analyses are required to provide ideal outputs, those analyses will be described in the final REAP.

For each zone, the REAP will aim to describe ordinance and zoning, current land use, the amount of suitable land appropriate for renewable resource development, and ultimately the resource potential (in MW by type). As a final step, the available resource potential will be compared against Illinois' policy need for renewable resources identified earlier. The goal will be to identify sufficient candidate zones to satisfy the state's total renewable procurement target. Should insufficient suitable renewable energy resource potential be identified to satisfy Illinois' policy needs, the final REAP may recommend statewide renewable energy ordinances or other reforms to expand the available area for future renewable energy development.

38 The potential for further granularity will be evaluated in the final REAP and in coordination with Illinois agencies and SEDAC.

IV. Electric Transmission Infrastructure: Existing, Planned, and Gaps

Transmission infrastructure is planned and managed by a combination of the RTOs and the utilities, but no entity has fully assessed the amount of transmission available for renewable energy development nor the upgrades that would be needed to meet Illinois' goals under CEJA. More work is needed through a comprehensive transmission planning process accounting for Illinois' needs, as discussed in Section V.

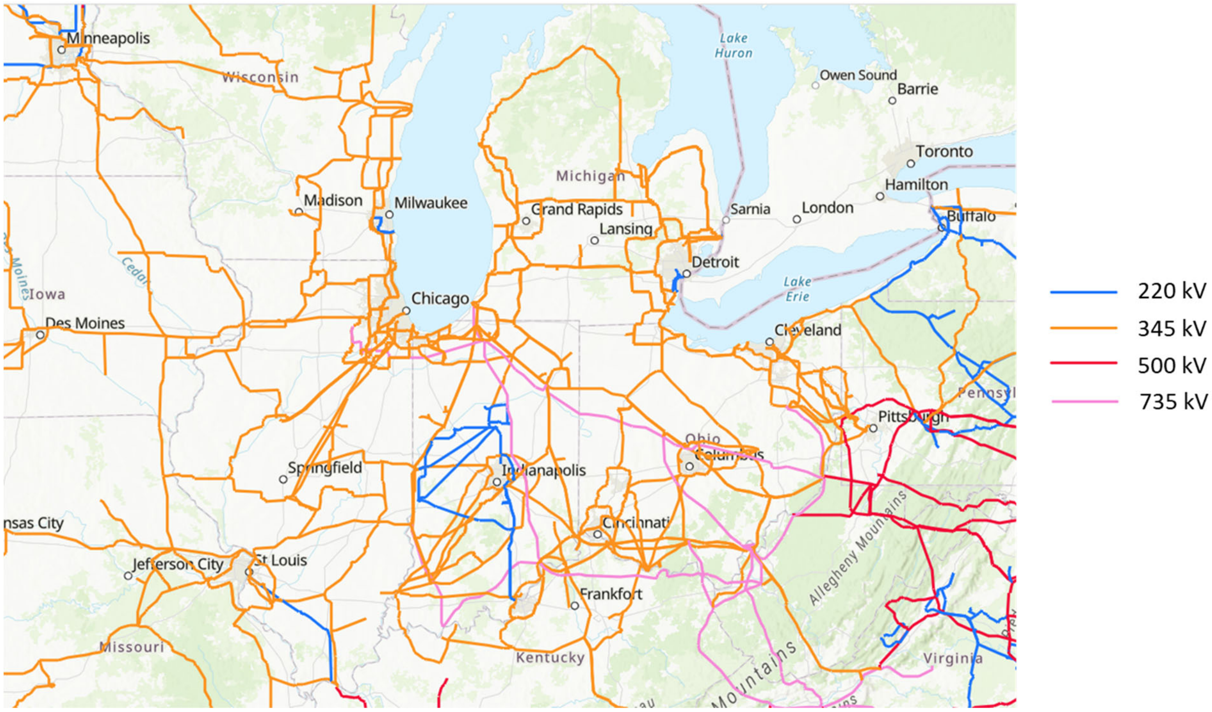
Until then, partial assessments of the system are available through MISO's Long-Range Transmission Plan, PJM's Offshore Wind Transmission Study, generation interconnection studies, and utility studies of headroom for accommodating Distributed Energy Resources (DERs). We propose an additional analysis to be pursued by the RTOs as part of the REAP, to inform and refine candidate renewable energy zones for inclusion in future planning processes. This section synthesizes the results of those assessments, following an introductory description of the current system and approved upgrades, and provides a proposal for identifying additional needs throughout Illinois resulting from CEJA.

A. Existing Infrastructure and Approved Expansion Projects

Illinois is a major consumer, producer, and transmitter of electricity. On net, Illinois typically sends about one-fifth of the power it generates to other states over interstate transmission lines, and serves as a conduit for more than that.[39] Illinois is part of two regional power grids that are connected but planned and operated independently, with some coordination. PJM serves Northern Illinois while MISO serves Central and Southern Illinois. Figure **8**Figure **8** shows the existing transmission network (220 kV and above) in Illinois and neighboring states.

39 US EIA 2021 Illinois State Profile.

FIGURE 8: REGIONAL HIGH-VOLTAGE TRANSMISSION SYSTEM MAP (220KV AND ABOVE)



Source: ArcGis

Both PJM and MISO have invested heavily in tranmission infrastructure to interconnect new resources and maintain system reliability. Since PJM's first Regional Transmission Expansion Plan (RTEP) in 1997, the PJM Board has approved transmission system projects totaling $38.9 billion.[40] Another $22.1 billion in supplemental projects were built by PJM Transmission Owners outside of the PJM Board approval process.[41] Among the nearly $39 billion in baseline investment, $32.4 billion was driven by North American Electric Reliability Corporation (NERC), regional or local (Transmission Owner) planning criteria, or market efficiency drivers (called "baseline" projects), and $6.5 billion was directed toward network facilities to reliably interconnect over 90 GW of new generation.[42] In 2021 alone, PJM approved 118 new baseline projects at an estimated cost of $920 million, although 52% of these projects were driven by Transmission Owner criteria violations.[43] PJM evaluated, but did not approve, an additional 412 supplemental projects in 2021, totaling $3.3 billion.[44] In PJM's Illinois territory, transmission development included one baseline reliability project, 19 network projects, four supplemental projects, and two active merchant project requests in 2021.[45]

40 PJM, 2021 RTEP, at 4. Not including supplemental projects.

41 *Id.*, at 290.

42 *Id.*, at 4.

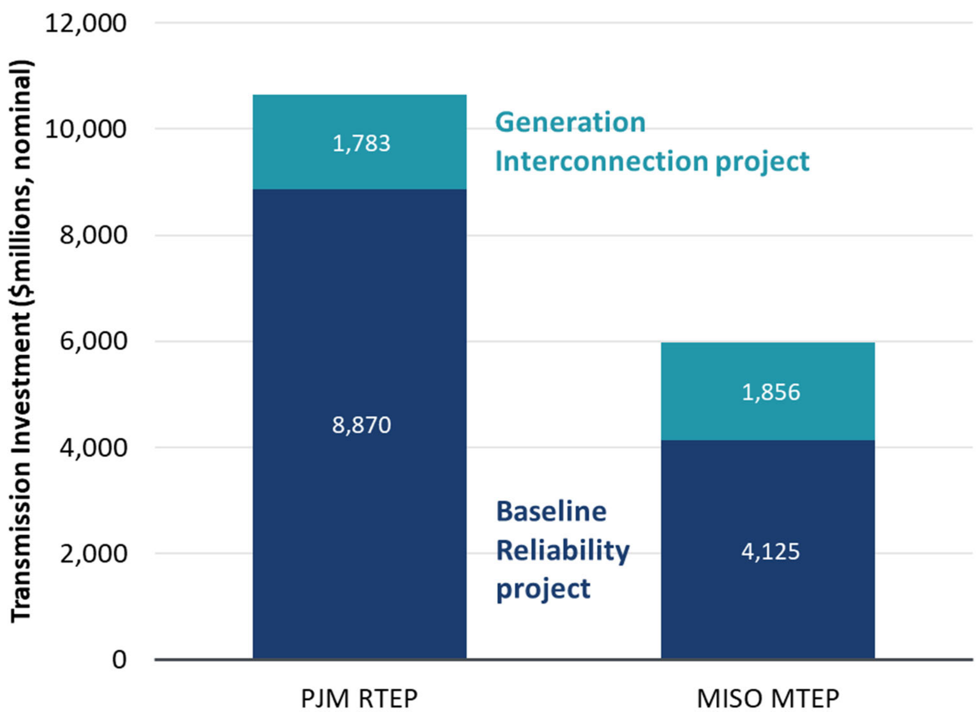
43 *Ibid.*

44 *Id.*, at 61.

45 *Id.*, at 111.

MISO has also invested in major new transmission infrastructure, approving over $42 billion since 2003. In the 2021 MISO transmission expansion plan (MTEP) alone, the RTO approved 335 transmission projects throughout the MISO footprint, totaling approximately $3 billion. Of this investment, 11% was driven by Generator Interconnection requests, 6% was directed by Baseline Reliability needs, and the remaining 83% are 'Other' projects driven by aging infrastructure, local non-reliability needs, interconnection of new loads, and other local transmission owner needs.[46] Within Illinois, MTEP 2021's approved projects include $448 million of investment, including three Generation Interconnection projects, three Baseline Reliability projects, and Other projects.[47] Figure 9 shows the invement in approved transmission projects from 2016 to 2021 in both MISO and PJM.

FIGURE 9: COST OF APPROVED TRANSMISSION PROJECTS IN PJM AND MISO FROM 2016 TO 2021



Sources and Notes: PJM RTEP 2021 and MISO MTEP 2021. Does not include PJM supplemental projects or MISO Other projects.

B. Assessments of Future Bulk-Power Transmission Needs

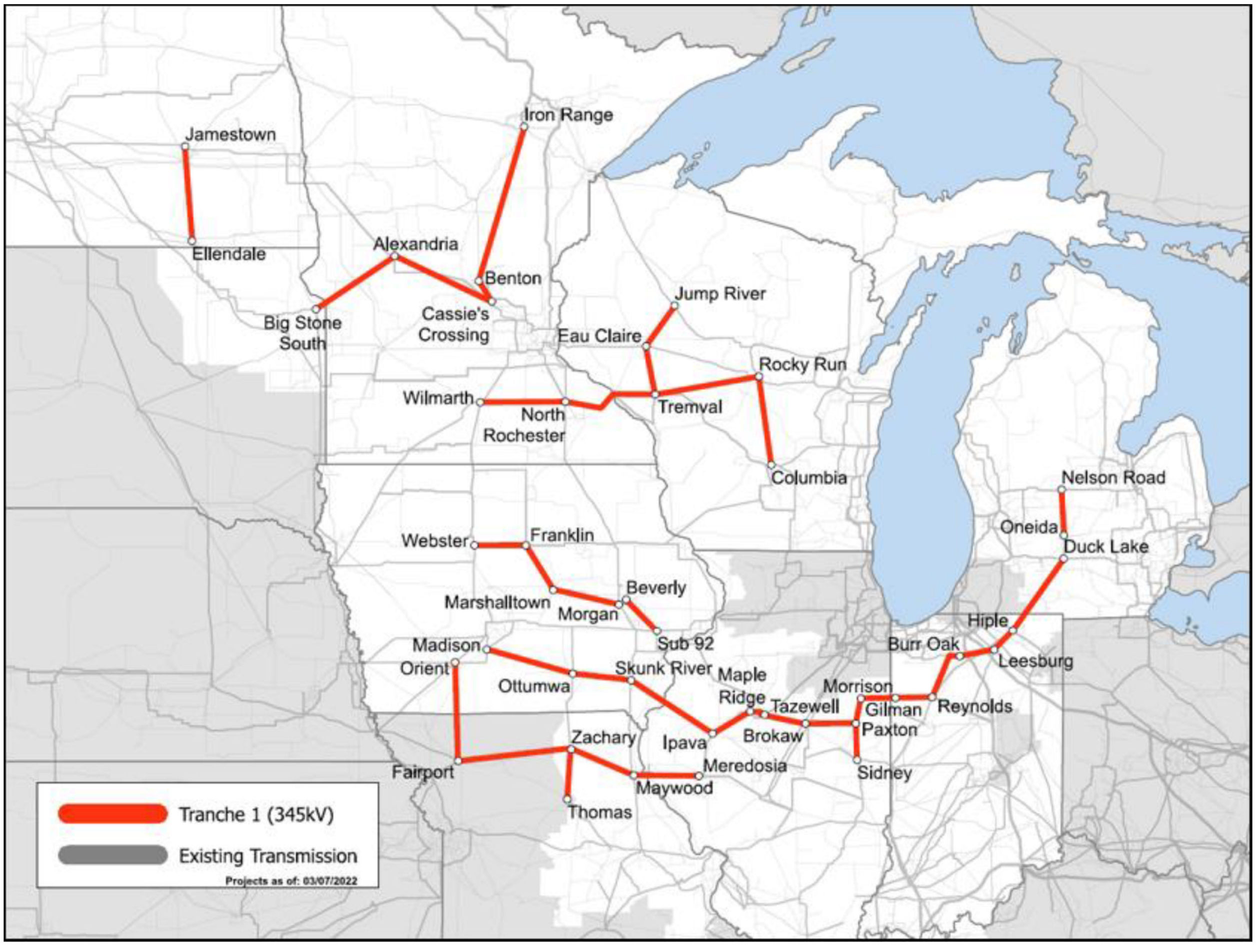
MISO and PJM have both recently identified transmission enhancements needed to meet regional RPS targets, including Illinois' "25% by 2025" target that was in effect when the studies were conducted, before CEJA was passed.

46 MISO, 2021 MTEP, at 2, 4, 15.

47 *Id.*, at 17.

MISO's Long-Range Transmission Plan (LRTP) Tranche 1 identified $10.4 billion of cost-effective projects, including 345kV lines through Illinois as shown in Figure 10. This plan is still awaiting MISO Board approval. The portion in and around Illinois is Madison–Ottumwa–Skunk River in Iowa, to Ipava–Maple Ridge 345kV–Tazewell–Brokaw–Paxton–Gilman–Morrison in Illinois, to Reynolds–Hiple–Duck Lake 345kV Paxton–Sidney 345kV–Oneida–Nelson Road 345kV in Indiana and Michigan.

FIGURE 10: MISO LRTP TRANCHE 1 PORTFOLIO



Notes/Source: MISO, LRTP Tranche 1 Portfolio Detailed Business Case, 2022, p. 12.

MISO's Plan was developed in response to MISO's *Futures Report*, which created detailed scenarios of resource development throughout the footprint.[48] The portfolio developed as part of LRTP Scenario 1 addresses Future 1, which sought to capture MISO states' policy requirements, meeting then-applicable RPS targets when added to existing capacity and existing headroom.[49] The Plan does identify the following benefits:

48 MISO, MISO Futures Report, at 44 (updated Dec. 2021); MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, March 29, 2022, at 12.

49 MISO, 2021 MTEP § 3.2.

- Delivers significant increase in transfer capability to support generation deficient areas due to unexpected decrease in renewable output;
- Mitigates 28 thermal overloads in Michigan, 16 thermal overload in Indiana, 19 thermal overloads in Missouri and Illinois, 14 thermal overloads in Iowa;
- Delivers $37.8 billion in congestion and fuel savings over 40 years to the MISO region;[50]
- Provides more robust performance under large shifts in dispatch of generation across the region;[51] and
- Incorporates achievement of then-present state policy goals.

PJM's Offshore Wind Transmission Study Phase 1 is only a study, not a "plan" like MISO's, but it provides some indicators of the system's capability and needs. The study concludes that Illinois previous RPS goal, 25% by 2025, could be met with moderate upgrades in the ComEd zone, although neither the specific upgrades nor the locations of the modeled renewables are identified in the results.[52] In Illinois, the study adds 7,329 MW of onshore wind, 2,406 MW of solar, and 1,080 MW of storage, and identifies $53 million of upgrades in the ComEd zone across scenarios, in addition to upgrades identified throughout PJM.[53] PJM's model only captures upgrades needed above 115 kV, so additional local and onramp capability to support the identified regional upgrades likely would be needed.[54] None of the Phase 1 study scenarios expand the scope of incremental renewable additions beyond Illinois' previous 25% RPS goal.

Although the study report does not indicate the specific transmission upgrades evaluated, the Offshore Wind Transmission Study Group (OTSG) Phase 1 study provides a helpful framework to begin identification of optimal locations for renewable additions required to meet Illinois policy goals. Together with PJM's ongoing study of resource retirements as a result of CEJA, discussed above, existing PJM analyses may prove to be a valuable resource to the final REAP. Additional collaboration with PJM may illuminate lessons learned from the OTSG Phase 1 study, other ongoing study work including Phase 2 of the OTSG analysis and Renewable Integration Study efforts, and any other relevant analyses applicable to optimizing locations for candidate renewable energy access zones.[55]

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50 MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, March 29, 2022, at 19.

51 *Id.,* at 45.

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

53 OTSG Phase 1 at 11–18.

54 OTSG Phase 1 at Table 4 (showing 115 kV as lowest voltage system element analyzed).

55 *See* PJM, Energy Transition in PJM: Frameworks for Analysis, December 15, 2021.

C. Existing Headroom for Incremental Renewable Development

While existing and planned transmission infrastructure across Illinois will provide some headroom for resources to access the system, the substantial growth of policy goals will likely require additional capability. Before determining the amount of capability that needs to be developed in the future, the REAP should seek to determine the headroom that is available today in candidate renewable zone areas.

Headroom depends on facility ratings and existing usage patterns, and can be considered on several levels: headroom for utility-scale resources that depends on onramp capacity onto the bulk power system, and headroom on the bulk system itself. Headroom for DERs is a more micro problem, depending primarily on the distribution system and lower-voltage parts of the transmission system.

BULK POWER SYSTEM

To determine the amount, location, and quantity of existing interconnection capability on the bulk power system, ICC Staff has requested that PJM and MISO analyze the amount of headroom that is available at potential points of interconnection across Illinois. Planned retirements and queued resources with requests at these points of interconnection will be evaluated as part of this survey, and will need to be incorporated into the analysis. The final REAP will seek to incorporate results of this initial screening analysis to initially prioritize candidate renewable energy zones. By overlapping the provided headroom data against candidate renewable energy zones identified above, the final REAP will seek to identify any optimal areas for interconnection available today.

In addition, this analysis will provide visibility into the remaining areas of candidate renewable energy zones that are limited by insufficient transmission capability. Through discussions with the RTOs, the final REAP will seek to identify facilities that are overloaded, constrained, or otherwise limiting queued resources in candidate renewable energy zones. Identified facilities will be candidates for review in future recommended transmission planning efforts to be described in the final REAP.

ONRAMP

To assess headroom capacity at the lower voltage levels for accessing the bulk system, utilities provide maps of hosting capacity with existing headroom. The REAP will summarize and review these utility hosting maps, in an effort to determine the amount of hosting capacity currently available. Overlapping these hosting maps with candidate renewable energy zone areas should help identify areas that currently exist for priority siting of policy resources.

In addition, the REAP will seek to identify constrained or overloaded onramp facilities that are limiting renewable energy deployment, particularly in areas identified as potential candidate zones, or recommend pathways for conducting this analysis in the future. Collaboration with the utilities will enable these analyses. Such constrained facilities or candidate renewable access zones may be identified in the final REAP for potential evaluation by the ICC in future distribution planning efforts. Depending on the ultimate recommendations and identified needs, other options may exist to develop facilities through the RTOs' local plans.

The final REAP will evaluate best practices in standardizing Illinois' utilities estimation of existing system headroom. As an example, New York has recently released guidance for its utilities to ensure that there is a consistent and standardized approach to estimating headroom, from a capacity and energy perspective.[56] These process improvements provide several benefits, including potentially providing standardized inputs to any future identification of renewable energy zones.

DISTRIBUTED ENERGY RESOURCES

Utilities assess capability on their distribution systems for interconnections of DERs. Many utilities use technical screens defined in FERC's Small Generator Interconnection Procedures (SGIP) to evaluate the impact of DERs on distribution systems.[57] Some states such as Illinois, California, and Ohio further adopt supplemental screens for DER interconnection specified in FERC Order No. 792 including minimum load screen, voltage and power quality screen, and safety and reliability screen. Emerging solutions may use power flow modeling or hosting capacity analysis as an alternative to the technical screens.[58]

In Illinois, the Illinois Administrative Code governs the interconnection of DERs. It provides guidelines and a process for utilities to evaluate the impact of a proposed DER on the electric distribution system.[59] It defines four levels of review for interconnection requests, based on the proposed resource capacity, voltage level, distribution network, and other technical specifications. An electric distribution company must determine the level of an interconnection request in accordance with these provisions, and use corresponding review procedures for evaluation. The final REAP will further evaluate existing distribution interconnection processes as relevant to the interconnection of resources in candidate renewable energy zones.

Typical hosting capacity assessments do not necessarily consider the amount of onramp and bulk headroom capability DERs consume or expand via counterflow. The REAP may therefore recommend enhancing DER hosting capacity analysis to evaluate interactions with the regional transmission system. Coordination with the utilities and RTOs will be critical to understand the currently available—and any additional—data that could inform recommendations of the final REAP.

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[56] NY Public Service Commission, Docket No. 20-E-0197.

[57] FERC Order 2006, Docket No. RM02-12-000.

[58] K. Horowitz, *et al.*, An Overview of Distributed Energy Resource (DER) Interconnection: Current Practices and Emerging Solutions, 2019.

[59] Illinois Administrative Code, TITLE 83, PART 466.80.

V. Transmission Planning and Interconnection Processes

The development of the regional grid occurs by way of the RTO transmission planning and interconnection processes. Any pursuit of the transmission necessary to enable Illinois' growing policy goals under CEJA requires close coordination with these processes to ensure regional plans produce efficient outcomes aligned with state policy. Too often, today's planning and interconnection processes result in piecemeal approaches insufficient to meet the needs of CEJA's mandates.

The final REAP will build on the transmission planning survey below to make recommendations for Illinois policymakers to engage in the regional planning process. Throughout development of the REAP, we look forward to working closely with the RTOs to craft recommendations enabling submission of detailed policy requirements into the regional plan. Based on this insight, the REAP will provide policy recommendations to continue improving regional planning processes to enable the energy transition.

A. Concepts

THEME 1: PROACTIVE TRANSMISSION PLANNING IS MORE EFFECTIVE THAN THE GENERATION INTERCONNECTION PROCESS

One of the most important themes of the REAP is to inform and favor proactive transmission planning over segmented interconnection processes. Proactive planning will lead to substantially more cost-effective transmission solutions and will present fewer barriers to development. Consider the findings of PJM's OTSG Phase 1 results compared with publicly-available queue data. On a regional basis, PJM found that 12.4 GW of offshore wind resources, and sufficient onshore wind, solar, and storage to meet every state's then-applicable RPS goal, could be integrated into the system for $2.1 billion of new transmission.[60] In contrast, Brattle analysis of PJM independently planned queue positions has found between $3.5–$4.7 billion in total identified transmission upgrades for integrating less than 8 GW of offshore wind resources in PJM. Other analyses found that integrating 15.5 GW of offshore wind under today's rules would lead to $6.4 billion in upgrades.[61]

This cost difference occurs largely because of the structure of each planning analysis. Current PJM queue studies evaluate only incremental additions to the system, and identify facilities that are overloaded as a result of that single resource addition—one resource at a time. This process

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60 OTSG Phase 1, at 18.

61 The Brattle Group and Grid Strategies, Transmission Planning for the 21st Century: Proven Practices that Increase Value and Reduce Costs, October 2021, at 5.

must be repeated not only for each resource in PJM's interconnection queue but also when projects earlier in the queue drop out, demanding substantial time and effort to identify only incremental transmission needs. Conversely, the OTSG Phase 1 study evaluated resource additions holistically on a scenario basis, and identified common transmission issues throughout the system. Instead of identifying them on a piecemeal basis, each issue was addressed once, resulting in substantial regional cost savings, and substantially more system access for RPS resources.

THEME 2: HOW TO DO PROACTIVE PLANNING

The goal of proactive transmission planning is to identify and pursue transmission projects that will cost-effectively meet reliability and policy objectives such as the CEJA. MISO already has such a framework in its LRTP, as discussed below. PJM's framework is less clear, but will have to be revised in response to FERC's Notice of Proposed Rulemaking (NOPR) on long-term transmission planning that will require transmission plans to consider reliability, economic, and policy objectives across a range of future scenarios evaluated using a broad range of benefits.[62]

The NOPR requires transmission providers to engage in long-term, 20-year forward transmission planning, and establish criteria to select transmission facilities revealed by these studies as more efficient or cost-effective solutions. The NOPR further proposes that these long-term processes consider transmission needs identified in several generation queue studies.[63] FERC also specified categories of transmission benefits that it recommended, but did not require, to be included in evaluating 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.[64] 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.[65]

While the NOPR is a meaningful start toward requiring forward-looking, portfolio-based, multi-benefit transmission planning, the time it will take to implement will not allow these reforms to meaningfully impact the short-term policy needs identified in the final REAP. Any compliance process resulting from the NOPR may take several years to refine, implement, and result in meaningful updates to RTO planning processes. Because the NOPR does not propose to change current planning processes accepted by Order 1000, targeted recommendations to integrate

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

[63] NOPR at PP 166–174.

[64] NOPR at PP 302–303.

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

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.[66]

A preferred approach to proactive transmission planning envisions scenario-based development of a diverse set of plausible future scenarios. Utilizing such a range of futures when evaluating future investment accounts for the inherent uncertainty of planning large-scale transmission, but allows identifications of upgrades that would be advantageous across a range of futures.[67] In addition to evaluating various futures, improvements to the interaction between generation queues and regional transmission planning should encourage streamlining interconnection timing. Overly restrictive generation queue study requirements create violations to be solved by interconnecting generators, even if those network upgrades are higher-voltage or otherwise regional upgrades.[68]

MISO's process employs much of this preferred approach. In planning a portfolio of multi-value transmission projects (MVPs), MISO seeks to take a least regrets approach to transmission planning. As highlighted above, while LRTP tranche 1 results resulted in an approximately $10 billion portfolio of transmission projects, these upgrades support interconnection of 53 GW of renewable resources and reduce other costs by $37–70 billion.[69] Benefits included in this analysis include congestion savings, avoided capital costs of local resource investments, avoided risk of load shedding, and others illustrated by MISO in Figure 11.

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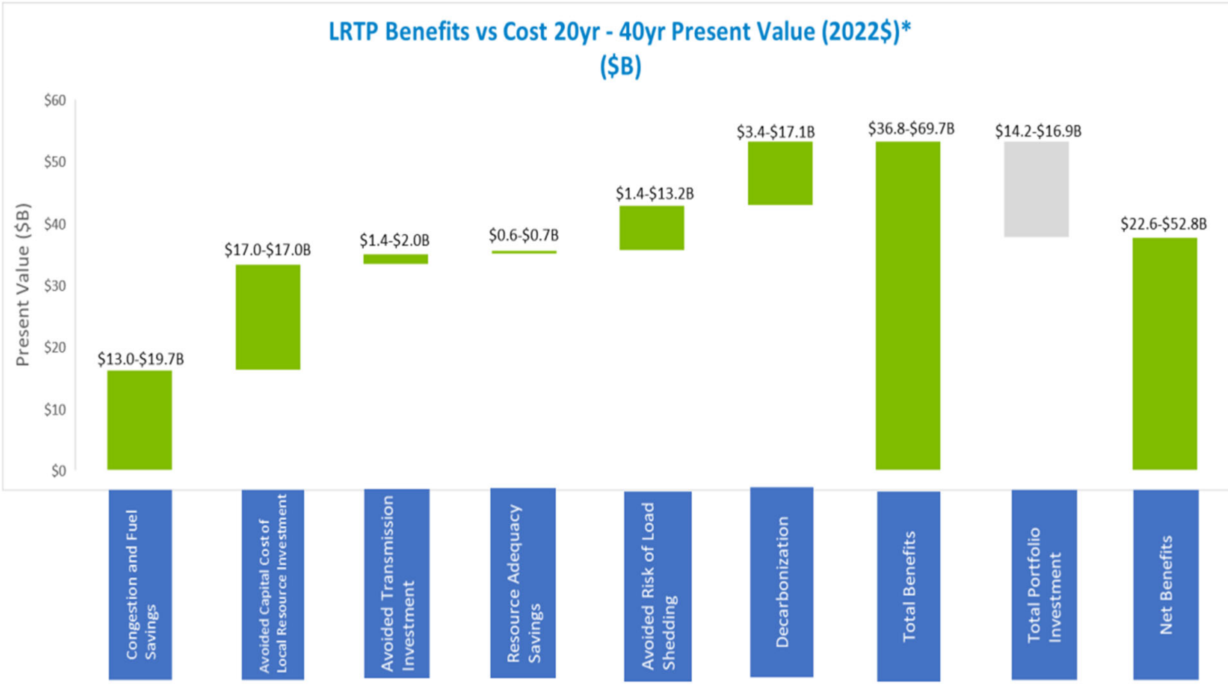
66 NOPR at P 3 ("We do not propose in this NOPR to change Order No. 1000's requirements for public utility transmission providers with respect to existing reliability and economic planning requirements.").

67 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.

68 *Id.,* at 5–6.

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

FIGURE 11: MISO CALCULATION OF LRTP TRANCHE 1 BENEFIT AND COST



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; and MISO, LRTP Tranche 1 Portfolio Detailed Business Case, LRTP Workshop, March 29, 2022.

A critical input to such planning processes is the specification of policy requirements and resource options for meeting them, and this will be the greatest value of the REAP. Specifically, while the final REAP will identify renewable development zones that Illinois policymakers can provide the RTOs as input to their studies, until such processes are fully in place, the final REAP may point to other ways to pursue transmission for meeting renewable energy needs.

Throughout the development of the REAP, we will work with RTOs to investigate any existing avenues that may be available under today's regulatory frameworks to integrate Illinois policy goals with regional plans. The avenues are likely different in each RTO, and may require separate recommendations. The final REAP aims to provide the necessary framework, details, and analysis to enable robust Illinois participation in each of these regional processes. Where roadblocks are identified, we are likely to make additional recommendations to improve any processes that inhibit Illinois' ability to fully reflect state policy goals in regional transmission plans.

THEME 3: 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. While this plan will look to evaluate areas of high likelihood for renewable development, it is unclear yet whether the final REAP will recommend, or ultimately the ICC will approve, any process enabling incremental transmission construction on the basis of public policy. However, 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 development needed to meet Illinois goals. The final REAP will evaluate current cost allocation methods associated with any recommended approaches, including the cost allocation for MVPs in MISO, and determine whether additional recommendations are required to reach CEJA's goals.

B. Current Bulk Transmission Planning Processes

1. PJM Interconnection

PJM plans expansions and enhancements to the regional transmission grid through the RTEP process. The RTEP includes analysis of several drivers of transmission projects, including reliability, market efficiency, and local needs. While the RTEP includes certain provisions allowing for the consideration and evaluation of public policies, these avenues have largely remained dormant.

RELIABILITY, MARKET EFFICIENCY, FORM 715 PROJECTS, SUPPLEMENTAL PROJECTS

PJM Reliability planning occurs in overlapping 18- and 24-month study cycles in the RTEP as shown in Figure 12. The reliability planning analysis includes PJM, NERC, and certain Transmission Owner criteria, and identifies system needs.[70] These studies only consider generators that have finished the interconnection process, with a signed Interconnection Service Agreement (ISA).[71] By only including resources with signed ISAs, the current structure of PJM's reliability planning assumptions fail to evaluate future resource growth mandated by CEJA and similar policies in other states.

70 *See* PJM Manual 14B § 1.5.

71 PJM, PJM Regional Transmission Expansion Planning Process, May 15, 2020, at 13.

FIGURE 12: PJM PLANNING PROCESS CYCLE

Source: PJM Manual 14B, at 34.

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 does not consider future resource additions.[72] Transmission Owners develop their own criteria, filed with FERC under Form 715, which drive baseline transmission needs that are included in the RTEP.[73]

In addition, any need identified by a Transmission Owner not required to comply with any other criteria can be addressed through a Supplemental Project. The process for planning Supplemental Projects allows Transmission Owners to upgrade facilities outside of the regional plan, including facilities that have not yet been identified under any PJM or Transmission Owner criteria.[74] In 2020 alone, ComEd developed $327 million in Supplemental Projects, compared with only $0.3 million in baseline projects designated in the zone.[75] Since 2010, ComEd has developed $1.8 billion of these Supplemental Projects and recovered the costs from Illinois ratepayers alone.[76]

72 *See* PJM Manual 14B § 2.6.

73 *See Id.* § 1.4.1.4.

74 *See* PJM Tariff, Attachment M-3.

75 *See* PJM 2020 RTEP, Book 1, at 262.

76 *Id.,* at 261.

These Supplemental Projects have been selected without transparent regional consideration of any potentially more cost-effective solutions considering Illinois policy goals.

PUBLIC POLICY PLANNING

PJM's governing documents provide several little-used provisions that potentially enable the consideration of public policy in the existing regional planning process. Despite the existence of these potential avenues, this process is not widely used to consider public policy in typical RTEP cycles.

PJM added provisions to its RTEP enabling the consideration of Public Policy Requirements and Public Policy Objectives in February of 2012.[77] 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.[78] In approving these revisions, 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."[79] Unfortunately, these initial assumptions meetings have not been particularly successful in gathering regional public policy needs, or incorporating them into the regional plan. PJM's RTEP planning Manual only has a single reference to this initial assumptions meeting and provides no clear process for submission of assumptions in advance.[80]

Around the same time, the PJM states created the Independent State Agencies Committee (ISAC), made up of state agencies throughout the PJM footprint. The ISAC Charter sets out its responsibility for providing input to PJM,[81] but formal ISAC meetings typically focus on existing PJM regional planning efforts, instead of evaluation of any state public policies.[82] Further, it is unclear whether any such submitted assumptions could be the basis for identifying needed regional transmission enhancements or expansions. PJM has noted that its revisions for considering assumptions driven by public policy do not include frameworks for acting upon needs

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77 139 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).

78 PJM Operating Agreement Schedule 6 § 1.5.6(b).

79 139 FERC ¶ 61,080, at P 19 (2012).

80 PJM Manual 14B, at 50.

81 *See* ISAC Charter.

82 *See* PJM ISAC Webpage.

identified by public policies.[83] Language in PJM's Operating Agreement casts doubt on whether pathways exist for projects driven in part by public policy needs.[84]

These avenues have not yet been used for submission of public policies into the regional plan, and have never driven incremental transmission construction in PJM. The final REAP will further explore the regulatory pathways described herein, and recommend actionable next-steps for incorporating public policies into the regional plan. In coordination with PJM, the final REAP will discuss the form, content, and process for ensuring that public policy goals identified and clarified in the final REAP can be evaluated and addressed in regional transmission planning.

STATE AGREEMENT APPROACH

Another potential option available to further public policy goals is PJM's State Agreement Approach (SAA). The SAA provides a pathway for a sponsoring state to select the transmission projects that best meet specified policy requirements.

Unlike public policy planning described above, which provides 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. In exchange, the sponsoring state is responsible for all costs of the selected SAA project.[85]

The New Jersey Board of Public Utilities is currently pursuing the SAA to plan transmission for integrating offshore wind. Their pioneering experience is demonstrating how the SAA can be used, and its benefits. For example, they helped enable, through a recent FERC order, a sponsoring state to reserve capability on a selected line for priority use by the state's selected generating resources.[86] Use of this reserved "SAA Capability" would require close coordination between the state and PJM, to ensure that incremental transmission headroom created for this purpose is efficiently allocated pursuant to the state's public policy.

In addition, the SAA provides an avenue for interested states to accelerate the overall timeline of renewable development, by sponsoring 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 timelines; even though generators need to advance through the PJM queue, upgrades can begin once any SAA project is approved. In the midst of

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83 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.'").

84 *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]").

85 PJM Operating Agreement Schedule 6 § 1.5.9(a).

86 179 FERC ¶ 61,024 at P 46 (2022).

major delays forecasted as part of PJM's interconnection reform process, detailed below, the SAA may have several advantages accelerating achievement of state policy or feasibility of candidate renewable energy zones in the short term.

The final REAP will expand and provide guidance on elements that might be needed to begin pursing a potential SAA process in Illinois. Based on development of candidate renewable energy zones and ongoing discussion with PJM, the final REAP will evaluate the benefits and drawbacks of utilizing the SAA alternative option to incorporate policy goals into PJM's regional plan. As discussed herein, this type of proactive planning may confer substantial benefits by identifying more effective project configurations than PJM's generation queue process, but is also associated with attendant cost responsibility.

PROCESS GAPS

Since 2011, FERC has required RTOs to "describe procedures that provide for the consideration of transmission needs driven by Public Policy Requirements in the regional transmission planning processes."[87] In response to Order 1000, PJM cited its 2012 revisions to its RTEP planning process, developed the SAA, and cited its interactions with the ISAC, but did not offer further changes to its planning process to identify solutions to regional needs driven by interactions with state public policy.[88] PJM emphasized that "requiring consideration of transmission needs driven by Public Policy Requirements is not a mandate to fulfill those requirements."[89]

Despite FERC's desire to enable the integration of policy needs into regional planning, there has only been one meaningful PJM planning process targeted to the development and potential implementation of a transmission project in response to public policy. This process was initiated in November of 2020, when New Jersey specifically requested that PJM initiate the SAA in response to their offshore wind goals, and remains ongoing.[90] As of today, no public policy or multi-driver project has been initiated through PJM's transmission planning process since PJM created the possibility of doing so through its compliance filing to address FERC Order 1000 requirements. In other words, PJM has not yet included any public policy requirements into its regional plan.

In addition to evaluating the current potential pathways to integrate public policies into regional planning, the final REAP will evaluate reforms that would be required to improve these processes. Through collaboration with PJM and continued analysis, the final REAP will bring experience in attempting to utilize these processes to any ultimate transmission planning recommendations.

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

88 *See* PJM Order 1000 Compliance Filing, Docket No. ER13-198, October 25, 2012, at 40–45.

89 *Id.* at 43.

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

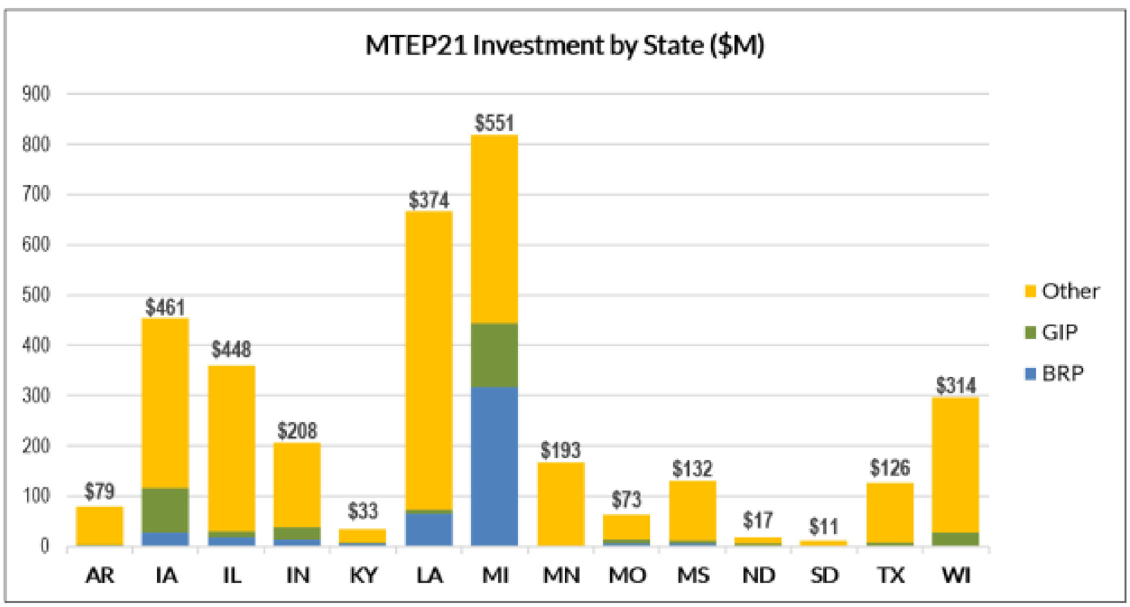
2. Midcontinent ISO

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 processes. As discussed above, MISO's LRTP process incorporates then-applicable public policies, providing an assessment of the public policy resource additions of the future. Detailed assumptions of candidate renewable energy zones, developed through the final REAP, may allow for improvements in already-existing planning processes refining potential futures evaluated through the LRTP.

MISO TRANSMISSION EXPANSION PLAN

The MTEP evaluates up to a 20-year planning horizon through multiple integrated planning processes to provide for regional development needs. The MTEP develops Baseline Reliability Projects (BRPs), Generator Interconnection Projects (GIPs), Market Efficiency Projects (MEPs), MVPs, and 'Other' project types.[91] Projects in the Other category do not meet the qualification requirements of BRPs, MEPs, MVPs, or other types of projects, and are similar in kind to PJM's supplemental project category. In 2021, GIPs and BRPs made up a small share of Illinois project investment, outweighed by Other projects. This trend persists throughout the MISO footprint as shown in Figure 13.

FIGURE 13: MTEP INVESTMENT BY STATE AND PROJECT CATEGORY



Sources and Notes: MISO, 2021 MTEP, at 11.

In addition to short-term reliability planning, however, MISO's planning process focuses on 'Future' scenarios to "align with the ongoing rapid transition" and "better incorporate the plans

[91] MISO, 2021 MTEP § 1.3.

of MISO's members and states."[92] In an encouraging development, MISO's stated goal in developing its Future scenarios is to inform consistency of its future planning across transmission, markets, and operations.[93]

MULTI-VALUE PROJECTS APPROACH

Development of MISO's Futures also creates opportunities for MISO's 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. In early 2022, MISO released its LRTP Tranche 1 portfolio, which provides a total 20-year benefit:cost ratio of 2.6 across the entire MISO footprint.

GAPS

MISO's approach to multi-value transmission planning is often viewed as a model for other regions.[94] But while MISO's general approach to multi-value planning seeks to incorporate public policy needs, additional refinements of Future scenarios could further enhance efficiency and accuracy of LRTP efforts. In addition, MISO's Tranche 1 projects are the first MVPs proposed in the region in over a decade, raising the question of whether a more regular process for identifying multi-value system upgrades would improve the regional plan.

3. Interregional Planning

The benefits of improved interregional transmission planning have been widely demonstrated by several studies over the last several years.[95] Despite this, and FERC's encouraging improved interregional coordination through Order 1000, the ensuing decade has seen no major interregional transmission projects approved in the US.[96] While PJM and MISO have jointly committed to a limited study of targeted market efficiency projects in 2022, the existing interregional planning process framework does not permit examination or evaluation of a wide range of potentially net beneficial projects.[97]

The PJM-MISO interregional planning process only allows for consideration of projects that share the same underlying transmission drivers (*i.e.,* reliability, market efficiency, or public policy) in

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92 MISO, 2021 MTEP, at 47.

93 *Ibid.*

94 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.

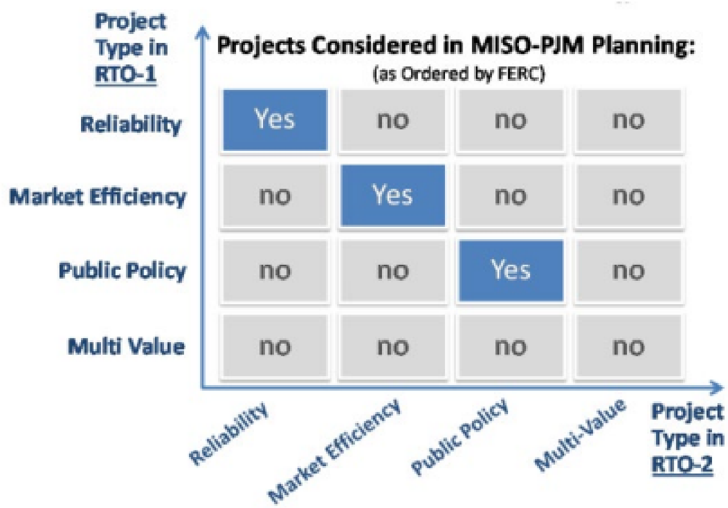
95 J. Pfeifenberger, K. Spokas, J.M. Hagerty, and J. Tsoukalis, A Roadmap to Improved Interregional Transmission Planning, November 30, 2021, at Table 1.

96 *Ibid.*

97 *See* MISO-PJM IPSAC, presented at MISO/PJM IPSAC Meeting, April 25, 2022, at 6.

both regions.[98] As illustrated in Figure 14, the PJM-MISO interregional process does not allow for the evaluation of projects that would satisfy different needs across regions. For example, the existing process would exclude any potential interregional projects that would address reliability needs in one region but market efficiency or public policy needs in the neighboring region.[99]

FIGURE 14: THE PJM-MISO INTERREGIONAL PLANNING PROCESS DOES NOT ALLOW FOR THE EVALUATION OF PROJECTS THAT ADDRESS DIFFERENT NEEDS IN EACH REGION



Sources and Notes: J. Pfeifenberger, K. Spokas, J.M. Hagerty, and J. Tsoukalis, A Roadmap to Improved Interregional Transmission Planning, November 30, 2021, at Figure 5.

The final REAP may include recommendations to improve interregional planning on Illinois' PJM-MISO seam, particularly as informed by the analysis. While several well-publicized improvements to the interregional planning process have been suggested, the final REAP will seek to focus on process improvements that are likely to improve the grid access of candidate renewable energy zones.[100]

C. Interconnection Processes

1. Resources in the Queue

Both PJM and MISO have seen significant increase in generation interconnection requests in the past few years, the majority of which are solar and wind projects. PJM's Generation Interconnection queue continues to receive record numbers of requests. In 2021 alone, PJM received over 1,300 new project requests that remain currently active, a nearly threefold

[98] J. Pfeifenberger, K. Spokas, J.M. Hagerty, and J. Tsoukalis, A Roadmap to Improved Interregional Transmission Planning, November 30, 2021, at 16.

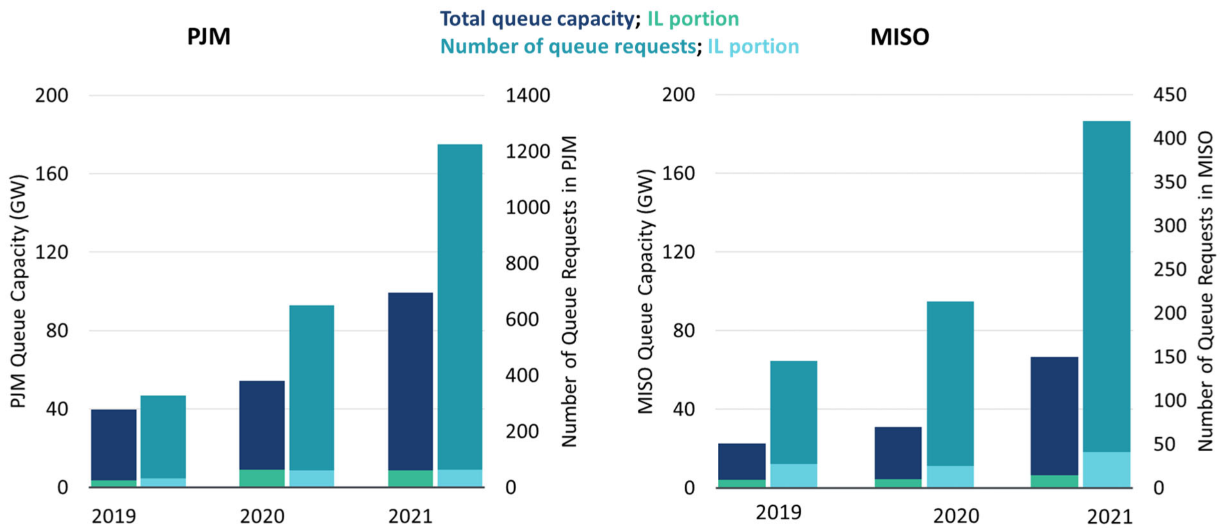
[99] *Id.,* at 17.

[100] *Id.,* § D.

increase since 2018. In the current PJM queue, there are 2,668 currently active projects totaling 251 GW, including 104 GW submitted in 2021 alone as seen in Figure 15.[101] Solar, onshore, and offshore wind, and hybrid projects comprise 76% of PJM's current queue Installed Capacity (ICAP).[102]

In the current MISO queue, there are 790 currently active project requests totaling 123 GW, including 66 GW submitted in 2021 alone.[103] Solar, wind, and hybrid projects comprise of 85% of MISO's current queue.[104] Figure 15 shows the capacity and projects submitted in 2019–2021 that are still active under study in the queue.

FIGURE 15: ILLINOIS PROJECT REQUESTS AND CAPACITY IN PJM AND MISO QUEUES IN 2019–2021



Sources and Notes: MISO Interconnection Queue; PJM New Services Queue, accessed June 17, 2022; only project requests that are "active" are accounted for in the total capacity and number of queue requests.

Illinois has approximately 320 projects representing 50 GW ICAP currently under study in the PJM and MISO queues. PJM's queue contains 231 active project requests from Illinois, totaling 34 GW under study; MISO's queue contains 95 active project requests from Illinois, totaling 16.4 GW under study.[105]

Figure 16 shows the type of resources in the state of Illinois in the current queues of PJM and MISO. In Illinois, 42% of the interconnection requests are from solar projects by nameplate capacity. These Illinois requests make up 12% of PJM's total queued solar capacity, and 10% of MISO's total queued solar capacity. The Illinois wind project requests make up 22% of PJM's total

[101] PJM New Services Queue, accessed June 17, 2022.

[102] *Ibid.*

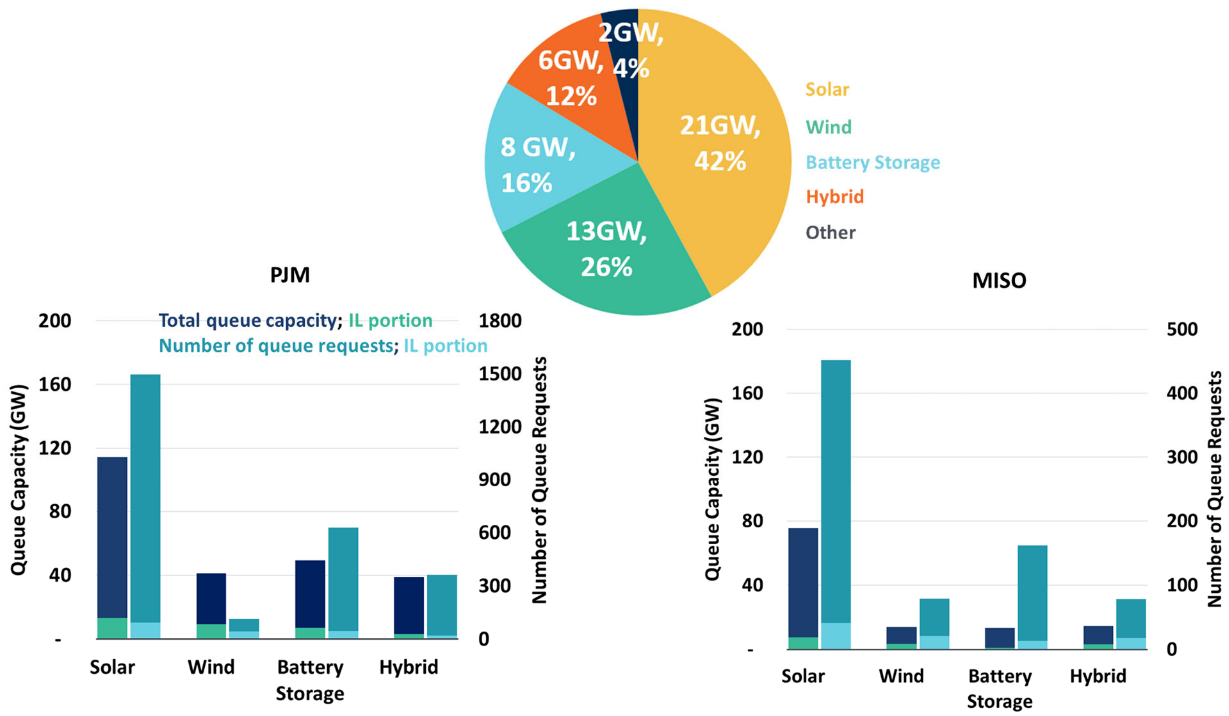
[103] MISO Interactive Queue, accessed June 17, 2022.

[104] *Ibid.*

[105] MISO Interactive queue; PJM New Services queue, accessed June 17, 2022.

queued wind capacity (including both onshore and offshore wind) and 24% of MISO's total queued wind capacity.

FIGURE 16: ACTIVE ILLINOIS PROJECT REQUESTS IN THE CURRENT PJM AND MISO QUEUES



Sources and Notes: MISO Interconnection Queue; PJM New Services Queue, accessed June 17, 2022; only project requests that are "active" are accounted for in the total capacity and number of queue requests.

This substantial amount of clean resources seeking interconnection demonstrates significant developer interest and provides indications of the specific locations of interest, even recognizing the inherently tentative nature of certain queue positions. As outlined further below, the generation interconnection process may serve as the limiting element preventing the timely development and interconnection of renewable projects in Illinois needed to fulfill the policy mandates of CEJA.

2. PJM Queue Challenges and Reform Efforts

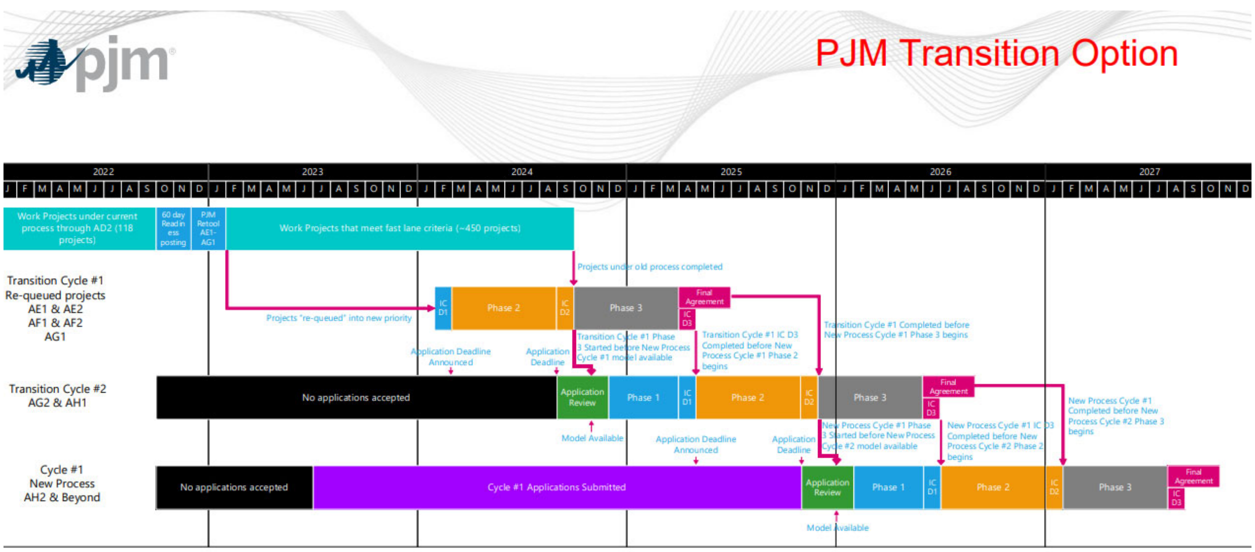
Significant increases in queue activity have stressed many aspects of the Interconnection Queue Study Process in RTOs, threatening the pace of clean energy deployment. The challenges of lengthy queue delays, uncertain timelines and upgrade costs, and insufficient transmission capability are common across all RTOs and utility Transmission Providers.[106] In PJM, initial stakeholder comments in other forums have revealed that many challenges to the current queue relate to queue request timing, speculative projects, and volume of re-studies caused by the queue exit of speculative projects:

[106] ENEL, Plugging In: A Roadmap for Modernizing & Integrating Interconnection and Transmission Planning.

- **Timing:** The majority of the projects submit their interconnection requests a few days prior to the close of the six-month queue window, which creates a significant time crunch for PJM staff.
- **Models:** There are misalignments between the RTEP models and the models used in interconnection studies. As a result, network upgrades identified in interconnection studies may conflict with system upgrades identified through PJM's RTEP process.
- **Speculative Projects or Withdrawals:** A large number of projects in the interconnection queue may never enter into service. Many interconnection requests could be speculative with certain project developers submitting multiple interconnection requests for a single project with the intention of selecting the location and/or capacity that minimizes their interconnection costs.[107]

To address these queue challenges, PJM has made extensive efforts to reform its generation interconnection process. Since April of 2021, PJM's Interconnection Process Reform Task Force has evaluated several options, settling on a transition proposal that will close the queue to new development for nearly two years as shown in Figure 17. Despite this delayed transition, creating substantial difficulty for achievement of short-term policy requirements, PJM's proposal received a favorable endorsement from the PJM membership in April 2022.[108] PJM filed its proposal with FERC on June 14, 2022.[109]

FIGURE 17: PJM INTERCONNECTION REFORM TRANSITION



Sources and Notes: J. Connell, PJM Transition Proposal Update, January 2022, at 11.

107 Exelon Corporation Comments, PJM Interconnection Workshop, December 11, 2020.

108 PJM Markets and Reliability Committee Minutes, MRC Meeting Date: April 27, 2022.

109 PJM transmittal letter, Docket No. ER22-2110, Tariff Revisions for Interconnection Process Reform, June 14, 2022. ("PJM Interconnection Reform Filing")

Despite the expansive transition timing, PJM's proposal was overwhelmingly supported by its membership.[110] One likely explanation is the proposal's adoption of a cluster-based approach to queue studies, moving away from today's interconnection studies with results dependent on other queue positions. In the prior process, queue requests were segmented into six-month cycles and processed individually, in the order in which they were received, creating interdependencies within and among generators' queue studies. Any generator's decision to remove itself from the queue would require laborious re-study of all subsequent queue requests, resulting in an unworkable process and the currently observed delays.

PJM's new process will be cluster-based, and conducted on a "first-ready, first-serve" 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.[111] Financial readiness deposits increase with each successive step through the queue cycle, requiring payment of 10% of allocated network upgrade costs at decision point 1 and 20% at decision point 2.[112] Decision points are well-defined, allowing the study process to proceed when projects drop out. The proposal also adjusts the allocation of network upgrade costs, which the proposal will allocate within one cycle, providing developers more certainty in their interconnection cost responsibility.[113] These guardrails are intended to ensure that more mature projects are submitted into the queue, replacing many of today's speculative interconnection requests.

3. MISO Queue Challenges and Reform Efforts

MISO shares common challenges with PJM. Notably, queue backlogs are large and growing due to a rapidly increasing number of project requests and unscheduled re-studies, delaying queue progress.[114] Project speculation raises network upgrade costs of all developers. Due to uncertainty surrounding interconnection costs, renewable developers often submit multiple requests for the same project, with different sizes, configurations, and interconnection points, leading to a large-size queue with far more projects than will actually be developed. The rapidly increasing cost of interconnection in recent years indicates that the large-scale network has reached its capacity and needs expansion.[115]

[110] PJM Markets and Reliability Committee Minutes, MRC Meeting Date: April 27, 2022. (Sector weighted 4.3/5 in favor).

[111] J. Thomas, Interconnection Process Reform, April 27, 2022, at 5.

[112] PJM Interconnection Reform Filing, at 49-52.

[113] J. Thomas, Interconnection Process Reform, April 27, 2022, at 6 ("No inter-cycle cost allocations"); PJM Interconnection Reform Filing § IV.B.6.

[114] J. Caspary, M. Goggin, R. Gramlich, and J. Schneider, Disconnected: The Need For A New Generator Interconnection Policy, Americans for a Clean Energy Grid, January 2021, at 13.

[115] *Ibid.*

MISO implemented major interconnection queue reforms in 2012 and 2016.[116] 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 durations, but increasing queue volume pushed the duration to increase again over the last few years.[117]

MISO's most recent queue reform efforts include prohibiting fuel-type changes while allowing queued projects to more freely request use of surplus interconnection service.[118] MISO and Southwest Power Pool (SPP) have filed a joint proposal to improve collaboration and timeliness of affected system studies.[119] The timing of affected system study results, which require input from both RTOs, factor significantly in the ability of viable queue projects to achieve interconnection. The recent revisions, approved earlier this year, seek to alleviate some portion of these delays, and improve the performance of each region's interconnection queue.[120]

4. Future Reforms

By integrating generator interconnection reforms more closely with regional planning, the pace of resource additions has greater potential to meet the policy demand outlined by CEJA and the broader transformation of the electric power industry. While most current reforms focus on study improvement and cost allocation issues (1 and 5 below), addressing existing overlap between currently siloed planning processes and the regional plan may unlock more rapid and implementable queue timing improvements. Namely, evaluation of major regional upgrades triggered by multiple interconnection requests could occur through efficient regional planning, and the need for those upgrades could be based on standardized criteria that would allow resources seeking energy-only interconnection service to operate under a connect-and-manage framework. In addition, when selecting solutions to the needs identified under these new interconnection study criteria, regions should evaluate a full suite of technologies to resolve violations, including grid-enhancing technologies such as power-flow-control devices or dynamic line ratings.[121] The final REAP will consider these leading recommendations, as well as input from stakeholders, in developing relevant reform priorities for regional interconnection processes. To summarize, areas where recommendations may focus include:

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

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

[118] 177 FERC ¶ 61,234 (2021).

[119] 179 FERC ¶ 61,148 (2022). An affected system is an electric system other than the Transmission Provider's Transmission System that may be affected by a proposed interconnection. *Id.* at n.4 (internal citations omitted).

[120] *Id.,* at P 26–27.

[121] J. Pfeifenberger and J. DeLosa, Proactive, Scenario-Based, Multi-Value Transmission Planning, presented to PJM Long-term Transmission Planning Workshop, June 7, 2022.

- **Interconnection Process and Queue Management:** individual vs. cluster studies, type of studies and contractual agreements, readiness criteria, financial deposits, efficiency of study and re-study sequences;
- **Interconnection Study Scope and "Handoff" to Regional Transmission Planning:** consideration of major ("deep") network upgrades in an efficient manner through regional planning, instead of incremental generation interconnection requests;
- **Interconnection Study Approach and Criteria:** study assumptions, modeling approaches, and specific criteria differ significantly across regions, challenging affected systems and interregional planning;
- **Selecting Solutions to Address the Identified Criteria Violations:** most regions select only traditional transmission upgrades to address criteria violations. Consideration of grid-enhancing technologies such as power-flow-control devices or dynamic line ratings may improve efficiencies; and
- **Cost Allocation:** most regions require the interconnecting generator (or group of generators) to pay for all upgrades identified, even though: (a) there may be significant regional benefits to loads and other market participants and (b) more cost effective (multi-value) regional solutions may exist.

VI. Regional Transmission Organization Markets

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 against 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 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 clean energy transition. In certain other circumstances, such as 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.

This draft of the REAP assesses 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.[122]

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 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

[122] 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.

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.[123]

This draft of the 2022 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.[124]

The role of the 2022 Illinois REAP and future updates to the REAP will be to identify RTO market reforms that could enhance alignment of the RTO markets with Illinois policy. The REAP will also aim to identify outstanding analysis that must be conducted by the RTOs or Illinois agencies to fully inform the ICC and the REAP; 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 inter-related 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 historical practice, if it remains unaltered, will tend to undermine Illinois progress toward GHG

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

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

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 first draft of the 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

The CEJA targets achievement of 100% economy-wide clean energy economy by 2050, a 100% clean electricity supply by 2050, and 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.[125] 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.[126]

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 declining GHG baseline. The Illinois EPA will monitor these emissions and the compliance of resources with the emissions cap through Continuous Emissions Monitoring System (CEMS), emission testing or fuel usage.[127] 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. 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. 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

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[125] *See* IL EPA, Climate Change in Illinois - Climate.

[126] 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.

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

injecting clean energy supply at that point in the grid).[128] Illinois has joined the other OPSI states to request that PJM expand its emissions accounting support to State agencies and consumers.[129] MISO has not yet begun publishing similar data, but has begun exploring solutions for tracking emissions data for market transactions by time and location.[130]

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 export;
- 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, the REAP will consider and recommend the specific accounting practices that can be followed consistently by both RTOs to best support Illinois' policy needs.

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 fixed or declining cap on individual fossil resources' GHG

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128 PJM, Marginal Emission Rate–A Primer.

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

130 MISO, Energy Ecosystem Evolution, 2021.

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 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) asset owners that operate too little early on, which creates an incentive to produce excess emissions later so as to maintain a higher rolling GHG cap; and (c) inconsistent beliefs and practices that can cause higher-GHG-emitting resources to be dispatched before lower-GHG-emitting resources within Illinois.

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 could offer such a system to Illinois fossil resources as a means to manage efficiently and reliably their GHG emissions caps over time, 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 will 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 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.

To prevent such "leakage" of GHG from in-state to out-of-state fossil resources, the RTOs would likely need to 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.[131] These prior efforts have illustrated a number of benefits from such a carbon pricing scheme, including increased incentives to attract and retain

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

clean energy resources (particularly renewables, nuclear, and batteries) and reduced aggregate GHG emissions. However, these prior efforts have illustrated the complexity in proper implementation.

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 large steps associated with key CEJA retirement deadlines. 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.[132] These underlying design limitations in the MISO capacity auction construct that 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.[133] 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 capacity market demand curve; (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 a minimum 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.

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

[133] 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.

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, fossil resources will not be possible 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 to stipulate "clean capacity" requirements that could address this problem.[134]

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;
- 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.

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[134] 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.

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

Historically, Illinois has relied primarily on RTO capacity, energy, and ancillary market signals to drive the majority 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 for possible incorporation into the final REAP. 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, and nuclear resources 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.

Though the timing of development for the proposed PJM procurement platform extends beyond the timeframe available for developing the 2022 REAP, this draft plan includes a recommendation 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.[135] 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.[136]

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 effective load carrying capability (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

[135] 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.

[136] *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.

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 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 2: 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 organizations, 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. The final Illinois REAP will include a revised and refined list of required RTO market reforms based on input and analysis provided by MISO, PJM, and stakeholders.

TABLE 2: 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.

RTO Market Reforms to Support Illinois' 100% Clean Energy 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

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
RPS	Renewable Portfolio Standard
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