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GOVERNOR'S OFFICE OF ENERGY

MINUTES

New Energy Industry Task Force

May 12, 2016

The Technical Advisory Committee for Grid Modernization (TAC-Grid Mod) held a public meeting on May 12, 2016, beginning at 12:00 PM. at the following location:

Public Utility Commission of Nevada, Conference Room
1150 E. William Street
Carson City, Nevada 89701-3109

The meeting was also available via videoconference at:

Public Utility Commission Of Nevada, Conference Room
9075 W. Diablo Drive, Suite 250
Las Vegas, NV 89148

1. Call to order and Roll Call: The meeting was called to order at 9:10 AM by Chairwoman Starla Lacy. The agenda item was opened up for roll call and a quorum was confirmed.

The following Task Force Members were present:

Task Force Members

Starla Lacy, Chair(Las Vegas)
Angela Dykema, NGOE Director
Rebecca Wagner, Member
John Candelaria, Member (Las Vegas)
Chris Tomchuk, Member(Las Vegas)
Hank James, Member

Task Force Members Absent

Brian Whalen, Member

Members of Public in attendance

None registered.

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2. Review and Approval of Agenda

Chair calls item and Agenda is approved.

3. Review of Prior Meeting Minutes

Chair calls for prior minutes approvals of edits/

Chris Tomchuk would like to edit Page 3, First paragraph to read as follows:

Chris Tomchuk, Valley Electric (Member) feels it will be interesting to see how the changing world and how to distribute generation and how that will fit together with the task force initiatives. Valley Electric has submitted a project for an additional transmission line from their service area to Pahrump up to the Bishop area. The project is intended to serve renewables using NEAC information and other information. It will be interesting to see how that fits with the reliability and affordability when it comes to this project.

The meeting minutes from the April 8, 2016 meeting are now approved into the record.

4. Public comments and discussions

Chair Lacy asked if there were any public comments to be made. No comments made from Carson City location. No comments made from Las Vegas location.

Chair Lacy thanked them all and closed this agenda item.

5. Progress Updates On the Two Other Technical Advisory Committees

The Chair opened agenda item number 5.

Chair Lacy speaks about other meetings that she sits in on, that will impact The Grid Modernization TAC work. In upcoming meetings Clean Energy Sub-Committee Technical Advisory Committee there will be some potential proposals for:

- De-coupling
- Electric vehicle incentives
- Energy Efficiency
- Proposals on generation portfolio design for the state.

Others request that Chair Lacy keep everyone on the TAC apprised of the status.

6. Review of Certain Available Resources for Committee Review

Hank James states that integrating the various types of renewables and distributed generation and keeping the Governors Agenda to promote economic development is a challenge and we will have to come up with common language and common initiatives.

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Chair Lacy states that John Candelaria had mentioned legislative proposals at the Federal level on grid modernization will be of interest to this group.

Chair Lacy will pull together some legislative language from the from the senate and house bill for review by the Technical Advisory Committee.

7. Presentation – Physical and Cyber Security of Nevada Grid Assets, NV Energy

Chair Lacy loads power point and Eric Schwarzrock begins presentation. (*please reference power point presentation*)

During this presentation, he will address the issue at a national level, not just an NV Energy level. When thinking about grid Security as a group, you should look at it from both a physical and cyber standpoint.

Physical security standpoint: Referring to the electrical system. To keep assets that keep the electrical system running safe and secure.

Cyber Security standpoint: Cyber assets that support the physical equipment that keep the electrical system up and running

At the national level, in 2003 there was a large northeast blackout and the root cause of the incident indicated that there were no legally enforceable standards in place for the industry. In 2005 the Energy Policy Act was signed into law and in 2007 NERC and the FERC Order 693 liability standards became legally enforceable. The next year the Critical Infrastructure Protection (CIP) Standards became enforceable. The Critical Infrastructure Protection Standards will be highlighted today.

At the national level, there is FERC who has delegated to NERC (National American Electrical Reliability Corporation) and issued several critical infrastructure protection standards.

CIP 014 – Specific to physical security of those large assets that help keep the electrical system up and running.

Under cyber security CIP Version 5 Standards – this refers to cyber security as it pertains to EMS at your control center or relays in a substation to transmission lines.

CIP 6 – Physical security of cyber assets. The industry cyber security standards, and first version went live in 2009 and version six goes live in July this 2016.

Physical Security – Generally in Nevada some of the large transmission lines are shown on the presentation slide. NV Energy, and all entities that are registered with NERC, are required to make a risk assessment of the transmission substations every 2 ½ years. Analysis both steady state and transient analysis are done in order to look for a weaknesses. An example being, a large truck bomb drives into a substation and blows up that substation, how would the electrical system handle that? If answer is, the system can handle it –that facility becomes a certain tier. If the answer is no, the system cannot handle that, it becomes a different tier. Once entities perform the analysis and have categorized the tiers, an unaffiliated third party will review the analysis. NV Energy used Utilities Systems Efficiencies last year, a transmission planning group from California. They look at

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the assessment, the method used in the assessment and result. They looked at NV Energy's assessment and gave a couple recommendations and we added a few more substations as a result.

Next, is to analyze how the substations, facilities, generating facilities and control centers are then categorized based on risk to reliability of the transmission system.

NV Energy then performs an evaluation of potential threats and vulnerabilities which are physical to the attached transmission facilities. The first step to look at the surrounding areas (are we in a rural area, city area, is there a mountain nearby, open land), what type of physical attachment is most likely at this facility? Things we look for are a possible history of attack, threat warnings received from other sources, and start to develop the risk to this facility.

From this point, NV Energy will develop and implement a documented physical security plan for the site based on the threat and vulnerability analysis. This plan includes several things, but highlighting here, law enforcement contact, coordination information and a timeline for security enhancement and modifications to the physical security plans.

Just like the technical analysis receives a third party evaluation, so does the physical analysis and vulnerability assessment. NV Energy used Security Management International, along with the Department of Homeland Security. Based on their reviews and feedback, again we utilized that information to modify our site specific plans.

Cyber Security Standpoint – NV Energy develops, documents and implements a process to prioritize and categorize all physical categories. Just as on the physical side - there are four categories based on risk, and then we apply a certain amount of physical security controls. On the cyber security side, there are four tiers based on risk of impact to the bulk electric system. NV Energy implements a policy and procedures plan for protection against the risk, and it is done annually. NERC requires that you assign an executive leader to direct oversee the program. At NV Energy, our Vice President of Transmission is the person responsible for cyber security and compliance with the standards. It creates a culture at the top which flows throughout the company.

NVE Energy implements an internal but independent annual review of the program, including but not limited to, a technical review of the application. Many entities do this, but besides being compliant with the standards, there is an internal review program to ensure that compliance is being met. Going above and beyond the requirements ensures that we are technically sound.

A lot of what is discussed, is not just an NV Energy standard, this is something that NERC and the industry is doing as well. NV Energy definitely meets the requirements, however, if the risk is high enough, you may need to go beyond the standards.

Questions?

Question by Chris Tomchuk – how much time or resources are spent on cyber security and physical security at NV Energy. Man-hour wise.

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Answer – The largest initiative taken on in some time. There are quite a bit of resources, approximately 30 + individuals working on a weekly basis. It is an enormous task that NV Energy as well as and industry has taken on.

CIP-6 goes live July 1, 2016 and a team is already drafting a plan to analyze the weaknesses in the new standards being released as well.

Chris Tomchuk says that Valley Electric is also dealing with the same process of cyber security and physical security.

John Candelaria asks since we last met, have you had a chance to look CIP standards and Grid Modernization legislation that has been considered?

Answer: FERC had a Technical Conference on Grid Modernization, and we dial in to those conferences and see what might arise. A big topic is drone usage and whether NV Energy may include drones in our policy if treated as trespassing, or threat, and have a plan to deal with it.

8. Presentation – California Independent System Operator Participation, Community Solar and Broadband Initiatives, Chris Tomchuk – Valley Electric Association

Chair Lacy loads presentation and Chris Tomchuk begins presentation. *(please reference power point presentation)*

Chris Tomchuk is with Valley Electric and gives a little background on the company. Valley Electric is a Member-Owned Cooperative Utility with service for 50 years. Service territory for Valley Electric covers southern Nevada and a portion of southern California.

Slide of map shows the service territories of the different entities. Map shows cooperatives as well. Valley Electric serves rural and remote Nevada and some communities have 300 families only. Lincoln, Overton, and other areas of service for Valley Electric are very small.

At one time Valley had 2800 MW of generation in queue that were requesting to access to market. The solution for Valley was to establish a direct connection to CAISO. The CAISO has the need for a higher renewal portfolio standard. Our southwest portion of state has enormous amount of solar resources to get to the market. Major drivers of why Valley Electric moved into the CAISO. Started this process in 2011, and January 3, 2013 Valley Electric moved into CAISO. Involved in that was constructing an 80 mile 230Kv line from the town of Pahrump into North Las Vegas into NV Energy's substation. In this process for the 230Kv line, started about 10 yrs prior for environmental permits etc. and we were required us to have bulk electric systems capped from north and south. At this time, we are now establishing a direct connection to the CAISO and the Eldorado Substation.

CAISO Mission – The operation of the grid, reliability effectively; provide fairness and open transmission access; promote environmental stewardship; and facilitate effective markets and promote infrastructure development.

What a Generator can do when they connect with us – is they can sell directly into California. There is a potential to sell their resources to larger mass. Also, CAISO has a maintenance program review by a Third Party. They will

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look at how the system is maintained. The task force that is part of the analysis, makes sure the system more reliable.

Valley Electric sees the future moving into an integrated, decentralized, electric power system. Currently, as you look at the model today, you see centralized generation aligned with marketing and transmission into the substation and then movement of energy into distribution systems serving the integrated member/end user. In the future, this is going to be more decentralized. There will be more battery technology and solar facilities behind the meter. We see the world changing and we can control it better as integrated members and consumers are wanting more interaction about their power and electric use. There are more solar resources now, as well as wind in some cases. There are more electrical car charging stations and other renewable power sources needing to be integrated. Once integrated we can manage it better.

Communication is the key. Valley Electric has made a conscious effort to install fiber wherever they install broadband to its members. Not everyone wants to be on the grid. Valley Electric wants ensure that its members are getting good service and reliability. We are bringing fiber to the home and integrating, whether it is batteries, electric cars or solar and using it as a resource and creating a market that a member can tap into. From a personal comment, Chris Tomchuk likes the internet speed in Las Vegas or Carson City, but finds he does not get that speed in his house Pahrump. Valley is seeing the need throughout the rural communities for fiber for that reason.

Valley Electric is also working on smart meters, and on the fourth generation of the meters to date. Members can use the technology and integrate into the daily lives of the members. Rural areas need that communication and affordability and Valley Electric is looking to making that happen.

Valley Electric also is working on a community solar project. They are building this solar field in Pahrump, an 80 acre site of solar which will deliver approximately 15MW and allow members to apply for energy out of the solar facility. Instead of the solar being built and maintained on the member property, it will be at a field that members can tap into. Technology changes, distribution and reliability, will also be maintained and worked on for its members by Valley Electric.

Another Valley Electric project is a 500kV line between Arizona and California (approximately 114 miles). Valley Electric will operate, maintain and manage the line using the Innovation Dispatch Center just built, which uses state of the art technology 24/7.

Also working with the Governor's Office of Energy and has installed an Electrical Vehicle Charging Station for Tesla at the Eddies' World Gas Station in Beatty Nevada.

Working with Desert Research Institute at UNLV and UNR. Valley Electric wants to make rural Nevada a better place.

9. Nevada's Rural Electric Cooperatives – Two Presentations Covering Grid Resiliency and Other Considerations.

Grid Modernization and Resiliency Presentation *(please reference power point presentation)*

Chair Lacy calls David Luttrell for the next presentation.

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David begins by saying that the rural perspective for grid modernization is at a much different starting point than others on the main grid. Issues are dramatically different than those for NV Energy as it relates to grid modernization. Nevada Rural Utility service territories are discussed. Serve about 60,000 consumers in Nevada, and cover half of the state. Map is discussed.

Globally and generically – Nevada Rural Utility doesn't own significant generation in comparison to NV Energy. Like Valley Electric, Nevada Rural Utility is also a cooperative, not for profit, and governed by local boards. Pros and cons exist, but the biggest advantage is being very close to consumers which allows them to react to needs and feedback that is received back from them. It does not take long for an issue to come from a neighbor, and travel to the board room for a decision.

Nevada Rural Utility background is discussed. Created in 1935; General improvement district under NRS 318. Five member elected Board of Trustees and provides electric service throughout Lincoln and Coyote Springs.

Review of Lincoln County map, transmission and distribution; radial lines on the map. Not much opportunity for networking in the rural area and distances covered. They interconnect at Reid Gardner Generating Station. 230 miles of transmission and distribution. In main utilities, there is much more distribution per mile than transmission. Not the case in rural areas. They offer 230 miles of transmission and 280 miles of distribution. There is about 5.7 consumers per mile in line. There is a large plant investment of \$44M for larger T&D for consumers.

Generation for Nevada Rural Utility. One thing that allows them to operate with cost effective rates, is that they get significant amounts from hydroelectric sources. Approximately 85% is hydroelectric and they have recently executed a contract renewal through 2067; another 14.7% of natural gas market purchases and give or take 1 % of generated solar. A very low carbon footprint, and a clean utility. Lowest carbon impact in the state.

Power supply cost is about 51% of the operating cost; in 2015 the average cost was 1.8 cents per kWh; the wholesale power cost is an important component of affordable rates. How does it compare to the benchmark, it will have a direct impact on rates in rural Nevada.

Nevada Rural Utility is not part of the bulk electric system; Valley Electric and NV Energy are the only registered bulk electric system. With the radial system and other items, they are not part of that bulk electrical system. They are trying to improve the rural transmission and distribution by looking for partnerships. Currently working with the Solar State Energy Association, a group of utilities and the Southern Nevada Water Authority to permit a 54 mile line to tie in to Overton, Boulder City and give a direct path to the substation. They are in the final stages of permitting with BLM (since 2008 and in final stages) and hoping for the permit to be issued soon. Permitting process is very difficult and slow moving.

At this time, Nevada Rural Utility is rebuilding an existing transmission line; they have completed approximately 76 miles; and framed for a 138kV upgrade and new poles are much taller. Additionally trying to improve reliability and implemented pole testing and change out. They have tested almost 9,000 poles; adding shield wire and avian protection; adding line sectionalizing for reclosers, switches and trip savers.

We have brought on federal agencies due to wildfire. They have engaged right of way and management and began the program in 2015, and treating 7.25 miles in 2015 and another 32.2 miles planned in 2016 for fire hazard

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planning and photos on the slide show clearing of lands and brush but leave behind sage brush for sage grouse habitat, but needed to keep fire hazard to a minimum.

Metering for Nevada Rural Utility is not as sophisticated as the large utilities. They are not on a 2-way continuous communication system but a ping-based communication. They are trying to move to that, but not highest priority. Focusing on other efforts to modernize the grid. For large commercial customers, they have an AMI meter OIN 600 Meter which allows web based access to their own information. Other improvements are the ITRON Nighthawk so the very remote areas, this is used for outages management purposes, are cellular based and placed on rural feeders and monitor the meter on a computer.

When Rural Nevada Utility has an outage, the feeder will report it. They can send support 24 hours a day. In the rural community it is a more hands-on first person basis to report an outage, versus a large call center. He can use his cell phone to know if there is an outage, and get the metering back up if needed.

Communication is a problem in rural Nevada. At this time, they are trying to make separate the SCADA system from the commercial networks. They are installing fiber optic underground – 4 miles in coyote springs and when they rebuild overhead, they are adding ADSS on transmission lines – 41 miles complete.

Nevada Rural Utility has some distributed generation; working with a solar developer proposing 3.75 MVA Project in Rachel Nevada. Follows what NV Energy does with visibility study, inter-connect study, etc. Trying to position with the next bid process. They have also constructed a small community solar project as of July 1, 2015. This solar is priced at a \$3,200 for 1kW per share with a limited to 3kW maximum a person can purchase. If you have a 20 yr contract it is just about the residential rate. Capital cost and lost revenue as how this cost/price was determined. Folks that did purchase, was for price resiliency. It may be a small amount past my residential rate today, but 5 years from now after rate increases, it becomes a cost savings to pay the same rate along the 20 years. The community solar project also allows the consumer to use solar, even if they are in a shaded area, as well as no maintenance of the system. The consumers feel that they can give to their kids the solar impact and transfer to another family member. During to the construction, they had calls daily from consumers wanting to know more because the project is in a visible location.

The capital improvement program allows 25% of operating budget to go to grid modernization and resiliency. Nevada Rural Utility has completed \$4.2M in capital improvements since 2011 and reduced SAIDI by almost 50% from 2011 levels.

Radial lines and long distances are a real issue to rural area. To go to a network and underground lines, become cost prohibitive.

Right of way permitting issues is a very long process. Took two years and \$100,000 to get permitting for eight 35-ft poles on the last distribution line.

Snow and ice storms and wildfire are very dangerous issues to the transmission and distribution lines in the rural areas. The power lines are not insurable assets so when a pole is lost due to fire, or storms, it is something that becomes a hard cost to the company, and not an insurance claim. It is a hard cost to replace lost lines due to fire paid by rate payers.

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Communications is a serious issue in rural areas, so wherever they are building lines, they add lighting protection, bird guard and you can see the fiber that is installed as well. They rely currently on radial technology, even though they are installing fiber everywhere. Other issues include access to facilities due to federal land management; cost effective distributed generation; as well as older infrastructure.

We have remodeled our solar site and our community meets every month.

Rural Utilities Approach to Grid Modernization and Resiliency (Mt. Wheeler) *(please reference power point presentation)*

Chair Lacy calls Kevin Robison for the next presentation.

Mt. Wheeler serves a large territory and is one of the large cooperatives in Nevada. Mt. Wheeler was created in 1963 and began doing business in 1970. Mt. Wheeler serves 16,000 sq. miles in both Nevada and Utah. Serving 7 counties in Nevada (including White Pine, Eureka, Elko & Nye Counties). In Utah, they serve the Western areas of Tooele, Juab and Millard.

The Mt. Wheeler Board of Directors serve on a 3 year rotating basis with 9 specific directors, and 3 rotate in each year. Annual revenue is approximately \$433.5M and 525 kWh sold.

The next slide show a distribution map, and showing the Baker Distribution line a 25kV distribution line that is 129 mile long line.

Generation resources: Mt. Wheeler owns (along with 5 other cooperates) the Deseret generation transmission with the Bonanza Power Plant in Vernal Utah. Also has an allocation with Glen Canyon Hydro. Mt. Wheeler is in coop with various other renewable projects as well. Mt. Wheeler also in involved with the Intermountain Power Project in Utah, wherein Los Angeles Dept. of Water and Power facility that is currently going through a refueling process and in 2025, the new fuel will be natural gas. The generation capacity has yet to be determined. Mt. Wheeler owns approximately 1.7%. All generation contracts will come up for renewal in the time frame of 2024 and 2026. The next slide shows the 2015 renewable generation Kwh generation. Net Metering creates 3 cents a kWh. Retail price is 6.5 cents per kWh.

Mt. Wheeler service territory is served by a robust grid system, tied in with NV Energy.

Modernization in 2009 included a deployment of ARM metering system. Just constructed two brand new substations (Gianoli Substation and New Pescio Substation). Serves Nye County and others. In Ely Mt. Wheeler replaced infrastructure and invested \$90M to allow for upgraded system for a higher load. Mt. Wheeler has experienced in smaller communities the other utilities (cable, telephone) not willing to share community facilities. It is very frustrating to construct each facility.

Mt. Wheeler has a 32 mile 69kv service line for extension to Pan Mine. Goes along the Hwy 50 corridor. That line could have been 8 miles, but sage grouse and other limitations caused the line to be 32 miles long. An additional \$8M cost.

Resiliency: All encounter fires in rural areas. June 2012 experienced a fire (Pinto Fire) that destroyed the 230kV structure line. 25kv system destroyed. Full restoration was achieved in 26 hours. Photos of the structures and

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damage from the Pinto Fire are discussed. A portable substation was vital in allowing restoration of power to the members effected by the fire.

One week later another fire (Range Fire) followed the Pinto Fire and burned 230 Kv systems of NV Energy and LADWP. 69 kv transmission system serving Baker Substation (Snake Valley, Spring Valley's, Great Basin NL, and Utah members). Photos of the Range Fire and damage are discussed.

Mutual aid agreements played a significant role in the disaster recover. Crews from Wells Rural Electric assisted to rebuild the 69kv line; Lincoln County Power District loaded and transported materials for the job allowing restoration in 18 hours.

Summary of Mt. Wheeler's Modernization and Resiliency. Decisions are based on cost effectiveness to member. Modernization and the environmental impacts must have a cost balance, otherwise it doesn't provide a benefit back to our members, as harsh as they may sound. When it comes time to step up, their employees are very dedicated and innovative. They regard employees as their greatest asset.

Q&A:

Would like to thank David and Kevin on the Rural Electric community presentations. There is a lot of rural area in the state of Nevada. The rural areas and the numbers that they are facing is something to consider in the modernization process. Reliability is key for the rural areas, with so much open land in the state of Nevada. And it is great job to keep service in those areas at the cost.

Chair Lacy Starla adds that nearly 50% of the Nevada grid is in rural territory. When thinking about the grid modernization of the entire state, the rural community is half of the state and must also be addressed and their challenges considered. Any policies created must cover both rural and urban territories. Comments that both presentations were very well thought out and done well, thanks David and Kevin.

10. Presentation- Prior Work Product Summary on the Renewable Transmission Initiative for the State of Nevada, NV Energy. (please reference power point presentation)

Chair Lacy introduces John Frankovich to speak on NV Energy's Renewable Energy Transmission Issues and Updates.

John Frankovich begins presentation. Hearing the presentations today will impact his presentation from the reliability perspective etc.

Renewable Transmission Initiative; John will speak about how to touch customers with the initiative and concerns from customers; he will discuss some of the failures; will discuss the transmission realities and trying to get access to the system; as well as discuss economic development. Additionally, he will give an update of large scale projects: Full disclosure, and he is in resource development, so he is starting to get involved in large scale solar projects, and has some insight of development to talk about the success with the large PPA and solar energy developments.

In 2009, Nevada legislature Bill 387 was passed to required transmission development and planning to support renewable generation public policy. During this time the portfolio requirements were ramping up and there was

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concern to ensure that they could handle the portfolio requirements. It is a good policy to get ahead of the curve in renewable development. Following, there was a Renewal Energy Transmission Access Advisory Committee, and on the committee we see renewable developers, PUCN, environmental organizations, federal agencies, rural cooperatives and NV Energy. Developers were required to be on the committee in order see where there was a high density of renewable opportunities in the state. If you don't know where the opportunity is, there is no way to move forward.

The next three slides deal with the Renewable Transmission Initiative. In 2011, NV Energy launched the Renewable Transmission Initiative, in response to AB 387. The zones on the slides represent types of renewable. Zone 1 is mostly geothermal area. Zone B is in the Reno/Carson City area, and more distributed energy resources area. Zone 2 is mostly solar and some geothermal. Zone 3 is Chris Tomchuk/Valley Electric service area and Zone 4 is the North Dry Lake BLM has a Solar Energy zone. Not shown on this map, around the Las Vegas area is a BLM solar energy zone and the Eldorado Valley area wherein lots of solar going in that area. In 2009 these zones were pretty good at predicting. Transmission strength in these areas, around areas 1 2 3 and 4, not really strong.

Content on the side is an abbreviated description of renewable; covers developers interested in access to areas to develop projects; after receiving that interest, and customers were notified of cost and scope of the transmission that needed to be conducted. Customers/Developers could vote to participate and submit a study request and share the cost of the study. Customers then have to commit to the shared development and cost sand transmission rights. When we look at the map and try to cover those areas/segments, you can see it's tied to the west side of the state; and tied to the north. There is one line from Las Vegas to Ely and then extending further north; this was intended to access wind projects

Looking at some of the challenges back then – why did they not move forward? At that time customers/developers were looking at a large risk. The market was not well defined; they did not know when they would get the projects; the length of the projects could be ten years or greater and the costs very large. The renewable portfolios were fairly new and barely starting to ramp up so there was very little interest.

In 2012 the initiative had ended. The statement made to the trade media basically concluded that there was not enough interest in the customers to commit to the funds and development process in order to proceed with the project.

To build the project at that time, a lot of costs would be paid by the developers. Compared to today, which when developers want to start a project, they can come to NV Energy and ask for an interconnection. Then a study is done, and a point to point service form can be generated to show the cost to that developer.

Current planning reality for transmission: Challenges for transmission strategy is: keeping costs low, reliability, market uncertainty. It is a very comprehensive study to take a lot into account; and a lot of the study is done on a piece by piece basis.

When a customer comes to NV Energy for an interconnection – that is when the study begins, in order to add that customer to the system. From a transmission and renewables standpoint only, the process will start out by making an interconnection request. From that point there is considerable lag time. It takes approx. 18 months for a study to be completed, once the customer commits to the cost for that study. If the project interconnect crosses BLM land or other sensitive lands, it could take 7 – 10 years for new transmission build-out. If there are substation

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upgrades, or a daisy chain of events of network upgrades that would need to occur, the time extends accordingly. It takes financial commitment, as well. Per the guidelines of the request, letters of credit up front are required to build network upgrades.

Renewable portfolios standards become uncertain as well. Based on the slide of step change in activity for renewables from state to state in our region. When transmission planning we need to ensure to expand the system. Renewable technology and intermittency is another challenge. If you look at the graphic and see the clustered bubbles, those are all individual interconnections; these connections in 2011 not sure if it was all inclusive or filtered. They are still clustered. Yellow is solar, Green is geothermal and blue is wind. Every time there is a change in technology, the bubbles will move because technology allows to build differently. NV Energy tries to keep up the strategy in renewable planning. Some other step changes in technology regarding solar Photovoltaics/PV includes the plant costs continue to dive. The production of solar panels continues to improve, and they see a value engineering in the systems. He expects that in the next 2 year they will see another 3-5% profit in costs in the way they building the power plants etc. and cost to produce solar will drop that much more.

Contractors are getting much more savvy on installations. Site installations on a utility large scale are much better. Large sites and permitting experience, not only on developers side, but permitting with the regulators, like the County and State are becoming more familiar with the way the plants are being built.

Solar thermal, while the costs are high today, the costs will come down as valuable lessons are being learned with geothermal plants. John believes that as storage becomes more valuable than solar thermal, it may be a game changer. Aggregated solar projects and distributed resources in the dispatchability is a game changer. Rooftop solar provides storage. On a transmission basis you can control voltage and some of the peak discharge times. Values of those systems will increase, once dispatchability is figured out. Providers are beginning to look at and talk to NV Energy about this.

The other item that moves the bubbles is the market. Fuel costs will move the bubble. Flipping of natural gas versus coal, and that will defer renewable investment. Retirements of large assets across the country will change renewables. Customer desires (growth, economy, efficiency programs, demand side programs). Competition amongst renewable technologies is also an effect on the market. This all moves the bubbles in transmission planning.

In looking at the renewable portfolio standards, California is shooting for 50% in 2030. Arizona is 15% by 2025 and Oregon just enacted 50% by 2040 New Mexico 20% by 2020. Just pointing out that while looking at a transmission planning horizon, it takes that long to make it happen. You must think about it now to make changes to your transmission network with both resources and deliverability in time to reach the goals.

Transmission is in between resource and demand.

Resources – get the concentrated resources to the loads; large scale renewable projects are successful; lowest cost PPA for solar. \$39-\$5 per MWh (year and half old); the Capital pricing is \$1600 - \$2,000 per Kw. Every time NV Energy submits an RFP it is looking for the project to be delivered within 2-3 years. That is a really short time frame for transmission.

To meet a 2-3 year deadline, they are looking for projects that are in process and waiting for a commitment. What makes a successful project from that perspective – a quick turn and the customer wants it,

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Attributes include: 100 – 300 Mw in size. It needs to be flat, minimal contouring, baseline for solar project. Mesa Valley Yerington area is very close and around Hawthorne and possibly Tonopah are areas good for solar. These are some of the best resources around.

Needs to be close to permanent roads, which makes it much easier to access; Construction water is key to keeping construction costs low, minimal environmental impact. Desert tortoise, and mitigation of the tortoise. In the north, the Sage Grouse is an environmental consideration. Another way to provide low cost PPAs for solar is to be in close substation proximity, to keep the generation tie line, a short interconnection. This is what makes zones successful. Dry Lake is a Zone. Eldorado is a Zone. These zones have each of these attributes to make a great location for PPA solar.

Next slide is a table of projects across the state and projects that can be implemented before 2025 and after 2025. Redacted the items for confidentiality purposes. Nevada Power service territory and Sierra Pacific service territory are separated and numbered on the state map. Most is located in the Las Vegas area. The numbers listed in the zones are listed very conservatively. Armargosa Valley could be higher, Dry Lake Valley north may also be much higher. There are about 6,000 Mw can be developed by 2025.

Almost all of that renewable load beyond 2020 does not have a transmission strategy that can support that development. The only way it will happen is to wait for someone to come, and start that long process and time line. It all comes back to economic development and reliability. If we had all of that transmission sitting, we could be capacity ready but it does not exist beyond 2020.

The multi-faceted strategy: when trying to plan for transmission modernization in the state and keep the customer cost down, we need to account for portfolio standards. Not just Nevada. It will change and grow, and what is the realism there. The other states in the region and their renewable standards are considerations as well. What is their strategy to assist in getting Nevada resources out to the other states in the region? There might be a plan that gets renewable projects in Nevada off of the board by serving other customers. Renewable energy zones and correctly locating the zones, keeps the costs down in the project. Makes more competitive than those seen in Oregon or California because of their limitations in those states.

Geographic diversify the RPS in Nevada. The map showing all of the interconnection and solar and the low cost renewable resources highly concentrated in Southern Nevada. That concentration is in a very small area, and we need to diversify across the state. If we can build transmission ahead of time, and build incrementally, it provides those substations and terminals which become the low cost and creates the next layer to connectivity. If we can remove the uncertainty to the provider and then the developer's costs will be reduced. When uncertainty is less so are the costs. Control and reduce transmission costs. If we can have a great strategy with transmission expansion to serve renewable projects that can be coupled with transmission network upgrades that helps to reinforce areas already weak that at some point need to be upgraded for just serving loads. When you couple multiple value stream, you can kill two birds with one stone.

Questions:

No questions in the south.

Questions in the north

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Rebecca Wagner asks about slide 10 referencing recent RFP's. Under the attributes, listed, are these attributes included in what was listed in the low bid RFPs?

Answer:

Yes.

Question:

Then does logic tell me that if these attributes are not available, then those costs will go up?

Answer:

Yes.

Question:

So keeping to the solar energy zones is very important?

Answer:

Yes.

Question:

Are you familiar with issues with the BLM and the RMP process changing or modifying the solar energy zones which would reduce some of the good flat areas, out of the zones, a process that is starting now?

Answer:

John Candelaria was not aware and Starla Lacy said she has not heard anything specifically, however they are changing their RMPs.

Rebecca Wagner is concerned that there is not a path forward for some of the cheap solar due to changes in the SEZ and/or other characteristics that could drag the costs up.

11. Presentation – Storage Solutions, Tesla. *(please reference power point presentation)*

Chair Lacy introduces Sarah Van Cleve to begin presentation.

Sarah will discuss what is going on in the world of storage and Tesla's involvement. She will address the storage of energy as it pertains to the Governor's task force to modernize the grid. She states that there is a lot misconception in the industry that renewables are cost effective. Certainly there are plenty of applications where you are not going to affect storage, but they are definitely there.

Sarah works with the Tesla Energy Team which is an energy storage division within Tesla Motors. Tesla got into the energy storage to achieve, in part, a goal to provide sustainable transport. Their cars are basically the same technology as the stationary storage, but with wheels. And is the same as the stationary systems. Sarah did come from Southern California before Tesla, and in a position to figure out a way to provide 1.3GW of storage for the state of California. She has a lot of relevant experience with a lot of these issues facing the committee.

Task force shows that each goal is related to storage. Tesla wants to reach a higher penetration in renewables. It is the next step in a modern and resilient grid. There are several types of energy storage uses; Storage can be used

for almost everything on the grid and can offset the need for peaking transmission distribution and provide micro grids for customer for power and help them manage their electricity bills. Storage can be made at every point of the grid.

A slide is showing a Tesla storage in a residential garage, with a power wall installed with approximately 3.3 kW 6.4 kWh is stored in a home to provide 2 hours of energy charged. This provides the customer power supplements to solar, back-up power, help reduce electricity bills and use rates. There are some applications being used for storage. Tesla is selling 500 power walls to Green Mountain Power and splitting the costs so that the customer pays half of the power wall. The customer can then use that for back-up power in winter when there is a storm they can maintain their loads and support the distribution systems especially on peak days.

The next slide shows a commercial installation of Tesla Power Packs. This slide shows a charge pack of 250 kW / 1 MWh which provides 4 hours of power storage. These packs provide 100 kWh but can be stacked to provide MWh load storage. With commercial storage, customer can reduced demand charges, provide back-up power, and provide a demand response as needed. Commercial storage customers see an economic propositions.

There are some large Nevada commercial customers that are interested in looking at these types of projects. There is a PUCN investigation at this time, for the Reno Tahoe Airport Authority to use storage of electrical loads. Squaw Valley and the Tahoe region are also integrating electrical storage at the ski resorts. Slowly we expect large customers down south, such as casinos, to consider electrical storage to help support the grid.

The next slide shows a utility-scale installation of electrical storage. This is a Project in Hawaii which stores 13 MW / 52Mwh system. Essentially, in Hawaii, it is a relatively temperate climate, and the only peaking hours are between 4 pm and 8 pm. These batteries hold solar energy created throughout the day and offers a solution to the peak demand. Hawaii also has a much higher energy cost in Hawaii so the storage brings down energy costs significantly. This project should be installed by the end of the year.

This slide is showing the battery cell density trend and how much energy can be stored in the same volume in the area. Twice as much energy can be stored within the same cell every 10 years. This is a large capacity within a 10 year period. Seeing huge improvements as electric vehicle production increases.

The next slide show the global battery cell market for batteries. The grey bars begin on the left for the last year in 2011 through 2015. The red bar is the plant production and projected Gigafactory production in Sparks NV in 2020. In a 5 year period, Tesla will essentially double the global supply of Ion batteries. The increase is providing significant manufacturing benefits and sourcing benefits.

By 2020, Tesla's Gigafactory will create 50 GWh in battery production which is enough to power 500,000 Tesla cars. This will all be powered by renewal energy, with a net-zero energy factory. The batteries manufactured in this facility will provide materials for Japan, and the entire world.

There are very real barriers to storage deployment. Utility processes and tariffs need to be updated to accommodate storage. Sometime energy storage acts like generation as far as load, and sometimes energy storage acts like transmission, but really it is its own product and category. Modeling tools and the way we procure generation typically certain procedures to interconnection, put it in storage and interconnection generation studies for the same - How does it get paid for? All questions that by nature never needed research before.

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Working with regulatory agencies and working with the utilities, it has been difficult to get the first few projects off of the grid. Now they are starting to get moving on some projects. Tesla really wants to help the regulatory agencies and the utilities understand the benefits of getting some of the power off of the grid. One example, where storage is cost effective, is a project from two years ago with NV Energy at a line in Smith Valley. NV Energy needed to upgrade a 60kV line and transformers. The estimated cost of upgrade was \$18M on the radial line. In trying to figure what other solutions exist while solving the upgrade issue, they proposed a 1MW solar system with 3MWh of storage, to fix the problem for \$8M instead. That is a \$10M savings on one project. Tesla would like to see all future projects move that direction with renewable energy and storage back-up facilities. That way they would offer the most cost effective upgrade.

Tesla is hoping for a commitment and buy energy storage at all points of the grid. The detailed processes and tariffs need to be updated to provide commercial energy projects at all points of the grid. The processes needs to include connectivity at the customer level, distribution level as well as the transmission level.

Questions:

Chris Tomchuk references the Reno site with the wind turbines. Sarah states that the projections made were done so about a year ago.

Chris Tomchuk asks to talk about Smith Valley project.

John Frankovich states that it was an upgrade line project for resource optimization. In rural areas where you have a long line, if you have the capacity of drawing a little incremental rotation, suddenly you have productivity. If you can look at some combination of renewable and storage versus a very long expensive transmission line, it can be very effective. Infrastructure mentioned throughout the meeting today, is the resource based power interconnected. Sometimes to a customer it becomes a burden. John likes the idea that there is a customer partnership, wherein the customer gets the reliability and the utility gets operations ability. It becomes an element to serve all customers reliably.

Electric vehicles to NV Energy is a value also. A recent study was done in Texas that a football game with all electric vehicles parked and charging, provides enough battery power to start a grid. Your car becomes your back-up power. Batteries are the first step. Utilities are looking at all options and building battery substations.

Question:

What is the life cycle of a battery?

Answer:

Sarah explains the life cycle of the battery is 10 years, but they also offer maintenance contracts. The 10 year is the warranty period, but plan that they will be used longer than 10 yrs.

Question:

What are the prices for the batteries?

Answer:

Prices are listed on the website at Tesla.com. Power pack prices are listed in pricing per KWh. Right now it is \$500.00 per kWh. The home unit is \$3,000 and installation costs.

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Question:

Hank James speaks regarding the disposal of batteries. There is a huge amount of battery energy within the power packs. What are the environmental consequences of the battery storage?

Answer:

Sarah explains that Tesla recycles all of its batteries. Currently, there are not many old batteries to be recycled, as they are mostly a new product and still in circulation. Currently Tesla uses a third party contractor to recycle the batteries that come back to them. However, in the future, the factory will also be equipped to recycle the batteries as that come out of circulation for use. They can break it down to re-use 98% of the batteries materials during recycle.

Question:

Rebecca Wagner asks if having a more detailed framework for distribution planning be helpful to identify optimal places storage could be a more cost effective solution.

Answer:

Sarah states that the distribution system provides the best location because of the radial lines and that there is storage capability on many points of the grid. Tesla is hoping that NV Energy is going through efforts to make sure that storage is an option for any upgrade on the system, just like when they do a transformer upgrade.

Question:

Rebecca asks John Candelaria if the substation has been included in rates case yet? Or will that be in the Sierra Pacific Power Company rate case filing. With respect to Smith Valley.

Answer:

John replies doesn't know if the costs are going to be included.

Question:

Rebecca Wagner asks, if storage is not defined in a statute and it may be challenging to define what it is storage, has any other states defined it by statute? Is there a good example of how to define it?

Answer:

Sarah replies that in some states they have defined it. Once example is Texas. Storage is defined as generation, and that has been a huge challenge because of the pricing structure for generation. Energy storage acts like generation and acts like transmission distribution, but Tesla does not want it defined as either and would like to see it become its own asset classification. As a definition of storage. There could allow for many types of storage, not just the battery that Tesla has. But have solar, geothermal, and rail storage. And other types of storage. Tesla believes lithium ion is very cost effective, but biased, but does not want the definition to encompass batteries only.

Question:

Rebecca asks if it would be beneficial to have a definition in statute around energy storage. She raises concerns that the committee will get too far down the path on utilizing energy storage, etc. before parameters are set. Should there be parameters in statute to guide and flow into PUCN decisions regarding updates to tariffs, interconnection agreements, etc.

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Rebecca states that the PUCN investigatory dockets can last a long time or a short time. Rebecca is concerned that there is an opportunity in the task force to get ahead of the game and make a recommendation to consider around a learning by doing program for energy and storage. Energy storage is a role within the Governor's agenda, and the task force should be thinking of ways to generally describe what energy storage is, even as a place holder. How this interacts operationally functionally and in terms of policy should it be discussed.

John Candelaria replies that the task force should have a statute included which requires consideration of energy storage. Certain situations for energy storage is cost effective. It is his opinion is that the grid modernization effort should at address situations wherein energy storage devices can be utilized when more economically suited.

Question:

Rebecca asks Sarah in relation to her experience in California, are there any lessons learned from the procurement targets? Are there things that can be learned about the reliability? Learning by doing and getting a storage system on the utility system seems valuable and she would like to understand more.

Answer:

California has created energy storage policy in a good way. They have made it the utility's responsibility for figuring out exactly where the storage would go on the grid. The California Public Utility Commission has required the utility to create storage by defining "X" amount of megawatts, but only 20% customer side, 20% distribution and 20% transmission, and the rest is done by putting it where best economically planned.

Question:

In California, was there was also a maximum or minimum requirement?

Answer:

Yes, there is a minimum target for all utilities across California, is 1.3 GW.

Question:

How did that number come in to play?

Answer:

There was a lot of discussion, however, it was more or less a policy decision. So that energy storage is not the only focus, and other renewables can come in to play.

Question:

1.3GW out of how many total?

Answer:

She believes at peak load, it is 52GW total.

Question:

What is the cycling reliability? Has Tesla studied the reliability of a split cycle charge versus a full cycle charging and how that affects the lifecycle?

Answer:

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Sarah says that Tesla has done a lot of research with 10,000 vehicles reporting back data, and the warranty provides for a full discharge.

Question:

Starla Lacy asks how the data is retrieved.

Answer:

Tesla is constantly “talking” with the cars, over cell towers, to retrieve data from them.

12. Discussion of possible legislative proposals to take to the Task Force

Chair Lacy opens the discussion for legislative proposals. She refers to a memo to task force chair which states that the bill draft request is due on May 26, 2016 and that they must submit proposals by May 19, 2016.

Opening discussion for proposals.

What proposal for language or policy on battery storage, does the committee want to put into action?

Rebecca Wagner asks is there anything on transmission that could be done as a policy recommendation. If there is even an objective for consideration.

John Candelaria states that we need to collect information, he is not comfortable yet and unsure how the effect on grid modernization, all will take. To try and come up with recommendations by next week is a tall task. The committee is just starting to look at a lot of the issues he is not sure if there is enough information to support any recommendation at this time.

Chair Lacy says that they need to find the baseline for the state. Where we sit today, in Nevada as it relates to the current grid. There are three states to be a test case, and Nevada is one of them. In Nevada, we are unique in that we have 85% Federal Land. The Clean Power sub-committee has any number of proposals. Chair Lacy has not been involved in the DG sub-committee, but that Jack McGinley of NV Energy is involved.

Rebecca states that if the committee is not comfortable moving forward with a recommendation that there should be some sort of bill draft request for energy storage with some broad parameters. Recommends establishing a benchmark and what do we anticipate coming in the future. We have knowledge that Tesla batteries are coming as well as other entities that are creating next technology. That is where the nexus on the operations resilience and interconnection on the physical system. Make a recommendation either from this committee or from other committees that based upon the presentations made today, this is important. If we can't take it up someone else should.

Hank James doesn't think that they are ready to provide specific language, but possibly guidelines on what to move forward with. Some issues include, integrating CAISO, the energy zones, and trying to get with the BLM and the ecology issues that we have in Nevada. They are very big ideas that need to be addressed and it is not possible to make a recommendation within a week. With respect to battery storage, he feels that a recommendation from this committee to get that issue on the table is the responsible thing to do.

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Chair Lacy explains that the committee needs to provide a proposed recommendation that anything would require a legislative change.

Chris Tomchuk asks what is the definition of “storage”? And then it could go to the larger task force.

Discussion that not only does the committee need to define “Storage” but also make a recommendation as to how and why it would be used. The committee does not want to stray off of the grid modernization type of directive.

Sarah Van Cleve has some legislative language from California (back at her office) that she could share and can be reviewed for future meetings and for a starting point to the next legislative session. No action may be necessary at this time, but you will need to find cost effective solutions. The committee could research and dig in and tweak it over the summer and legislative session.

A discussion ensues that this committee needs to ask for something from the legislature that will benefit the entire state. What else besides battery/energy storage, are we considering? Any other energy products? An investigation of those energy products will help commission understand, and make legislature more feasible. With so many new technologies, NV Energy takes a look at what is available currently in today's market, for a project – not in a broader scope.

The presentations today were very helpful, but the committee needs a little time to think more about it. How to connect to grid, and do where from here, where do we need to go to assist the grid.

Hank James doesn't feel that we should do any bill drafting at this meeting, but that the committee does have deliverables to make recommendations to other committees and task forces. Those committees are much more specific and focused, wherein this committee is thinking in a more global aspect.

13. Discussion and possible action on development of future meeting deliverables, schedule and goals through September, 2016.

Chair Lacy opens the item for discussion. Chair Lacy will send some proposed dates for future meetings, to everyone for consideration.

As far as topics, Chair Lacy will pull and distribute for review some house and senate bills that might be useful.

Other topics are discussed. Fiber interface and meters would be a good topic of discussion. Possibly get some topics together for new technology. Starla Lacy suggests a combined presentation of storage, fiber and other technology and communication tools.

The recommendations need to be – where we want to be, not where we are now. Communication will be a huge piece of the modernization. The controls that can be put in place, in connection with the fiber currently installed can be a benefit even ten years from now. What is the next level of communication, how do we get there? Who is making the newer communication technology? Physical security to protect the asset but fiber impact is critical for security.

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Hank James wants to discuss who will pay for the grid modernization and the communication tools and the technology proposed. He raises the concern of how the energy zones are shaped, if they are going to change, and the environmental impact that will occur as a result. If these zones are in mostly rural areas, how does it get paid for, when the population in those areas is few? We need to get creative on how to anticipate growth and development.

John Frankovich asks what is the strategy to build the transmission? Maybe someone from the transmission planning group can discuss what the mid-term strategy is for the future. Distribution planning side may also be able to offer what the plans are for the future, how they select technology.

Rebecca Wagner was out of the room on a conference call and apologizes, but she shares concerns of the importance to recommend that energy storage needs to be addressed even if it is to present to another committee, but move it forward. Sarah Van Cleve is going to make a presentation to the Clean Power Committee May 18, 2016. Rebecca would like to see (1) a definition of energy storage and (2) a learning by doing program and (3) and procurement targets for energy storage. Rebecca suggests that we draft a letter to convey to the committee that storage is an important factor.

In trying not to get ahead of it, Rebecca feels this an opportunity to address energy storage and no specific language is required at this time. The PUCN doesn't dictate legislature. The PUCN did not propose a bill draft request so somehow this issue will need to be addressed. The Governor would want to be aware of any investment that Nevada would make, so procurement targets might be important as well.

Committee agrees that it is an important factor, but there is not enough information for a final target to make a recommendation. Starla Lacy is willing to draft a letter stating that it is an important topic but that no formal recommendations or language can be formed at this time, until further information is compiled. From a public meeting perspective, the letter could be posted on the website so that it can serve the record as an outcome of this meeting.

A vote is made that the letter will be posted.

This agenda item is closed.

14. Set time and date of future meeting(s).

Chair Lacy will send some proposed dates for future meetings, to everyone for consideration.

15. Public comments and discussion. No action may be taken on a matter raised under this item of the agenda until the matter itself has been specifically included on agenda as an item upon will be taken.

In Las Vegas there is no public spectators.

In Carson City, Suzanne Johnson has comments. Ms. Johnson lives in a rural area of Douglas County, in a solar home, it is grid tied and does not metered and there is no gas. She has a 15Kw battery back-up. She has been on a solar and battery back-up system since mid-90s and loves it. Where she lives the grid has gone down but the inverter on her system is so fast that she does not know the difference from when the power goes from solar to

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the grid. Most folks understand generators, and possibly solar, but they do not understand batteries and inverters. She likes the batteries, and feels are electronic friendly and a very smooth transition as a back-up.

Ms. Johnson has a question on cyber security. Her background is in network architecture, and she has some system background that she understands enough of what was offered in the presentation. Ms. Johnson asks NV Energy, what cyber security oversight is provided over their facilities (such as Crescent Dunes). Her concern lies within a brochure that was publicly available in a hotel enough detail on heliostats and how they are set up and controlled.

NV Energy is not sure how much information they can divulge on this particular matter, noting that Crescent Dunes is not owned by NV Energy but provides power to them via a power purchase agreement. States that the national oversights of NERC standards apply to the bulk electric system. That is defined by 20MW or 75 aggregated. If the system facility is less, NERC standards would not apply. So that industry would need do it on their own.

Ms. Johnson is not concerned with the grid system security, but more along the lines of someone in a random location gaining access to and controlling the mirrors. Is there any kind of testing being done for security? It might be something to think about when individually control mirrors being near highways and airplanes. Her concern is the malicious intent of others and hopes that it is addressed before there is a need.

Travis Miller Great Basin Solar Commission. Mr. Miller is concerned that the other committees on the Clean Power Task Force cannot move forward without any recommendations from this Grid Modernization committee and it is disappointing that no recommendations will be made after today's meeting. They need something from this task force to build off of.

No other public comments. Chair Lacy closes this agenda item.

16. Adjournment.

The Chair took a motion to close the meeting, thanked all for their participation and attendance and adjourned the meeting.