Working Group 2: Metering, Communications, and Data

Meeting No. 4

March 26, 2018

Meeting Summary

[Note: descriptions of presentations and discussion are condensed summaries and paraphrases]

NextGrid Working Group 2 Leader: Matthew Olson, assisted by Chris Raider

Opening and Overview

Working Group Leader Matt Olson opened the meeting and welcomed participants. The main topic of discussion was a continuation of last meeting's topic, "Communication." Instead of presentations, the group focused on a set of questions for discussion.

Question 1 - What are the existing regulations and policies that constrain the ability to add third party devices to the OT network sued to server (EV, DER, etc)?

Discussion:

- Rules are pretty silent on this. Before fiber was invented it wasn't an issue. These might not be entirely regulatory. Could be administrative issues also, including municipal considerations - if we're talking about putting things on poles and have to follow the local rules. Rules vary. For example, today if you're putting a Communication device on a pole, use blanket permits.
- Didn't do user studies, but ran into problems with easements. Biggest hurdle was easements. Court case in Missouri where third parties were running fiber/networks across a land. The land owners sued. So this is transmission lines that crossed private property.
- If we're going to note this in the report in a comprehensive way, there are a number of issues we'll need to discuss, including:
  - Utility easements
  - Licenses
  - Non-property right agreement
  - Joint occupancy agreements, with railroads, etc.
  - In some cases, rights granted by a particular permit issues by a government and then generic things in a franchise agreement, such as things that apply to IDOT and ISDA (toll highway authority)

- The issue of building and constructing depending on municipal requirements for permitting, etc. varies by jurisdiction. If you're changing out and putting something on an existing pole, v. putting in a new pole. Handled differently by different munis. In general, larger munis have more complicated rules and smaller munis have less regulatory impacts.
- Question related to third-party added devices. What are the processes that utilities currently have related to connecting home devices to the meter? What is the process for the customer to connect the device to a meter. Or, rooftop solar with a smart invertor, what is the invertor spec process that utilities have in place to Communicate with utility network. Communication between customer devices and network.
  - Ameren lists which *home area network* devices connect with network. If customer has a device that Ameren hasn't tested, the customer can try to connect it to the network themselves.
    - SAP 1.1. if the device meets the utility standards (1.1) the network is open to those. We know those work.
  - There are lots of intricacies of how to connect smart invertors. They're lab testing that right now and trying to validate if inverters can connect with the network, that they integrate and can Communicate. Included in the incentive legislation in Illinois.
- how do you Communication? And then once the devices are "talking", what are the message you can send, what is the configuration? Are those two things coupled? What he's seeing in the market, what would like is high level recommendations for manufacturers and consumers rather than specificity, but that isn't how it works today.
- Are Utility requirements similar, so that developers don't have to create two different processes?
- can you Comment about home area network? For connected devices, there are some devices designed by ComEd that are compatible with SAP 1.1. on the invertor, still coming up the processes, what are the devices, and how to they interact. This is in research now.
  - Depends on type of solar. Rooftop solar might be behind the meter. But Community solar could be different.
  - We're talking 10 kW, what you can put on your roof, for the purposes of this discussion. For large, megawatt solar that is different.
  - Home mounted devices, we don't have a much awareness. The issue will really be raised when the customer asks for net meter or two way meter, then you find out that the customer has solar or storage device there. Utility needs to be able to react quickly.
  - Zigbee to the meter, the AMI has that capability. Not across the whole network. In the short term, utility public or private (in the future) LTE to integrate those assets. In the long term looking at smart meter to interact and looking at future ways to allow the Communication to happen.
- what's the universe we're talking about? Solar, storage. Are we also talking about dishwashers, IoT?
  - yes, smaller appliances are included but not much weight on the grid. Those types of appliances could talk to many systems - your home wi-fi or other networks. Sufficient capacity on the grid for them. But as we march toward system capacity, the tighter control we're going to need to have. Solar is going to be the first one - need fairly tight

control there. That's the context I'm thinking of. What things do we need to talk to from control standpoint? Trying to solve a problem that's 10-15 years out.

- o from third-party that's actually building these things, we're promoting a handbook that the utilities can put out with detail that gives direction, what fits into their network, so that customers and manufacturers can adhere. There are people who will come out and meet with customers. Next step is to develop a handbook. How do you create policies to remove constraints? Utilities providing more information or direction on what to do. Handbooks from utilities could be very helpful.
  - o If I want to control it at some point…the AMI network less concern for control. If it's critical and you need to know it's happening, you put it on the grid side.
- From last meeting, went into description of networks. Differentiating between critical control and things put on the network. Does anyone have a better name for market network? Haven't come up with one.
  - o There is a lot moving from AMI network to grid side. As things get up and running, it becomes more important, so the AMI network is moving to grid side, as it develops and must work. I think in the future there will be three networks.
  - o Look at California's smart invertors. The sooner we get requirements of what utilities need, better we'll all be. Every day installations are happening on current standards and maybe that's not what we need in the future. What we've seen in Cali is utilities not taking advantage of Communication networks that already exist. Particularly with utility and Community scale systems that have big impact on grid, we need policies and procedures in place.
  - o Some of this may kick over into other groups…the broader regulatory concerns. We could put together the bullet points of existing policies and regulations – some are federal, some are ICC standards via rules, rules via utilities tariffs, then technical standards. We could march through these regulatory requirements. Plus the local requirements that may exist, not just for utilities. We should list those – to identify for the reader the answer to this question at a fundamental level.
- If there's something that is a particular challenge (like easements), do we want to put out that there as challenges that exist, whether it's ICC authority or outside of it? Some states have passed laws that govern some of this.
  - o are there any attempts to reserve some of the spectrum for utilities, maybe not for today, but in the future with EVs. Should there be a dedicated channel in 5G or in the network for utilities.
  - o we do have some space reserved. In 5G there is a lot of discussion about how to break up the spectrum to reserve for utilities…very busy and very expensive to find space to dedicate.
  - o in the process of trying to lobby for space in spectrum. Working with DOE to try to get licensed for use in space. Also discussion for partnerships in spectrum.
- 5G is very high frequency. It would be good to be in less. The way spectrum is allocated right now is about auction, so expensive. Talking about how to standardize in Illinois, but we really need this standardized across the country, if not the world. So that a smart invertor speaks some tech that is clear, open face standard that everybody can manufacture against. Knowing

the spectrum bands available is important. Modern cell phone has 7-9 bands so it's getting a little cheaper on a chip standpoint to get into spectrum.

- o utilities shouldn't have to buy spectrum.
- o The FCC argues that 900 megahertz – they're trying to get every dollar out of every bit of space they can. Until utilities are considered first-responders, we're forced to the same level as the public. When disaster strikes, we shouldn't be at the same level as a regular user, but that's how it is now, unless we purchase the spectrum through the FCC.
- o some movement to re-farm spectrum. Convert all the 900 megahertz, that might be best mechanism to achieve a national standard. Fraught with challenges.
  - ▪ billions of dollars to re-farm the 800 megahertz.
  - ▪ but what if, when EVs are the norm
- Communication aspects are going to be just as important as wiring, we have to have a plan. The way spectrum is now, the need is going to have to rise to the level. Canada allocated a portion of spectrum to utilities. Little traction to standardize the spectrum in the U.S.
  - o Back to the fundamental question that Matt posed that we're trying to answer, should we add "what are the existing regulations and policies that…change the word CONSTRAIN…to EFFECT"
  - o I agree. Regulations are there for a purpose, not just to constrain.   The word itself implies a negative thing. I agree with changing that word to EFFECT. More comprehensive and less negative connotation.
  - o Common profiles for the standards. Use of Common profile and why it's under Zigbee. If EV company or home area network, yes it should be aligned with a Common profile but devices should work similarly and connect to the utility similarly. EDI trying to get them to open the 700 band, I agree with the utilities that they shouldn't be forced to compete with everybody else because of the service they provide.

Question 2 - What are the existing regulations and policies that constrain the ability of utilities to sell excess capacity to third parties?

Discussion:

- For the selling of excess capacity, wireless, fiber, and spectrum, we previously talked about the constrains coming from company policy, and regulatory concerns from fiber standpoints, such as once third party is going across. Does it change the classification from a utility asset to a Common carrier? Lots of regulations for Common carrier. One of the biggest challenges of that process is the act of getting easements amended is more costly than the payment of the easement rights themselves…
  - o Suggest replacing CONSTRAIN with EFFECT. And are we narrowing the discussion by using the word 'sell' which implies a permanent alienation of rights?
  - o Agree - in last meeting it seemed unclear that utilities would even want to go down this path. Shouldn't the utilities be treated as a first responder. Should there even be an inability to use the excess capacity if there is a first responder.

- o clarifying point – this is a broad question. It gets bifurcated….if you're using public airways, how should they be allocated. If you're using fiber and using your own Communication path, lots more capacity there. Different between those two lines.
  - o Under the model mentioned above – some networks are critical for utility networks. AMI is not critical. Not capacity either. If we want to get to smart cities, benefit to not each using every bit of spectrum.
- What about each utility – gas, water, electric – if they each need their own, are we working on top of each other, instead of participating together. Another nuance, the physical infrastructure, what can be on that physical infrastructure and keeping the Communication separate on the airways or fiber.   There are problems when the Communication is competing. When you own the infrastructure, you make the decision on who and how it gets process. what are limits? I was thinking of external constrains. One of the overarching questions, who pays and what is equitable. If I'm building an AMI network across the state and utilities build it, then citywide they want to build something on it, do all ratepayers pay for it. If a rural Community gets broad band, apportioning value of that. In Cali, 75/25 rule – if utility builds network, 25% goes back to ratepayer, 75% goes to offset utility operating cost. Is that ratio right? Who and how are we apportioning values of the network? By law not supposed to encumber one rate class with another one's cost. And yet each customer is not equal.
  - o I have concern about the gist of the question entirely. Existing laws that limit but don't prohibit utilities to do that. My concern is this Working Group is about data and metering, and this issue is more for the ratemaking group.
  - o agree, and we're helping the ratemaking and regulatory WG groups by identifying the challenges from a technical side. We're teeing up this important issue for the later WG.
  - o discussed ownership in last meeting. If we're trying to provide a balance, we shouldn't presume ownership at this point of time for utilities.
    - ▪ What if the concern about presuming ownership of?
  - o at previous meeting, ComEd and Ameren gave presentations around owning the components of their Communication networks, as opposed to leasing them from a third party. It's fine if that's the plan, but as far as the report goes, it's reasonable to include that there are examples of utilities not owning the Communication network. Just as reasonable to consider if the utilities should not own the networks. Some utilities have made the decision that don't want to own the networks.
  - o This is both a regulatory decision and technical. To some degree it's a statutory decision. But I have no with noting what is assumptions and not conclusion. Note that there are other systems, but saying that other systems are equal to what we have is also a presumption.
  - o Last presentations were appropriate. The question of ownership is a loaded term. Doesn't carry judgments, utilities have not made firm Commitments. Maybe ownership is not the right word….no issue with teeing up regulatory background that these are technical aspects that affect regulatory, for the later groups to tackle. Maybe a question of how we present it. Maybe what's best for our chapter of the report is to say, this is what was presented by the utilities, a discussion ensued on ownership, and leave it as an open question….it is a regulatory question, many of us who are lawyers know it's an open question.

- One of the reason…50 years utilities owned no Communication infrastructure, because of the services they want to buy aren't available in the marketplace. Is there a regulatory aspect – if you have public airways, should you have to offer what we need to make the grid work. Most utilities – if you ask if they want to be in the Communication network business, they don't necessarily want to but believe they need/have to be. If your own Communication carrier, should you have to offer it to utilities.
  - That's a good question. We can say describe this, and this WG doesn't presume the answer. We flag that issue, give that level of technical description to the other WGs. It's very important for the attorneys in other WGs to understand the technical issues. We could give possible outcomes.
  - One of the other complexities, fiber and network is so much more complex than people realize, many technologies, along with circuits, firewalls, integration of many pieces make it very complex. You're not really going to buy it, all of it, when it's very integrated with internal systems.
- Do case studies on entities that have thought they would get rid of their network and spent money and didn't work. Can the utility act as a large Communication company? X number of devices, we would be rivaling a significant telecommunication company. Look at responding to an indecent. If we own it then we can control the response. But if the power and Communication cables are down, do we have the resources to get both issues resolved at the same time? When I talk to technical people, what does control mean…I have more detail about what's broken. If I'm buying it and there's a strong wall between companies, answer may be a broad range. Lot of what you're getting with ownership, is more information for repair.
  - Often when leased through a third-party, you're at their behest on their schedule of when upgrades are rolled out. Right now if you're upgrading 3G to LTE, we have to do an upgrade on their schedule. If we own it, we can control that schedule and it lowers operational costs.
  - There are different apps of what utilities need than telecoms need.
  - The latency requirement is the issue, when challenges arise. Will it work at a certain level, yes, but cannot guarantee it all of the time.
  - Even across a private network, we don't have as much security as we think we do. I would argue we should provide security.
  - Being able to control Communications during these storms, etc. being able to monitor our own Communications was very helpful. Control mattered so I know where pressure points are and can see the environment better and manage the grid.
    - To reason we couldn't get that service from someone else, if that they aren't offering.
    - The third-parties don't want us in their business. Their restoration of service is not the same as ours. They may just be concerned about bottom line dollars….a phone company is worried about getting the user back on the device and that's an issue of money. Utilities worries are about larger grid concerns.
- The discussion has me wondering, how would a utility Communication network, engage with a peer-to-peer network. How are the utilities thinking of impact of peer-to-peer networks?
  - If in the future, there were peer to peer transactions between producers and consumers, is that what you're talking about?

- In transactive energy future, peer to peer transactions between neighbors or microgrids, what are the utilities thinking about Communication, restoration, how are you thinking about coordinating with those networks? Realize we don't have peer to peer network today, but its' coming soon.
- What does that future look like? Whatever end point is, talking to each other? It's possible…security plays into this, how do you set up so Communication in flowing in the same direction. We have to figure this out – end devices not just talking back to corporate, but to each other or some system of record. We have to figure it out and I think it's very feasible, but it's about how we implement it.
- This is where 5G is going, then you get into the service of peer to peer. Can you get low latency or it go to central security to monitor for cyber security? Have to figure out requirements for each Communication system. Very difficult to come up with proper catalogue – each Communication needs this level of latency and security.
- Could do it on current mesh network. Based on what vendors are telling us about what they can do. The tech will work, but managing the configurations and data is the complexity.
- It will be driven by 5G.
- Things happening outside of the context of the utility, some of the market functions, utility doesn't need to participate with everything, but grid stability and controls is where utility needs to be involved.
- Question is the ability – what level of visibility is the utility going to need about the technology.
- This in return brings up two questions: (1) What role will the utility play in the marketplace of capacity? (2) What role will the utility play in the peer to peer transaction?
- Need metering capability, voltage and current, details about stability of the grid. If assets are already integrated into the market, I don't think the utility cares about peer to peer transactions.
- The Communication needs to occur to inform the market. Capacity and state of the system is very important. And setting the control points for the market…what is the maximum voltage, etc. What are the capacity constraints? What is the state of what the grid CAN be doing.

Question 3: Which Communication protocols should be used on the OT networks (DNP, IEEE, 2030.5)?

Discussion:

- Focus conversation on standardization of the process of how to interact with third-party devices and systems.
  - Standard to add – interconnection standards, look at what 1547 does around Communication, Rule 21 in Cali which govern the interconnection between homeowners and utilities, the value model they're both built on is the Common information model, which provides the data model for 1547 and Communication

standards on Zigbee. Does the ICC need to specify how that Communications are going to be done, like Cali did?

- That's a dangerous question. Are you proposing legislation?
- In Cali not legislation, but rule provided in a tariff. I would say legislation should not mandate that, may be a better decision for the regulator to decide in utility tariffs.

- There's a lot of value …one aspect we undervalue in utility, how much efficiency we can get in streamlining standards. To get economies of scale from manufacturing and consistency of information into devices, it's going to have to be standardized, and it's going to be up to PUCs and utilities to drive those decisions. Thinking about EV charging types, voltages, etc. We get there with tech, but messy road to figure out what's best.
  - Shouldn't market drive some of this? Talk to vendors…if you can meet my standards and device works, we can buy that device quicker than a device that has no standards. Market should solve some problems. If you have a Commodity product, we're going to go with the ones that fit our standards.
  - Try to drive to standards so that we can get what we need out our devices. Also, interoperability. Standards have to meet the customer need. I want to try to drive down price. Do we want regulators and legislators to push that out in front of us? Utilities have to take the lead, since ultimately we buy the product.
  - Step back to Zigbee, when meter manuals looked at home Communication network and developed home devices. Now, Nest is making a good product with wifi, but meters aren't putting wifi chips in the meters.
  - Some comes from users, ease of use. Driving what consumer wants, giving them a product that is easy to install.

- The reason a device has wifi isn't so it can talk to the meter, but so that it can talk to your smart phone which is what the consumer prefers. Consumer wants cheap, reliable power. If those needs factor into that device having a specific spec, then do we drive to do that? From home area network, the idea to talking to the meter is not completely dead, but waning. It will all talk over the internet, not the meter. It could swing back if, will it work if the internet is not there.
  - Rule 21 Cali, Zigbee 2030.5 is embedded as a or preferred standard for things that are Communicating to the network. Shouldn't limit the conversation to 2030.5.
  - 61850, DNP, IEEE 2030.5 the three largest utility standards. Customer side – green button, internet facing.
  - The physical meters are installed to upgrade to new technologies.
  - If the question is, can the manufacturers incorporate new Communications onto existing Communication paths, yes, they can. It can take a lot of money. How can we increase interoperability while ensuring security protocols? If you put an EV on there, it's going to talk 2030.5.
  - Providing the profile that spells out what can be Communicated. New things are coming, but we don't have the customer demand to drive it. A question – testing, certification – how do you prove conformance to a standard. Not the only utilities asking this question.

- clarifying point: a lot of these frameworks, standards, they define the message structure and how you're going to talk, who are you talking to and what is the data that you're sending. Home

energy profiles more specific about that. DNP covers how you're going to talk to each other – not what the data, Communication is. When there is demand, sufficient volume, several ideas in the marketplace…one idea will rise to the top. Think of ethernet, there were hundreds in the beginning. Took 15 years to get to a standard ethernet. The one that won had lowest cost. Home energy profile 2.1 – how do we fit the code into the memory space in the meter? This was the biggest challenge.

- o To get to the question, it's a timeline question, how soon do we think the market will solve it, versus the need. Cali thought there was a need, thought they couldn't wait for the market so they made the rule, Rule 21. Does Illinois need to set a profile or a pathway like that for home area networks, smart inverters, other things we're contemplating? If there's not a need for it now, these are the general frameworks. Or do we see that smart inverters need regulation – do we set a working group to study regulatory standard?
- o IL has been successful in the past with working groups…the answers in the working groups weren't frozen in tariffs or rule. Don't think it's a two-way answer – just either market or regulation. Many more options than just these two.
- o The utilities' ability to shift with markets versus the private sector. We need flexibility, don't want to regulate ourselves into an old way of thinking.
- o Home area network question, that is a legislative question.
- o The real alternative for home networks is the smart home appliances which are using broadband connection. What does the meter need to provide – meter provides usage, and so if devices need usage? Very little in the home that needs that. Broadband is the solution for home devices. Almost want regulations that dictate what we want to see in the future, now how.
- o Cali Rule is flexible for the transport. Protocols in the tariff for how to Communicate and what data model looks like.

- Is there anything, going back to first questions, is there anything coming from a market standpoint that isn't being provided. Real-time rates. Customer profile adjusting to the market. What would you love to offer today but you can't because of data and Communications standards that are out there?
  - o two big things coming:
    - 1.) residential perspective – piloting peer to peer transactions with residential customers. We are able to do it and it's a financial question, but utility systems comes into play for us.
    - 2.) Commercial and Industrial come with resiliency questions, and ask how they do it themselves? Microgrid all the way down to battery. What can I add to the system that won't hurt utility.

Additional Communications Topics

Discussion:

- Standardization of Communication – can it be standardized across the country, not just Illinois?
  - o There is a group but you have to pay for that standards.
  - o That goes back to 5G discussion, a lot of good ideas but who will pay for that.

- o There is schema for green button on their website, making it publicly available. But to be certified you have to show that you've bought it. You still have to buy the standard…green button will be $250 or $500…at least having the schema you can start building the product.
- Last discussion, hit on how control signals might be different based on capacity in the system. Didn't feel we had consensus on: When we're talking behind the meter, are we sending price signals, controls or both? People agree the market should solve the problem, purely financial, but there might be times when swing for the price signal for direct control message aren't appropriate.
  - o I see a toolbox of applications. Zigbee, wifi…
  - o You don't have to control al the devices to have grid stability. Maybe in spring you can be more aggressive…summer, less room to maneuver.
  - o Don't forget– looking at it from utility setting those prices, but in Illinois utilities aren't setting the prices. I go to gas side, penalties that apply to suppliers if they go outside the tolerance band. Don't think we should leap to utility tariff rates. Don't like the idea of too far into penalizing suppliers. But responsibility goes to suppliers, rather than customers.
  - o Agree utilities aren't setting those prices. Price set by market, other factors. No limits on price. Limits on amps, volts, frequency, to get grid stability. If you can't do that, maybe there are penalties.
  - o This market is going to be very different than transmission market than we're used. For this group it's a question of what does the Communication do, not what the market does.
  - o Some of the research doing EMLC, about Communication architecture could be useful.
  - o we could link to the project in our Working Group report, even if it's not done. We would like to reference other activities in the report. Please contact us with the group.
  - o Hard to divorce Communications from market. We have a transmission system that works. Illinois law says IPA has to procure 13% from renewable now, 25% by 2025. We're creating a system where equivalency of natural disasters will happen all the time – because of intermittent nature of solar and wind. Pessimistic about how much storage will be available. From CTA perspective, I want the pricing signals to happen in real time. If I'm told not to turn on - there's a value loss for me if I'm not using the product. He feels that Communications has to happen much faster. It's not an open market – as opposed to NYSE doesn't tell me when to buy and sell.
  - o When he says 'signal' sent in spring and fall, he means Communication signal to see if you're up against a limit, I'm not telling you to buy or sell, but you have to maintain so many volts, so that is your limit, you can sell up to that limit. This is something you would have to adjust very often. Conversely, you can take energy up to xx volts, and then the grid can't support you.
  - o Gets back to the point made earlier….it becomes so complex in the future. Ultimately, it will be the behavior on your vehicle feeder, but also feeding into grid from nearby devices.

Adjourn

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