FRM Offer Cap Amendment

Ben Griffiths | Markets Committee | December 12-14 2023

About LS Power

LS Power is a development, investment and operating company focused on the North American power and energy infrastructure sector

- Founded in 1990, LS Power has 280 employees across its principal and affiliate offices in New York, New Jersey, Missouri, Texas and California
- LS Power is at the leading edge of the industry's transition to low-carbon energy by commercializing new technologies and developing new markets.
  - **Utility-scale power projects across multiple fuel and technology types**, such as pumped storage hydro, wind, solar and natural gas-fired generation
  - **Battery energy storage**, market-leading utility-scale solutions that complement weather dependent renewables like wind and solar energy
  - **High voltage electric transmission infrastructure**, which is key to increasing grid reliability and efficiency, as well as carrying renewable energy from remote locations to population centers
  - **EVgo, the nation's largest public fast charging platform for electric vehicles** and first platform to be 100% powered by renewable energy
  - **CPower Energy Management**, the largest demand response provider in the country that is dedicated solely to the commercial and industrial sector
- Since inception, LS Power has developed, constructed, managed and acquired competitive power generation and transmission infrastructure, for which **we have raised over $47 billion in debt and equity financing.**
  - **Developed over 11,000 MW of power generation** (both conventional and renewable) across the United States
  - **Acquired over 34,000 MW of power generation assets** (both conventional and renewable)
  - **Developed over 660 miles of high voltage transmission**, with ~400 miles of additional transmission under development

Utilize deep industry expertise as owner/operator

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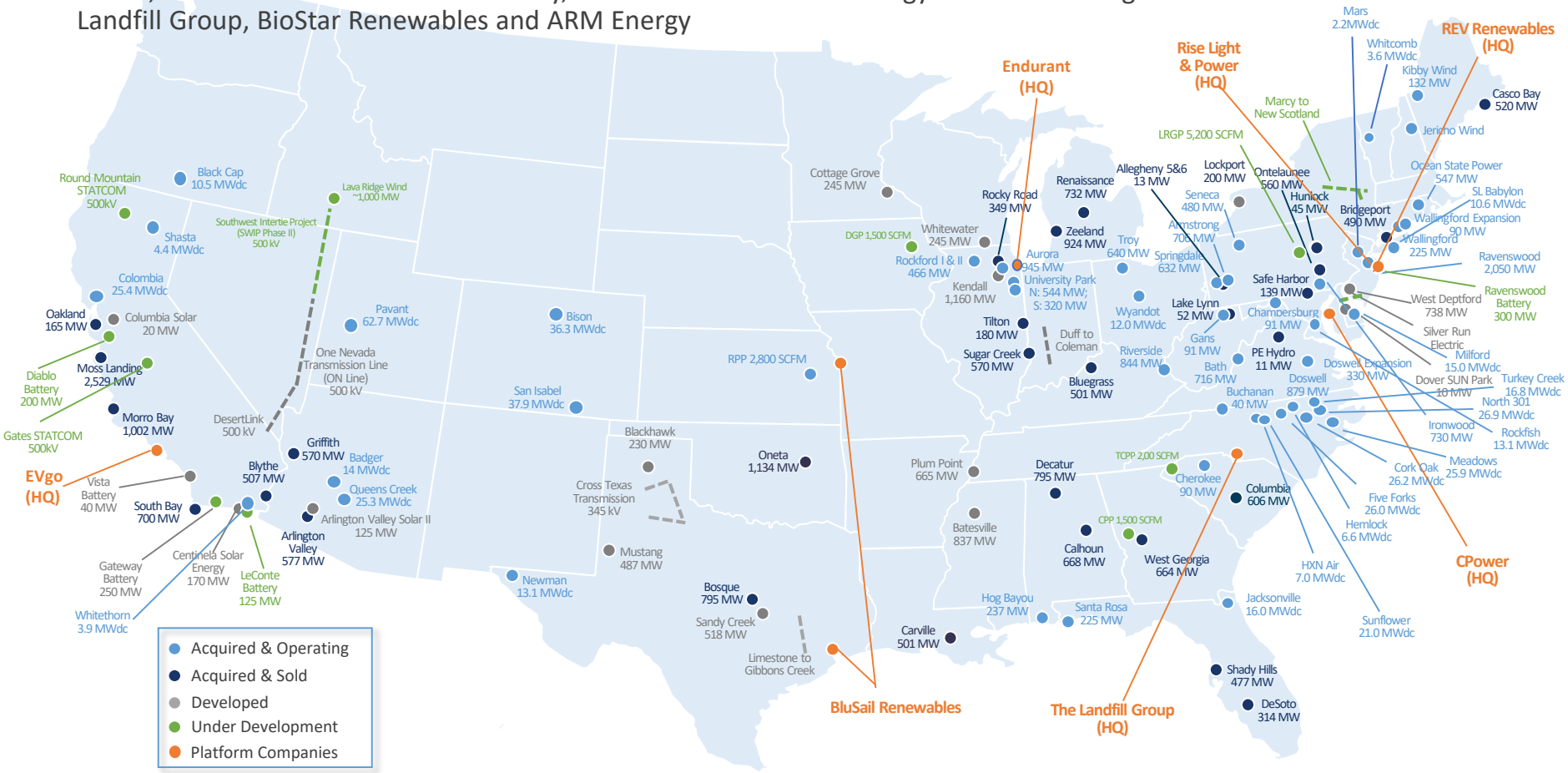
LS Power Project Portfolio

Extensive development/operating experience across multiple markets and technologies

- With over $47 billion in equity and debt raised, LS Power has developed and acquired 120 Power Generation projects (renewable and conventional generation), 7 Transmission projects, and 5 Battery Energy Storage projects
- LS Power's Energy Transition Platforms includes CPower Energy Management, Endurant Energy, EVgo, Rise Light & Power, and REV Renewables. Additionally, LS Power has Waste to Energy initiatives through its Joint Ventures with the Landfill Group, BioStar Renewables and ARM Energy



Position Summary

- Setting a reasonable FRM offer cap is essential to a well functioning market
  - A too low offer cap may discourage resources from participating in FRM, which would increase the likelihood of the market clearing at its cap
- LS agrees with the IMM's suggestion that the current $9,000/MW-mo offer cap is too high, largely because PfP events are a lot less common than region anticipated in 2016
- LS also agrees that the FRM offer cap should be "based on an expectation of a reasonable upper-limit on the bid-in cost for a hypothetical forward reserve resource" [1]
- The ISO's estimation approach does *not* reflect a "reasonable upper-limit" on costs
- **Reasonable variations on the ISO's approach yield significantly higher offer caps between $7,100 and $8,200/MW-month, compared to the ISO's $6,400 value**

1. 1. IMM 2023 Spring Quarterly Markets Report at 44; see also ER16-921 Filing Letter at 8: "the FRM offer cap will be **set reflecting the high end of the ISO's estimate of costs** for a representative, existing resource to assume an obligation to provide forward reserves"

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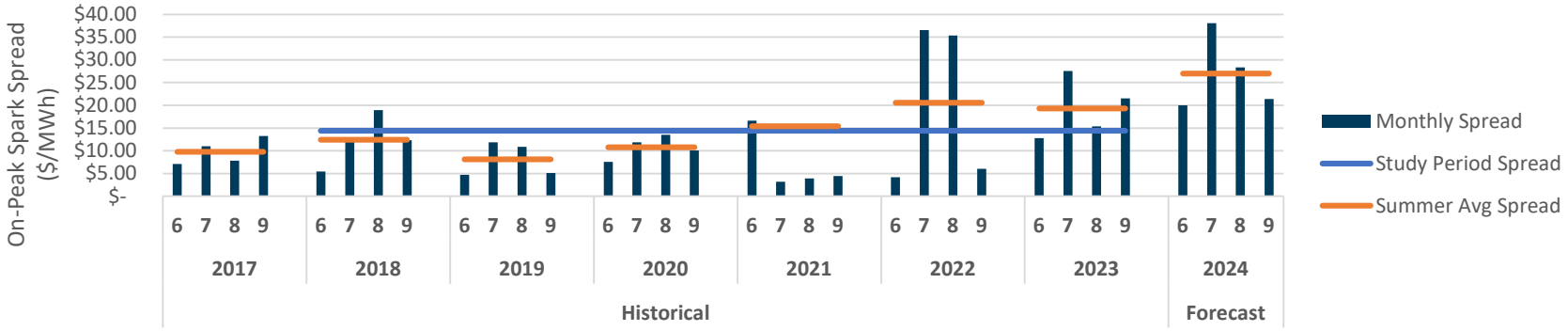
Concern with ISO's current approach to calculating E&AS revenues

- The ISO is currently relying on a "lookback" approach to computing foregone E&AS revenues, based on observed pricing data from the 2018-2023 period
  - The IMM, using a conceptually similar approach found revenues would be 50% higher
- Last month, LS expressed concern that the ISO's approach to computing E&AS revenues will fail to capture salient differences between **(a)** past market performance and **(b)** current expectations for the upcoming summer seasons
- The ISO retorted that their historic approach "captures the high costs of summer 2022" and that "July 2022 and August 2022 prices exceed current futures prices"
  - LS readily agrees that current power forwards are *lower* than those in 2022
- But, foregone revenues aren't a function of the *absolute price* of commodities. Instead, revenues are based on *energy margin*, the spread between prices for power and gas
  - As shown on next slide, Summer 2024 has spreads 87% higher than the 2018-2023 average and 31% higher than Summer 2022.
- **Historic prices used by ISO are still *not* representative of future market conditions**

Forwards suggest higher spark spreads in Summer 2024

Presented at November MC

- FRM will likely be sunset starting March 2025, so any changes to the cap should reflect a reasonable upper-limit on offers for the June 2024 – February 2025 timeframe
- Historic prices used by ISO are *not* representative of future market conditions
  - Using unadjusted prices will lead to downward bias in revenue estimates and FRM cap because historical period had lower margin than forwards suggest for Summer 2024
- Chart below estimates on-peak spark spreads for each month in study period as well as based on current forward prices (as of 11/3/2023)
  - Recall, Spark Spread = [Avg On-Peak LMP] – [9.575 MMBtu/MWh HR] x [Avg Algonquin Price]
    - Historical sparks range from $4 to $36/MWh (avg = $14.44/MWh)
    - Forward sparks range from $20 to $38/MWh (avg = $26.96/MWh) → **87% higher**



Lack of correlation between reserves & energy revenues mean that values should be treated as independent

Presented at November MC

- While reserve prices and energy prices are correlated on an hour to hour basis, there is no real correlation between energy revenues and reserve revenues on a monthly basis
  - E.g., a generally low margin month from an energy perspective might have high reserve revenues due to the system tightening (but not hitting scarcity)
- A review of historical summer data from June 2017 to July 2023 shows the lack of relationship between energy and reserve prices. The correlation between
  - the (a) number of hours with positive reserve prices and (b) average DA LMP is -0.28
  - The (a) average combined TMNSR+TMOR price and (b) average DA LMP is +0.22
- As regressions, same variables yield R-squared value of 0.009 and 0.08 respectively
- **Separate estimates for energy and ancillaries, like IMM proposed, better reflects the lack of relationship**

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Energy & (Non-Scarcity) Ancillary Service Revenues

Presented at November MC

- 50% difference in EAS revenue from IMM & ISO using conceptually similar approaches
  - ISO-NE estimates foregone E&AS revenues at **$2,170/MW-mo**
    - Estimate relies on the "CONE reset" dispatch models, several years of historic pricing data, and unit parameters based on a "more efficient unit" [1]
  - IMM estimated the same foregone revenues at **$3,233/MW-mo**; nearly 50% higher!
    - Energy estimated at $2,091/MW-mo based on the 90% percentile of observed summer energy revenues, over six summer seasons for a relatively new dual-fuel peaking resource [2]
    - Non-Scarcity Reserve Revenues estimated at $1,142/MW-mo based on 90% percentile value of available reserve revenue on observed over four summer seasons [2]
  - The difference in these two estimates, **$1,063/MW-mo**, is larger than the *entire* 15% risk premium offered by the ISO ($836/MW-mo)!
- [**Dec Update**: ISO-NE's estimate is now $2,070/MW-mo, $100 lower than previously estimated, which results in even larger differences in revenue estimates]

1. November MC presentation, Slides 20-24; Oct MC presentation, Slide 8 suggests HR of 9,575 BTU/kWh
2. IMM 2023 Spring Quarterly Markets Report at 50

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Reasonable variations on the E&AS ISO approach all result in higher FRM Offer Caps

Offer Cap ($/MW-month)	Change to ISO Approach
$8,200	Using IMM's E&AS Revenues [1]
$7,800	Using Forward-Adjusted Prices [2]
$7,100	ISO-NE approach, but assuming unit not in Connecticut [3]
$6,400	ISO-NE's proposed approach

1. IMM estimated the E&AS foregone revenues at **$3,233/MW-mo**
2. LS submitted a memo to the ISO on November 15th that estimated E&AS revenues at **$2,977/MW-mo**, based on forward-adjusted prices. *This memo is provided as part of this month's meeting materials*
3. Allows FRM unit to avoid a 5% state tax on gas, which increases estimated E&AS revenues to **$2,524/MW-mo** – holding all other ISO assumptions and prices content
4. From the ISO's December MC presentation, which estimated E&AS revenues at **$2,070/MW-month**

Details on FRM Computation by Case

Updated Offer Cap ($/MW-Month)						
Item Number	Item Description	ISO Revised Item Value (Nov MC)	LS Alternative with IMM E&AS Revs	Using Fwd-Adjusted Prices	Unit Not Located in CT	Item Units
1	**Foregone Revenue**					
1.1	Number of Reserve Shortage Hours	5.4	5.4	5.4	5.4	hours/year
1.2	Reserve Shortage Hour Reserve Revenue	1,990	1,990	1,990	1,990	$/MW-month
1.2(a)	*Minimum Total Reserve Req. Shortage Revenue*	*1,350*	*1,350*	*1,350*	*1,350*	$/MW-month
1.2(b)	*Ten-Minute Reserve Req. Shortage Revenue*	*640*	*640*	*640*	*640*	$/MW-month
1.3	Energy and Reserve Market Revenue	2,070	3,233	2,977	2,524	$/MW-month
Item 1 Subtotal	***Foregone Revenue Subtotal***	***4,060***	***5,223***	***4,967***	***4,514***	***$/MW-month***
2	**Penalties**					
2.1	Failure to Reserve (32.12%)*	1,304	1,678	1,595	1,450	$/MW-month
2.2	Failure to Activate (5.17%)**	210	270	257	233	$/MW-month
Item 2 Subtotal	***Penalty Subtotal***	***1,514***	***1,948***	***1,852***	***1,683***	***$/MW-month***
3	**Supplier Risk Premium** ([Item 1 subtotal + Item 2 subtotal]*15%)	***836***	***1076***	***1023***	***930***	$/MW-month
						$/MW-month
4	Total Offer Cap (Item 1 + Item 2 + Item 3)	6,410	8,246	7,842	7,127	$/MW-month
Item 4 Rounded	**Updated Forward Reserve Offer Cap**	**6,400**	8,200	7,800	7,100	**$/MW-month**

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Amendment

- LS proposes a simple amendment which replaces the ISO's E&AS revenue value with the values computed by the IMM.
- **Redlines are simple: a single value is changed**
  - LS is not proposing any changes to Section III.9.3

Tariff Section	Description of Change	Reason for Change
I.2.2	Modify definition of Forward Reserve Offer Cap to "is ~~$9,000~~$8,200/megawatt-month."	Update offer cap

Questions?