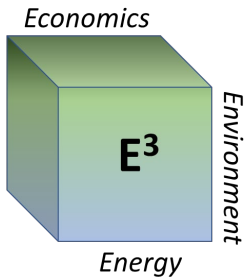


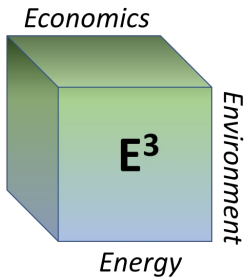
Comprehensive CIR-ELCC Proposal:

Paul M. Sotkiewicz, Ph.D.

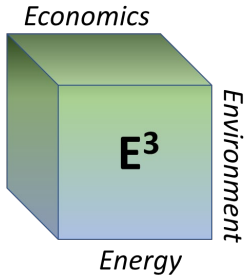
September 23, 2022-revised

Changed ordering mistake and misstatement on slide 44

E-Cubed Policy Associates, LLC
www.e-cubedpolicy.com | Gainesville, Florida | +1-352-244-8800



Summary of Issues and Considerations Guiding this Proposal



Capacity Interconnection Rights (CIRs) and Accredited Capacity for RPM are Not the Same

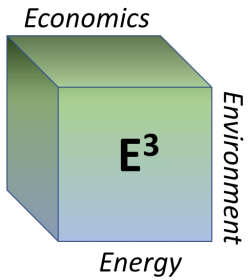
Interconnection Process and Obtaining CIRs

1) **Definition of a Generation Capacity Resource**
2) **Obtaining Capacity Interconnection Rights (CIRs)**
3) **Distinction between a Generation Capacity Resource and Energy Resource**

Accredited Capacity That Can Be Sold in RPM

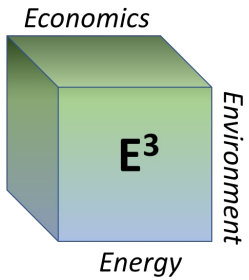
1) **UCAP for "unlimited resources" based on EFORd**
2) **AUCAP for ELCC Resources**
3) **Anything contributing to accredited capacity must be supported by CIRs as determined by the deliverability tests in the interconnection process and stated in the Interconnection Service Agreement (ISA)**

CIRs are necessary condition for any energy output to be considered for capacity accreditation



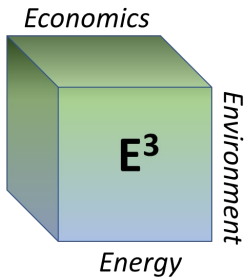
Design Considerations

- Non-discriminatory:
  - No one set of resources by size, type, or in-service date should be given preferential treatment
  - This applies to place in the queue, CIRs granted, and capacity accreditation
  - The rules (Tariff, RAA, OA) apply to all resources, and not selectively to some but not others
- Does not result in downstream distorted market outcomes:
  - Costs should not be shifted by those who cause them, to those who have not caused the costs
  - For example, costs should not be shifted from ICs requesting CIRs to load, or costs should not be shifted from existing resources desiring more CIRs to those new resources who have yet to clear the queue
  - Does not result in capacity market prices that differ from competitive outcomes based improper accreditation of resources for the RPM Capacity Market.



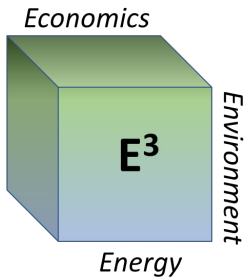
Economic Considerations for the Interconnection Customer (IC)

- Assumption:
  - IC wishes to maximize profits/minimize costs.
  - This should be non-controversial in a market environment such as PJM
- Revenues:
  - Energy market net revenues.
  - Capacity market revenues.
  - Ancillary services revenues such as reactive, reserves, regulation, etc.
- Costs:
  - Costs of interconnection inclusive of upgrades needed for Capacity Interconnection Rights (CIR)
  - Any performance penalties in the capacity markets
  - Take the costs of the generation resource and particulars of location as given as these decisions have been made

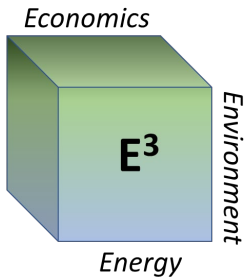


Economic Considerations for the Interconnection Customer (IC)

- Trade-offs to consider:
  - Cost of interconnection vs. Revenues from capacity market less any expected penalties in capacity market
  - If revenues from capacity inclusive of expected penalties are less than interconnection costs to secure CIRs, choosing to be an Energy Resource makes more sense.
  - Likelihood of testing to maintain requested CIRs and not losing CIRs which increase the cost of interconnection in effect over time.
- Finding the right balance:
  - There may be an “optimal” level of CIRs to request by the IC based on the above considerations
  - This balance may result in some part of a resource being a Generation Capacity Resource in part and an Energy Resource in part.

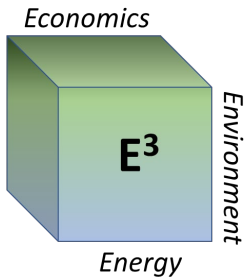


Proposed CIR Request Policy and Key Governing Document References



CIR Request Policy: Rules and Features

- **Objective:** Allow IC to request the CIRs they believe they can support through testing and operations
- **Tariff Rules Today and Going Forward**:
  - CIRs have never been the equivalent of UCAP for Capacity Purposes, but only the show the energy that can be delivered from Capacity that qualifies a Capacity Resource. (See Definition of Capacity Interconnection Rights in the Tariff)
  - Attachment N (Feasibility Study Agreement) in the Tariff in no place has ever restricted the amount of CIRs requested by technology or fuel type. This will remain the case explicitly.
- **Features**:
  - Net output 10am to 10pm EPT June, July, Aug, Sept, and May of each Delivery Year based on IC's expectations
  - IC takes risk of being able to test or operate to CIRs requested in the future. No different than those risks faced by unlimited resources historically
- **Implementation:** Begin with Transition Cycle 1 that allows resources to request additional CIRs prior to the start of that Cluster in this proposal.

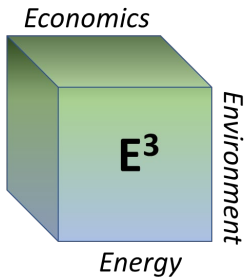


CIR Request Policy: Incentives and Governing Rules

- **Incentives:**
  - IC has no incentive to request more CIRs that are needed to maximize its Capacity Resource Status in ELCC so as not to incur more interconnection costs than necessary to request the CIRs they believe they can support through testing and operations. Allows as much of the resource as possible to be eligible to participate in the RPM Capacity Market.
  - IC's that request fewer CIRs to reduce interconnection costs may give up some MW in Capacity Resource status and thus reduces their Capacity Resource capability in ELCC and reduces the MW offered into the RPM Capacity Market.
  - IC's that view interconnection costs as being too high, or studies talking too long, can opt to be an Energy Resource and not request any CIRs and thus forego opportunities in the RPM Capacity Market.

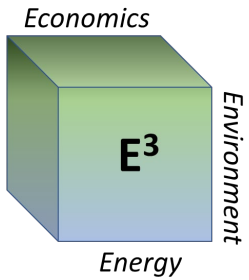
- **Tariff Rules Today and Going Forward for RPM and Capacity**:
  - ***RAA 9.1 (H): Energy Resources are not included in the effective load carrying capability analysis***
  - Att. DD 5.5 and 5.6.1: Capacity Resources must satisfy the capability and deliverability requirements of RAA Schedules 9 and 10 to be eligible for RPM
  - Interconnection Service Agreement, Sections 2.1 and 2.1(a): Any portion of a facility without CIRs is an Energy Resource.

- **Implementation:** Begin with Transition Cycle 1 that allows resources to request additional CIRs prior to the start of that Cluster in this proposal.



Comparison to other Packages (See Matrix from 9/6/22)

- Similar in spirit to the PJM Packages D, H, I and LS Power Package E and Eolian Package F
  - Unlike PJM packages and LS package, there is no limit to the amount of CIR that can be requested up to the MFO
  - Allows the IC to make this decision
  - Leave the issue of UCAP/AUCAP to CIRs to the accreditation portion of the proposal



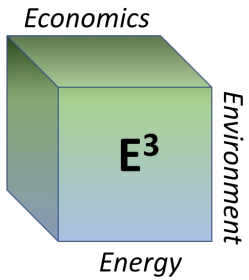
Capacity Interconnection Rights: Definition in the Tariff

Capacity Interconnection Rights:

"Capacity Interconnection Rights" shall mean the rights to input generation as a Generation Capacity Resource into the Transmission System at the Point of Interconnection where the generating facilities connect to the Transmission System.

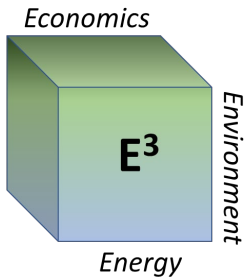
230.1 Purpose:

Capacity Interconnection Rights shall entitle the holder to deliver the output of a Generation Capacity Resource at the bus where the Generation Capacity Resource interconnects to the Transmission System. The Transmission Provider shall plan the enhancement and expansion of the Transmission System in accordance with Schedule 6 of the Operating Agreement such that the holder of Capacity Interconnection Rights can integrate its Capacity Resources in a manner comparable to that in which each Transmission Owner integrates its Capacity Resources to serve its Native Load Customers.



OATT, 230.2 Receipt of Capacity Interconnection Rights

Generation accredited under the Reliability Assurance Agreement Among Load Serving Entities in the PJM Region as a Generation Capacity Resource prior to the original effective date of Part IV shall have Capacity Interconnection Rights commensurate with the size in megawatts of the accredited generation. When a Generation Interconnection Customer's generation is accredited as deliverable through the applicable procedures in Part VI and Part VI of the Tariff, the Generation Interconnection Customer also shall receive Capacity Interconnection Rights commensurate with the size in megawatts of the generation as identified in the Interconnection Service Agreement. Any Generation Owner of an Intermittent Resource or Environmentally Limited Resource which has been accredited as deliverable for additional Capacity Interconnection Rights for the winter period (defined as November through April of a Delivery Year) under the Preamble of Part IV of the Tariff, shall receive such Capacity Interconnection Rights as further documented in section 2.0 of the Specifications of the Interconnection Service Agreement of such Generation Owner for the year specified. Pursuant to applicable terms of Schedule 10 of the Reliability Assurance Agreement Among Load Serving Entities in the PJM Region, a Transmission Interconnection Customer may combine Incremental Deliverability Rights associated with Merchant Transmission Facilities with generation capacity that is not otherwise accredited as a Generation Capacity Resource for the purposes of obtaining accreditation of such generation as a Generation Capacity Resource and associated Capacity Interconnection Rights.



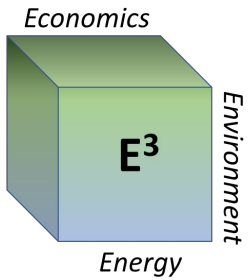
Definition of Energy Resource Distinction from a Capacity Resource in the ISA

- *Pro Forma* Interconnection Service Agreement, section 2.1

Pursuant to and subject to the applicable terms of the Tariff, the Interconnection Customer shall have Capacity Interconnection Rights at the Point(s) of Interconnection specified in this Interconnection Service Agreement in the amount of ___ MW. {Instructions: this number is the total of the Capacity Interconnection Rights that are granted as a result of the Interconnection Request, plus any prior Capacity Interconnection Rights}

- *Pro Forma* Interconnection Service Agreement, section 2.1(a)

To the extent that any portion of the Customer Facility described in section 1.0 is not a Capacity Resource with Capacity Interconnection Rights, such portion of the Customer Facility shall be an Energy Resource. PJM reserves the right to limit total injections to the Maximum Facility Output in the event reliability would be affected by output greater than such quantity.



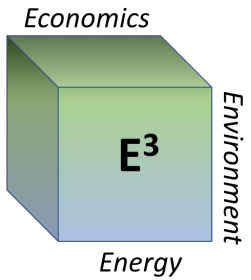
Key Definitions and Terms from the RAA

- **Generation Capacity Resource:**

"Generation Capacity Resource" shall mean a Generating Facility, or the contractual right to capacity from a specified Generating Facility, that meets the requirements of ***RAA, Schedule 9 and RAA, Schedule 10***, and, for Generating Facilities that are committed to an FRR Capacity Plan, that meets the requirements of RAA, Schedule 8.1. A Generation Capacity Resource may be an Existing Generation Capacity Resource or a Planned Generation Capacity Resource.

- **Capacity Resources:**

"Capacity Resources" shall mean megawatts of (i) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources meeting the requirements of the ***Reliability Assurance Agreement, Schedules 9 and Reliability Assurance Agreement, Schedule 10*** that are or will be owned by or contracted to a Party and that are or will be committed to satisfy that Party's obligations under the Reliability Assurance Agreement, or to satisfy the reliability requirements of the PJM Region, for a Delivery Year; (ii) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources not owned or contracted for by a Party which are accredited to the PJM Region pursuant to the procedures set forth in such Schedules 9 and 10; or (iii) load reduction capability provided by Demand Resources or Energy Efficiency Resources that are accredited to the PJM Region pursuant to the procedures set forth in the Reliability Assurance Agreement, Schedule 6.



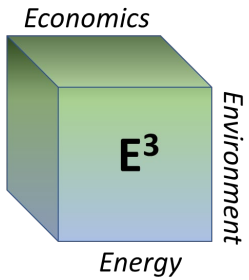
RAA Schedule 10 Deliverability

SCHEDULE 10: PROCEDURES FOR ESTABLISHING DELIVERABILITY OF GENERATION CAPACITY RESOURCES

- ***Generation Capacity Resources must be deliverable***, consistent with a loss of load expectation as specified by the Reliability Principles and Standards, to the total system load, including portion(s) of the system in the PJM Region that may have a capacity deficiency at any time. Deliverability shall be demonstrated by obtaining or providing for Network Transmission Service within the PJM Region such that each Generation Capacity Resource is a Network Resource. In addition, for Generation Capacity Resources located outside the metered boundaries of the PJM Region that are used to meet an Unforced Capacity Obligation, the capacity and energy of such Generation Capacity Resources must comply with the deliverability requirements of PJM Tariff, Attachment DD, section 5.5A, and the receipt of such capacity and energy at the PJM Region interface for delivery to loads in the PJM Region shall be subject to all applicable Capacity Import Limits.

- ***Certification of deliverability*** means that the physical capability of the transmission network has been ***tested*** by the Office of the Interconnection and found to provide that service consistent with the assessment of available transfer capability as set forth in the PJM Tariff and, for Generation Resources owned or contracted for by a Load Serving Entity, that the Load Serving Entity has obtained or provided for Network Transmission Service to have capacity delivered on a firm basis under specified terms and conditions.

Deliverability is a necessary condition for the award of CIRs, but it alone is not sufficient.

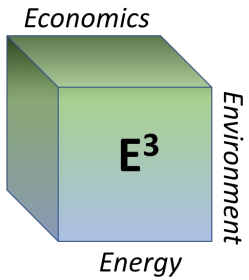


Example and Observation

- Wind facility with a Maximum Facility Output (MFO) of 100 MW, requests 13 MW Capacity Interconnection Rights (CIRs).
- Under the terms of the RAA and ISA, only 13 MW have been studied and tested by PJM to be deliverable, the remaining 87 MW of output above 13 MW are considered an energy resource.

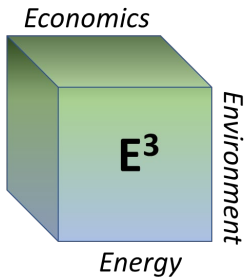
- Thermal resource with 100 MW MFO, requests 95 MW CIRs.
- Under the terms of the RAA and ISA, 95 MW have been studied and tested to be deliverable, the remaining 5 MW of output above 95 MW are considered an energy resource.

The terms "deliverable or deliverability" is not a defined term in the Tariff or RAA

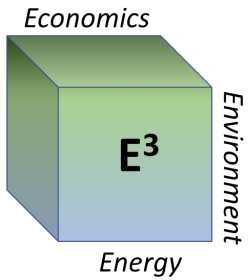


CIR Transfers

- **Objective:**
  - Reduce the time for new projects with existing CIRs at their original POI coming into service
  - Show value in existing CIRs and sites
- **Properties**:
  - Status quo plus;
  - Resources using existing CIRs at the original POI can be entered directly into the commencement of the next cluster cycle without waiting
  - Those CIRs are already modeled for deliverability and will not affect subsequent or existing queue studies.
  - This is simply an extension of the CIR request process, albeit by different means.

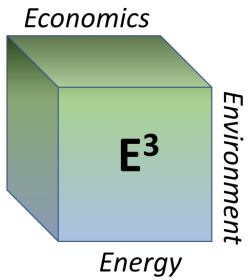


Proposed CIR Testing and Verification



CIR Testing, Verification

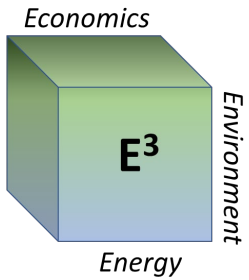
- **Objective:** Ensure CIRs are being utilized and supported by the IC
- **Features (Variable and Limited Resources)**:
- Maximum of last 3 Delivery Years' output of the resource between hour ending 10AM and 10PM Eastern Prevailing Time June, July. August, September, May that closest meets or exceeds the CIR value currently in place.
- **Features (Hybrid)**: Sum of Limited and Variable
- **Features (Unlimited)**: Status quo
- **Properties**:
  - Shoulder months around the peak summer months are included given problems are often seen in these months with above normal temperatures that occur with transmission and generator maintenance outages.
- **Implementation:** Begin with the 2023/2024 DY



CIR Testing, Verification: Incentives

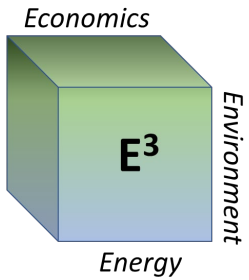
- ICs have the incentive to request CIRs such that they can be assured CIRs can be retained when testing

- Linked with the incentives for CIRs requested to not “over-request”

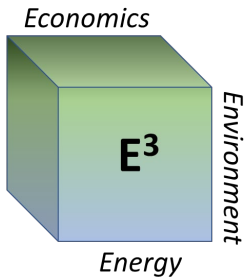


Comparison to other Packages (See Matrix from 9/6/22)

- Similar in concept to the PJM Packages D, H, I and LS Power Package E and Eolian Package F
  - Unlike other packages (which follow Package D) allows testing into the shoulder months of May and September leading into and out of summer for variable resources
  - Allows for the IC to choose the limited duration class at the time of interconnection

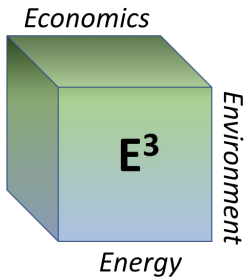


CIRs and Accredited UCAP



CIRs and Accredited UCAP

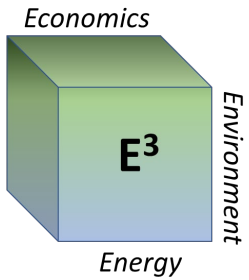
- **Objective:** Translate CIR usage into Accredited UCAP in RPM
  - Note, this is not about deliverability. Deliverability is a necessary condition for obtaining CIRs
  - CIR's are a necessary, but not sufficient condition for accrediting UCAP or AUCAP
  - Thus, there is no, and never has been any direct, one-to-one translation from deliverability to UCAP or AUCAP under ELCC
- **Variable Resources**:
  - Hourly output used in ELCC model and in unit-specific Performance Adjustment (i.e. based on 10 years of 200CPx2 hourly output values) cannot exceed:
    - a) during the months of May through October (inclusive), the CIR value; and
    - b) during the months of November through April (inclusive), the lesser of the winter deliverability MW or CIR value. Also: UCAP cannot exceed CIRs. This differs from PJM packages in that winter deliverability cannot exceed CIRs
    - UCAP and CIRs are not equivalent, CIRs measure deliverability across transmission and UCAP measures the expected output of the resource adjusting for performance criteria.
    - By construction, UCAP or AUCAP can never exceed CIRs as Package E (LS Power) has offered.
- **Limited Duration, Dispatchable Hydro, and Unlimited Resources**:
  - Same as PJM Package D



CIRs and Accredited UCAP

- **Hybrid Resources:** Similar to PJM Package D, but adding that all output, including the performance adjustment, limited to the CIR level.
- **Relevant Governing Documents**:
  - RAA 9.1 (H): Energy Resources are not included in the effective load carrying capability analysis
  - Att. DD 5.5 and 5.6.1: Capacity Resources must satisfy the capability and deliverability requirements of RAA Schedules 9 and 10 to be eligible for RPM
  - ***Interconnection Service Agreement, Sections 2.1 and 2.1(a): Any portion of a facility without CIRs is an Energy Resource.***
- **Implications for Status Quo:**
  - RAA 9.1 (H): Energy Resources are not included in the effective load carrying capability analysis. However, the status quo in the matrix says this is not the case and thus has already over-accredited ELCC resources in the 23/24 BRA.
  - ISA 2.1 and 2.1(a) are clear. ***Any portion of a facility without CIRs is an Energy Resource.***

- **Implementation:** Begin with the 2024/2025 DY for which the BRA is scheduled December 2022.

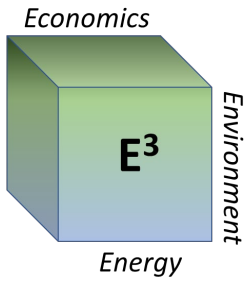


Capacity Values in RPM and CIRs: PJM's Statements from July 2021

- By definition from the RAA and ISA:
  - Wind resource when it produces 26 MW, that energy has not been tested as deliverable and confirmed in the ISA, only 13 MW has been tested and for which CIRs have been requested and awarded in the ISA(See PJM presentation July 22, 2021, by Andrew Levitt example on slide 3-6). https://www.pjm.com/-/media/committees-groups/committees/pc/2021/20210722-special/20210722-item-02-cir-quantities-and-their-use-in-the-elcc-analysis.ashx

  - Thermal resource with 95 MW of CIR. Assume a EFORd of 10%, this gives a UCAP value in RPM of 85.5 MW UCAP. This resource has been tested up to 95 MW, which supports the UCAP of 85.5 MW

- That is energy that can be produced above the UCAP value has, AND SUPPORTS THE UCAP VALUE, has been tested for the thermal resource but not for the wind resource. (See PJM presentation July 22, 2021, by Andrew Levitt stating, "Because of variable availability for all resource types, CIRs are usually higher than UCAP." https://www.pjm.com/-/media/committees-groups/committees/pc/2021/20210722-special/20210722-item-02-cir-quantities-and-their-use-in-the-elcc-analysis.ashx



Historically PJM Knows UCAP Values are Based on Energy Exceeding CIRs Prior to ELCC

Example—Pre-ELCC Accreditation for Wind/Solar: Output Above Tested Deliverability Level Counts

- The "368-hour Rule" in Manual 21 Appendix B sets both the pre-ELCC UCAP levels & the ongoing CIR eligibility/retention of wind/solar based on the **average output across all summer afternoons*** of the last 3 years.

- For example, a hypothetical 100 MW wind unit that during summer afternoons makes 26 MW half the time, and 0 MW the other half of the time, has a 13 MW average summer afternoon output→ 13 MW UCAP, can retain 13 MW of CIRs.

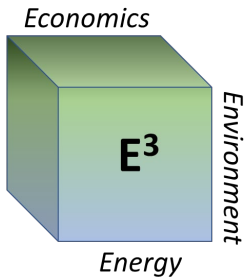
Note: w/ 13 MW of CIRs, there is 13 MW of tested deliverability

Note: even though the 13 MW of capacity is deliverable under today's standards, ***half of the 26 MW hourly output is above the tested deliverability level. Further note: those MWs can & will still flow in operations if the transmission system has the capability.***

Note: such a wind resource is today not eligible to request 26 MW of CIRs—they are limited to only 13 MW.

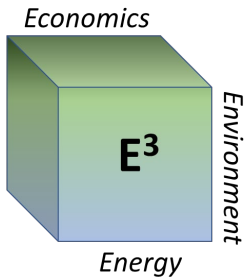
**Summer is June, July, and August, afternoon is hour ending 3, 4, 5, and 6 PM Local Prevailing Time*

https://www.pjm.com/-/media/committees-groups/committees/pc/2022/20220215-special/20220215-item-02d-interactions-of-cirs-deliverability-and-elcc-studies.ashx



There are No Provisions in the Tariff Limiting the CIRs that Can be Requested as Asserted by PJM

- In the previous slide, PJM asserts “Note: such a wind resource today is not eligible to request 26 MW of CIRs—they are limited to only 13 MW.”
- A search of the interconnection provisions in the tariff does not provide any such limitation, thus no Interconnection Customer (IC) could be legally prevented from requesting more CIRs if it elected to do so.
- The request for CIRs are included in the Feasibility Study Agreement in Attachment N of the Tariff and nowhere in the governing documents is there any limitation placed on CIR requests.
  - Only reference is in Manual 14G that references Manual 21 and these are oblique at best.
- But, since interconnection costs for upgrades could increase with requesting additional CIRs, ICs had no incentive to request more given PJMs ongoing violation of the CIRs stated in the ISA as determined through the requirements for capacity accreditation.



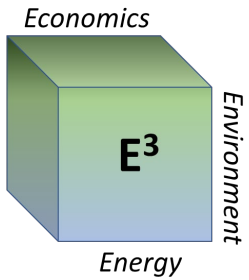
PJM Knows All Energy Going into ELCC Must be Supported by CIRs…see also RAA Schedule 9.1(H)

Note: w/ 13 MW of CIRs, there is 13 MW of tested deliverability → ***half of the 26 MW hourly output is above the tested deliverability level.***

PJM believes that, under high renewables deployment, it will be important that the transmission system is tested for all meaningful hourly injection levels accounted for in the ELCC accreditation process.

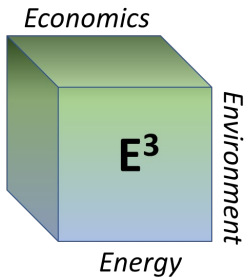
- *I.e., that* ***the hourly output used for a resource in the UCAP accreditation method does not exceed that resource's tested transmission deliverability level.***

https://www.pjm.com/-/media/committees-groups/committees/pc/2022/20220215-special/20220215-item-02d-interactions-of-cirs-deliverability-and-elcc-studies.ashx



PJM IMM Recognizes Energy in Excess of CIRs Counted as Capacity is Contrary to Reliability

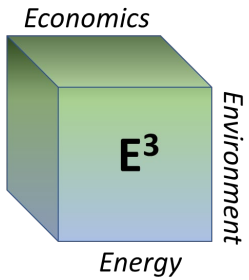
- The MMU recommends that intermittent resources, including storage, not be permitted to offer capacity MW greater than the CIR values assigned to such resources. Derating factors and ELCC values are used in capacity auctions to convert the nameplate capacity of intermittent and storage resources into MW of capacity equivalent to resources that can produce for any of the 8,760 hours in a year. Both the capacity derating factors applied to intermittent nameplate capacity in the 2022/2023 BRA and the ELCC calculations to be used for future capacity auctions are based on the assumption that the intermittent resources provide reliable output in excess of their CIRs. But that output is not deliverable when needed for reliability because it is in excess of the defined deliverability rights (CIRs) and therefore should not be included in the definition of intermittent capacity.
- https://www.monitoringanalytics.com/reports/Reports/2022/IMM_Analysis_of_the_20222023_RPM_BRA_20220222.pdf. P.8



IMM Position Regarding ELCC and the 23/24 BRA

- Derating factors and ELCC values are used in capacity auctions to convert the nameplate capacity of intermittent and storage resources into MW of capacity equivalent to resources that can produce for any of the 8,760 hours in a year. Both the capacity derating factors applied to intermittent nameplate capacity in the 2022/2023 BRA and the ELCC calculations used in the 2023/2024 BRA are based on the assumption that the intermittent resources provide reliable output in excess of their CIRs. But that output is not deliverable when needed for reliability because it is in excess of the defined deliverability rights (CIRs) and therefore should not be included in the definition of intermittent capacity. The definition of intermittent capacity is thus not consistent with the way that capacity is defined. This results in an overstatement of the supply of capacity and reduces the clearing price in the capacity market. The MMU recommends that intermittent resources, including storage, not be permitted to offer capacity MW based on energy delivery that exceeds their defined deliverability rights (CIRs). Only energy output for such resources below the designated CIR/deliverability level should be recognized in the definition of capacity. There is the related issue of ensuring that intermittent resources, like all other resources, are required to pay their own interconnection costs in order to meet their attributed capacity value, consistent with the longstanding PJM market design, or reduce their capacity value.

- https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2022/2022q2-som-pjm-sec5.pdf P. 332.



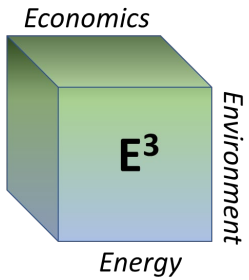
IMM Estimates from February 23, 2022: Average 2019-2021

- **Intermittent Generation Above ICAP**
- **Definitions:**
- **ICAP is the derated MW value of a resource**
- **ICAP is the amount of capacity sold in the PJM capacity market**
- **ICAP equals CIR value**

Intermittent Generation in Excess of ICAP: 2019-2021

	2019 - 2021 Summer Testing Hours (June through August, 2pm - 6pm)		
	MWh	MWh > ICAP	Percent
Solar	1,406,066.2	388,100.9	27.6%
Wind	1,588,997.1	816,952.9	51.4%
Solar & Wind	2,995,063.3	1,205,053.8	40.2%

https://www.pjm.com/-/media/committees-groups/committees/pc/2022/20220223-special/20220223-item-05-imm-intermittent-output-and-cirs.ashx



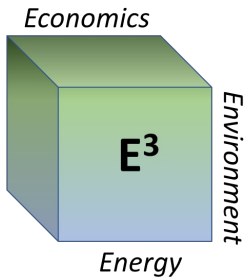
IMM Estimates from February 23, 2022: Average 2019-2021

- **Intermittent Generation Above ICAP**
- **Definitions:**
- **ICAP is the derated MW value of a resource**
- **ICAP is the amount of capacity sold in the PJM capacity market**
- **ICAP equals CIR value**

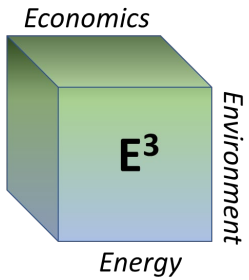
Wind and Solar ICAP

Fuel	Current ICAP (MW)	ICAP based on Max MWH: $ICAP_1$ (MW)	ICAP based on Max MWH: Percent Difference	ICAP based on current CIR levels: $ICAP_2$ (MW)	ICAP based on current CIR levels: Percent Difference
Solar	1,818.4	3,563.3	96.0%	1,455.6	(20.0%)
Wind	1,575.4	8,922.2	466.3%	804.7	(48.9%)
Wind & Solar	3,393.8	12,485.5	267.9%	2,260.3	(33.4%)

https://www.pjm.com/-/media/committees-groups/committees/pc/2022/20220223-special/20220223-item-05-imm-intermittent-output-and-cirs.ashx

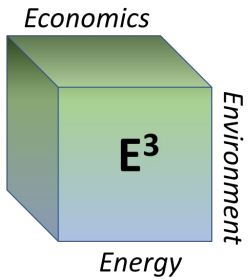


Transition Mechanism-Existing ISA Resources



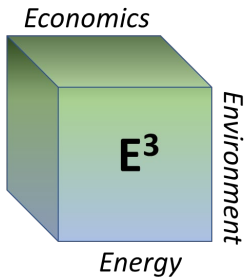
Transition Mechanism – Existing Resources

- **Objectives:**
  - Ensure non-discriminatory treatment of new and existing resources
  - Ensure no distortions to capacity market outcomes
  - Ensure the rules of the Tariff, RAA, and OA are followed and apply to all resources alike
- **Existing Resources**:
  - "PJM will adjust the AUCAP for Existing Units participating in the Base Residual Auctions commencing with the 2024/2025 BRA and subsequent BRAs to reflect the CIRs ~~/Deliverability~~ modeled by PJM at current level of CIRs. ~~where CIRs = Deliverability~~.
  - Hourly historic performance data, including resource performance adjustments, will be used and will not exceed awarded CIRs.
  - Existing wind and solar, defined as having signed ISAs as of the date FERC approval, can request additional CIRs in accordance with Design Component 1 above by entering the Interconnection Queue in accordance with the interconnection rules as ~~and~~ any hydro or unlimited resource would need to do currently.
  - Any modification to CIR/Deliverability and associated accreditation will only be represented in the auction when i) an amended/new ISA is in place reflecting the increase in CIRs if requested, ii) any and all necessary transmission system upgrades are implemented and paid for by the resource owner, and iii) associated Tariff changes are approved by FERC order. “
  - Existing Resources that want more CIRs must get into the back of the queue like all other resources types must do for additional CIRs



Transition Mechanism – Existing Resources Comparison to other Packages (See Matrix from 9/6/22)

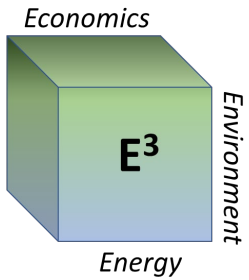
- Identical in concept to the original PJM Package A which has disappeared without any explanation or rationale after 9/21/2021 meeting.
  - "Design Component #5: CIRs will be established as an upper limit for the 24/25 Delivery Year if the current stakeholder process can be wrapped up and necessary approvals of manual and governing document changes to implement Solution Option A can be made in a timely manner. Any developer that would like additional CIRs will need to reenter the queue." https://pjm.com/-/media/committees-groups/committees/pc/2021/20210826-cir-elcc/20210826-item-02-summary-of-solution-options-for-cirs-for-elcc-resources-issue-charge-for-pjm-pc.ashx
- Closely aligned if not the same as Package E (LS Power)
- PJM's Package D and H will simply give away CIRs to existing ISA holders without getting back into the queue
  - Discriminates against queued renewables and all other resources types who do not get the opportunity to obtain CIRs without entering the queue
  - Distorts the market by favoring existing resources over newer, lower cost and more efficient resources, especially zero emitting resources, that have lower costs and larger scale than existing zero emitting resources
  - Fails against what FERC has already rejected in the original ELCC filing that favored existing resources over new resources.



Transition Mechanism – Existing Resources Comparison to other Packages (See Matrix from 9/6/22)

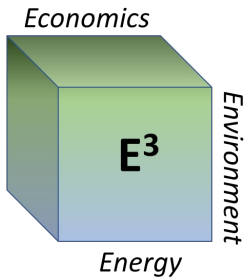
- PJM Package I with its transition studies does no better
  - It is *de facto* no different than Packages D and H as these resources are in effect jumping the queue ahead of others to obtain CIRs for near term auctions while PJM works through the new transition queue process.

- PJM's Packages have not articulated how ISA would be updated as there is no Part VI or Part IV Tariff process being followed.
- PJM's packages lock in practices that are in direct contravention to the RAA, ISA, and Tariff with respect to what is a Capacity Resource and Energy Resource
  - From a reliability perspective, PJM cannot guarantee reliability of these resources as Capacity Resources (no CIRs to back the capacity)…PJM already knows this!
  - From an economic perspective, it allows capacity that does not qualify to participate in the market artificially reducing prices below the competitive levels.



PJM IMM Estimates the Harm in Pricing and RPM Revenues to Retain or Attract Resources for Reliability

- Overstatement of the reliability contribution of intermittent resources can have a significant impact on capacity market results. As a sensitivity to calculate that impact, the capacity MW of intermittent solar and wind capacity resources were reduced by 50 percent. Reducing the reliability contribution of the intermittent solar and wind capacity resources by 50 percent would have had a significant impact on the 2022/2023 RPM Base Residual Auction results. Based on actual auction clearing prices and quantities and uplift MW, total RPM market revenues for the 2022/2023 RPM Base Residual Auction were $3,916,990,303. If the unforced capacity of solar and wind resources offered in the 2022/2023 RPM Base Residual Auction had been reduced by 50 percent and everything else had remained the same, total RPM market revenues for the 2022/2023 RPM Base Residual Auction would have been $4,209,145,809, an increase of $292,155,506, or 7.5 percent, compared to the actual results. From another perspective, the inclusion of all offers from solar and wind resources resulted in a 6.9 percent decrease in RPM revenues for the 2022/2023 RPM Base Residual Auction compared to what RPM revenues would have been if offers from solar and wind resources had been reduced by 50 percent. (Scenario 5).
- https://www.monitoringanalytics.com/reports/Reports/2022/IMM_Analysis_of_the_20222023_RPM_BRA_20220222.pdf. P.15-16



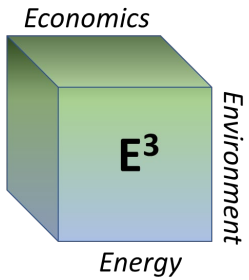
PJM IMM Estimates the Harm in Pricing and RPM Revenues to Retain or Attract Resources for Reliability

Table 32 Impact of Intermittent Capacity overstatement: 2022/2023 RPM Base Residual Auction

Scenario 5

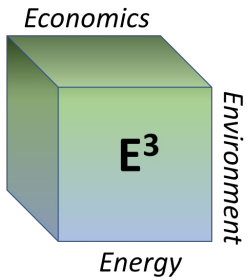
		Actual Auction Results		Adjusted Intermittent MW	
LDA	Product Type	Clearing Prices ($ per MW-day)	Cleared UCAP (MW)	Clearing Prices ($ per MW-day)	Cleared UCAP (MW)
RTO	Annual	$50.00	143,790.5	$58.40	143,846.7
	Summer	$50.00	686.8	$58.40	337.7
	Winter	$50.00	686.8	$58.40	337.7
RTO Total			144,477.3		144,184.4
MAAC	Annual	$95.79	64,449.6	$99.04	64,459.4
	Summer	$95.79	164.6	$99.04	96.2
	Winter	$95.79	164.6	$99.04	96.2
MAAC Total			64,614.2		64,555.6
EMAAC	Annual	$97.86	29,333.8	$99.04	29,398.0
	Summer	$97.86	0.0	$99.04	48.0
	Winter	$97.86	0.0	$99.04	48.0
EMAAC Total			29,333.8		29,446.0
BGE	Annual	$126.50	2,494.5	$126.50	2,494.5
	Summer	$126.50	0.0	$126.50	0.0
	Winter	$126.50	0.0	$126.50	0.0
BGE Total			2,494.5		2,494.5
ComEd	Annual	$68.96	18,914.8	$78.35	19,004.1
	Summer	$68.96	282.7	$78.35	131.1
	Winter	$68.96	282.7	$78.35	131.1
ComEd Total			19,197.5		19,135.2
DEOK	Annual	$71.69	2,114.8	$75.00	2,107.6
	Summer	$71.69	0.0	$75.00	0.0
	Winter	$71.69	0.0	$75.00	0.0
DEOK Total			2,114.8		2,107.6

- Intermittent Resources that were not deliverable displace resources that are deliverable to the system and harm reliability.
- The IMM simulation reducing cleared intermittent capacity by 50% is equal to about 1620 MW UCAP for wind and solar in the 22/23 BRA based on PJM data for cleared wind and solar capacity.
- https://www.monitoringanalytics.com/reports/Reports/2022/IMM_Analysis_of_the_20222023_RPM_BRA_20220222.pdf. P.100



Calculating the Harm to Consumers from PJM IMM Simulations

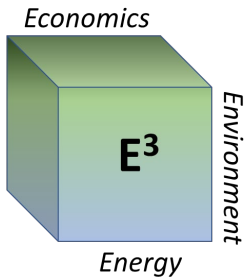
- Consumers are paying for capacity that is unsupported by CIRs and are thus harmed from a reliability and expenditure perspective
- For the actual BRA results, using the IMM's 50% reduction (1620 MW), consumers only received 142,857.3 MW of capacity, despite paying for 144,477.3 MW in the BRA
- Intermittent Resources that were not supported by CIRs displace resources that are supported by CIRs to the system and harm reliability.
- The 1620 MW of renewables unsupported by CIRs displaced 1327.1 MW of capacity that is otherwise supported by CIRs to the system.
- *PJM only states overall costs to consumers of $230 million in 2022/2023 BRA would be lower by allowing these resources to participate, but lacking any other details unlike those provides by the IMM*



PJM's Market Simulations Do Not Provide the Details Necessary for Comparison

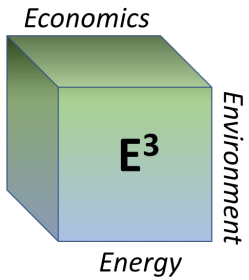
- *PJM only states overall costs to consumers of $230 million in 2022/2023 BRA would be lower by allowing resources unsupported by CIRs to participate*
  - No prices or cleared quantities by LDA
  - No comparison to cleared quantities and prices
- Not clear who requested this…appears PJM did this on its own

- *PJM only states overall costs to consumers of $139 million in 2023/2024 BRA would be lower by allowing resources unsupported by CIRs to participate*
  - No prices or cleared quantities by LDA
  - No comparison to cleared quantities and prices

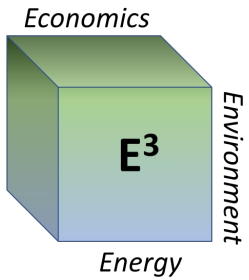


Transition Mechanism – Existing Resources Comparison to other Packages (See Matrix from 9/6/22)

- PJM's Packages D and H would shift costs from existing resources to new queue resources who entered and did studies and chose sites under the idea the headroom existed.
  - Now these newer, lower cost, and larger scale zero emitting resources will be placed at a competitive disadvantage to higher cost small scale zero emitting resources
- To make up the difference, PJM also proposes load pay for at least $2 Billion in RTEP costs that otherwise would be borne by ICs in the interconnection process shifting costs from the supply side to the demand side of the market.
- Overall, PJM's proposal for this portion of the transition would retard the transition to lower emitting resources

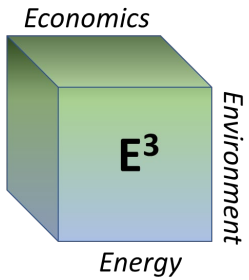


Transition Mechanism-Existing Queue Resources



Transition Mechanism – Existing Queue Resources

- **Objective:**
  - Ensure non-discriminatory treatment of new and existing resources
  - Provide options for resources to request more CIRs if desired
- **Existing Queue Resources**:
  - "Existing Queue Units" are defined as Variable Resources in the PJM Queue without an executed ISAs as the date of March 31, 2023 and are not in the Fast Track process.
  - Resources in the Fast Track Process must submit queue positions for any subsequent CIR requests.
  - Allow Resources in the Fast Track process to request more CIRs but then be bumped into the Transition Cycle 1 process.
  - Existing Queue Units in Transition Cycle 1 and Transition Cycle 2 may request higher CIRs. Any additional CIRs that may be desired after this point, ICs and will need to get back into the queue to request higher CIRs if desired.
  - For those resources in the Transition Cycles, requesting additional CIRs should result in no extra burden for PJM as in effect these resources will be studied *de novo.*

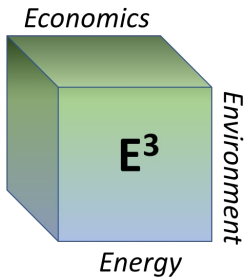


Transition Mechanism – Existing Queue Resources Comparison to other Packages (See Matrix from 9/6/22)

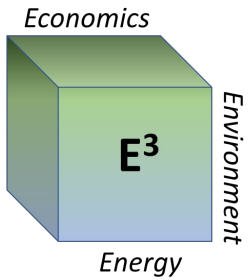
- This provides more flexibility compared to LS Power's Package E which requires any additional CIRs to be requested by getting back into the queue.

- Unlike PJM Package D, there is no transitioning to higher CIRs if an ISA is signed as of the effective date.~~, and~~ If extra CIRs are desired by Existing Queue Resources (those in the queue, and no ISA), they can be requested in the Transition Cycles and paid for by the ICs, or by simply requesting a new queue position and can be going to the back of the line.

- Unlike PJM Package D, there will be no transitional capability studies, as additional CIRs can be requested up front. This proposal also avoids the current practice of counting energy over the CIR level for capacity accreditation which solve the problem of operating in contravention to the Tariff, RAA and ISA

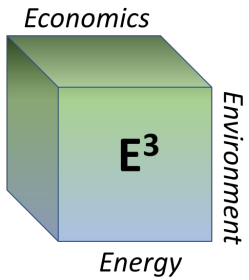


Transition Mechanism-New Queue Resources

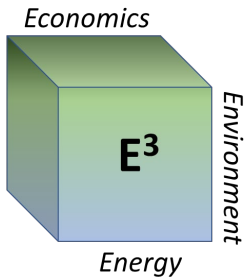


Transition Mechanism – New Queue Resources

- **Objective:**
  - Ensure non-discriminatory treatment of new and existing resources
  - Provide options for resources to request more CIRs if desired
- **New Queue Resources**:
  - May request CIRs up to their MFO as has always been the Case under Attachment N as described in the CIR Request Proposal in this package.
  - This is no different from PJM Package D and seems non-controversial.

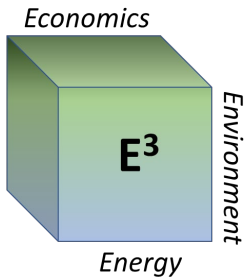


Benefit-Cost Analysis



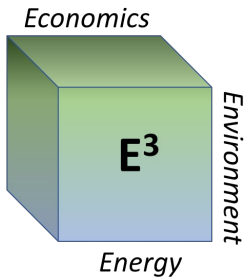
Benefit-Cost Analysis (BCA)

- **Objective:**
  - Examine the costs to be incurred across the entire market
  - Examine the cost savings resulting from the initial investment
  - Really a look at production and investment costs
  - Efficient outcomes minimize productions costs regardless or market and pricing outcomes
  - ***IS NOT*** an analysis of changes in load expenditures or supply revenues in isolation as PJM has shown
    - These are simply transfers between loads and suppliers, and between different suppliers



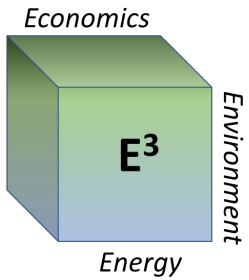
Benefit-Cost Analysis (BCA)

- **PJM's BCA Analysis Faults:**
  - Erroneously conflates changes in market pricing and quantity outcomes as benefits in the capacity market
  - Fails to recognize changes in market prices and quantities are simply transfers between different suppliers or load and suppliers and should not be counted as a cost or a benefit
  - PJM's load expenditure analysis on the capacity market side simply captures transfers to load from the entire supply side, improperly showing a priority of load expenditures over the interests of the supply side (lack of independence)
  - PJM's proposals effectively prioritize one set of resources (existing variable, limited duration, hybrid) over other resources such as existing unlimited and new resources of all types
    - If PJM is so concerned about load expenditures, why not show these transfers?
  - PJM ignore the increased costs (transfers or shifting of costs) from existing resources to new resources that are still in the queue showing a preference of the existing resources over new resources (similar to the problem in the first ELCC filing that was rejected by FERC)

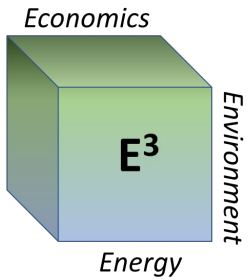


Benefit-Cost Analysis (BCA)

- **<u>PJM's numbers as they are indicate their packages are do not pass the simple BCA test even if only looking at load expenditures or BCA:</u>**
  - Minimum of $2 billion in transmission costs to load in Packages D versus "capacity market expenditure reduction" of $0.695 Billion makes no sense.
  - Package H $0.7 Billion in transmission costs to load but knowing the $0.695 billion are just transfers among market participants…costs still exceed any benefits.
  - Old PJM Package A, E-Cubed Package G, and LS Power Package E do not require any new transmission build in the RTEP, do not shift costs between existing and new generators in the queue, and results in capacity prices that are competitive based on capacity being supported by CIRs

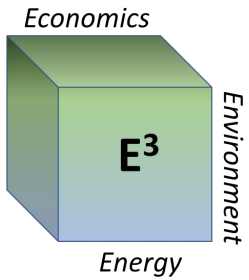


Conclusions



Design Considerations-Revisited

- Non-discriminatory:
  - No one set of resources by size, type, or in-service date should be given preferential treatment
  - This applies to place in the queue, CIRs granted, and capacity accreditation
  - The rules (Tariff, RAA, OA) apply to all resources, and not selectively to some but not others
- Does not result in downstream distorted market outcomes:
  - Costs should not be shifted by those who cause them, to those who have not caused the costs
  - For example, costs should not be shifted from ICs requesting CIRs to load, or costs should not be shifted from existing resources desiring more CIRs to those new resources who have yet to clear the queue
  - Does not result in capacity market prices that differ from competitive outcomes based improper accreditation of resources for the RPM Capacity Market.



Packages Consistent with Design Principles

- PJM old Package A, E-Cubed Package G, LS Power Package E
  - Costs incurred are consistent with cost causation and no cost shifting
  - None favor one set of suppliers or load over suppliers
  - Least-cost overall relative to other PJM options
  - Consistent with current governing document rules that capacity must be supported by CIRs unlike other proposals supporting reliability
  - Results in competitive capacity market outcomes without artificially inflating supply that is not supported by CIRs
- Going forward with any of these packages is most straightforward and is cleanest before FERC.