

Southwest Power Pool
PRICE FORMATION TASK FORCE MEETING

May 25, 2016

AEP Offices – Dallas, TX

• M I N U T E S •

Agenda Item 1 — Call to Order

Matt Moore (GSEC) called the meeting to order at 8:00 a.m. The attendance was recorded (*Attachment 1 - PFTF Attendance May 25 2016*). Matt Moore announced that there were no proxies. The group reviewed the agenda (*Attachment 2 - PFTF Agenda for May 25 2016*).

Agenda Item 2 — Review SPP level of effort issue rankings

Jared Greenwalt (SPP) presented the level-of-effort ranking for the submitted concerns and solutions noting the reasons for the difficulty (*Attachment 3 - Concerns Matrix_Final.xlsx* and *Attachment 4 - PFTF Issues Compiled.docx*). The difficulty ranking included not only implementation but also the expected effort to develop the market design and to reach agreement with the appropriate stakeholders.

Agenda Item 3 — Review prioritized concerns

The PFTF members, excluding the chair, ranked the proposed solutions prior to the meeting. The rankings were reviewed, and no changes were made. The PFTF will address the issues in priority order. Anyone may add an agenda item out of order time permitting.

Agenda Item 4 — Headroom and headroom transparency

Matt Moore presented his thoughts on headroom (*Attachment 5 - Head-room and Head-room Transparency.pptx*). Matt noted that headroom seems like an ancillary service. Gary Cate (SPP) explained that Resources are cleared to meet average hourly load. Due to the nature of an average, more than the average load will need to be met. Since committing for peak load for the whole hour is not an efficient solution, headroom is cleared to meet this instantaneous load. Matt added that the definition in the Tariff mentions using headroom for generation variability due to Variable Energy Resources. Gary pointed out that the formula in the Protocols includes only average hourly load and instantaneous load and does not include any other variables. The group noted that the definition seemed to include more than the equation. A question was raised regarding whether SPP had flexibility to adjust headroom throughout the day. SPP staff explained that the equation calculates a value each hour, but the floor is the same for the whole day. Furthermore, it is possible via a software change to change that floor in each hour. Members asked if headroom should be cleared as an existing product or a new product. Gary answered that headroom is clearing for load above average hourly load forecast, and it is not part of an existing product. Serhat Guney (SPP MMU) clarified that FERC's definition of "Ancillary Services" included six components: (1) Scheduling, System Control and Dispatch Service; (2) Reactive Supply and Voltage Control from Generation Sources Service; (3) Regulation and Frequency Response Service; (4) Energy Imbalance Service; (5) Operating Reserve - Spinning Reserve Service; and (6) Operating Reserve - Supplemental Reserve Service. Members also questioned whether ramp was optimized in the clearing of headroom noting that many slow-ramping Resources should not be cleared

when one fast-ramping unit could provide the ramp cheaper. SPP staff explained that the market clearing engine co-optimizes for all parameters and constraints, including ramp rate.

Matt also presented a draft revision request (*Attachment 6 - Headroom and Headroom Transparency - DRAFT_PFTF.docx*). The revision proposes to clear 100% of headroom in the Day-Ahead Market and only clearing for headroom in RUC if the 100% target was not met in the Day-Ahead Market. In the case of clearing headroom in RUC, the Resource owner would be notified of the reason for commitment. The language also proposes that any change in headroom be approved by the Market Working group. Some participants were concerned that not clearing for headroom with the more up-to-date information in RUC could present reliability issues due to the changes between the Day-Ahead Market and Intra-Day RUC. The group discussed the previous arguments for and against including headroom in the Day-Ahead Market. It was stated that including headroom in the Day-Ahead Market helps to converge Day-Ahead and Real-Time prices. It was also stated including headroom in the Day-Ahead Market moved the make-whole payment from RUC to Day-Ahead. This changes the distribution because the Day-Ahead make-whole payment is distributed by load-ratio share while the RUC make-whole payment is distributed by deviation share. A participant also noted that clearing headroom in the Day-Ahead Market could suppress Day-Ahead prices. **Matt Moore requested an action item for SPP staff to explain the need in the Day-Ahead Market that headroom fulfills. Additionally, the PFTF requested for SPP staff to bring a pros/cons list to the PFTF regarding the inclusion of headroom in the Day-Ahead Market.**

Agenda Item 5 – Review action items

The group reviewed the action items captured in the meeting. In the next meeting, the following items will be on the agenda: headroom, the issue of connecting Day-Ahead and Real-Time clearing, action item #7, and a presentation from Cliff Franklin.

Agenda Item 6 – Adjournment

Matt Moore (GSEC) adjourned the meeting at 12:06 p.m.

Action Items:

- **Agenda Item 4:** Matt Moore requested an action item for SPP staff to explain the need in the Day-Ahead Market that headroom fulfills.
- **Agenda Item 4:** The PFTF requested for SPP staff to bring a pros/cons list to the PFTF regarding the inclusion of headroom in the Day-Ahead Market.

Future Meetings:

June 22, 2016 (8:00 a.m. – 12:00 p.m.)

Location: AEP Office – Dallas, TX

Room: 8th Floor

July 20, 2016 (8:00 a.m. – 12:00 p.m.)

Location: AEP Office – Dallas, TX

Room: 8th Floor

August 24, 2016 (8:00 a.m. – 12:00 p.m.)



Location: AEP Office – Dallas, TX

Room: 8th Floor

Respectfully Submitted,

Debbie James

Secretary

Attachments

Attachment 1 - PFTF Attendance May 25 2016

Attachment 2 - PFTF Agenda for May 25 2016

Attachment 3 - Concerns Matrix_Final.xlsx

Attachment 4 - PFTF Issues Compiled.docx

Attachment 5 - Headroom and headroom transparency.pptx

Attachment 6 - Headroom and Headroom Transparency - DRAFT_PFTF.docx

X = In Person		PFTF May 25, 2016 AEP in Dallas			
P = By Phone					
* = By Proxy					
Day 1	Full Name	Company	E-mail	Business Phone	Other Phone
X	Matt Moore (Chair)	Golden Spread Electric Coop	mmoore@gsec.coop	(806) 379-7766	
X	Carrie Dixon	Xcel Energy	carrie.e.dixon@xcelenergy.com		
X	Cliff Franklin	Westar	clifford.franklin@westarenergy.com	(443) 226-7787	
X	Jim Flucke	KCPL	jim.flucke@kcpl.com	(816) 701-7836	
X	Valerie Weigel	Basin Electric Power Co.	vweigel@bepec.com	(701) 557-5430	
P	Brandon McCracken	WFEC	b_mccracken@wfec.com		
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X	Hailey McKewon	GRDA	hmckewon@grda.com		
P	Jake Pannell	SPP	jpannell@spp.org		
X	Jared Greenwalt	SPP	jgreenwalt@spp.org	(501) 688-8314	
X	John Krajewski	Nebraska PRB			
X	John Luallen	SPP	jluallen@spp.org		
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P	Kevin Bates	SPP MMU	kbates@spp.org		
P	Kim Sullivan	WFEC	k_sullivan@wfec.com		
P	Lee Anderson	LES	landerson@les.com	(402) 467-7591	
P	Marisa Choate	SPP	mchoate@spp.org	(501) 688-1707	
X	Micha Bailey	SPP	mcb Bailey@spp.org	(501) 688-2522	
P	Nick Parker	SPP	nparker@spp.org	(501) 614-3574	
P	Patti Kelly	SPP	pkelly@spp.org	(501) 614-3381	
X	Richard Ross	AEP	rross@aep.com	(918) 599-2966	(918) 284-8702
P	Ricky Finkbiner	SPP	rfinkbeiner@spp.org		
P	Rob Janssen	Kelson Energy	rob.janssen@kelsonenergy.com		
X	Rob Safuto	CES	rsafuto@ce-ltd.com	(917) 446-2579	
P	Ron Chartier	SECI	rchartier@sunflower.net		
X	Ron Thompson	NPPD	rthomp@nppd.com	(402) 845-5202	
P	Roy True	Aces Power Marketing (APM)	royt@acespower.com	(317) 695-4146	(317) 695-4146
P	Ryan Sutton		rsutton@utexas.edu		
P	Sara Pettus	Wind Coalition	sarah@windcoalition.org		
X	Shawn Geil	KEPCo	sgeil@kepco.org		
P	Sherry Hamilton	SPP	shamilton@spp.org		

X	Tony Alexander	SPP	talexander@spp.org		
P	Terry Wright	EDE	twright@empiredistrict.com		
X	Walt Shumate	Shumate & Associates	waltshumate@sbcglobal.net	(512) 496-7704	

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PRICE FORMATION TASK FORCE

May 25, 2016

Meeting

• A G E N D A •

8:00 a.m. – 12:00 p.m.

1. Call to Order, Proxies, Agenda Discussion (8:00) Matt Moore
2. Review SPP Level of Effort Issue Rankings (8:05).....Jared Greenwalt
3. Review prioritized concerns (8:35)..... Matt Moore
4. Headroom and headroom transparency (10:35) Matt Moore
5. Review Action Items (11:45)Jared Greenwalt
6. Adjournment Matt Moore

Issue	Submitted By
<p>Headroom processes should be examined to determine if the existing process for Headroom commitment is being properly reflected in the LMP's while reducing the uplift charges to the market. In addition, the commitment of Headroom should not mask the need for the development of what could be other market based products such as ramping, a 30-60 minute contingency reserve product, redefining and expanding the supplemental time frame or market based primary frequency response.</p>	GSEC
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<p>Proper Pricing and Deployment of Regulation Services and Energy in Real Time</p>	Dogwood
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<p>Scarcity pricing should be examined to determine if participants are being compensated for the services they are providing in the interval they are providing it.</p>	GSEC
<p>Lack of Multi-Day Resource "Reliability Coordination" Activity by SPP Leading to Over-Commitment of Resources by Market Participants</p>	Dogwood
<p>Over production in the real-time market should be examined. Resources should not be required to meet a Day Ahead commitment when the LMP is below production cost in real-time. This should hold true for all Resources but especially Quick Start Resources.</p>	GSEC
<p>Over production in the real-time market should be examined. Resources should not be required to meet a Day Ahead commitment when the LMP is below production cost in real-time. This should hold true for all Resources but especially Quick Start Resources.</p>	GSEC
<p>Excessive Volatility of SPP IM Real Time Energy Pricing</p>	Dogwood
<p>Make Whole Payment Allocation Based on Real Time Imbalance Deviation from Day Ahead Schedule Rather than Deviation from Deployment Signal</p>	Dogwood

Transmission/Resource Outages Coordination	NPPD
Scarcity pricing should be examined to determine if participants are being compensated for the services they are providing in the interval they are providing it.	GSEC
Transmission/Resource Outages Coordination	NPPD
Mitigation of Resource Offers to “Cost plus 10%” Rather than “Cost” as a Reasonable Proxy for Cost Recovery in FERC-Regulated Energy Markets	Dogwood
Violation Relaxation Limit Process – The existing VRL process should be examined to determine if the protocols and related process are distorting LMP’s during any circumstance.	GSEC
Transparency related to manual commitments, RUC’s and Headroom should be posted for the Market Participant on a more frequent basis to ensure the Resource owner knows why the Resource was committed beyond normal market processes. In addition, the number of manual and RUC instances should be posted.	GSEC
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The unit commitment process should be reflected in the LMP to properly reflect the value for a particular unit and particular need while also reducing uplift to the market.	GSEC
Improved coordination between slower and faster ramping units where faster ramping units are compensated	NPPD

The ability of Block Loaded fast start Resources to set LMP should be examined.	GSEC
Intermittent Resources Management adds costs to the Market	NPPD
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Market Concern

Resources are committed for Headroom which is used for rampable capacity. These commitments create uplift when these Resources are not profitable and make pricing non-transparent.

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Resource can clear Regulation in the Day-Ahead Market, then, in Real-Time, not be cleared for Regulation. When MCPs are higher, the Resource must buy back its Day-Ahead position at a higher price.

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Resources are committed for Headroom which is used for rampable capacity. These commitments create uplift when these Resources are not profitable and make pricing non-transparent.

Scarcity Pricing should occur during the interval in which the product was scarce. The scarcity price should value the provided product properly. Scarcity prices should not be reduced or avoided by over-commitment.

High wind generator output and high levels of self-commitment cause an un-optimized, over-commitment, and thus too many Resources to be on-line.

Over-production of Energy as a result of over commitment or a needless requirement can lead to depressed, inefficient price signals.

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Real-Time LMPs vary from Day-Ahead LMPs such that the Day-Ahead Market does not provide a sufficient hedge for RTBM.

Make Whole Payment Allocation Based on Real Time Imbalance Deviation from Day Ahead Schedule Rather than Deviation from Deployment Signal.

The current coordination of scheduled transmission outages increases the risk of more congested flowgates and the volatile prices that tend to follow in RTBM.

Scarcity Pricing should occur during the interval in which the product was scarce. The scarcity price should value the provided product properly. Scarcity prices should not be reduced or avoided by over-commitment.

The current coordination of scheduled transmission outages increases the risk of more congested flowgates and the volatile prices that tend to follow in RTBM.

When offers are mitigated to short-run marginal cost, Resources cannot recover their necessary costs.

VRLs relax constraints to allow economic dispatch to solve. By relaxing the very need for these available services and technologies, the pricing and the very need for these services are diminished.

Resource owners are not sufficiently aware of why their Resource is committed and how often market Resources are committed manually and by RUC.

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Start-up and no-load costs are not included in LMP. Therefore the LMP does not reflect these costs and thus the value of certain Resource types. This also increases uplift charges.

When wind Resources do not produce as forecasted, scarcity prices can occur and create price volatility in Real-Time.

Anytime a Resource is not allowed to set LMP then there is a clear direct connection with price formation. **Block loaded Fast Start Resources** should be allowed to set LMP. Other markets are taking steps to ensure this is the case.

VERs increase the production cost of the market by increasing the Operating Reserve (OR) requirement and by causing scarcity, which leads to scarcity pricing.

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Proposed Solution	Regulation Deployment	Real-Time Price Volatility	Mitigated Offers	Over-Commitment of Resources	Scarcity Pricing	Violation Relaxation	Headroom
Make headroom a market-based solution instead of a RUC-based solution so that the need is reflected in LMP.							X
Clear for headroom in the Day-Ahead Market.							X
Connect Real-Time clearing with the Resource's Day-Ahead position.	X	X					
Create a make-whole payment for a Resource that is cleared for Regulation in the Day-Ahead Market but does not get cleared for Regulation in Real-Time.	X	X					

Create a ramp product.							X
Disallow SPP's temporary use of Operating Reserve to meet ramp requirements.	X				X		
SPP or the Market Monitor should publish a forecast describing the predicted mix of generation types that will provide the optimal solution.				X			
Allow some committed Resources to be dispatched to zero MWs if LMPs do not merit running the Resource.							
Allow Resources to buy back its Day-Ahead position without being charged MWP distribution.							
Lower scarcity pricing demand curves.		X			X		
Change Make Whole Payment allocations to dispatchable Resources to be based on failed commitments and deviations from Real Time deployment signals rather than just deviations from Day Ahead award schedules. Alternatively, eliminate allocation of Make Whole Payments to dispatchable Resources and allow deployment failure penalties to adequately incent Resources to follow deployment signals.							

Improve the process for coordinating transmission outages so that flowgate congestion is reduced, and thus, price volatility is reduced.							
Develop an Operating Reserve Demand Curve (ORDC).					X		
Possibly apply penalties when a planned, scheduled outage is not followed.							
Change mitigated offer rules to reduce the offer to cost plus ten percent.			X				
Do not relax constraints related to VRLs. Allow the price to reflect the VRL.						X	
The number of manual commitments and RUCs should be posted.							
Post the reason for a Resource's manual commitment or RUC for the Market Participant (e.g., Regulation, additional Operating Reserve, Headroom, rampable capacity, etc.).							
Incorporate start-up and no-load costs into LMP by developing extended LMP.							
Create a process where slower ramping Resources are used in the early stages of operation needs, and faster ramping resources are available for use later and are compensated accordingly.		X			X		

Block loaded Fast Start Resources could be allowed to set LMP through mechanisms such as ELMP which had been addressed in MISO.							
Make VERs more accountable in scarcity pricing events.		X			X		
Make VERs more accountable for the additional Operating Reserve they require to reliably operate.	X						
Develop a process where the AO is made whole if the generation unit is harmed by deployment levels in the Real Time Market.	X						

Transmission Limits	Control Room	Start-Up and No-Load Costs	Over-production	Transparency	Variable Energy Resources (VERs)	Transmission Outage	Level of Effort (1 = Easy)	Importance (1 = Most Important)	Overall
						High	1		3.33
						Low	2		3.33
						High	3		4.67
						High	4		4.67

					Medium	5	6.00
					High	6	6.33
					Medium	7	9.67
	X				High	8	9.67
	X				High	9	9.67
					Medium	10	10.00
					High	11	10.00

				X	High	12	10.00
					Medium	13	10.33
				X	High	14	11.33
					Medium	15	11.67
					High	16	12.00
		X			Low	17	12.00
		X			Low	18	12.67
X					High	19	13.67
					Medium	20	17.67

		X			High	21	18.33
			X		High	22	19.33
			X		High	23	19.67
			X		High	24	20.00

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SPP Comment

Headroom/Floorroom is currently part of the SCUC and used to commit enough rampable capacity to meet the instantaneous load above/below the average load. It must be added to the SCED for pricing.

Determine appropriate hourly headroom values.

Integrate DAMKT results with the RUC and Regulation selection process. How do you relax the DAMKT Regulation requirement when there is a reliability issue?

Significant effort to define the market rules around another MWP.

Leverage ramp product market design work performed by the Ramp Product Focus Group.

Integrate this discussion with the FERC Order related to the AD14-14 NOPR on shortage pricing.

Use SPP public information request process and monitor Stakeholder Prioritization Quarterly Meeting (SPQM) process.

Day-Ahead committed QSRs are allowed a zero dispatch without MWP penalties. Settlement could be significant.

Day-Ahead committed resources are exempt from MWP distribution charges.

There is significant effort to determine the appropriate demand curve price, and to incorporate demand curves in software and business processes. If the demand curve is set too low, violations become more frequent, and if it is set too high it could have a significant price impact.

SPP working with Rob Janssen on the Dogwood Energy MWP issues. Significant effort to re-define MWP market rules.

Already discussed with ORWG as part of the TCR Outage Sub-Group

There is significant effort to determine the appropriate demand curve price, and to incorporate demand curves in software and business processes. If the demand curve is set too low, violations become more frequent, and if it is set too high it could have a significant price impact.

Already discussed with ORWG as part of the TCR Outage Sub-Group

MMU and FERC hurdle could be high.

Current VRLs are used to encourage the MCE to respect system constraints until it reaches the VRL price threshold while allowing MCE to find a solution. The alternative to VRLs is demand curves. There is significant effort to determine the appropriate demand curve price, and to incorporate demand curves in software and business processes. If the demand curve is set too low, violations become more frequent, and if it is set too high it could have a significant price impact.

Use SPP public information request process and monitor Stakeholder Prioritization Quarterly Meeting (SPQM) process.

Manual commitment reasons could be identified. The reason for RUCs is not available since there is no single reason identified in the SCUC for the unit commitment. All resources are committed economically to meet the input requirements. Use SPP public information request process and monitor Stakeholder Prioritization Quarterly Meeting (SPQM) process.

Significant effort to define the market rules around ELMP eligibility rules and evaluate the impact.

Leverage ramp product market design work performed by the Ramp Product Focus Group.

Significant effort to define the market rules around ELMP eligibility rules and evaluate the impact.

Requires development of cost allocation methodology and could require significant Settlement changes.

Requires development of cost allocation methodology and could require significant Settlement changes.

Combine with Dogwood Energy Issue #1.

Issue to Be Addressed by the Price Formation Task Force

Issue	1	Title	Excessive Volatility of SPP IM Real Time Energy Pricing
Submitter Name: Rob Janssen		Company: Dogwood Energy	
Email: rob.janssen@kelsonenergy.com		Phone: 443-542-5125	
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>As documented by SPP in various reports and substantiated by our own review of Day Ahead and Real Time energy pricing, the volatility of Real Time energy prices is significantly greater than that of Day Ahead prices. As a result, since increased volatility equals increased risk, active participation in the Real Time energy market is significantly riskier than the Day Ahead market prices would indicate. Dogwood Energy believes that Market Participants have few viable options for mitigating the risk of financial losses due to increased price volatility in the Real Time market, other than restricting their economic operations to more closely follow their Day Ahead award schedules. Following this course of action would result in less dispatch range and ramping capability being made available to the SPP system, thereby resulting in a less reliable system. Further, Dogwood Energy believes that reduction of the dispatch range of Resources in Real Time versus Day Ahead would also further depress Real Time energy prices leading to less efficient price formation in the market.</p>			
<p><i>Explain how the issue relates to price formation.</i></p> <p>Described above.</p>			
<p><i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i></p> <p>One potential solution could be reduction of appropriate VRL dollar values established for the market. VRL dollar values establish the limit of price excursions resulting from scarcity of market products. While Dogwood Energy firmly believes that product scarcity events should result in price impacts in the market, the current level of the pricing excursions is a significant contributor to the increased volatility of Real Time prices. The key question is whether and why we would need a \$1,000/mwh real time price spike if a \$200/mwh price spike at current market and fuel price levels would accomplish the objective of moving Resource output in the right direction and reduce the risk of excessive financial losses. Reduction of the appropriate VRL dollar values to a more appropriate level could both reduce pricing volatility and lead to increased system reliability.</p>			

Issue	2	Title	Make Whole Payment Allocation Based on Real Time Imbalance Deviation from Day Ahead Schedule Rather than Deviation from Deployment Signal
Submitter Name: Rob Janssen		Company: Dogwood Energy	
Email: rob.janssen@kelsonenergy.com		Phone: 443-542-5125	
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>Currently, Resources are allocated a share of Make Whole Payments based on their Real Time energy output deviation from their Day Ahead award schedule. However, this effectively penalizes dispatchable Resources for correctly and accurately following SPP's Real Time deployment signals. Theoretically, Make Whole Payments should be allocated to the Load and Resources that caused the Make Whole Payments to be incurred. However, online, committed, dispatchable Resources following SPP's Real Time deployment signals cannot reasonably be viewed as causing Make Whole Payments to be incurred. Instead, if a portion of Make Whole Payments are going to be allocated to dispatchable Resources, they should only be allocated to dispatchable Resources that fail to meet their commitment and dispatch obligations, including meeting Real Time deployment signals.</p>			

Explain how the issue relates to price formation.

If this mechanism is not changed, it should be expected that Market Participants will include estimated Make Whole Payment costs in their Real Time energy offers, if they are not doing so already. This would result in inefficient price formation in Real Time market prices.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Change Make Whole Payment allocations to dispatchable Resources to be based on failed commitments and deviations from Real Time deployment signals rather than just deviations from Day Ahead award schedules. Alternatively, eliminate allocation of Make Whole Payments to dispatchable Resources and allow deployment failure penalties to adequately incent Resources to follow deployment signals.

Issue	3	Title	Proper Pricing and Deployment of Regulation Services and Energy in Real Time
Submitter Name: Rob Janssen		Company: Dogwood Energy	
Email: rob.janssen@kelsonenergy.com		Phone: 443-542-5125	
<i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i>			
Dogwood Energy has observed significant pricing discrepancies between Regulation services and Energy in Real Time. For example, SPP frequently revokes Day Ahead Reg Down awards in Real Time, which often corresponds with price spikes in Reg Down service. However, at the same time, Real Time Energy prices are much lower than the price spike that occurs in the Reg Down service, resulting in a financial loss to the Resource that has its Day Ahead Reg Down award revoked.			
<i>Explain how the issue relates to price formation.</i>			
The Real Time Regulation deployment decisions being made by SPP's systems and operators result in price spikes and financial losses to Resources. This directly discourages Resources from supplying Ancillary Services, thereby increasing market prices and reducing system reliability. Dogwood Energy believes that Regulation should be priced such that an economic incentive is provided to Market Participants to provide regulation. Currently, our experience has been that the mechanisms currently in place in the SPP IM result in net negative incentives to provide Reg Down Service, when both the Day Ahead and Real Time results are considered.			
<i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i>			
SPP could change its decision-making parameters for revoking Day Ahead Regulation Services awards to include consideration of Real Time Energy and Regulation prices. Alternatively, Resources could be made whole when SPP revokes their Day Ahead Regulation awards, presumably in order to supply Energy instead, and suffer financial losses in Real Time when Regulation prices spike and Real Time Energy prices do not increase in a similar manner.			
Issue	4	Title	Mitigation of Resource Offers to "Cost plus 10%" Rather than "Cost" as a Reasonable Proxy for Cost Recovery in FERC-Regulated Energy Markets
Submitter Name: Rob Janssen		Company: Dogwood Energy	
Email: rob.janssen@kelsonenergy.com		Phone: 443-542-5125	

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

Due to the risk involved in the operation of generation facilities, (generator trips, wear and tear on equipment, equipment failure, firm LD pricing commitment of participating in the Day Ahead market, etc.) no Resource should reasonably be committed “at cost” based on a mitigated offer. Mitigation of Resource offers should drop offers to the historical FERC standard of “cost plus 10%” as reasonable level of cost recovery when mitigation occurs rather than only the cost calculated in mitigated offer curves.

Explain how the issue relates to price formation.

In many cases, this issue will have little or no impact on the broad price formation of the SPP market. SPP has reported that very few Resources are now being mitigated. Presumably, that is because Resources are offering at levels lower than their applicable mitigation levels or congestion is not present in the market such that mitigation would be activated. In any event, this proposal would provide a better “safety net” for Market Participants that believe they need to offer their Resources at levels that are higher than the applicable mitigation levels for those Resources. This may result in Market Participants seeing less financial risk in offering their Resources at levels above applicable mitigation levels, which in turn could result in impacts on price formation in the SPP IM.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Mitigation of offers should drop offers to the historical FERC standard of cost plus 10% as a reasonable proxy for cost recovery rather than to the approved mitigated offer without any adder.

Issue	5	Title	Lack of Multi-Day Resource “Reliability Coordination” Activity by SPP Leading to Over-Commitment of Resources by Market Participants
Submitter Name: Rob Janssen		Company: Dogwood Energy	
Email: rob.janssen@kelsonenergy.com		Phone: 443-542-5125	
<i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i>			
SPP Staff presented to the MWG in March 2016 that recent depressed Day Ahead Energy prices have been the result of increased wind resource generation and higher than optimal levels of self-commitment of dispatchable Resources given the level of load in SPP during low-load period shoulder months. Assuming that wind generation output and load levels are fixed and not reasonably changeable, artificially depressed pricing due to self-commitment of Resources results in inefficient price formation in the market. According to SPP Staff, it also leads to reduced system reliability.			
<i>Explain how the issue relates to price formation.</i>			
See above.			
<i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i>			
One potential solution could be more transparency regarding forecasted levels of various types of generation SPP or the Market Monitor believes would result in efficient price formation. This could assist Market Participants in making decisions regarding whether to self-commit Resources with multi-day start-up and online operating time requirements. This advance Resource “Reliability Coordination” process, updated daily and optimally forecasting up to one week in advance, could lead to more informed and economically efficient Resource self-commitment choices by Market Participants.			

Issue	6	Title	Scarcity Pricing
Submitter Name: Matt Moore		Company: GSEC	

Email: mmoore@gsec.coop	Phone: 806-349-6557
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>Scarcity pricing should be examined to determine if participants are being compensated for the services they are providing in the interval they are providing it.</p>	
<p><i>Explain how the issue relates to price formation.</i></p> <p>Scarcity pricing is related to price formation in that if scarcity pricing isn't properly designed then a) the value the Resource provides is not properly reflected; b) Resources won't be encouraged to follow dispatch instructions; and c) there could be unwarranted uplift payments. Furthermore, if not properly designed it could discourage certain technologies.</p>	
<p><i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i></p> <p>A solution to scarcity pricing concerns related to price formation could be change the market rules to disallow SPP's temporary use of operating reserves to meet energy requirements. Scarcity pricing should be allowed and observed. This includes during transient events that might not be viewed as a reliability event by SPP. Operating reserve requirements should not be compromised to benefit energy demands, even during transient events. In addition, scarcity pricing events should not be masked or muted by manual or RUC commitments. Any unit commitment need should be accounted for and indicated in the LMP. Otherwise, capacity shortages are masked and therefore scarcity pricing can be muted. A possible solution could be the establishment of an ORDC type structure. The type of ORDC structure or other solutions could be up for discussion.</p>	

Issue	7	Title	VRL
Submitter Name: Matt Moore		Company: GSEC	
Email: mmoore@gsec.coop		Phone: 806-349-6557	
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>Violation Relaxation Limit Process – The existing VRL process should be examined to determine if the protocols and related process are distorting LMP's during any circumstance.</p>			
<p><i>Explain how the issue relates to price formation.</i></p> <p>Related to scarcity pricing are Violation Relaxation Limits which have a direct impact on LMP's and price formation. Currently a process exist in which constraints are "relaxed" to allow economic dispatch to solve when there is a Resource capacity constraint, global power balance constraint, resource ramp constraint or operating constraint. By relaxing the very need for the available services and technologies it diminishes the pricing and the very need for these services now and in the future. In addition, there is an existing process that diminishes and eliminates that price transparency and price value associated with operating reserve shortages as a result of insufficient ramp capability among other things. Currently insufficient ramping capability is not be subject to scarcity pricing. Fast Ramping resources, including resources that can go from zero output to full output quickly, can be greatly impacted by the aforementioned methodology which directly masks the value of these newer and faster technologies.</p>			
<p><i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i></p> <p>Specifically address the protocols as it relates to VRL with potential elimination of VRL. Similar to item 1, there should not be a scenario in which constraints are relaxed that mutes or masks the value of resource capacity constraint, global power balance constraint, resource ramp constraint or operating constraints. The price should be allowed to indicate the true need for these services.</p>			

Issue	8	Title	Headroom
Submitter Name: Matt Moore		Company: GSEC	
Email: mmoore@gsec.coop		Phone: 806-349-6557	
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>Headroom processes should be examined to determine if the existing process for Headroom commitment is being properly reflected in the LMP's while reducing the uplift charges to the market. In addition, the commitment of Headroom should not mask the need for the development of what could be other market based products such as ramping, a 30-60 minute contingency reserve product, redefining and expanding the supplemental time frame or market based primary frequency response.</p>			
<p><i>Explain how the issue relates to price formation.</i></p> <p>Headroom is defined as the additional committed capacity required above the average load for the hour due to the uncertainty of the real-time instantaneous load, hourly load forecast and Variable Energy Resource output. Real-time instantaneous load variation, hourly load forecast and Variable Energy Resource output are all areas in which a market needs fast rampable capacity. This is evident even in the SPP Protocols section 4.1.3.2 "Head-room and Floor-room Requirements" in which it describes the need for resources during the "morning load pickup" etc. This sections also states that the "SPP may include up to 0% of the calculated Head-room and Floor-room requirements as an input into the Day-Ahead Market and may include 100% of the calculated Head-room and Floor-room requirements in all RUC processes." Not factoring rampable capacity in the Locational Marginal Price impacts proper price formation and transparency. In addition, it is creating market uplifts. This rampable capacity should be part of the Locational Marginal Price and could include the creation of a ramping product in combination with an operating reserve product such as a 30-60 minute product among other products.</p>			
<p><i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i></p> <p>Headroom should be a market based solution vs. a RUC solution. Alternative product development should be considered to replace Headroom while at the same time examining the placement of Headroom in the Day Ahead Market vs. RUC.</p>			

Issue	9	Title	Unit Commitment Reflected in LMP
Submitter Name: Matt Moore		Company: GSEC	
Email: mmoore@gsec.coop		Phone: 806-349-6557	
<p><i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i></p> <p>The unit commitment process should be reflected in the LMP to properly reflect the value for a particular unit and particular need while also reducing uplift to the market.</p>			

Explain how the issue relates to price formation.

The lack of **unit commitment** in the LMP has a direct impact on price formation. Manual commitments and RUC should not be used to ensure the market has capacity synchronized and in place for the upcoming intervals to provide regulation and other services. Often times it can be the faster technology that is receiving a RUC. There are two inherent issues as it relates to price formation in this area. Many newer technologies can respond very rapidly to a 5 minute dispatch. In fact, they can go from zero to full output in 5 minutes in some cases. In many other cases the Resource can be on in 20-30 minutes and most assuredly, less than an hour. These units should not be receiving a RUC or manual commitment in advance of the interval to avoid scarcity events which in turn eliminates scarcity prices. This action extinguishes any price signal that would value the services. In other words, the Locational Marginal Price is dampened prior to the 5 minute interval. If the synchronization of a Fast Resource is needed to provide Operating Reserves then the need for the actual synchronization of that resource should be included in the LMP. If capacity is needed in 30 minutes for example, then a product should be developed for such technology and service. The RUCs also lead to direct market uplift. There should be proper pricing incentives and products to include the unit commitments in the Locational Marginal Price rather than “keep whole” payments which create uplift.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Unit Commitment could be incorporated into the LMP by leveraging and automating the Look Ahead tools or developing an extended LMP model.

Issue	10	Title	Over-Production
Submitter Name: Matt Moore		Company: GSEC	
Email: mmoore@gsec.coop		Phone: 806-349-6557	

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

Over production in the real-time market should be examined. Resources should not be required to meet a Day Ahead commitment when the LMP is below production cost in real-time. This should hold true for all Resources but especially Quick Start Resources.

Explain how the issue relates to price formation.

Over production of energy as a result of over commitment or as a requirement in protocols can create depressed energy markets and lead to inefficient and depressed price signals. As mentioned previously, manual commitments or RUCs can lead to over commitment of Resources. In addition, the protocols and regulations can require that Resources meet a Day Ahead position even when the real-time prices are below production cost. Resources should be allowed to buy back their Day Ahead position from the market without being assessed URD or other Make Whole Distribution charges. There are some technologies that are intended to be used in a rapid fashion and take advantage of any market admirations that might present themselves such as low prices.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Over production could partly be addressed by changing the market design to send dispatch signals of zero to Resource that cleared Day Ahead when the LMP is below the production cost of that Resource in RT.

Issue	11	Title	Transparency
Submitter Name: Matt Moore		Company: GSEC	
Email: mmoore@gsec.coop		Phone: 806-349-6557	

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

Transparency related to manual commitments, RUC's and Headroom should be posted for the Market Participant on a more frequent basis to ensure the Resource owner knows why the Resource was committed beyond normal market processes. In addition, the number of manual and RUC instances should be posted.

Explain how the issue relates to price formation.

A lack of transparency can prohibit and preclude the proper perspective of actual happenings that could be impacting price formation. For example, the market and specifically a Resource owner should be aware of what their units are being used for exactly. For example, manual commitments and RUC's should be very few and far between in a properly designed market with efficient price formation. To the extent there is a manual commitment or RUC, the Resource owner should know on a timely basis what the unit was being used for exactly. It should be noted that the unit was used for Regulation, additional reserve, Headroom, the need for rampable capacity, etc.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Transparency can be partly addressed through market design changes. Each Resource and unit commitment should be eligible to set LMP. Each manual commitment and RUC along with the reason for each instance should be posted no later than two days after each occurrence to the market. In addition, each Resource owner should be made aware of why their particular unit was manually committed or RUCed.

Issue	12	Title	Block Loaded fast start Resources
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Submitter Name: Matt Moore

Company: GSEC

Email: mmoore@gsec.coop

Phone: 806-349-6557

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

The ability of **Block Loaded fast start Resources** to set LMP should be examined.

Explain how the issue relates to price formation.

Anytime a Resource is not allowed to set LMP then there is a clear direct connection with price formation. Block loaded Fast Start Resources should be allowed to set LMP. Other markets are taking steps to ensure this is the case.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Block loaded Fast Start Resources could be allowed to set LMP through mechanisms such as ELMP which had been addressed in MISO.

Issue	13	Title	Intermittent Resources Management adds costs to the Market
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Submitter Name: Ronald Thompson

Company: Nebraska Public Power District

Email: rjpick@nppd.com

Phone: 402-465- 3510

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

Intermittent and variable resources increase the cost to the Market. These types of generation do not take into account the additional head room that is needed for Ancillary Services, especially in RegDn for which the load pays. When scarcity events occur, the cause is usually reflected in this type of generation not being available as projected. There is additional risk of moving base load resources and tripping the unit off-line to follow variable and intermittent resources. Moving base load units also cause continued maintenance cost and operational risk.

Explain how the issue relates to price formation.

Scarcity pricing causes the market to become inefficient and will make the RT market more volatile compared to the price consistency seen in the DA clearing prices. Stable resources and loads have risk and cost in forecasting. However, variable and intermittent resources seem to have a larger share of the additional costs to the market when forecasting is incorrect.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Discuss methods of having variable and intermittent resources be more accountable (likely should include all units) for price scarcity events.

Issue	14	Title	Impacts of volatile Real Time Market
Submitter Name: Ronald Thompson		Company: Nebraska Public Power District	
Email: rfthomp@nppd.com		Phone: 402-631-8823	
<i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i>			
Asset Owners are seeing impacts of how SPP Deploy Resources due to volatility in the Real Time LMP and the same resources are not clearing the Day Ahead LMP. This results in the AO having to buy back the energy in the RT market at much higher prices.			
<i>Explain how the issue relates to price formation.</i>			
The SPP Market should want the resources not to be harmed by following DA deployment signals and buying back in the RT higher volatile market price.			
<i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i>			
Develop a process where the AO is made whole if the generation unit is harmed by deployment levels in the Real Time Market.			

Issue	15	Title	Transmission/Resource Outages Coordination
Submitter Name: Robert Pick		Company: Nebraska Public Power District	
Email: rjpick@nppd.com		Phone: 402-465- 3510	

Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.

Unscheduled transmission and generation outages impact the market. If better planning took place on outages, minimal impact to the market would occur... Usually on a daily basis a new "Temporary Flowgate" is created and has an impact on the market. Better process on transmission scheduled outage vs unscheduled outage would relieve the volatility in the market.

Explain how the issue relates to price formation.

Current coordination of schedule outages does increase the risk of more congested flowgates and the volatile prices that tend to follow in the RT Market.

(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.

Discuss methods of improving the coordination of scheduled outages to reduce flowgate congestion thus reducing the risk of volatile periods in RT. Should there be penalties for not following planned scheduled transmission outages?

Issue	16	Title	Improved coordination between slower and faster ramping units where faster ramping units are compensated
Submitter Name: Ronald Thompson			Company: Nebraska Public Power District
Email: rfthomp@nppd.com			Phone: 402-631-8823
<i>Describe in detail the price formation issue that you would like the PFTF to address. It may be helpful to provide examples.</i>			
Scarcity prices occur when wind production does not come in as forecasted. This results in a large price separation between the Day Ahead and Real Time market.			
<i>Explain how the issue relates to price formation.</i>			
The SPP Market needs to reduce the volatile Real Time market with wind resources. This volatility will be reduced with the correct Head room, getting the right price signals in place, and using the resources that are available.			
<i>(Optional) Describe a proposed solution(s) that is acceptable or that is unacceptable and explain why. It may be helpful to provide examples.</i>			
When determining Head room, develop a confidence factor matrix. Create a process where longer ramping resources are used in the early stages of operation needs and make sure resources that have cleared (compensated accordingly) have a faster ramp response and can be used later.			

Head-room and Head-room
Transparency – PFTF May 25, 2016

Head-room

- Headroom as defined in SPP Tariff: **The additional committed capacity required above the average load for the hour due to the uncertainty of the real-time instantaneous load, hourly load forecast and Variable Energy Resource output.**

Head-room

- Protocols 4.1.3.2 Revision 37 Head-room and Floor-room Requirements
 - For Day-Ahead Market and RUC which use hourly load granularity, intra-hour Head-room and Floor-room requirements **represent the needed real-time online capacity to address load changes within the Operating Hour and variations between real-time variable Resource output and projected variable Resource output.** For example, **during morning load pickup**, the end-of-hour capacity requirements may be much greater than the average hourly energy represented by the cleared demand in the Day-Ahead Market or the load forecast used in the RUC processes. **Additionally, the load forecast or generation forecast for a variable Resource can be off due to uncertainties inherent in these load and generation forecasts.** If Resources were committed only for the average hourly load, the online capacity at the end of the morning load pickup hour may be insufficient to support reliable Real-Time operations. SPP calculates the required Head-room and Floor-room requirements for both the Day-Ahead Market and the RUC processes as follows. **SPP may include up to 0% of the calculated Head-room and Floor-room requirements as an input into the Day-Ahead Market and may include 100% of the calculated Head-room and Floor-room requirements in all RUC processes.**

Head-room

- Capacity should be compensated through competitive market clearings when committed for things such as load and resource variation and instantaneous load uncertainty.
 - The market should send the proper price signal to incent Resources to provide the reliability coordinator what is needed vs. the reliability coordinator committing the Resource despite the price signal.
 - Headroom is an additional ancillary service BUT IT ISNT CLEARED LIKE ONE.
 - This becomes even more important as the variable resource output continues to grow.
 - Calculations are made considering Day-Ahead but then no action is taken in the Day-Ahead market. Therefore, SPP is behind the curve immediately.

Conclusion

- Competitive Solution
 - Move Headroom to the DA Market clearing
 - **New ancillary service or increased volume of existing ancillary service**
- Transparency
 - Any Headroom procured that is not in the DA market but committed through RUC should be posted to the SPP portal within two days for the market to access.
 - In addition, each Resource owner should be informed through a posting when *their* specific Resource is being committed specifically for Headroom or specifically for additional Operating Reserves.

Revision Request Form

SPP STAFF TO COMPLETE THIS SECTION		
RR #:	Date:	
RR Title: Head-room and Head-room Transparency		
System Changes <input type="checkbox"/> No <input type="checkbox"/> Yes		
Process Changes? <input type="checkbox"/> No <input type="checkbox"/> Yes		
Impact Analysis Required? <input type="checkbox"/> No <input type="checkbox"/> Yes		
SUBMITTER INFORMATION		
Name: Matt C. Moore	Company: Golden Spread Electric	
Email: mmoore@gsec.coop	Phone: 806-418-3449	
<i>Only Qualified Entities may submit Revision Requests. Please select at least one applicable option below, as it applies to the named submitter(s).</i>		
<input type="checkbox"/> SPP Staff <input checked="" type="checkbox"/> SPP Market Participant <input type="checkbox"/> SPP Member <input type="checkbox"/> An entity designated by a Qualified Entity to submit a Revision Request "on their behalf"	<input type="checkbox"/> SPP Market Monitor <input type="checkbox"/> Staff of government authority with jurisdiction over SPP/SPP member <input type="checkbox"/> Rostered individual of SPP Committee, Task Force or Working Group <input type="checkbox"/> Transmission Customers or other entities that are parties to transactions under the Tariff	
REVISION REQUEST DETAILS		
Requested Resolution Timing: X Normal <input type="checkbox"/> Expedited <input type="checkbox"/> Urgent Action		
Reason for Expedited/Urgent Resolution:		
Type of Revision (select all that apply):		
<input type="checkbox"/> Correction <input type="checkbox"/> Clarification <input checked="" type="checkbox"/> Design Enhancement <input type="checkbox"/> New Protocol, Business Practice, Criteria, Tariff	<input type="checkbox"/> NERC Standard Impact (<i>Specifically state if revision relates to/or impacts NERC Standards, list standard(s)</i>) <input type="checkbox"/> FERC Mandate (<i>List order number(s)</i>)	
REVISION REQUEST RISK DRIVERS		
Are there existing risks to one or more SPP Members or the BES driving the need for this RR? <input type="checkbox"/> Yes <input type="checkbox"/> No		
If yes, provided details to explain the risk and timelines associated:		
<input type="checkbox"/> Compliance (Tariff, NERC, Other) <input type="checkbox"/> Reliability/Operations <input checked="" type="checkbox"/> Financial: Price Formation and Transparency		
SPP Documents Requiring Revision: <i>Please select your primary intended document(s) as well as all others known that could be impacted by the requested revision (e.g. a change to a protocol that would necessitate a criteria or business practice revision).</i>		
<input checked="" type="checkbox"/> Market Protocols	Section(s):	Protocol Version:
<input type="checkbox"/> Operating Criteria	Section(s):	Criteria Date:
<input type="checkbox"/> Planning Criteria	Section(s):	Criteria Date:
<input checked="" type="checkbox"/> Tariff (OATT)	Section(s):	
<input type="checkbox"/> Business Practice	Business Practice Number:	

Objectives of Revision Request:

Describe the problem/issue this revision request will resolve.

Concern was expressed at the SPP Price Formation Task Force that Headroom was procured in the form of a RUC vs. clearing in a competitive market solution such as the Day Ahead Market. By NOT clearing the Headroom through competitive markets it masks the need for the Resources and distorts an efficient market price signal.

In addition, concern was expressed around transparency related to Head-room. The market and the Resource owner should know when and why their Resources are being committed and on a timely basis.

Describe the benefits that will be realized from this revision.

By settling Head-room through a competitive clearing solution such as the DA Market clearing, the value of the Headroom would be appropriately realized and uplift charges could be reduced. The value would be recognized by allowing the market price to reflect competitive clearing. In addition, informing the market and the Resource Owner when Resources are receiving a RUC vs. a competitive clearing will create transparency.

REVISIONS TO SPP DOCUMENTS

In the appropriate sections below, please provide the language from the current document(s) for which you are requesting revision(s), with all edits redlined.

Market Protocols

1. Glossary

Head-room

...

4.1.3 Operating Reserve, Head-room and Floor-room Requirements

SPP calculates the amount of Operating Reserve required for the Operating Day, on both a system-wide basis and a Reserve Zone basis, to comply with the reliability requirements specified in the SPP Criteria.

Additionally, SPP calculates the amount of Head-room and Floor-room required for the Operating Day to ensure that unit commitment is sufficient to reliably serve load in real-time *while maintaining the Operating Reserve requirements*. SPP calculates the hourly Regulation-Up, Regulation-Down, Contingency Reserve, Head-room and Floor-room requirements on an SPP BAA basis and calculates minimum Operating Reserve requirements and maximum Operating Reserve limitations for each Reserve Zone.

- (1) SPP BAA Contingency Reserve requirements are set consistent with SPP Criteria and may vary on an hourly basis.
- (2) SPP BAA Regulation-Up and Regulation-Down requirements are set to ensure compliance with NERC control performance requirements and are based upon a percentage of forecasted load, adjusted up or down to account for Resource output variability, and may vary on an hourly basis.
- (3) SPP BAA Head-room and Floor-room requirements are set to ensure that expected variations between real-time instantaneous load and the average load and variations between real-time variable Resource output and projected variable Resource output cleared in the Day-Ahead Market and the projected average load used in the RUC unit commitment processes can be reliably served in real-time *while simultaneously maintaining the SPP BAA Operating Reserve requirements*

- (4) The SPP BAA requirements, minimum Reserve Zone Operating Reserve requirements and maximum Reserve Zone Operating Reserve limitations are calculated and posted no later than 7:00 AM Day-Ahead. At this time, SPP will also communicate each Asset Owner's estimated Operating Reserve obligations in each Reserve Zone using the BAA Mid-Term Load Forecast and the Asset Owner load forecasts developed by SPP under Section **Error! Reference source not found.**
- (5) These Operating Reserve requirements and limitations are used by SPP as inputs into the DA Market and RTBM clearing and RUC processes.
- (a) SPP may increase Operating Reserve requirements for use in RTBM clearing and RUC processes above the requirements used in the DA Market clearing, including changes to Reserve Zone minimums and maximums, as required to meet increases in reliability requirements caused by changes in system conditions.
- (b) When a Resource is committed through the RUC process to accommodate an increase in Operating Reserve requirements in the RTBM, the RUC volume information will be posted to the SPP portal indicating the service that was being provided and why. In addition, the resource owner will be informed if their Resource is receiving a RUC specifically for Operating Reserves and which one or specifically for Head-room. This information will be posted within two days.
- (6) Reserve Zone minimum Operating Reserve requirements and maximum Operating Reserve limitations are determined through reserve zone studies prior to the DA Market. Reserve zone studies are performed as described under Section **Error! Reference source not found.**

4.1.3.2 Head-room and Floor-room Requirements

For Day-Ahead Market and RUC which use hourly load granularity, intra-hour Head-room and Floor-room requirements represent the needed real-time online capacity to address load changes within the Operating Hour and variations between real-time variable Resource output and projected variable Resource output. For example, during morning load pickup, the end-of-hour capacity requirements may be much greater than the average hourly energy represented by the cleared demand in the Day-Ahead Market or the load forecast used in the RUC processes. Additionally, the load forecast or generation forecast for a variable Resource can be off due to uncertainties inherent in these load and generation forecasts. If Resources were committed only for the average hourly load, the online capacity at the end of the morning load pickup hour may be insufficient to support reliable Real-Time operations. SPP calculates the required Head-room and Floor-room requirements for both the Day-Ahead Market and the RUC processes as follows. SPP ~~will may~~ include ~~up to 100%~~ of the calculated Head-room and Floor-room requirements as an input into the Day-Ahead Market and ~~will may~~ include ~~100%~~ of the calculated Head-room and Floor-room requirements in all RUC processes.

4.1.3.2.1 Day-Ahead Market

SPP estimates the hourly Head-room and Floor-room requirements to be included in the Day-Ahead Market using SPP's Mid-Term Load Forecast and expected real-time instantaneous load values for the Operating Day including a factor of for load forecast and variable Resource output uncertainty. ~~The factor will be~~

Commented [MM1]: What is this factor?

reviewed and approved by the Market Working Group. SPP's Mid-Term Load Forecast represents the expected average load in an Operating Hour. For Head-room and Floor-room requirement calculations, the instantaneous load is assumed to be equal to the expected average load at the midpoint of the Operating Hour and ramp linearly from this point to the expected average load at the midpoint of the neighboring Operating Hours. Because this assumption will not always be accurate, especially in Operating Hours in which an instantaneous peak load or an instantaneous minimum load trough occurs, and due to load forecast and variable Resource output uncertainty, SPP requires an amount of Head-room and Floor-room requirements.

- (1) The Head-room requirement for the current Operating Hour is set equal to the maximum of: (i) the difference between the expected instantaneous load at the beginning of the Operating Hour and expected average load in the Operating Hour; (ii) the difference between the expected instantaneous load at the end of the Operating Hour and the expected average load in the Operating Hour; or (iii) the minimum Head-room requirement. SPP may ~~reduce-modify~~ the Head-room requirement calculated above as approved by the Market Working Group, operational experience dictates and/or to account for differences between offered Day Ahead Market Resources and those available in the RUC processes.
- (2) The Floor-room requirement for the current Operating Hour is set equal to the maximum of: (i) the difference between the expected average load in the Operating Hour and the expected instantaneous load at the beginning of the Operating Hour; (ii) the difference between the expected average load in the Operating Hour and the expected instantaneous load at the end of the Operating Hour; or (iii) the minimum Floor-room requirement. SPP may ~~reduce-modify~~ the Floor-room requirement calculated above as approved by the Market Working Group, operational experience dictates and/or to account for differences between offered Day Ahead Market Resources and those available in the RUC processes.

The expected instantaneous load at the beginning of the Operating Hour is estimated as the load forecast value at the point at which a straight line drawn from the midpoint of the previous Operating Hour's expected average load to the midpoint of the current Operating Hour's expected average load crosses the beginning of the current Operating Hour.

The expected instantaneous load at the end of the Operating Hour is estimated as the load forecast value at the point at which a straight line drawn from the midpoint of the current Operating Hour's expected average load to the midpoint the next Operating Hour's expected average load crosses the end of the current Operating Hour.

The minimum Head-room and Floor-room requirements will be ~~recommended~~determined by SPP based upon operating experience. The Head-room and Floor-room requirements will be reviewed and approved by the Market Working Group quarterly, ~~and may be refined over time based upon the relationship between SPP Mid Term Load Forecast average loads and observed instantaneous load values.~~

4.1.3.2.2 RUC

SPP will include 100% of the calculated Head-room and Floor-room requirements as an input into the Day-Ahead Market. To the extent additional Head-room is needed to achieve the 100% after the DA market closes then f~~or~~

all RUC processes, SPP ~~will~~ estimates the hourly Head-room and Floor-room requirements to be included in the RUC analyses using the most current Mid-Term Load Forecast and expected real-time instantaneous load values for the Operating Day using the same methodology as described under Section **Error! Reference source not found.** for the Day-Ahead Market. The Resource owner will be notified via posting within two days that their Resource was committed for Head-room in the RUC process and not Day-Ahead.

SPP Tariff (OATT)

Attachment AE

3.1.4 Operating Reserve, Head-room and Floor-room Requirements

The Transmission Provider shall calculate the amount of Operating Reserves required for the Operating Day, on both a system-wide and Reserve Zone basis, in order to comply with the reliability requirements specified in the SPP Criteria. In addition, the Transmission Provider shall calculate the amount of Head-room and Floor-room required for the Operating Day on a system-wide basis in order to ensure that load can be reliably serviced in real-time. The Transmission Provider shall, on a daily basis:

- (1) Calculate the hourly Regulation-Up, Regulation-Down and Contingency Reserve requirements on an SPP Balancing Authority Area basis and post such results by 0700 hours Day-Ahead for use in the Day-Ahead Market, Day-Ahead RUC, Intra-Day RUC and RTBM;
- (2) Calculate the total minimum and total maximum Operating Reserve requirement for Operating Reserve deployment in the up direction and for deployment of Operating Reserve in the down direction for each Reserve Zone. These minimum and maximum Operating Reserve requirements will be determined by conducting a simulated energy transfer study for each hour of the Operating Day on the transmission system, reflecting expected outages and economic energy flows, in order to determine the energy transfer limitations into or out of a Reserve Zone in any hour. If a Reserve Zone is unable to import enough Energy after a contingency and still maintain all necessary operating limits, a minimum amount of Operating Reserve may be required to be carried in that Zone. The minimum Operating Reserve requirement is the largest difference between the Resource MW lost in the simulated contingency and the resulting import capability of that Reserve Zone. Similarly, if a Reserve Zone is unable to export additional Energy after a contingency outside of that Reserve Zone, then a maximum amount of Operating Reserve that is deliverable from that Zone will be specified in order to ensure that deliverable reserves are carried in other Zones. The maximum Operating Reserve limitation is equal to the export capability of that Reserve Zone when replacing Energy lost due to a Resource contingency outside of that Reserve Zone. The Transmission Provider may, at its option, set specific Regulation-Up and/or Spinning Reserve minimum requirements for each Reserve Zone, as needed, to address reliability issues that can only be alleviated through carrying synchronized reserves. In such cases, the Transmission Provider will include these minimum Regulation-Up and/or Spinning Reserve requirements when posting the Operating Reserve requirements by 0700 Day-Ahead;

- (3) Estimate each Market Participant’s Operating Reserve obligation by Asset Owner in each Reserve Zone and provide such information to Market Participants by 0700 hours Day-Ahead. The Transmission Provider shall calculate such estimates by multiplying the system-wide Operating Reserve requirements calculated in (1) above by the Transmission Provider’s estimate of each Asset Owner’s load in each Reserve Zone divided by the Transmission Provider’s estimate of system-wide load;
- (4) The Transmission Provider may increase Operating Reserve requirements for the Day-Ahead RUC, Intra-Day RUC and RTBM above the requirements used in the Day-Ahead Market, including changes to Reserve Zone minimums and maximums, as required to meet increases in reliability requirements caused by changes in system conditions; and
- (5) Calculate the hourly Head-room and Floor-room requirements on an SPP Balancing Authority Area basis for use in the Day-Ahead Market, Day-Ahead RUC and Intra-Day RUC in accordance with the calculation procedures specified in the Market Protocols. SPP will include 100% of the calculated Head-room and Floor-room requirements as an input into the Day-Ahead market. To the extent that additional Head-room is needed to achieve the 100% after the DA market closes then for all RUC processes SPP will estimate the hourly Head-room and Floor-room requirements to be included in the RUC analysis using the most current Mid-Term Load Forecast and expected real-time instantaneous load values for the Operating Day using the same methodology as used for the Day-Ahead market. The Resource owner will be notified via posting within two days that their Resource was committed for Head-room in the RUC process and not Day-Ahead.

SPP Operating Criteria

N/A

SPP Planning Criteria

N/A

SPP Business Practices

N/A