EKPC Resource Adequacy Reform Design Concept

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March 2023

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Capacity Market Design -- Big Picture Principles

- The capacity market design should not be overly complex; should identify minimum rule set that allows PJM to secure commitments from resources to meet regional resource adequacy target, with consideration of extreme weather risk
- Capacity market rules should not constrain actions PJM operators need to take to ensure real-time reliability.
  - Export, call DR, call long-lead generators, allow hydro to pump, etc.
- Non-performance penalties should apply only to outcomes which can be mitigated via prudent actions taken consistent with good utility practice. (Should not be punitive)
- The “planning model” used to establish the resource adequacy “requirement” must be consistent with the performance expectation in the market model
  - Generation outages, extreme weather, etc.
  - Recognize reliability attributes and delivery capability of the evolving generation mix
- Capacity resources must be compensated for all costs incurred to provide the required service; must compensate sufficient amount of resources to be fuel secure

Capacity Market Design -- Big Picture Principles

- The capacity market needs to secure a portfolio of resources that in aggregate meets reliability targets
  - The portfolio should be structured to hedge against extreme outcomes
  - Individually, each resource does not have to perform through all potential events
- Provide greater flexibility for “self-supply” to meet resource adequacy obligation (e.g., allow residual participation, reform FRR to recognize TDU entities may not serve entirety of zone and even serve across zones with transmission rights)
- Forward commitment for a Delivery Year

Capacity market reform alone will not resolve fuel security concerns --

Should reform the PJM energy market to allow multi-day unit commitment to mitigate gas fuel procurement challenges in emergency conditions.

Reliability Requirement

Model

- The model used to establish the requirement should include assumptions regarding the load, resource availability (including maintenance and forced outages of generation and assumptions around demand response) and maximum deliverable energy including renewable resource production.
- The model needs to incorporate weather condition assumptions, including extreme weather.

Reliability Metric

- The metric should focus on the ability to provide energy to meet hourly needs (hourly LOLP or EUE).
- If focused on hourly needs, no need to create seasonal metric

Reserve Target (Level)

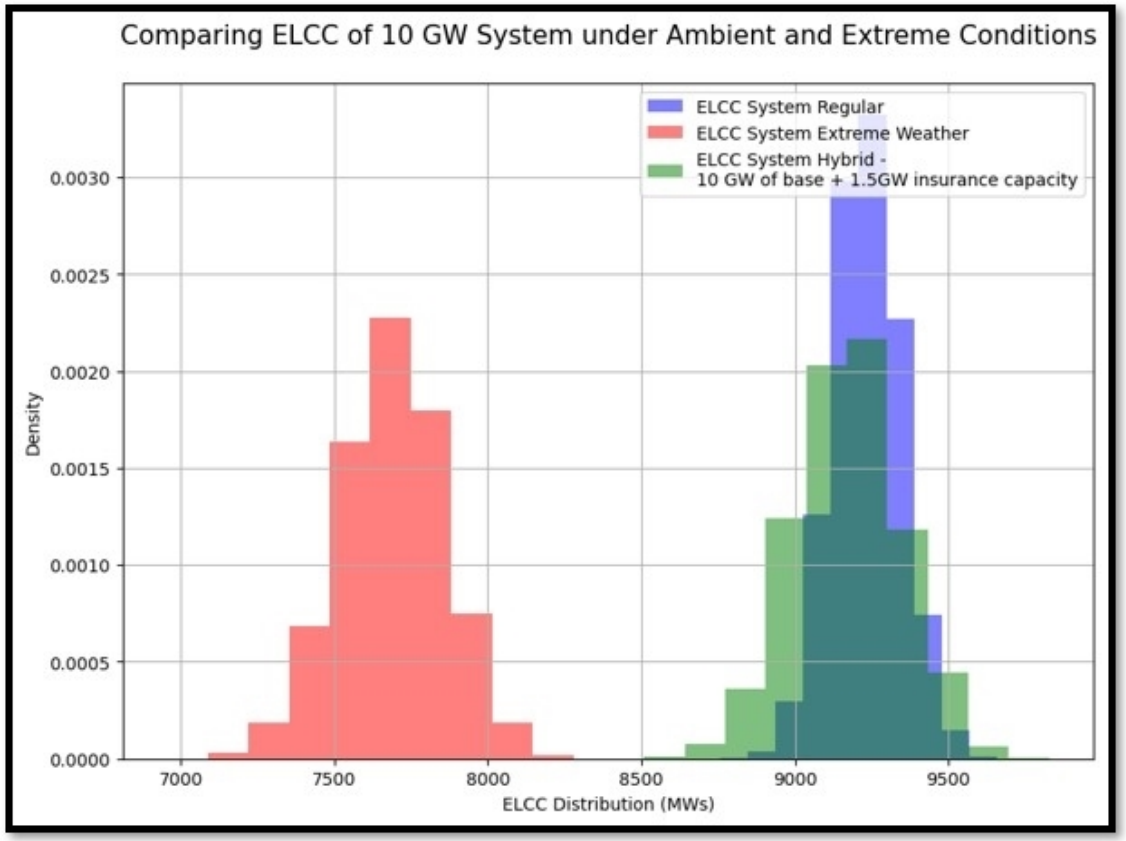
- Base: procure to meet expected hourly system needs (consistent with model assumptions of expected load, *normal* weather, resource availability/production profiles)
- Insurance: procure to meet modeled *extreme* load exposure (conditions that produce force majeure resource unavailability)
- Capacity requirements would be set using a planning model with hourly granularity on an adjusted ICAP basis.

Simple example of Base and Insurance requirements concept

Assume the following hypothetical 10,000 MW system which broadly shares the portfolio characteristics of PJM

Unit Type	# Units	Actual Capacity MW	% Total MW	Forced Outage Rates % - **regular conditions**	Unit Size	Extreme weather forced outage rate % - **used in model**	Actual outage observed in Elliott %
CC	234	3,411	34%	3.10%	14.58	30%	38%
CT	358	1,400	14%	4.76%	3.91	30%	38%
Diesel	78	33	0%	10.30%	0.42	25%	17%
Coal	167	2,651	27%	9.66%	15.88	15%	17%
Nuclear	31	1,783	18%	0.92%	57.51	7%	7%
Hydroelectric	20	480	5%	15.90%	24.00	20%	20%
Solar	26	101	1%		3.87		
Wind	25	141	1%		5.66		

We calculate the following system ELCC distributions; i.e., the distribution of firm load that can be reliably served



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Capacity Product & Accreditation

Capacity is the planned for capability of a resource (physical asset) to deliver energy or provide ancillary services to firm load; or the planned for capability of the load resource to curtail firm load.

Qualification:

- **Base**: must demonstrate made commercially reasonable arrangements to maximize availability
- **Insurance:** must be available within 2 hours of dispatch; have verifiable firm fuel source that allows continuous operation for at least 24 hours; demonstrated ability to operate through extreme temp/humidity conditions; and financial ability to absorb “penalty”

Accreditation: hourly “as-modeled” ICAP; no seasonal accreditation; not average or marginal ELCC

For example, a combined cycle plant would have an ambient air temperature adjusted max capacity modeled in the reliability model. Its hourly accredited ICAP would be based on those values.

Procurement

- Base Capacity and Insurance Capacity could be purchased through separate mechanisms or through a simultaneous auction that clears both Base and Insurance capacity (preferred)
- Self-Supply Entities (SSE) must be able to self-supply their obligation; any needs not self-supplied will be purchased through the capacity market.
  - If an SSE has sufficient resource portfolio to cover both Base and Insurance requirements, then it is self-supplied and self-insured.
  - An SSE can allocate assets in its resource portfolio to Base or Insurance – taking on differential operating expectations and non-performance exposures.
- All resources must be able to fully reflect their opportunity costs.
- All (Base and Insurance) qualified capacity resources “must offer” at a minimum as Base capacity. Insurance qualified capacity can (voluntary) also submit an Insurance capacity offer
- The auction will simultaneous clear against the Base and Insurance requirements, minimizing the total cost of procuring both
- Consider the commitment for Insurance Capacity for 3-years, rather than 1-year for Base Capacity.
  - PJM procure Insurance Capacity in rolling tranches, so it is not procuring more than 1/3 of its total Insurance capacity requirement in any given auction cycle.
  - If PJM does not commit the full 1/3 in one year, seek to commit the delta with the additional 1/3 in subsequent auction.

Obligation

- All cleared capacity will have an obligation to offer its accredited hourly ICAP into the DA and RT energy markets.
  - Base: offers its opportunity cost
  - Insurance: offers at tariff-specified rate (e.g., $800/MWh)
    - Seek to ensure Insurance Capacity is dispatched before region is short of Primary Reserves (when ORDC = $850/MWh)

- A capacity resources that is available and offer correctly into the DA/RT markets but is not committed or dispatched by PJM is paid for its capacity – irrespective of system conditions.

- If dispatched, all receive the energy clearing price.

Non-Performance

- If Base or Insurance Capacity resource is unavailable in any hour during a dispatch day, the resource is not paid capacity for that hour
- If Insurance Capacity resource is unavailable (or fails to operate as dispatched) in an hour during a dispatch day when emergency conditions are declared, in addition to foregoing hourly capacity payment, will be assessed penalty.
  - Penalty = 120 x daily capacity payment
  - Max penalty exposure = 3 non-performance events (Will be removed as Insurance Capacity for balance of Delivery Year)
- Replacement capacity, both Base and Insurance, can be part of the model.
  - Consider provisions that would allow obligation holders to avoid penalties if in-kind capacity is timely secured.
  - Resources could secure replacements bilaterally or through a PJM facilitated mechanism.
  - Additionally, if Insurance capacity, for example, 3-time fails, PJM could run a special procurement to backfill or wait until the upcoming regularly scheduled auction and procure replacement in addition to the normal tranche.