ELCC – IMM Comments

Markets & Reliability Committee

September 19, 2020

IMM

Monitoring Analytics

ELCC Issues

- **ELCC values**
  - **Source/basis/logic**
  - **Single value or a set of interdependent values (surface)**
- **Guaranteed ELCC**
  - **Class or unit**
  - **Impact**
- **ELCC in the capacity market clearing**
  - **Static, predefined, ex ante**
  - **Dynamic, internally consistent**
  - **Marginal or average value**

PJM Logic for ELCC Values

- With all thermal units, increase load to get to 1 in 10 LOLE
- Add PJM forecasted intermittent generation (temporal shape of output based on historical data).
- LOLE improves to over 1 in 10 (e.g. to 1 in 15).
  - Load Method: Increase load until LOLE is equal to 1 in 10. Added load divided by intermittent ICAP is the ELCC.
  - Gen Method: Remove base capacity until LOLE is equal to 1 in 10. Removed capacity divided by intermittent ICAP is the ELCC.

Ex Ante ELCC

- **Ex ante approach**
  - **ELCC values by class define the resource UCAP for offers into capacity auction**
  - **ELCC values for each resource are determined prior to the auction based on modeling**
  - **A single value for each class of intermittent resources**
  - **The ex ante ELCC resource mix is not a function of capacity market clearing.**
    - No interactions;
    - No simultaneous determination.
  - **Ex ante ELCC is always wrong; accurate prediction not possible.**

Proposed Ten Year Lock In

- **Lock in / floor values to be based on 10 year forecast of class ELCC values**
  - **A 10 year ELCC forecast will necessarily be based on many unknown inputs (inputs would include thermal capacity levels, intermittent capacity levels, intermittent generation levels and shape)**
  - **There is no means or structure for understanding the ELCC forecast error**
  - **ELCC should reflect the capacity resource mix and can only be accurately determined when incorporated into the auction clearing engine**

Proposed Ten Year Lock In

- Lock in / floor values to be based on 10 year forecast of class ELCC values. Ignores key variables.
  - No analysis of coal retirements;
  - No analysis of nuclear retirements;
  - No analysis of impact of significant rule changes;
  - No analysis of significant technology changes.
- Imposes risks on customers?
  - Who pays in the event of significant change?
- The goal of markets is to shift risk to investors.
- Ten year lock in shifts risks to other investors and to customers. Inefficient result.

Proposed Ten Year Lock In

- **Proposal calls for a hierarchy of "support" to compensate for locked in ELCC floors in excess of realized ELCC values**
  - **Resources within a related ELCC class or group of classes will be penalized by using required ELCC values that are less than their realized ELCC**
  - **If ELCC class cannot cover shortfall, an allocation across all ELCC classes will be required**
  - **It is not clear from the proposal what happens in the event there are not enough renewable resources to make up the shortfall resulting from the lock in.**
    - PJM clears additional thermal resources?

Proposed Ten Year Lock In

- **Old units will be over valued and overpaid.**
- **New units will be under valued and underpaid.**
- **Underpayment can affect unrelated asset types.**
- **No analysis of expected impact of lock in over 10 years .**
  - **Payments to resources.**
  - **Payments by customers.**

Lock In Example

- **The ELCC value for 20,000 MW nameplate of solar is 50 percent which results in 10,000 MW UCAP**
  - **5,000 MW has a guaranteed floor at 60 percent (Group A)**
  - **7,000 MW has a guaranteed floor at 50 percent (Group B)**
  - **8,000 MW has a guaranteed floor at 40 percent (Group C)**
  - **Group A is credited with 3,000 MW UCAP (60 percent)**
  - **Group B is credited with 3,500 MW UCAP (50 percent)**
  - **Group C is credited with 3,500 MW UCAP (43.75 percent)**
- **Group C penalized. Lower floor value.**
- **What happens if Group C is guaranteed 45 percent floor value?**

Lock In Example

- **The ELCC value for 20,000 MW nameplate of solar is 50 percent which results in 10,000 MW UCAP**
  - **5,000 MW has a guaranteed floor at 60 percent (Group A)**
  - **7,000 MW has a guaranteed floor at 50 percent (Group B)**
  - **8,000 MW has a guaranteed floor at 45 percent (Group C)**
  - **Group A is credited with 3,000 MW UCAP (60 percent)**
  - **Group B is credited with 3,500 MW UCAP (50 percent)**
  - **Group C is credited with 3,600 MW UCAP (45 percent)**
- **Credited UCAP exceeds 10,000 MW**
- **100 MW must come from a different class, or PJM must clear an additional 100 MW of thermal.**

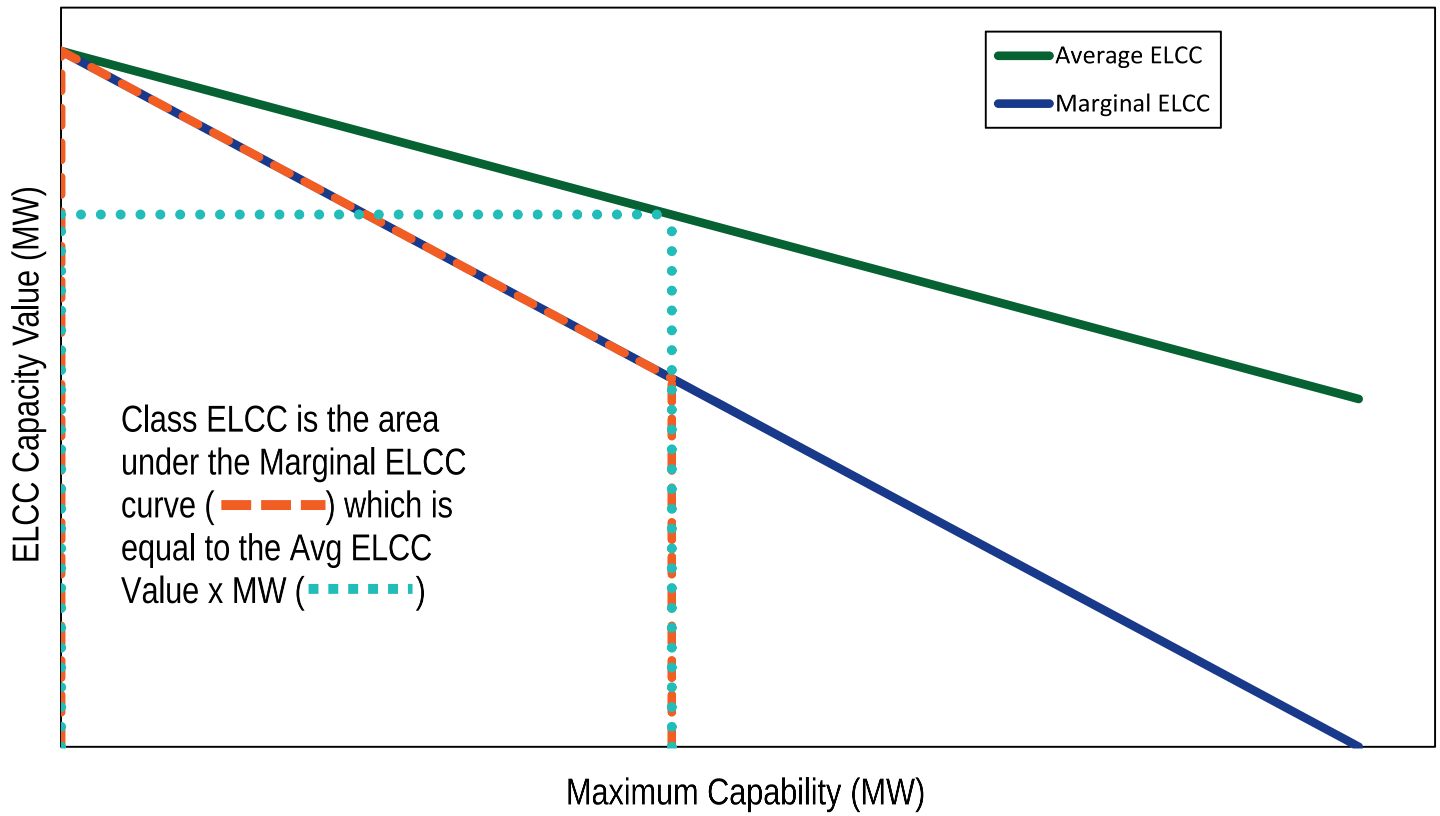
Simultaneous ELCC

- Inputs to the ELCC study are the actual capacity resources that intend to offer into the capacity auction
- The level of thermal resources and the levels of intermittent classes are varied to produce different ELCC values for different resource mixes (the ELCC surface).
- Contrast to PJM method which results in a single ELCC point, based on forecasts rather than actual offers.
- ELCC values for each resource class are determined as part of the clearing of the capacity market, based on the optimal, least cost combination of resources .

Average vs Marginal ELCC

- **Average ELCC – the ELCC for a class of resources is equal to the ELCC value for the class divided by the total maximum net capability of the class.**
- **Marginal ELCC – the ELCC for a class of resources is equal to the ELCC value associated with the last MW in the class.**
- **Both average and marginal results are the result of the same ELCC study.**

Simultaneous ELCC: Average vs Marginal



Simultaneous Marginal ELCC

- **Use of marginal ELCC results in correct measurement of total resource value.**
  - **Area under the curve**
- **Use of marginal ELCC results in correct measurement of resource performance obligation.**
- **Use of marginal ELCC results in correct payment to resources.**

Prices and Revenues with Marginal ELCC

- **If a 100 MW solar resource clears, the obligation is to provide 100 MW of solar when conditions allow.**
  - **Regardless of marginal ELCC.**
- **If a 100 MW solar resource clears with a marginal ELCC of 1.0, effective MW = 100 MW:**
  - **100 MW * 1.0 = 100 MW**
- **If a 100 MW solar resource clears with a marginal ELCC of 0.5, effective MW = 50 MW:**
  - **100 MW * 0.5 = 50 MW**

Prices and Revenues with Marginal ELCC

- **If a 100 MW solar resource clears at $1.00 per MW-day, with a marginal ELCC of 1.0, revenue is:**
  - **100 MW * 1.0 * $1 = $100 per day**
- **If a 100 MW solar resource clears at $1.00 per MW-day, with a marginal ELCC of 0.5, revenue is:**
  - **100MW * .0.5 * $1/0.5 = $100 per day**
  - **= 50 MW * $2 = $100 per day**

Prices and Revenues with Marginal ELCC

- **The price per effective MW will vary with the ELCC.**
- **The total payment to the resource is always equal to or greater than the offer, regardless of the marginal ELCC.**

Marginal ELCC Payment Example

- Intermittent resource with 100 MW maximum capability offers at $15 per MW-day
  - Payment: ($ 15 x 100 x 365) = $547,550 per DY
  - If unit is marginal. Payment greater if inframarginal.
- If resource clears and marginal ELCC is 10 percent:
  - Effective capacity is (100 MW x 0.10) = 10 MW
  - Offer per effective MW is ($15 / 0.10) = $150.00 per MW-day
  - Offer for delivery year is $150 x 10 x 365 = $547,500 per DY

Marginal ELCC and Effective Offers

Marginal ELCC Percent	Effective Offer ($ per MW-day)	Effective Offer ($ per DY)
100%	$15.00	$547,500
80%	$18.75	$547,500
50%	$30.00	$547,500
40%	$37.50	$547,500
30%	$50.00	$547,500
20%	$75.00	$547,500
10%	$150.00	$547,500
5%	$300.00	$547,500
1%	$1,500.00	$547,500

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