

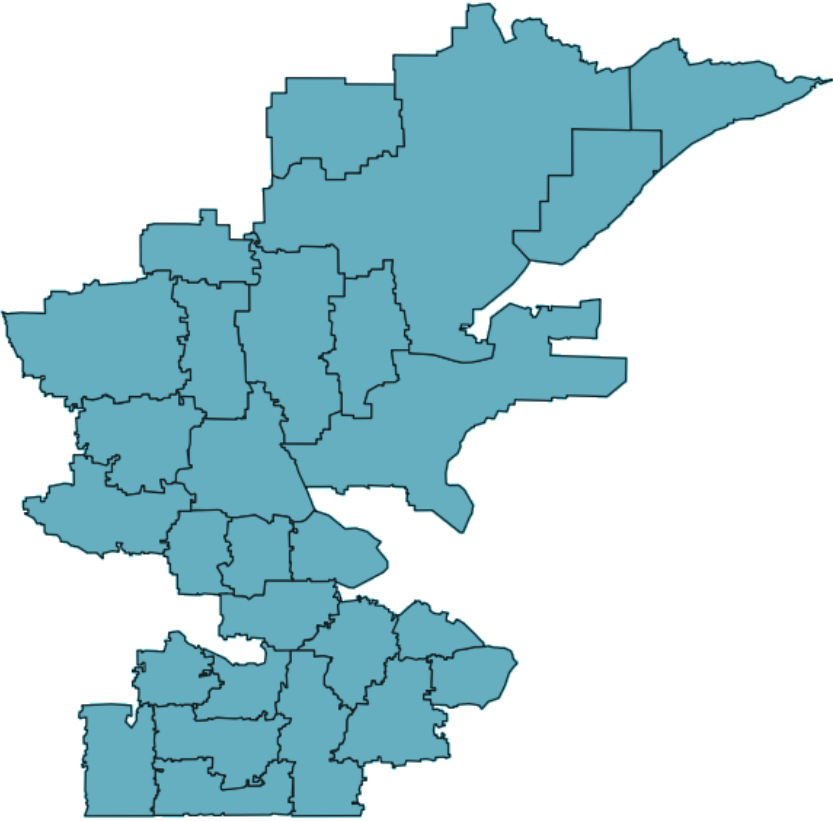
The Demand-Side Management Innovation Initiative

Final Report

October 2021



**Electric
Cooperative**
Innovation Center



**GREAT PLAINS
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The Demand-Side Management Innovation Initiative
Final Report

Research Team:

Gabriel Chan, University of Minnesota, Twin Cities
Matt Grimley, University of Minnesota, Twin Cities
Jamison Stallman, University of Minnesota, Twin Cities
Eric Barry, University of Minnesota, Twin Cities
Lissa Pawlisch, Clean Energy Resource Teams
Trevor Drake, Great Plains Institute

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Contact: gabechan@umn.edu

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Building Vertical Alignment:

A Summary and Evaluation of the Demand-Side Management Innovation Initiative Process

Dr. Gabriel Chan, University of Minnesota

Matthew Grimley, MS, University of Minnesota

Jamie Stallman, MS, Great River Energy

Eric Barry, MS

Lissa Pawlisch, State of Minnesota

Trevor Drake, Great Plains Institute

Executive Summary

This report summarizes the Demand Side Management Innovation Initiative (DSMII), a one-year partnership between Great River Energy (GRE), its member cooperatives, the University of Minnesota, the Clean Energy Resource Teams, and the Great Plains Institute. DSMII conducted interviews, engagement sessions, and focus groups with GRE and GRE-member staff to learn about the opportunities and challenges for the future of demand side management (DSM) in GRE's system. This report summarizes the key findings and recommendations of DSMII, namely the need for stronger collective action to govern DSM and the need for spaces to more actively learn and experiment across the GRE system.

This report concludes with a proposal for continued collaboration between GRE, its members, the University of Minnesota, and the Clean Energy Resource Teams to advance the recommendations of DSMII. The proposal for continued work focuses on continued collaboration on advancing innovation in DSM and other distributed energy resources (DERs) in a Distributed Energy Resource Innovation Initiative (DERII).

The proposal for continued collaboration would contribute to establishing deeper research collaborations between universities and cooperatives as part of the newly formed Electric Cooperative Innovation Center (ECIC), a collaboration between the University of Minnesota and the University of California-Davis.

DSMII Created Grounds for DSM of the Future

Over the course of 11 months, from November 2020 to September 2021, the **Demand Side Management Innovation Initiative (DSMII)** sought to engage Great River Energy (GRE) and their member electric cooperatives in an ongoing discussion and exploration of the role of DSM in the changing energy landscape.

Created as a joint initiative between GRE, the University of Minnesota, the Great Plains Institute (GPI), and Clean Energy Resource Teams (CERTs), DSMII served as a **collective brainstorming and deliberation process** for the examination of the value of DSM to GRE and its member co-ops, as well as the future of DSM programs. DSMII's structure represents a replicable model for research-informed engagement within a generation and transmission cooperative system to facilitate collective deliberation.

Seeking to build **vertical alignment** in the multi-level cooperative structure (Figure 1), our group structured the initiative around four guiding principles in partnership with our participants:

- Enable understanding and collaboration
- Plan for the future
- Assess current policies and programs
- Focus on value

Engagement sessions with all stakeholders brought a large group of voices together, while additional planning sessions, interviews, and focus groups continued the engagement process in other forums. A summary of DSMII's research-engagement process continues below.

Engagement Sessions:

Member cooperatives, GRE, and the research teams all participated in the six large-group engagement sessions. Cooperative attendees held various positions within their cooperatives, including member service manager, vice president, power supply manager, and finance manager. Our team convened six times over nine months to provide project continuity, facilitate group discussions, and create a common understanding. A kick-off meeting set the stage for the initiative and future discussions, while the next three meetings focused on desired outcomes, key issues, lessons learned from current programs, and DSM in the future. The fourth and fifth meetings centered around the focus groups, reviewing their findings and discussing potential pilot projects and next steps. The final meeting focused on the roles of ACES and GRE and discussed project metrics and feedback on the DSMII engagement process.

Planning Sessions:

Our team regularly consulted with GRE's Member Services department on topics ranging from engagement and strategies to DSM evaluation tools and technical specifics. Information

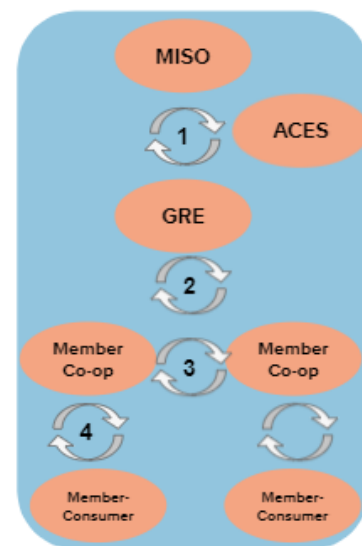


Figure 1: Building Vertical Alignment in Great River Energy. The multi-level structure of GRE, its co-ops, and member-owners is intermediated between 1) the wholesale market, third parties like ACES, and GRE, 2) GRE and its member co-ops, 3) between the member co-ops themselves, and 4) member co-ops and their member-consumers. Image created for DSMII engagement sessions.

sharing and the cross-pollination of ideas provided important insights into the local contexts of the individual member cooperatives.

Interviews:

Through small-group interviews with staff at the co-ops and GRE, a baseline list of DSM challenges and opportunities was identified. Broken into five categories (economic, social, administrative, policy, technical), DSM topics were explored with each cooperative individually. A synthesis report was then assembled, teasing out common themes from the private interviews (Figure 2). While interview details and quotations were kept anonymous, these findings were used to inform the large-group discussions and tailor agendas to relevant topics. All member co-ops were represented in the interviews.

Focus Groups:

Member co-ops engaged further on DSM topics through focus groups. Similar co-ops were placed together in order to guide discussions in constructive directions and identify areas of commonality. The focus groups were centered around three critical areas of change: technology, markets, and rates. As GRE prepares for a changing future, it is critical to hear the thoughts and concerns of the member cooperatives (Figure 3).

Evaluation: DSMII Needs Collective Action

While DSMII seemed helpful to GRE member cooperatives, and to our own project team, in further understanding of DSM's roles in GRE's energy transition, our team wondered what it might take to lead these ideas into action. Several ideas for pilots and other actions were offered during the focus groups and last engagement session (Box 1).

Building off those ideas, our team begins below to evaluate the DSMII process in terms of governance and innovation among the participants. The evaluations are a mix of our own ideas and participants' ideas throughout the DSMII process, and surmise potential collective actions in each area.

Governance:

Across the DSMII events, 17 employees from 14 co-ops made up half of all attendances at DSMII events. While employees from larger and fixed co-ops typically showed up to more events and

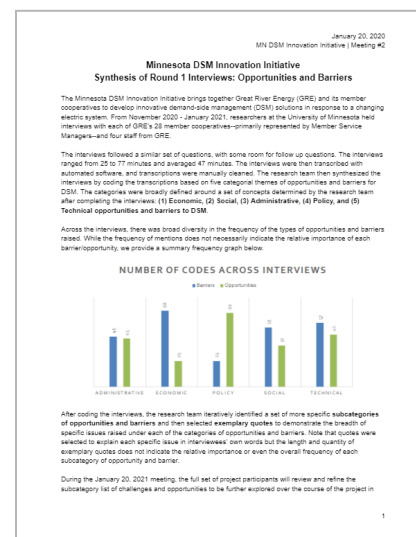


Figure 2: Synthesis Report of DSMII Interviews. Among the common themes, participants often expressed a desire for a clear valuation of DSM, a concern over cross-subsidization in the cooperative governance model, a desire to embrace future changes as opportunities, and a hesitancy to be early adopters without sufficient data and resources.

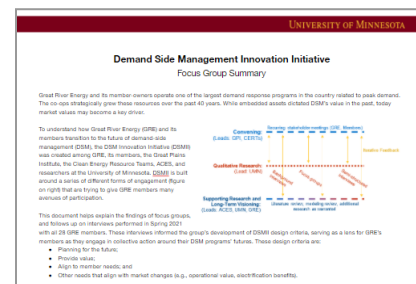


Figure 3: Focus Group Summary Report. Groups included small fixed members, large fixed members, and members located in different areas of the state (metro, South and West, North). Among numerous thoughts and concerns, member co-ops brought up issues of technological reliability, member flexibility, and institutional and market transparency as important topics to address in order to move forward.

Box 1: Pilot Ideas and Actions Going Forward. Building on ideas for actions generated during the interviews and focus groups, our last engagement session brainstormed several pilot project

participated more, and smaller co-ops were often under-represented, it was hard to generalize who would choose to participate and who wouldn't.

Instead, DSMII participation tended to focus on key individuals who worked in multiple disciplines of the utility world and the unique history of the GRE family. Newly hired employees, those joining on behalf of superiors, those with quieter participation styles, and those pressured by more important work tasks or emergencies, seemed left out.

Participation in DSMII (Figure 5) was on an opt-in basis, during the COVID-19 pandemic, mostly among member services personnel, and is not indicative of the whole of participation in the GRE system. Full participation during the interviews was only achieved through negotiating, reminders, and accommodation. This relates to what we heard from co-ops throughout the process, that participation in and across other forums -- committees, boards, departments, and groups -- can be enhanced by working to support the many on-the-ground member services personnel. Creating more support creates more certainty for co-op employees that their collective actions will bear fruit.

This participation leads us into general governance, which is the rules, norms, and strategies used within the co-ops to create stability and change. The heart of DSMII referred to the need to change from the "old world" of embedded costing toward the "new world" of incremental or marginal costing, as the wholesale market presents new opportunities for aggregation and value for DSM resources.

Like many utilities, GRE has an opportunity to move wholly into the new world and capture new values. There are many realms where this value can be accounted for. For example, resource planning has yet to fully take into account DSM. While moving ahead on rollouts of a Demand Response Management System (DRMS), the idea of a true Distributed Energy Resource Management System (DERMS) is still untested for GRE. Sale of Coal Creek, the Member Directed Resources initiative, and the individual strategic organizational moves of different co-ops are on everyone's minds. Weighing these multi-scale changes, member co-ops (and GRE) know and feel that change is wanted.

Essentially, DSMII focused on the co-ops' middle managers, managing between different dualities of the new and the old,

- ideas:
- Complete Distributed Energy Resource Management System (DERMS) set-up
 - Residentially- or community-sited battery with cooperative ownership
 - Electric vehicle batteries
 - Non-wires alternatives
 - Marketing practices for residential member-consumers
 - Strategies for working with aggregators or C&I member-consumers

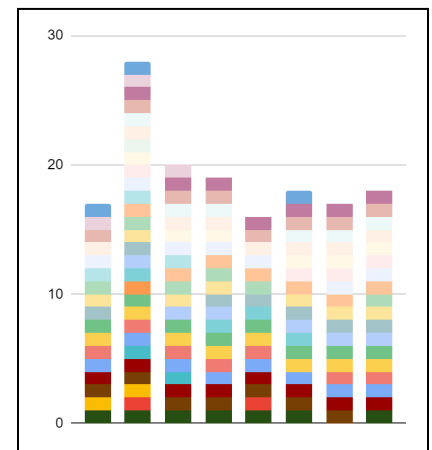


Figure 5: Participation Counts of Co-ops Across Engagement Sessions, Interviews, and Focus Groups. Interviews (second column) involved all 28 co-ops, but about 10 of GRE's co-ops were absent from many other DSMII events. As indicated in interviews and focus groups, it's possible that GRE's membership will include predictable early adopters and laggards as they transition toward the future of DSM. While some never showed, and others showed every time, the average attendance among employees was 2.78 out of a possible 8 attendances. The average deviation of our sample is 85.8%, showing a wide variation in participation.

between public and private organizational needs, and satisfying member-consumers on one hand and executives on the other. Participants often described the delicate weighing of trade offs in decision arenas for DSM in our events. While internal surveys from GRE showed, and DSMII helped elaborate, that most co-ops wanted to know the true “value” of DSM (Figure 6), or the exact number of its avoided costs, it remained debated in our groups what “value” even means.

To find the right “value,” co-op employees prized different social, administrative, cultural, and economic solutions to solving their dualities. Here we suggest that member co-ops have a strength in their abilities to make decisions collectively. To leverage this strength, GRE might create governance forums to find, through trial-and-error, different DSM and system rules that work for the whole.

Innovation:

Working through their policies, programs, and projects, DSMII participants showed a wide breadth of knowledge, creativity, and capacity for innovation. This was often despite the time or resources for idea development, research, and application, making the innovation all the more impressive.

As innovation managers, co-ops displayed a tendency to rely on vicarious learning from other co-ops. Often these learning spheres were among friends, or certain co-ops or regions of co-ops. Though co-ops prized technological and economic solutions over administrative and social solutions, they often worked outside of their silos to make tech solutions workable across domains. For example, CFOs worked with member services, member-consumers worked with billing, and data analysts worked with grid planners. While GRE and the co-ops were also often concerned about who should take the first step on innovation, citing (for example) the difficulty of knowing whether actions were core or non-core expenses, their abilities in innovation should not be underestimated.

For innovation to work fully within co-ops, it needs breadth and depth and stability. Everyone seems to see that innovation is needed throughout the GRE family to transition to the new world (Figure 7), and while many are doing it, their entrepreneurship is just beginning to scale.

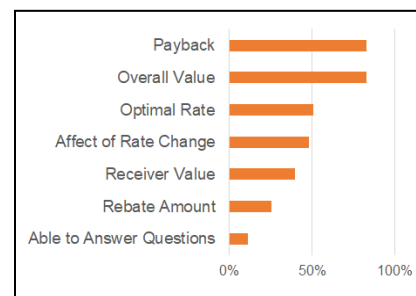


Figure 6: Common Questions about DSM from GRE Members, as Percent of Total Respondents. More than 80% of respondents (29) had questions about payback and overall value of their programs, while only 11% (4) had the tools and resources to answer these questions. 35 member co-op respondents answered this survey from GRE Member Services staff in March 2021.

Background

Great River Energy and its member-owners operate one of the largest demand response programs in the country related to peak demand. These resources were grown organically over the past 40 years with the realized value of demand response being driven by strategic provisions in GRE's wholesale contract.

GRE's historical ability to create long-term value for its members has been driven by embedded resources, like Coal Creek Station, to directly serve our member-owners before the Midcontinent Independent System Operator (MISO) was formed. Consequently, GRE's resources were designed to recover the costs of embedded resources. Changes to GRE and its member-owners' power supply will result in a larger dependence on the wholesale MISO market and variable generation resources. Now GRE has a new value proposition: to leverage resources that are tied on the distribution systems of our member-owners as a wholesale market hedge against our daily load needs.

These changes require GRE and its member-owners to adapt and evolve the demand-side management (DSM) resources to realize greater value from the wholesale market related to the operational capabilities of demand-side resources and other distributed energy resources (DERs). This evolution is the focus of the Demand Side Management Innovation Initiative (DSMII), which has facilitated discussions with GRE and its member-owners in both group discussions and one-on-one interviews to ensure the capabilities of these resources are responsive to the long-term needs of GRE's member-owners.

Long-term needs of the member-owners have been summarized as design criteria that have been established through facilitated discussions of the DSMII. These criteria are:

- Planning for the future;
- Provide value;
- Align to member needs; and

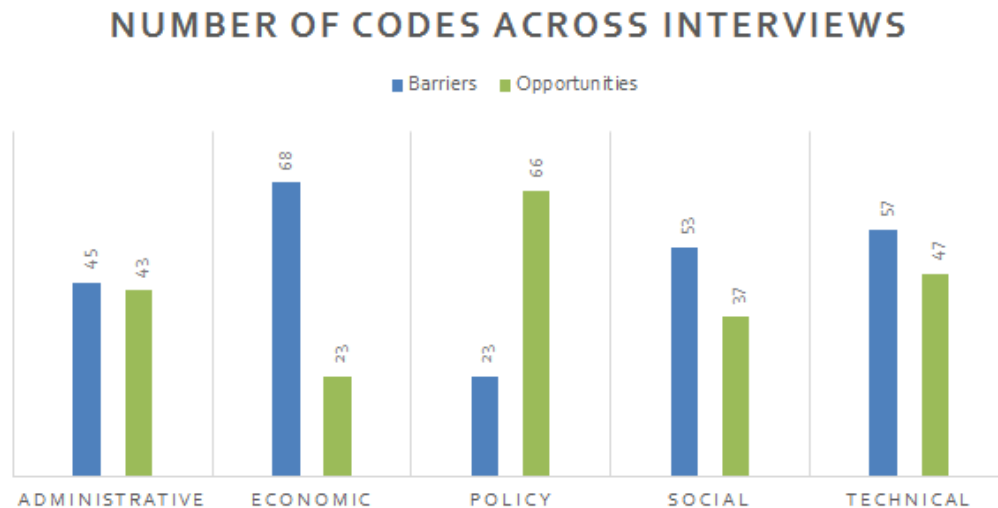
Figure 7: DSMII Primer, Prepared by GRE Staff for the DSMII Process. The Primer describes historic, current, and future trends regarding DSM in the GRE system. Showing time periods of innovation for DSM over the next decade, it looks at how technologies, markets, and rates might innovate.

Minnesota DSM Innovation Initiative Synthesis of Round 1 Interviews: Opportunities and Barriers

The Minnesota DSM Innovation Initiative brings together Great River Energy (GRE) and its member cooperatives to develop innovative demand-side management (DSM) solutions in response to a changing electric system. From November 2020 - January 2021, researchers at the University of Minnesota held interviews with each of GRE's 28 member cooperatives--primarily represented by Member Service Managers--and four staff from GRE.

The interviews followed a similar set of questions, with some room for follow up questions. The interviews ranged from 25 to 77 minutes and averaged 47 minutes. The interviews were then transcribed with automated software, and transcriptions were manually cleaned. The research team then synthesized the interviews by coding the transcriptions based on five categorial themes of opportunities and barriers for DSM. The categories were broadly defined around a set of concepts determined by the research team after completing the interviews: **(1) Economic, (2) Social, (3) Administrative, (4) Policy, and (5) Technical opportunities and barriers to DSM.**

Across the interviews, there was broad diversity in the frequency of the types of opportunities and barriers raised. While the frequency of mentions does not necessarily indicate the relative importance of each barrier/opportunity, we provide a summary frequency graph below.



After coding the interviews, the research team iteratively identified a set of more specific **subcategories of opportunities and barriers** and then selected **exemplary quotes** to demonstrate the breadth of specific issues raised under each of the categories of opportunities and barriers. Note that quotes were selected to explain each specific issue in interviewees' own words but the length and quantity of exemplary quotes does not indicate the relative importance or even the overall frequency of each subcategory of opportunity and barrier.

During the January 20, 2021 meeting, the full set of project participants will review and refine the subcategory list of challenges and opportunities to be further explored over the course of the project in

focus groups, additional interviews, and group meetings. The initial list prepared by the research team is summarized below:

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1. Economic Barriers and Opportunities

1.1. Barriers

1.1.1. Difficulty Identifying Many Different Values of DSM

*"The key thing for us is really **putting a value on the programs.**"*

*"It's not just important to answer the question on what the value of DR is today. It's important, even more important, perhaps, to answer the question, **what's the value of DR...after Coal Creek retires.**"*

*"We see that **value of the air conditioning load, significantly decreased.** ...one of our challenges moving forward in the next few years is modifying all of those AC programs to get them in line with the cost versus the benefit to our entire membership into our system on those AC programs"*

1.1.2. Potential for Cross-Subsidization Reveals Equity Concerns

*"I understand renewable energy, I understand a clean environment. But that model of **having the rest of our membership basically pay the cost for somebody else** that can afford something like that **is wrong.**"*

*"Going forward, those members that want flexibility can choose to procure power supply outside of GRE if they want. But we're also trying to set up a framework (and it's a very straw horse right now) whereby those members that don't want that flexibility, they like the requirements aspect of our contract, can continue to take all requirements, power supply services from us. So the trick is, **how do you calculate rates for the folks that have flexibility? How do you calculate rates for folks that don't? Making sure there's not cross-subsidization going on.**"*

1.1.3. Cost of Replacing Control Technology is a Financial Burden

*"Now we have to **replace our current control system with a new system and [it's] very expensive.** And it's new technology. And how do we go about implementing this in the most cost-effective manner?"*

1.2. Opportunities

1.2.1. Exploration of a Time-of-Use Rate Could Benefit DER Deployments More Broadly

*"As to the time of use... **I'd really like to see GRE offer some type of incentives** or, you know, see where GRE is on that or where other cooperatives are."*

*"That's one thing I'd like to add, I really see **time of use, especially with the EVs.**"*

1.2.2. Potential Values of DSM Remains High as Power Supply Leans More on Market

*"I foresee the value or the need for load management to probably be even **greater than it is today.**"*

1.2.3. Economic Evaluation Remains Important for Both Current and New Programs

*"The concern to me was like air conditioners and air source heat pumps, **whether those programs are actually beneficial.**"*

*"If we find that **some of [our DSM programs] just are a thing of the past**, then we decide how to let go of them and not put the financial investment into replacing more control receivers and things like that."*

2. Social Barriers and Opportunities

2.1. Barriers

2.1.1. Generational Differences in Attitudes towards DSM Present Engagement Challenges

*“I think a lot of the more older membership understands that by participating in this, they're helping us **keep our costs low, which in turn keeps their costs low**. You have the younger ones that...understand it because, you know, it's a technology based world and they get it, and then you have, I'd say, **the vast majority of younger people that they don't care if they want their electricity, they don't want to be burdened with control.**”*

*“The older people are harder to engage with these programs because they've been with us from **the start**, say they're concerned about their rates and so forth, just like when somebody is out of power. I guess they don't want to notify us unless they're out of power...**But the younger members are harder to get them to understand the value of our load management program.**”*

2.1.2. Many End-Users Seek More Choice and Control Than in Years Past

*“The increasing demand for clean and renewable energy and **that consumers want more control and choice in their electric service**, whether it's choosing their rates [or] more control over their usage.”*

*“Every year we lose participants. You know, it's hot and my house is super hot. Get this thing off my house. I want control. You know, every year we lose participants for those type of events where...**they can't control the environment in their house.**”*

2.2. Opportunities

2.2.1. Tech-Savvy Members Ready for More Control through Smart Appliances and Wi-fi Technology

*“I think a lot of the younger members...want to take control of some of those things and they don't mind doing it on their own. They want to be more hands on. So I think there may be some potential there to see what might work for them. **And they're very tech savvy, so they have their smart thermostats and look at their phones and do things so there's probably a whole world of potential.**”*

2.2.2. Member Engagement Critical to Maintaining Co-op Relevance through Future Changes

*“The big thing in the future is going to be **consumer engagement, putting more information in the hands of our member owners so they can take ownership of their energy usage.**”*

“Right now we have a Stihl battery powered weed whip rebate and it has nothing to do with electrification, but it's about giving our members comfortable with battery technology because that's where the future is going. And if they can weed whip their yard and say, hey, this battery powered weed whip works really

good, that's going to change your mindset when it comes time to buying an electric vehicle. **And when they buy that electric vehicle, if they can remember having the first battery powered thing I had was from the co-op and it worked really well.** And the co-op saying, hey, you should put your car on a time of use rates where it makes sense for America and the nation and the cooperative to be able to charge this car at times that make more sense for the power grid and things like that. That's kind of the way we've changed the mindset over the years.”

2.2.3. Collaborative Learning between Co-ops, Working with Contractors, Offer Positive Returns

“Like I said, being face to face...with other people that do the same position at another co-op. And, hey, what are you guys up to for doing this? We've had this success....**That's probably the best way...to learn more about the real life knowledge, to learn more about the DSM and other real life cases.**”

“I try to key on contractors because I don't have the time or I can't go meet with every member. **If you hit 20 contractors in the area** that are selling the equipment or putting the equipment in, let them know what you have. **That to me, that's the best way to push it out to the membership.**”

3. Administrative Barriers and Opportunities

3.1. Barriers

3.1.1. Lack of Staff Capacity Across Different Types of Utilities

*“We want to adopt some of this new stuff, but we're not the guinea pig. **We can't afford to be the guinea pig. We just don't have don't have the manpower or the financial part of it currently to do that.**”*

3.1.2. Lack of Coordination Across Boards, Managers, and Member Services

*“There's an understanding of the value of DSM from the member services cohorts they have across co-ops. **Communication on short term gain versus long term value is not being presented well enough to the board level and manager level.** There's a lot of looking for short takes and quick wins and playing a short 3 or 5 year game versus a 10 to 15 year game, and I think that part of that honestly stems out of the fact that these programs have been around for a long time.”*

3.1.3. Lack of Coordination Across Utilities, Customers, and Third Parties

*“You know, they want to put in a smart thermostat to run their air conditioner. And they want us to give them a rebate. **They want to know, do we have a time of use rate** for that where they can monitor their own water heater? I had a guy called the other day, he's into it. He's got an EV. He's got an electric water heater and he's got basically a whole home automation. He wants a time of use rate where [he] can kind of run [his] home pay what [he] wants. **It's like, no, and GRE just doesn't offer [it and] we don't get any discounts. It's hard for us to give a discount to a member or not getting a discount from the G&T.**”*

3.2. Opportunities

3.2.1. Potential for R&D with Data Analysis and Evaluation

*“I think that the opportunities are in finding ways to use [data]. We all have meter data management systems where we have data with many AMI systems being put in place. **There's a lot of ways to look at, and use that data to find other rate opportunities, other program opportunities or to promote and to really understand values of programs as they grow.**”*

3.2.2. Eagerness to Learn, Implement New Programs

*“I tell our younger staff here, your future is going to be fun. **There's going to be a lot going on with EV's, beneficial electrification, the information we're going to be able to give our members the technology.** So I fully expect to see GRE be a leader and be engaged in this.”*

4. Policy Barriers and Opportunities

4.1. Barriers

4.1.1. The Conservation Improvement Program Is Not Entirely Supportive of DSM

*“But, you know, our demand-side management programs have been successful for people, correct me. But that over 40 years and when, you know, when energy conservation was not even talked about, though, I look at the cooperatives as being a leader. But **when state laws and mandates and federal mandates came down, none of that was taken into account that we’d already done it. And we didn’t get credit for a lot of that**, where others who basically took our ideas and ran with them got all the credit in the world. They got the low hanging fruit.”*

*“The other piece is maybe a little bit more impactful to my work is around energy policy in our state thinking. Very specifically, of the 2017 Minnesota next generation act that governs are CIP programs and in thinking about that **legislation is 13, 14 years old**. Thinking of how some of the metrics with those programs might better support things like beneficial electrification, especially coupled with our decarbonizing power supply to really drive emissions reduction in our state.”*

4.1.2. Fixed Members See Fewer Incentives. Benefits from DSM

*“The only other thing that’s a challenge. And again, this just goes back to being a fixed co-operative. And this is based on this is a GRE research project. But and this is just the way it is, is we don’t get to participate in the. All the rebates that the other GRE cops have now, we could, but **GREs subsidize those rebates and where I don’t get any subsidization from Great River for the rebates**. And that’s just the way the power contract is not a big deal.”*

4.1.3. State Permitting Requirements Sometimes Hurting, not Helping

*“Is it worth continuing to do demand response and spend two hundred bucks for an AMI enabled load controller, plus the labor to install it, plus the electric permit that they’re going to have to pull for every single one of those. And those are thirty five dollars a pop. And you might have heard some of our members talk about they’re unhappy that the **Minnesota Department of Labor and Industry is requiring that they pull an electric permit for every one of these new load control receivers** if they have to install on the home to replace the one that’s currently out there. And they also have to use a licensed electrician to do that work. And so some of our members are really, really unhappy with the Minnesota Department of Labor and Industry.”*

4.2. Opportunities

4.2.1. Establishing Strategy for EV’s Now, Before Mass Adoption, Critical for Program Success

“We want to get involved early with people to shape their charging habits so they’re not coming home, plug in their cars right at the dinner time when they get home from work, that is if we ever all go back to work again. And those charging programs, **I spent my whole career chasing loads after the fact.** To try and manage those loads, this is one time we can get out in front of them, so we really work hard meeting with dealers to get those electric cars on a charging program which encourages overnight charging.”

“we are really working towards having, you know, a strong programs with EVs as any adoption happens. **We’ve done a lot of work in that space, learning about the technology and learning about the usage, the impacts to our system.** You know, what happens with clustering takes place with EVs on our system and just trying to make sure we have the right programs in place. So we’ve gone through an initial pilot study with just to understand usage patterns. We’re now going to an additional pilot study after we did our cost service study. And [name] can maybe talk about this a little bit more, but we’re going to be introducing a subscription rate.”

4.2.2. Changing Power Supply Offers More Flexibility to Member Co-ops

“I think that there’s a lot of different opportunities there, especially now with so much solar and wind coming online, that that’s one that’s why we’re looking at this right now, is because we’re controlling today versus yesterday is totally different for the load management control and the demand-side management in general. **We weren’t part of the MISO market years ago, and when these programs were designed and everything during the day was bad, everything at night was good, which now is evolving with so much more production becoming more relevant during the day.** So things are going to have to change. It doesn’t mean that our existing equipment is bad or is obsolete. It’s just that now we do have options to explore with daytime hours as well.”

“Now, with our changing power supply, we’re going to be in a fairly good position to give the members more flexibility than they’ve ever had because of the market exposure piece I mentioned before will be exposed to the market for capacity. But we’re also going to be exposed to the market for a certain amount of our energy as well. And so if our members would prefer to procure their share of that market exposure on their own, that, then that’s just fine with us. But there are some members that don’t want anything to do with that, too”

5. Technical Barriers and Opportunities

5.1. Barriers

5.1.1. Managing Technology Deployment Amid Uncertain, Competitive, or Aging Technologies

*"95 percent of our service territory is covered by natural gas. So when a member builds a house and they have a choice between natural gas or electric heat, we tell them natural gas. **From a member standpoint, we're going to advise you natural gas is going to be the most cost-effective option, right?** Whereas a lot of Co-ops, they don't have natural gas, they don't have that level of penetration."*

*"But that's high-speed Internet access for rural America. And, you know, there are things coming. We know there are, **but it's hard to tie this technology piece in when the access to the Internet is limited.** But as more and more of that comes out, then we will see more of this technology going."*

*"Each of those [AMI] cost me over two hundred dollars apiece. Whether someone is getting on peak shave AC and getting the credit for that or they're coming in with a whole electric heating system. **So whether the benefit is greater or not, it's two hundred fifty dollars apiece for these switches.** And then I'm paying internally ninety dollars apiece to have them hung. And when and if they go bad or fail, the member has an obviously poor experience because of a piece of equipment that's ours goes bad. And now their member satisfaction with my load management program is very low because it's a high, highly negative impact and a very impactful one to them. So my thing is this is a long term. How do I get away from that? I don't want to switch. I don't want my equipment in play."*

5.1.2. Current Technologies, Operational Strategies Sometimes Fall Short of Utility, Member Needs

*"We can have different peaks like the GRE peak might be in the evening and for other power supply or it might be earlier in the afternoon. So then we run into situations where we might have to be controlling, say, starting at noon and we might have to control till 4:00 p.m. to cover that peak. And then GRE control kicks in from four to nine. **So the challenge is to not over control because that can make members angry and are also losing some sales after controlling.**"*

*"Some of the older electric heat systems that maybe can't handle the load control. There have been some that have been **not happy when we tell them without proper backup, you have to go off the program.** And a lot of people are kind of disheartened by that because they've been involved for so long and they like a little bit of reduced rate that they get."*

*"And we really you know, in the 11 years I've been looking for other opportunities that will accomplish similar things to what [name] has on the residential program. But either trying to adapt those to a commercial hasn't really been feasible. And we've had a few at the thermostat program and so forth. But most of them or cycle AC even, but **most commercial members don't want to do those kind of things because they don't want to impact the comfort of their customers** or other types of issues like that. And then as far as large building management systems, again, where, you know, most of our members*

are either way too big, it would cost, you know, high, high six figures to do a complete building management system or they're so small."

5.2. Opportunities

5.2.1. Emerging Control Technology Offers More Capability

"We're also in the midst of replacing all of our load control equipment and doing that, we get further enhancements as far as visibility, visibility into usage, how and when it's used to load curtailment, what do we see, what do we get and what is the participation level, all those kind of things. **So I think we have greater ability to do load control.**"

"If you're at home and it's off and you want it on, you go in and override it. It's... going to be a home network system. And **that's really the direction all this stuff is going with the Smart Home Network.**"

"We have really not consistent Wi-Fi or broadband in our area. But we've also thought about the smart thermostats. ...GRE is talking about or working with a company... Aquafin... to put a device on the water heater that allows the member to understand that they have 50 percent hot water left or whatever it might be, just **another education tool and allows us to control that, gives them a better understanding of their savings** and where we're at with the program as well. So that's kind of a rough answer, but we're really open to any suggestions or anything that's going to help our membership."

5.2.2. Emerging End-Use Technology (including EVs and Storage) Likely to Impact Future Load

"**The other thing... that I find really intriguing is EV's...** Yes, we've seen studies. Yes, we've seen all sorts. But that is just a huge amount of unknown that we're all just throwing darts at and from terms of what that load is going to do to our existing system. Can we shift it at night to how many hours do they need to charge at night? To take that a step further, can I take that remaining 30, 40, 50 percent of battery charge that that car has left when they plug that in at four o'clock, when they get home from work? Can I plug that in and now use that as a battery storage system and dump that back onto the grid until 9:00 p.m. when I get past the peak and now I'll start charging that back up at midnight? How much load shifting can we do with these things? And **that is just a wide-open target right now that I don't know anything about, I find it extremely intriguing and I'm not sure anybody knows a lot about [it].**"

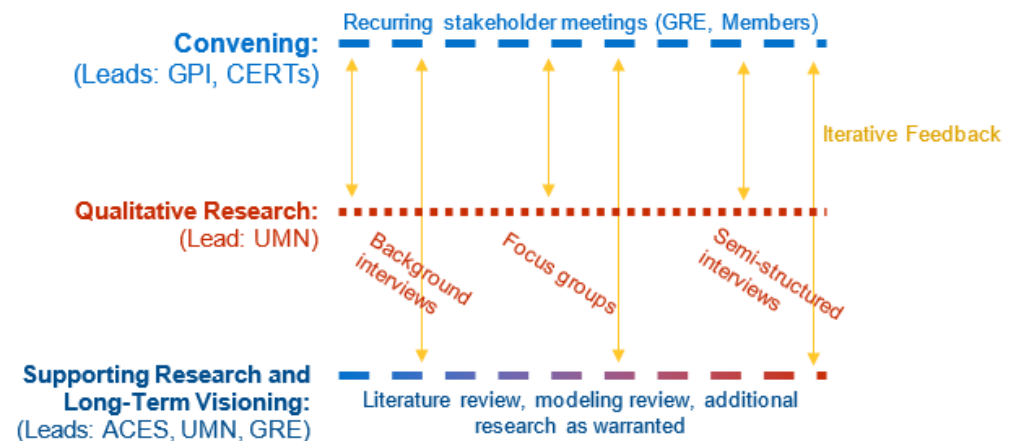
"And I think emerging technologies is a very broad topic, and I do understand that, but whether it's specifically electric transportation or whether it's something for storage, **I think emerging technologies is going to play a huge role, and I think staying on top of that, staying in front of that, being that expert, being that that source for our membership is something that should be very important to each of the cooperative's.**"

Demand Side Management Innovation Initiative

Focus Group Summary

Great River Energy and its member-owners operate one of the largest demand response programs in the country related to peak demand. The co-ops strategically grew these resources over the past 40 years. While embedded assets dictated DSM's value in the past, today market values may become a key driver.

To understand how Great River Energy (GRE) and its members transition to the future of demand-side management (DSM), the DSM Innovation Initiative (DSMII) was created among GRE, its members, the Great Plains Institute, the Clean Energy Resource Teams, ACES, and researchers at the University of Minnesota. DSMII is built around a series of different forms of engagement (figure on right) that are trying to give GRE members many avenues of participation.



This document helps explain the findings of focus groups, and follows up on interviews performed in Spring 2021

with all 28 GRE members. These interviews informed the group's development of DSMII design criteria, serving as a lens for GRE's members as they engage in collective action around their DSM programs' futures. These design criteria are:

- Planning for the future;
- Provide value;
- Align to member needs; and
- Other needs that align with market changes (e.g., operational value, electrification benefits).

Using Focus Groups to Brainstorm on Vertical Alignment

In June 2021, GRE developed a **DSMII Primer**, describing pathways to unlock the market value of DSM resources. This primer was shared with all GRE members. Following this, the University of Minnesota research team conducted five focus groups with groups of GRE members chosen based on their categorization in GRE’s integrated resource plan (below).

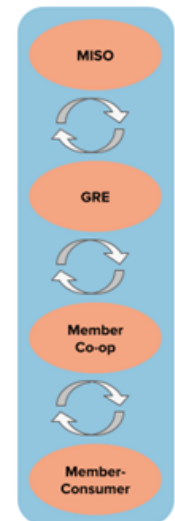
Groups	Methodology
<ul style="list-style-type: none"> ● Fixed Small ● Fixed Large ● Metro ● South and West ● North 	<p>Recording 60 to 90 minute interviews with each group, we live coded each focus group discussion along the DSMII Primer’s themes of markets, technology, and rate changes. Within each group, we looked for levels of agreement across and within topics. Then across all groups, we looked for commonalities. From the different scales of analysis, we developed a DSM Aggregation Evaluation Tool (Appendix A) and a Focus Group Summary Table (Appendix B) that helped frame our findings.</p>

The value associated with member-sited distributed energy resources, such as DSM, will grow increasingly important as GRE navigates its power supply evolution. Adapting programs and strategies to be more market facing will also help to better position GRE’s member-owners as new distributed and decentralized energy resources to markets. To accomplish this, GRE and its members are navigating ways of building new forms of vertical alignment.

Vertical alignment builds responsiveness between wholesale markets, GRE rates, retail rates, and member incentives. Vertical alignment does not prescribe a certain set of rates or practices. Vertical alignment results in resource aggregation and the development of hedged portfolios of resources at different “levels.” It also provides risk reduction value down through the system that is reflective of system dynamics.

The results from the focus groups presented here are an attempt to summarize current levels of vertical alignment, and present new frames of thinking for future realignment, if needed. This document does not reflect consensus, merely ongoing discussion. We offer summaries of the focus group interviews below, then specific recommendations as voiced by focus group members at the end of the document.

Vertical Alignment



1. Market Change and Control

GRE's power supply is evolving alongside wholesale market changes. Member-owner sited DERs, including DSM, can provide value within each of these areas by providing capacity value and operational value/risk mitigation.

Aggregating DSM resources and DERs means that GRE can save and hedge costs for all its members by avoiding having to purchase additional wholesale purchases. Because DSM and DERs have the greatest capacity value when aggregated over many devices (thereby smoothing out variation in resource availability), GRE can play a key coordinating role for member-owned DERs to create and pass through value for all members.

What the Focus Groups Said

- With more market exposure, some co-ops may lack internal **technical expertise** needed to capture value for members, but some member distribution utilities already have (or could develop) the technical expertise to make decisions about DSM control in markets. GRE offers the necessary technical background to make decisions with more complex market dynamics, but co-ops are often unsure how to tap GRE's and each other's learnings.
- When it comes to device control, allowing for some degree of **member flexibility** (in choosing aggregators, software platforms, etc.) aligns well with co-ops values, but questions remain about how to create alignment across control strategies of the G&T. Many co-ops, especially smaller members, expressed the need for GRE to take the lead on interpreting market signals and controlling member loads.
- Despite differences in technical expertise, co-ops expressed needs for more **transparency** around overarching control strategies in response to power suppliers, price signals, and local realities with different technologies, members, and timings.

2. Technology Change and Deployment

GRE and its member-owners are in the midst of significant technology change related to the replacement of the legacy load management system. These changes allow for the continuation of the GRE member-owner legacy program offerings, while adding functionality related to granularity of control and greater determination of demand response availability and advanced post-event performance analysis. These technologies are offering new pathways for member-owners to control end uses and are increasingly associated with connected devices that can be controlled by either the GRE member-owner or their member-consumer via Wi-Fi or cellular connectivity.

Technology changes are also happening within a broader wholesale system. [FERC Order 2222](#), which opens up wholesale markets to distributed energy resource participation, is anticipated to lower the cost of acquiring and deploying demand response in the future.

What the Focus Groups Said

- Co-ops continued to appreciate **GRE's leadership and forethought** in supporting new technology education and demonstrations, but members also expressed the need for much more communication, more general support, and education to help scale up these efforts as technological change accelerates. As one co-op said, "I don't know what I don't know."
- The **value of metering swap-outs** across co-ops continues to be debated, as especially smaller co-ops fret about the upfront and ongoing cost of the deployments compared with the ongoing, uncertain value of DSM.
- While some co-ops, particularly fixed members, appreciated increased visibility from meters, many co-ops expressed frustration that they weren't able to **cost-effectively manage and analyze new data** without extra staff capacity or help from GRE.
- Members from all focus groups doubted **security and reliability** of new digital technologies, as co-ops commented on the difficulty of integrating new vendors, communication protocols, and knowledge into their systems.
- Many new opportunities for deploying DSM involve technologies for communication (e.g. broadband and cellular) and controllable loads (e.g. EVs), which are currently **unequally deployed** across GRE's members. Lack of access to these DSM-enabling technologies is limiting co-ops' willingness to work on new initiatives, but also spurring members to pursue integrated technological approaches (i.e. pairing DSM with new broadband).
- Co-ops are balancing **autonomy and efficiency** in choosing new technologies and services. Co-ops expressed uncertainty around the division of core and non-core services, belying a question among co-ops as to how actively GRE should coordinate the membership for technological deployments (e.g. by coordinating vendors and realizing GRE's collective buying power).

3. Rates and Value

Rates are a means of ascribing financial value from costs, while also communicating price signals. One of the biggest member benefits associated with the power supply transition will be the associated cost reductions that are expected to help to stabilize GRE's rates.

Today, member rates are based around demand and energy charges, with both on- and off-peak rates for DSM technologies. The primary value of DSM to members is avoiding demand charges and growing load over time. In the future, rates might have to be more aligned with wholesale market signals and other values, potentially necessitating a change to how DSM programs deliver value. In order to capture these market values it is imperative to develop new processes around communication of market changes, market price transparency and new systems that enable both the day-to-day visibility of the resource and allow greater enrollment and connectivity of new types of DSM resources.

What the Focus Groups Said

- Given new realities in control strategies that control for transmission, wholesale energy, reliability, and other values, co-ops expressed a need for **more transparency** in how GRE accounts for those values. In this way, cost of service is “more than math,” as one co-op said, and there are wide expectations among co-ops of the value that DSM can deliver today and the future as conditions change.
- Co-ops expressed concerns about ongoing member satisfaction and that member-owners would see losses from potential GRE rate changes. Losses could materialize through stranding existing member-owner-owned assets, or losing future opportunities for new deployment amid increased competition with fossil-fuel powered end uses. While other values were highlighted, preserving or enhancing the value to member-owners was most frequently cited as the most important value. Co-ops suggested **phased transition paths** could help member-owners and co-ops amid GRE rate changes.
- Co-ops differ in their perceptions of the merits of **aggregating capital** across the G&T. Some see the advantages of continuing to rely on pooling capital as a G&T-wide team, letting value flow down to the membership from GRE-coordinated investment portfolios. Even among some small- and mid-sized co-ops, others contemplate co-op or member-owner levels of capital pooling to create the greatest individual benefits for their membership through more disaggregated investments.

Conclusion

Aggregation comes in many forms, through control, technology, capital, and even technical expertise. As documented throughout this document, aggregation can be performed at any one of the G&T, distribution, and member-owner levels, or even third parties. Across the focus groups, co-ops expressed different desires regarding who is best positioned to be in the leading role of which form of aggregation.

Vertical alignment provides the framework for how the GRE co-ops might explore their DSM futures. There is no correct answer but many potential paths to try out and see what works. The focus groups teased out some of those paths for vertical alignment, but not all. The following recommendations are sourced from co-ops in the focus groups and are meant as starting places for many future conversations.

Specific Recommendations Mentioned by Focus Group Members

- **Increase transparency and communication.** More explanation of the “why’s” of control, technology, and rates from GRE and co-ops is necessary through weekly, monthly, and annual updates in member meetings, emails, and other communications. More types of communication can help engage different members’ staff and different working styles.
- **Encourage ongoing collaboration and learning.** A dashboard to highlight current and upcoming DSM initiatives and research and development at other co-ops and GRE, as well as uptake of different GRE services across co-ops
- **Lessen the cost of DSM products and innovation processes themselves.** Group buying or financing of DSM technologies could leverage economies of scope and scale. Partnerships with GRE, third parties, and non-profits can help leverage additional outside funding.
- **Clarify core and non-core services, and who needs to organize for new services.** Collective action for GRE services is confusing for many co-ops.
- **Translate historic knowledge and recruit new talent.** Different levels of technical expertise create roadblocks for co-ops. Increased training for co-op staff and technical service provision from GRE can prepare them to operate DSM programs while honoring historic program usage.
- **Increase co-op education about technical and policy matters.** Information on policy changes, especially ECO Act, is needed, as is information around new technologies (like heat pumps and electric vehicles).

Appendix A: DSM Aggregation Evaluation Tool.

Between control, capital, technology, and expertise, co-ops deploy load management across different levels and third parties. How they choose to aggregate those resources depends on the co-op and their collective contexts with each other. This DSM Aggregation Evaluation Tool is meant for co-ops to place themselves along each of the four spectrums, to see who aggregates the resources for which level of resources.



Appendix B: Focus Group Summary Table

Group <i>Validity Level</i>	Rates and Value	Markets and Control	Technology and Deployment
Fixed Small <i>High Validity</i>	<p>Might need to align the value of DSM with GRE fixed contracts (i.e. will off-peak program credits continue?)</p> <p>Biggest value is savings for co-op and end member, as well as member comfort</p> <p>Want to know more about different values of distribution, transmission, or power supply peaks and reliability in future</p>	<p>Need options, but don't want to or can't interpret markets directly</p> <p>Questions about "what" controlling for in futures (transmission, MISO, etc.)</p> <p>Want more precision on control geographically and temporally</p>	<p>Even WiFi, cellular, and broadband deployment, there are questions about security and dependability</p> <p>Questions about ability to cost effectively use new data, esp. from vendors, but appreciate new visibility</p> <p>GRE has offered great support on marketing, education around new tech</p>
Fixed Large <i>Low Validity</i>	<p>Need savings for co-op and end member</p> <p>Questions about the value of programs between power suppliers, shifting contracts (i.e. will CCS closing change the value prop of DSM completely?)</p>	<p>Good for G&T to lead: GRE leads better, takes more risk from co-op than other power suppliers</p> <p>If more market transparency, and even with more advanced control schemes, need more personnel to monitor and interpret</p>	<p>Internet communications seen to lack dependability, although if it could integrate well, then they'd make it work</p> <p>Current DSM deployments configure differently between power supply values, and are thus offered differently to customers, presenting challenges for program continuity to co-ops</p>
Metro <i>Low Validity</i>	<p>Seeing a phased approach to rate change could help co-ops adjust, as would new programs to help offset degradation in old program value</p> <p>Different cost of services across levels and co-ops obscure subsidy and can send wrong signals for cost-causing behaviors</p>	<p>Some co-ops ready to explore DER aggregation and work with vendors on their own, while others still looking for GRE lead to offer aggregation, control options</p> <p>Despite differing levels of market knowledge, co-ops need assistance on different technical subjects</p>	<p>GRE's approach of providing information, access to programs is great, but there is a greater need to understand the pipeline of opportunities across co-ops and within GRE</p> <p>There are concerns about how DSM will be treated as a core or non-core service going forward, and understand how much of a co-op contingent is needed to treat a service as core</p>

Group <i>Validity Level</i>	Rates and Value	Markets and Control	Technology and Deployment
<p>S&W <i>High Validity</i></p>	<p>How will rates be made in the future that will be equitable and easy to understand and communicate? There is a great need to understand the "why's" of different rate, investment decisions. Rates are more than "math", there are values that need to be included.</p> <p>Wholesale power makes up the vast proportion of member rates. Changes to GRE's rates will be needed, but co-ops expressed doubts about feasible GRE rates changes are to such a heterogeneous GRE group, or "how to make something equitable to everyone."</p>	<p>Staff capacity and resource limitation leads the co-ops to see future reliance on GRE for all load management signals</p> <p>If co-ops needed to make more decisions, some anticipate small co-ops could adapt, although workforce and technical problems might lead to increased reliance on mission-aligned third parties</p>	<p>GRE's role of aggregating technical assistance, programs, third parties is useful and necessary moving forward, but more communication between co-ops and with GRE might be needed. "I don't know what I don't know."</p> <p>Broadband, wifi, and cellular technology uptake is not expected to be widespread, and geographic availability of technology might limit different GRE DSM initiatives across co-ops</p> <p>Clarity needed on the difference between core and non-core services offered from GRE. Sometimes, both parties waiting for the other to lead and organize. Need to understand "why" of control and programs to deploy effectively.</p>
<p>North <i>Medium Validity</i></p>	<p>Many look to management and GRE for guidance on matters of rates and values, but also need flexibility in negotiating those different values.</p> <p>Large proportion of energy comes from storage heat and dual fuel so changes to off-peak rates would have a huge impact on overall rates.</p> <p>Co-ops needed emphasis on how their DSM programs could work as portfolios across and within co-ops. For instance, C&I and residential DSM are often thought of in separate silos, but they need to act in concert.</p> <p>"DSM for Dummies." GRE can engage members in teaching them about the future of DSM.</p>	<p>There is some desire for GRE leadership here, while still giving members options on different controls</p> <p>There is uncertainty about the AMI swap-out deadline and who will be controlling. In addition, co-ops cited multiple concerns for controlling, including staff resources, geography, physical grid needs, vendors, demographics, and desire to respond</p> <p>Co-ops expressed concern that they could shift peaks onto those members who don't have the ability to control</p>	<p>AMI swapout's benefits are seen as uncertain and not worth the cost in some cases, especially for small co-ops.</p> <p>"Hard to beat the old legacy radio controls." Co-ops expressed skepticism about new two-way technology.</p> <p>GRE needs to continue its leadership in vetting new technologies for co-ops, but allow co-ops to create new initiatives and really sell new loads onto systems.</p>