

Meeting Summary
NorthWestern Energy Electric Technical Advisory Committee
Helena, Montana
May 11, 2017

Attendance

Those participating in or attending the Electric Technical Advisory Committee (ETAC) meeting in person or via the web and by teleconference included:

| Name | Organization |
|-----------------|--|
| Beki Brandborg | ETAC Facilitator |
| Chuck Magraw | Natural Resource Defense Council (NRDC) |
| Brian Fadie | Montana Environmental Information Center (MEIC) |
| Frank Bennett | NorthWestern Energy (NWE) |
| John Bushnell | NWE |
| Jeff Blend | Montana Department of Environmental Quality (DEQ) |
| Luke Hansen | NWE |
| Joe Stimatz | NWE |
| Diego Rivas | Northwest Energy Coalition (NWECC) |
| Mike Dalton | Montana Public Service Commission (MPSC) |
| Jamie Stamatson | Montana Consumer Counsel (MCC) |
| Mike Babineaux | NWE |
| Jonathan Pytka | NWE |
| Bill Thompson | NWE |
| Jim Williams | NWE |
| Larry Nordell | MCC |
| Tom Power | District XI Human Resource Council (HRC) |
| Pat Barkey | UM - Bureau of Business and Economic Research (BBER) |
| Dave Bausch | NWE |
| Eric Sayre | NWE |
| Danie Williams | NWE |
| Lisa Barkell | NWE |
| Doug Peoples | NWE |
| Dawn Petritz | NWE |
| Kevin Markovich | NWE |

Agenda

1. Duck Curve Discussion
2. Demand Side Management (DSM) Acquisition Goals
3. Update on Flexible Capacity RFP
4. Community Renewable Energy Project (CREP) RFP
5. Variable Energy Resource (VER) Integration and Load Variability Study RFP
6. Reliability Based Control (RBC) Update
7. Energy Imbalance Market Update
8. ETAC Membership Discussion
9. Strawman Proposal for the 2018 Electricity Supply Resource Procurement Plan
10. Future Meeting Dates

Meeting

NorthWestern overviewed the meeting agenda.

1. Duck Curve Discussion

NWE provided an overview of the daily activities and work flow of the energy supply marketing operations group. Comments were made on current market trends.

Question - What geographic area are you talking about?

Answer – The WECC. ID, CA, MT, WA, OR, etc.

Question - Does that include BC?

Answer - Yes, BC. There are 11 states, CA has the main load.

Renewables Have Altered the Supply/Demand Paradigm

CA said a long time ago that when they wanted power they would bring it in from other states, but they did not need the plants in their own state. Now with solar and other renewables they are generating more than they need and even exporting. Oversupply risk is real. With rooftop solar there is no ability to ramp down. Super peak prices have tanked due to this phenomenon.

Frequency must be held as close as possible to nominal level (60 Hz). The means supply equals demand. Our area control error (ACE) is the way we measure this balance.

The “Bouncy Ball” Chart

For NWE, the goal is to get the real time indicator (“bouncy ball”) in the middle of the 60 Hz bandwidth. We must operate within these limits (red arcs). The chart also shows the recent history of the ball’s location. We have 30 minutes to get back inside the curves.

The schedulers do their best to plan for the upcoming hour. But once the hour starts we make adjustments within the hour. We have incremental and decremental stacks (“INC” and “DEC”) to add power to or remove power from the system.

Question - Can Colstrip Unit 4 (CU4) handle such a quick change?

Answer - At Colstrip, there is potentially up to 8 MW/min of ramping capability available unless the other owners are moving it too, in which case NWE gets its proportional share.

Question - How do you determine which resources to use?

Answer - When we INC we add the next lowest cost unit. When we DEC we take off the one that costs the most. The generation folks determine the cost parameters that create the stack. The focus is on economic dispatch. That is our current challenge with our resources and the current market.

California Independent System Operator (CAISO) Duck Curve Chart

Looking at March 31, there was a 13,000 MW ramp in 3 hours. How to handle this? You need dispatchable units. But not every one of those is going to start. So you need enough capacity. Resources need to be able to turn on/off for 3-4 hours a couple of times during the day. CAISO sees this need as does NWE.

Question - What happens in the summer?

Answer - It is more like winter but not as exaggerated.

CAISO Market Prices Reflect Supply and Demand

NorthWestern has seen a distinct change in the hourly markets. Even if the day-ahead market (DA) is \$4-5/MWh, during the real-time market it may be \$20/MWh in the morning then drop to \$2-3/MWh or even negative later. We have seen \$50-60/MWh and then prices drop to \$2/MWh for hours 11-16.

Question - Are you talking about MID-C prices?

Answer - Yes. We are seeing effects all the way here in Montana.

Question - But CAISO is not taking directly from MT, maybe from the Northwest in general?

Answer - Yes, but if NWE also wants to take from the Northwest, it affects our prices too.

Question - So this means that in the middle of the day NWE should think about buying instead of running Dave Gates Generating Station (DGGS)/CU4?

Answer - Yes, this is exactly what we do. We are getting the benefit of the excess energy in the duck belly.

Question - We have transmission capability to handle this?

Answer - We are seeing problems with transmission going from east to west in MT. Others are bringing power across, in the opposite direction. For example, when prices in the Rockies are \$30/MWh, they are bringing power across Montana to the Rockies.

The current market is the total opposite of what it was 10 years ago. For example, it is signaling consumers to run their dishwasher at noon in July!

Question - Regarding fast ramp-up, when we were talking about ramping CU4 up, you had several hours to move from the belly to the head of duck. Is the argument that the capital cost of a baseload plant would discourage you from using/building these plants? How steep is the ramp on a baseload plant? Could you use it for duck curve ramp-related needs?

Answer - The existing units can do it, but they were not designed for this. Ramping increases operational and maintenance costs. It all depends on how they were designed. INC/DEC is a faster ramp need. We do not need light load (LL) energy, so building a large facility with the market prices where they are now is a tough argument to make.

CAISO Need for Flexible Resources

CAISO defines the operating capabilities needed from a flexible resource.

Comment - CA recently increased their battery storage requirements by 500 MW from their previous plan.

Response - We believe that batteries will be a primary player at some point but not right now.

Question - Even if backed by a mandate, would the increased use of batteries in CAISO affect the prices that we see at MID-C?

Answer - It should. But regarding the requirement of roughly 1,800 MW by 2020, this will meet only 10% of the ramp needs. It will have an effect but will not solve the duck curve issues.

Comment - Policy is a driver on this. If CAISO develops enough batteries to be self-sufficient, then the rest of us will need to be self-sufficient.

In terms of supply for NWE, that is what our future needs: "flexible resources with the right operational characteristics in the right location." We are proud of our work. We take it seriously. We invite you to come visit the marketing group to see what we do.

Comment - Your analysis pivots off of CAISO's needs to NWE's needs. But there is a massive gap between what is going on in CAISO and what we face, primarily in the market. One needs some modeling or analysis that looks at NWE as the small piece that it is. Not only very small but also isolated in terms of transmission connections. NWE has to put its case for new resources in the context of NWE taking advantage of the opportunities this presents as well as the problems. The commission may not be impressed by CAISO saying what the region needs. You need to address what potential benefits/risks exist due to these CAISO issues. There may be skepticism about whether you should throw your lot in with CAISO. What's good for CAISO may or not be good for NWE.

Response - NWE would not say to the MPSC that if CAISO is doing this, then we need to do it. Solar is getting better, and batteries are getting better. So what do we need to integrate these into our portfolio in a way that complements our existing resources?

NWE added that the way we had been modeling daily prices in PowerSimm in the past does not work anymore. Therefore, we will be working the new price shape into the PowerSimm model going forward and modeling what we are currently observing. With the old shape, solar got more value during the day than it would now. This has implications for avoided costs.

6. Reliability Based Control (RBC) Update

One key difference between CPS2 and RBC is that CPS2 required ACE to be between 22 MW and -22 MW for 90% of the 10-minute periods. There was a little bit of flexibility in terms of capacity needed to meet the requirement. On the other hand, RBC requires that you get back within the limits in 30 minutes or less.

NWE presented a series of graphs. Regarding the limits for CPS2 and RBC, the red lines/curves are NWE's limits. CPS2 had two horizontal red lines at 22 MW and -22 MW. RBC has two hyperbolic curves representing the limits. A comparison of these two graphs shows that with the same ACE we would have exceeded the limits under CPS2 but are within the RBC limits.

Question - What is the rule? You have to get back in within how long?

Answer - Within 30 minutes.

Question - When are there penalties?

Answer – There are penalties after 30 minutes. There is not a published schedule of penalties. They (NERC) take circumstances and history into account.

Question - On DGGS, the third 50 MW unit is usually just sitting there?

Answer - We often use that for reserves.

To meet RBC, you do not need a lot of capacity, but you need to be able to use it when you need it. It needs to be available and dispatchable.

If wind is scheduled to be really high, then the only place we can go is down, so we would need INC available.

Approximately 4400 times, we were in an event during the year. 1100 times the event lasted for at least 5 minutes. 400 times the event lasted for at least 10 minutes.

Flexible Capacity Need

The contingency reserve requirement is 3% of load plus 3% of generation. From both owned and contracted resources. For the whole BA, it is about 90 MW for contingency reserves.

There is a total of 265 MW of intra-hour need.

For flexible capacity, Basin Creek can be called on for 52 MW. For the Hydros, 45 MW is the typical high. For CU4, 24 MW is our share of the ramp for 10 minutes (2.4 MW/min). DGGs is good for 150 MW. All of these add up to 271 MW of flexible capacity.

Near Future Flexible Capacity Need

NWE needs an additional 75 MW of INC and 6 MW of contingency reserves. This is what NWE believes it needs for the Qualifying Facility (QF) resources that we know will be coming online in the next few years.

Question - What year is the near future?

Answer - The bulk of the QF wind will be coming in 2018, with some in 2019. These projects are 80 MW, 78 MW, and 25 MW. Also, solar is coming on in 2-3 MW increments, up to 8 MW now.

Question – Regarding the DGGs block flexibility and changes to how it is used, could this shrink from 150 MW?

Answer - The one change that has occurred since RBC in March 2016 is that we have used other resources to help, when predictable, and used DGGs more when there is an event.

Question - So does joining an Energy Imbalance Market (EIM) change any of these needs?

Answer - No, what you need to be in an EIM is to be able to meet your generation requirement. But you do have diversity, so you might get a little reduction in your requirements. EIM defines the flexibility requirement.

2. Demand-Side Management (DSM) Acquisition Goals

Previously, ETAC has seen Nexant's study. The avoided cost of \$40.70 was much different than in 2009 (~\$70/MWh). The potential they found was 62 aMW over 20 years (with EISA 2020 backstop requiring light bulbs to be more efficient). So LEDs then become the base case, getting away from fluorescent technology. After 5 years the potential drops.

NEEA is also part of the programs now, but this is regional based on their 5-year business plan. Historically, it has been very cost-effective to participate in NEEA's programs.

The result is a goal of 4 aMW per year for DSM/NEEA/USB for the next 5 years, with 3.6 aMW being the level after that, primarily due to the decrease in residential lighting potential.

Question - About what percentage of 4 aMW is USB related savings?

Answer - We would have to look at the numbers. These are weighted. For the 5-year period, it is about 10% (0.45 aMW for USB).

Question - Can you explain the multiplier?

Answer - We know that what NWE will see is less than what is achievable.

Question - Why is there another move from achievable to program potential, especially during the early years?

Answer - We want to show what we think we can actually get.

Question - So what is it lacking that your program cannot achieve?

Answer - For example, with a reversible heat pump we cannot get in a more efficient unit because the customer's existing unit has not failed yet. For another example, if the homeowner does not see the need he or she will not participate.

Question - But haven't you already taken that out?

Answer - We are just trying to be realistic.

Comment - But your last program potential was realistic and you exceeded that. Why is there another drop? NWE is not new to these programs. You have lots of experience.

Comment - He is saying that NWE's latest adjustment was already embedded. Can you describe the various levels used to come up to the target, and what goes into the differences?

Answer - There is not a mathematical background behind this number. We just know that we are not going to get 100% of the achievable goal. If you do not use the 90% number, it only becomes 4.35 aMW.

Question - Is the achievable number partly tied to subsidies?

Answer - Nexant looked at high achievable at about 70% incentive and a low achievable at a 30% incentive. We went with a mid-level with 50% incentive.

Question - In part, it is NWE policy?

Answer - In 2008, we incented furnaces and boilers higher to drive up participation and get people involved in the program. What we have seen in Missoula, you could incent for 100% and people still will not do it. They do not want to participate because it is disruptive to their lives.

Comment - What the answer has been is that you can increase the subsidy to 75% or to 100%, and if you do not get participation, you are just passing this off to customers with very little payoff and throwing customer dollars away.

NWE's plan going forward would be to put in place this 4 aMW, but when the new supply plan is being worked on, to have Nexant to look at these numbers again. For example, if avoided costs take a big jump, we would more than likely increase our goals.

Question - There have been on-going changes in energy standards for appliances. Does this close off potential that was there earlier?

Answer - Yes, there is also very little difference between the Energy Star version and others in some measures, so we consider the Energy Star version to be the standard.

We get cost recovery on our DSM program, which includes NEEA, so based on the business plan and what we can get from NEEA, this adds up to what the budget would be in total.

3. Update on Flexible Capacity RFP

NWE presented some statistics on the nature of the responses that NWE received in the RFP.

On the all-source side, there were 13 bidders with 24 bids total received. The RFP allowed one primary and two alternate bids for each project.

On the EPC/DGGS side, there were 7 bids.

Based on information given to NWE by Accion, there were 18 distinct all-source projects: 6 thermals, 4 hydros, 4 solar with storage, 3 wind with storage, and 1 energy storage project.

On the all-source side, there were no Build-to-Own Transfers (BOTs). They were all PPAs. Projects were located in three states: Montana, Washington, and Idaho. NWE speculated that the Washington project was a hydro and that the Idaho project was an existing resource.

Most of these (21) would be new facilities. Fourteen had an option to purchase the project after the PPA expiration. Most (20) had escalating rates.

Question - On the EPC side, it sounded like battery storage was not allowed to bid into the RFP, can you expand on the reason why?

Answer - For DGGS, we did a site validation and technology study. As you may know, for a site with gas, you want to take advantage of those services. What we graded them on was what they bid in. Some bids were not graded well due to their responses on the pre-qualification. Utilizing gas and transmission at DGGS, reciprocating engines (recips) were the best at that site.

Question - Regarding the pre-qualification stage, can you discuss this in more detail?

Answer - This was more of a technical review. On the EPC side, there was a pre-qualification for bidders that narrowed the field. Bidders had to show up for the site-walk (about 30 bidders showed up). We let them know that we wanted to limit the pool to about 5-7 bidders. If you leave it wide open, that drives away competition. We have seen this with HDR. To get down to only 5-7 bidders, you need a pre-qualification process. We asked about environmental and safety performance. NWE ranked bidders, and HDR did the same. We then compared results and sent them to the independent evaluator (IE). They validated our concerns. Some of the battery bidders did not take the time to complete the form properly.

There was no pre-qualification process on the all-source side. Anyone could bid in.

NorthWestern read some sample questions from the EPC pre-qualification forms:

What are your tools and experience building these projects?

Show us your design capability.

Describe your ability to perform maintenance.

Describe your safety record.

Question - For the batteries, isn't the risk on the developer to decide to put in the time and resources to submit a full bid?

Answer - On the EPC side, you are asking me to deal in bad faith by bringing along a project on the short list when we know that it is not the best fit for this site. We have other EPC bidders that may see a perceived risk that NWE is wasting their time.

Question - But the pre-qualification cut-off may have excluded batteries?

Answer - We are talking about EPC at the DGGs site, which is a site set up for gas. If we install a battery at the DGGs site and then later need a site with gas, the effect is that the battery would have pushed this later project to a more costly site. Because of the battery mandates in CAISO, we are getting a good idea what batteries can do and at what cost. On a straight \$/kW basis, battery costs are coming down. But for longer duration needs, batteries are still uneconomical. We can glean price point information from other sources. It is not necessary to take batteries along on the EPC short-list process just to find this information out.

4. Community Renewable Energy Project (CREP) RFP

Because the Governor vetoed the bill (SB 32) to repeal the CREP requirement, NWE is again soliciting for CREP projects. NWE has done this process a number of times before. NWE sent out an email last Friday to ETAC and now is on a fast-track schedule. NWE sent out the notices. NWE asked ETAC for comments.

Comment - Perhaps NWE should not be approaching CREPs from the standpoint of meeting the full 65 MW in one year but instead looking at those projects that may contribute to eventually reaching compliance (in aggregate). Perhaps NWE should broaden the bidding window to allow more developers enough time to bid in. Just a thought to try to help make it successful.

5. Variable Energy Resource (VER) Integration and Load Variability Study RFP

NorthWestern discussed the VER Integration Study, mentioning that the RFP had already been issued by the NWE transmission group.

In 2017, Ascend did a study on NWE's need for flexible capacity resources. But NWE now needs more analysis. So the transmission group is going out for an RFP. The timeline is compressed.

The study will have three major goals:

1. Determine the regulation and load following needs of NWE's current loads and generation.
2. Determine the regulation and load following needs if new VERs are added to the NWE BA.
3. Determine the allocation of BA regulation and load following needs to customer classes.

Question - Will energy supply have a role in identifying the resources?

Answer - Yes, we will have a role.

Question - Do you anticipate the scope of the study to include possibly joining the EIM?

Answer - No, to do that we would need to bring in market effects and broaden the scope.

7. Energy Imbalance Market Update

If we join the EIM, we are still a BA, and we still have the responsibility to meet our own load. EIM would not change what our long-term need is for capacity. Each BA must maintain their ability to serve load. NWE has not decided yet. We had a meeting with commissioners, CAISO, and E3 to gain stakeholder input and provide information to them. It is complicated a bit by the progress that Mountain West has made in joining an RTO. This affects the decision process.

8. ETAC Membership Discussion

NWE raised the topic of ETAC membership and how to add more diversity to the group. NWE contacted a former state representative from Bozeman, Chris Pope, who has agreed to be an ETAC representative for the residential customer class. NWE would like to see different interest groups represented at ETAC. It is hard to get a residential customer. NWE has had membership from these groups before. ETAC did have MSU facilities for awhile. NWE is not interested in more environmental groups on ETAC, as that constituency is already adequately represented.

A robust discussion followed with the entire group making proposals and counterproposals. This was a great in-depth open discussion. NorthWestern will review future suggestions and discuss structure of ETAC internally.

9. Strawman Proposal for the 2018 Electricity Supply Resource Procurement Plan

NWE gave an update on the status of its strawman proposal for the 2018 Plan. The table of contents is still a work in progress that will need more internal review before being circulated to ETAC. However, it will be sent to ETAC at least one week prior to the next meeting.

10. Future Meeting Dates

Ascend is available on June 15 or 16 for a follow-up meeting in Helena. Regarding the ETAC meeting on June 1, we typically move meetings to Butte after the legislative session is over.

Potential topics for the next meeting: Update on Flexible Capacity RFP, Hydro Upgrade Study.

The question was raised that if the June 1 meeting were in Butte would this affect ETAC members' decisions whether to attend. The consensus was no, not really.

We will try to get a room in the Butte General Office building for the June 1 meeting.

For the June 15 or 16 meeting, this would be a follow-up with Ascend to talk about how other resource types were put into PowerSimm, batteries, modeling, base portfolio, and requested simulation scenarios. The next step would be to go to Bozeman and have those simulation runs already completed to show ETAC there.

Regarding the next meeting in July, this will be tentatively planned for July 19.