Carbon Reduction Options

MEA Special Board Meeting

March 24, 2021

Strategic Plan Goal D

Investigate a renewable energy and/or carbon reduction strategy either as a standalone utility or in conjunction with other Railbelt utilities.

Initial Deliverable Date: Q4 2020

MEA Board Decisions to Date:

- Focus efforts on carbon reductions vs only a Renewable Portfolio Standard (RPS)
- Use 2012 as the baseline year to coincide with Clean Power Plan metrics.

Executive Team Approach

1. Compile meaningful metrics about current generation mix and recent carbon reduction gains.

2. Research potential levers and impacts/tradeoffs:

A. Better understand the needs and behaviors of our members

B. Anticipate system impacts or needs

C. Fully articulate financial impacts of various programs

D. Understand opportunities and tradeoffs

3. Recommend realistic plan that meets the needs of our members.

Step 1: Compile Meaningful Metrics

Step 1: Meaningful Metrics – Where is MEA Now?

MEA has reduced carbon emissions* by 21% since 2012.

This reduction is primarily the direct result of MEA constructing and utilizing the Eklutna Generation Station ("EGS") vs previous options.
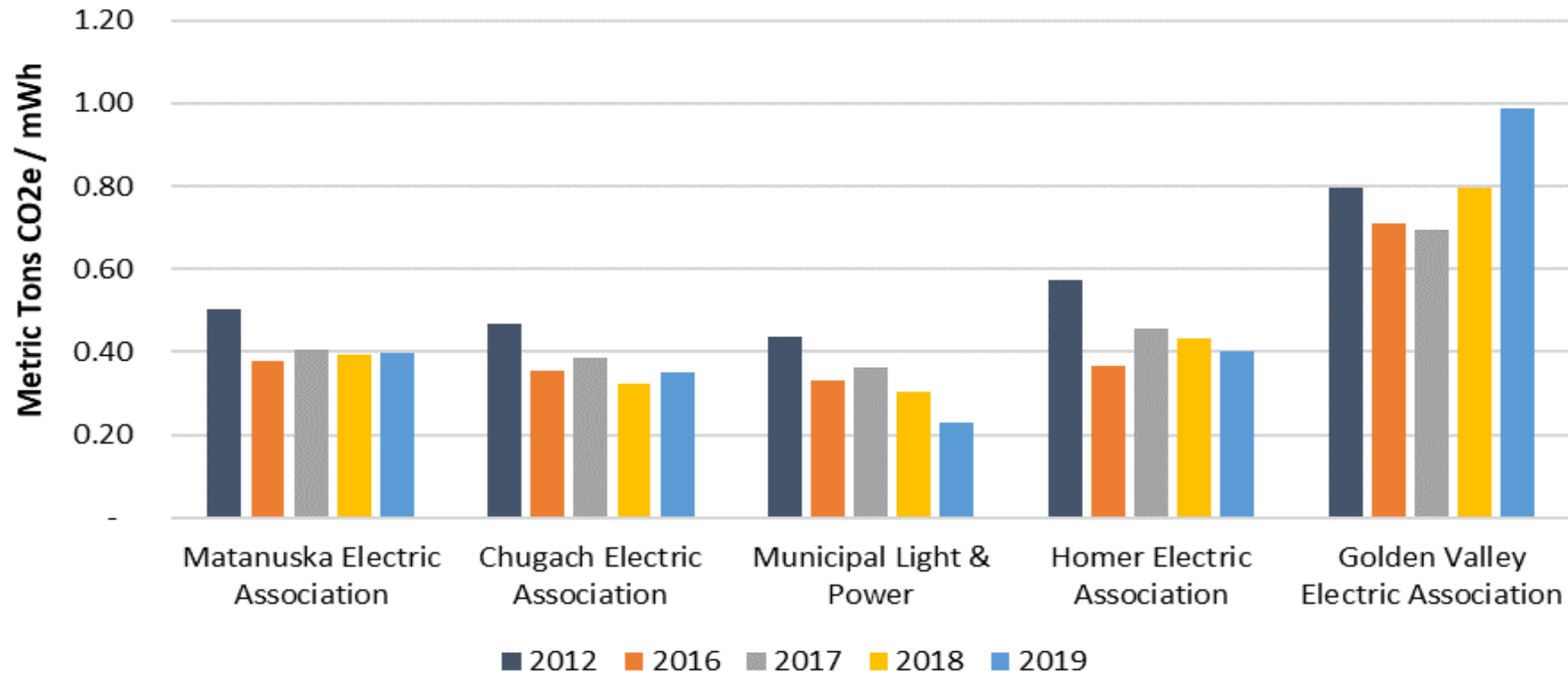
Other contributors include economy energy purchases, net metering, other renewable power but much less significant than EGS contribution.
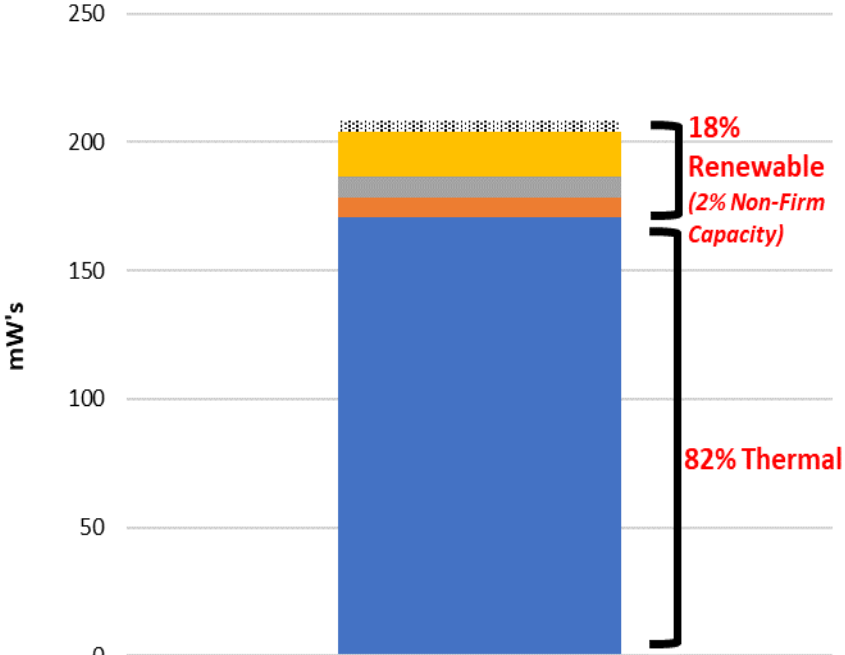
*Metric Tons of CO2e / mWh

Step 1: Meaningful Metrics – How Do We Compare?

Railbelt Utilities Rate of Carbon Emissions


Bar chart — Metric Tons CO2e / mWh by utility and year (2012, 2016, 2017, 2018, 2019):
- Matanuska Electric Association
- Chugach Electric Association
- Municipal Light & Power
- Homer Electric Association
- Golden Valley Electric Association

Step 1: Meaningful Metrics – How is MEA's Power Generated?

2021 Generation Capacity

18% Renewable *(2% Non-Firm Capacity)*

82% Thermal

	2021 Budgeted Capacity (MW)
Net Metering	1.2
Battle Creek	-
Independent Power Producers	2.9
Bradley Lake Hydro	17.4
Eklutna Lake PPA	8.4
Eklutna Lake Hydro	7.4
Eklutna Generation Station, Net	171.0
Total	208.3

2021 Projected Energy

16% Renewable Generation

84% Thermal Generation
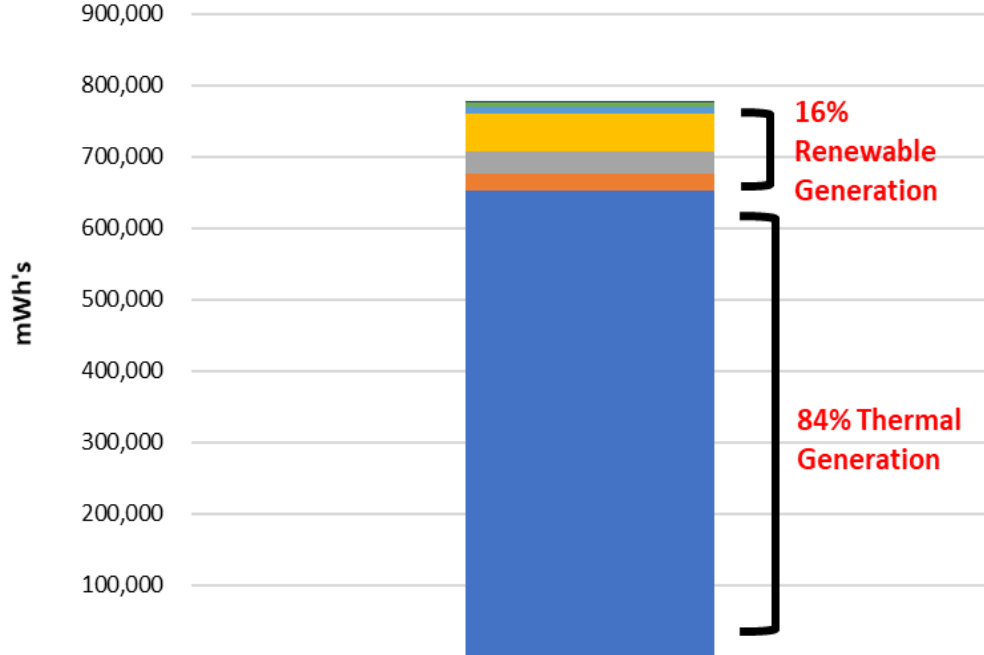
	2021 Budgeted Energy (mWh)
*Net Metering	130
Battle Creek	6,700
Independent Power Producers	8,780
Bradley Lake Hydro	54,300
Eklutna Lake PPA	29,800
Eklutna Lake Hydro	25,200
Eklutna Generation Station, Net	651,722
Total	776,632

* Net Metering generation does not reflect Member consumption; it reflects what is sold back into the MEA system.

Step 2: Research Potential Levers

Current Landscape:

Considerations and Uncertainties

- Federal and/or state policies
- Railbelt Reliability Council and Integrated Resource planning process
- Power pool and joint generation development decisions
- Economics, rate impacts and associated RCA actions

Step 2: Research Potential Levers

- A. Member Needs and Behaviors -

Step 2: Potential Levers – Understand Member Behavior

2020 GDS Load Analysis & Long-Term Study

Purpose: To understand the key drivers of member demand and to develop a long-term forecast through 2039 based on weather (heating, cooling), growth , conservation, and economic factors.

Findings:

- Residential Energy Growth is projected to be 0.8% annually.
  - Approximately 85% of Residential Members load is associated with "Base Load" while 15% is due to Heating and 0.3% is attributed to Cooling (Air Conditioning).
  - Overall, Heating Load accounts for over 20% of Residential demand November through February.
- Commercial Energy Growth is projected to be 1% annually.
  - Approximately 95% of Commercial Members load is associated with "Base Load" while 4.7% is due to Heating and 0.3% is attributed to Cooling (Air Conditioning).
- GDS found that changes in rates has minimal impact to member demand.
- The data provided will allow MEA to internally generate updated forecasts based on weather scenarios and updated growth projections.

Step 2: Potential Levers – Understand Member Needs

Approach

- Formal and informal surveys

- Focus groups

- Listening Session

- Outreach to conservation-focused groups

Findings

- Members are very curious and engaged on carbon reduction-related topics

- Most members feel like MEA should be doing more, but the majority are not willing to accept an increase in rates to achieve results.

- Many members did not realize what MEA is already doing.

- Significant majority support member choice-based initiatives

Step 2: Research Potential Levers

- B. Anticipate System Impacts/Needs -
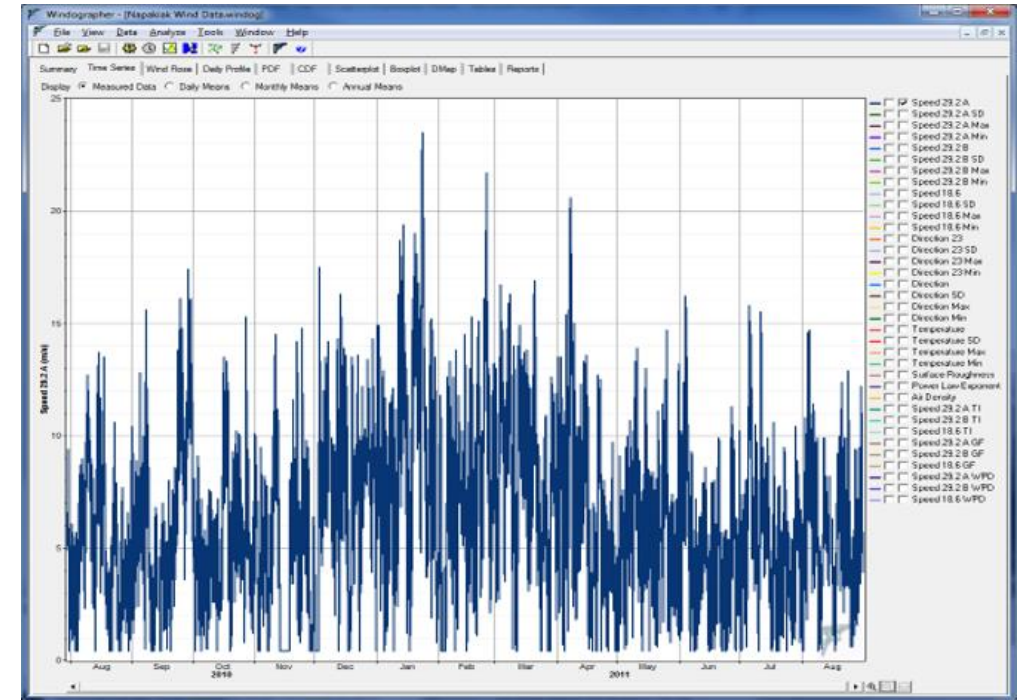
Step 2: Potential Levers – System Impacts

Intermittent Resource Regulation Study -

Purpose: Understand MEA's ability to incorporate and regulate intermittent resources and begin the valuation of economic impact.

Approach: Model the impact of increasing penetration levels of intermittent resources on MEA using scaled data from existing solar PV installations.

Goals

- Define the capacity of current MEA assets to respond to the negative and positive ramp rates from solar PV.

- Document changes in the MEA system as a result of increasing penetration of intermittent resources. (e.g. EGS run hours, engine start/stops, decreased natural gas usage)

- Begin valuation of these changes.

- Identify potential assets that may decrease negative impacts to the MEA system and/or increase economic viability.

Step 2: Potential Levers – System Impacts

Intermittent Resource Regulation Study - Preliminary Findings

- Solar PV has the highest negative ramp rates of intermittent resources and provides a "worst case" scenario to study.

- Geographic diversity is paramount to mitigating ramp rate effects from solar PV.

- Current MEA assets are **<u>TECHNICALLY</u>** capable of integrating up to the 50 MW of solar PV modeled. Economic viability is under further study.

- Above 15 MW of installed solar PV there is a marked increase in negative system effects and need for curtailment, including both net metering and IPP's.

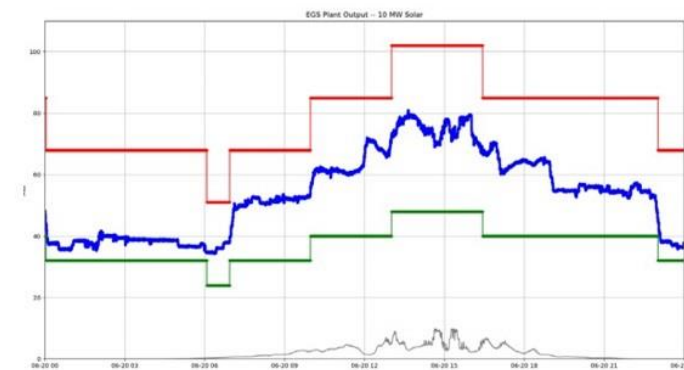Figure 5: Simulated EGS Plant Dispatch with No Solar Farms

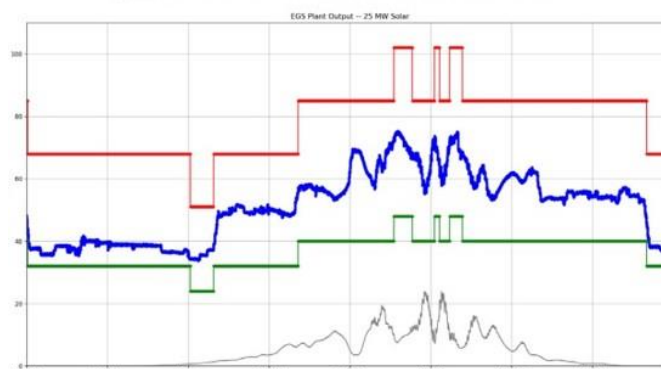Figure 6: Simulated EGS Plant Dispatch with (2) 5 MW Solar Plants

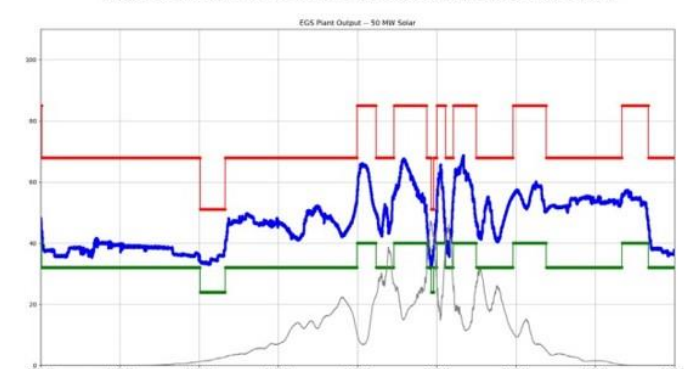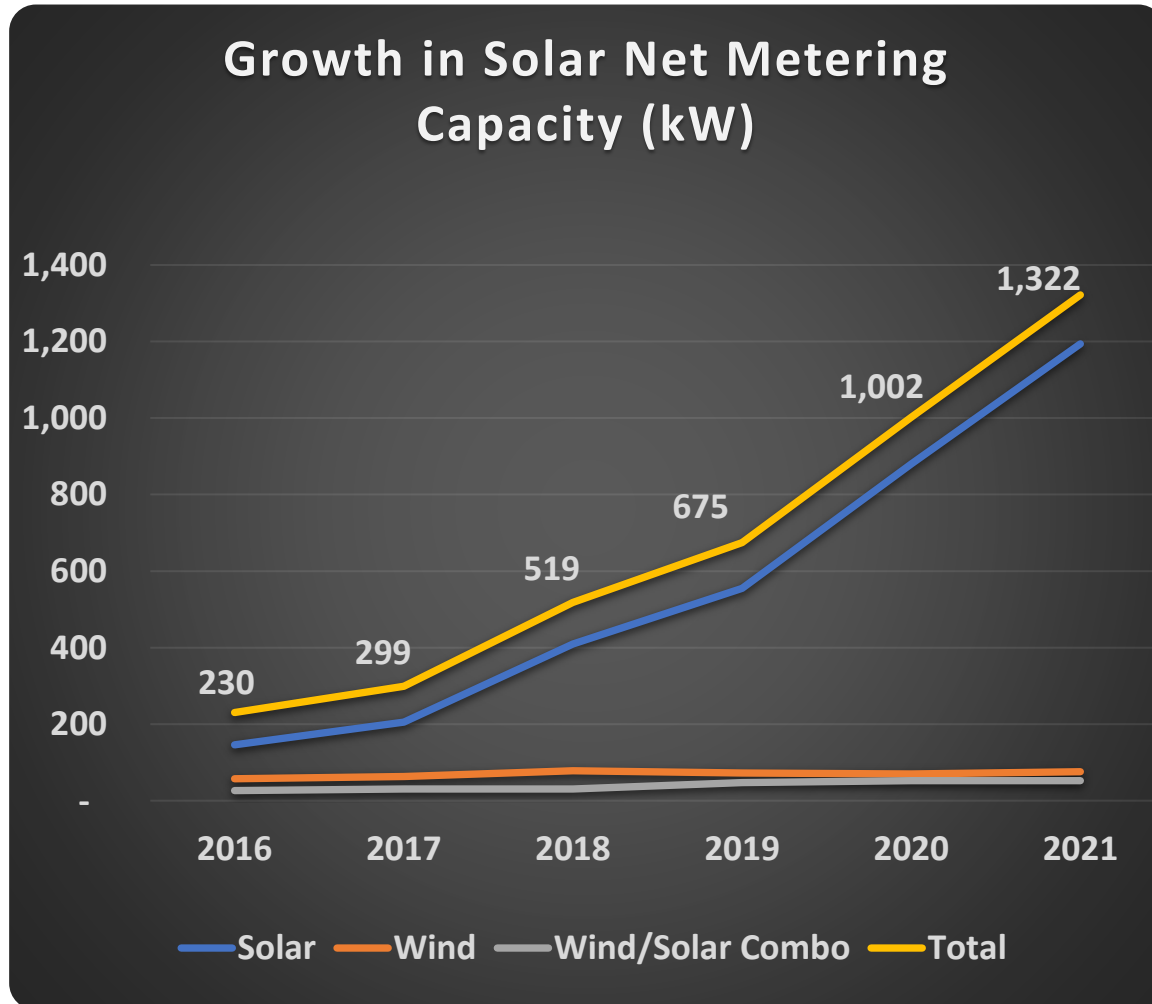Figure 7: Simulated EGS Plant Dispatch with (5) 5 MW Solar Plants

Figure 8: Simulated EGS Plant Dispatch with (10) 5 MW Solar Plants

Step 2: Research Potential Levers

- C. Articulate Financial Impacts -

Growth in Net Metering on MEA's System

Growth in Solar Net Metering Capacity (kW)

- In 2020, 1.5% of MEA's retail demand was 1,283 kW and total nameplate capacity for eligible systems as of Feb 1, 2021 was 1,322 kW

- MEA has reached the current 1.5% retail demand threshold

- MEA has not established any limit on net metering service.

- Most members engaged in net metering are residential consumers with solar.

- Only solar capacity has been added since 2017.

Net Metering Financial Impact Findings

If installations jumped to 200 per year, 10 Years to impact revenues by 1%, $1.1M, or 49 Years to impact revenues by 3%, $5M

Conclusion: from a financial perspective, there is time to continue deliberate development of a rate structures roadmap as planned, identifying new rate structures for Distributed Energy Resources (DER) rather than limiting net metering

Step 2: Research Potential Levers

- Identify Opportunities and Tradeoffs -

Step 2: Potential Levers – Opportunities

Microgrid Pilot Project Overview

Pilot Project Approach: Use the system configuration of the Douglas substation distribution feeders and load data to study microgrid modeling tools to create a conceptual design and recommendation.

Preliminary Results: A least cost approach was identified based upon project criteria, including outage duration limits and the value of avoided outages.   Final refinement is under way in order to come to a go or no-go decision for MEA's 2022 budget.

Goals

- Generate a list of required data sets.

- Understand the available modeling tools and their capabilities.

- Compile a database of viable microgrid and microgrid enabling technologies.

- Create a conceptual design for a microgrid project off the Douglas sub-station.

Electric Vehicles

Form of Beneficial Electrification.
Note: may result in increase to MEA's carbon emissions because increase load.

- Passenger vehicles emit 2.7 times more carbon emissions than EV's powered by EGS*.

- The net reduction of carbon emissions could be counted towards a Carbon Reduction Goal

- Based on internal EV Adoption projections, MEA's Forecasted Carbon Emissions would decrease an additional 1.7% by 2030.

- MEA is acting in a leadership role with EV owners and business/municipal members to develop corridors:

- Investigating incentive options for members, including benefits and tradeoffs.

* Based on 15,000 miles/ year.

Assumes 10% Capacity Factor

Step 2: Potential Levers – Opportunities

Carbon Reduction Opportunities Expanded/Increased Solar Farms

- Assuming a 6MW Solar Farm is commissioned within MEA's Service Territory in 2022, carbon emissions would decrease an additional 0.6% annually*.

- According to modeling, any additional potential future solar projects would decrease efficiency at EGS and increase maintenance costs.

- A potential 6MW solar facility will impact MEA's ability to participate fully in the Power Pool and delay until 2029 the full cost savings or carbon reduction from pool operations.

*Note: Summer-peaking solar capacity does not offset MEA's winter peak load requirements.

Step 2: Research Potential Levers

- Opportunities and Tradeoffs: Known Opportunities -

Step 2: Potential Levers – Opportunities

Known Opportunities

MEA is forecasted to reduce carbon emissions 28% by 2030* when compared to 2012 based on existing projects in the pipeline:

- Additional Hydro Generation Resources
  - Eklutna PPA
  - Battle Creek Diversion
- Power Pooling Operations with Chugach
- Steady Growth in Net Metering Members

*Based on planned projects. Uncertainties and risks may impact the numbers.

Forecasted Carbon Emissions Reduction (Metric Tons CO_2e/ mWh)										
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Current Forecast	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Reduction to 2012	27%	27%	28%	28%	29%	29%	29%	29%	28%	28%

Short Term Considerations – Existing Gas Contracts

- Existing gas contracts go through 2028 and are essential in allowing MEA to serve our members by providing firm, reliable power year-round.

- Compared to other utilities, MEA's contract allows for cost-effective flexibility and provides important options.

- Current gas contracts impact full participation in the Power Pool through 2025.

- Options exist to acquire additional flexibility from current contracts. Preliminary analysis shows this would come at a material financial cost to MEA members with no long-term benefit.

Staff Recommendations Based on Findings

- Stay the course on identified opportunities to achieve 28% reduction by 2030 (assuming current load growth estimates).

- Implement and support member choice programs
  - Green Power Program
  - Support Net Metering
  - EV Level 2 Charger Pilot Program
  - Time of Use Rates

- Develop member-based group focused on innovation

- Take advantage of other opportunities and mandates.

- Evaluate progress in relation to next generation gas contracts.

- Review in 3-5 years.