Massachusetts Grid Modernization Advisory Council

Meeting Presentation

December 4, 2025







Item	Time
Administrative Items	
Welcome, Roll Call, Agenda	
Public Comment Period	
Meeting Minutes Review and Approval	1:00 – 1:20
Update on GMAC EDC Representatives	
December GMAC Stakeholder Session	
2026 GMAC Meeting Schedule	
Updates on ESMP Activities	1:20 – 1:25
Integrated Energy Planning	
EDC Presentation on IEP Stakeholder Working Group	1:25 – 2:15
Priorities for the Future of IEP	1.25 – 2.15
HEET Presentation on Geothermal	
Break	2:15 – 2:20
IEP Facilitated Discussion	2:20 – 2:55
Facilitated by Councilor Kyle Murray	
Close	2:55 – 3:00

Public Comment



- 15-minute period for public comment
- Speakers will have up to **3 minutes** to speak on any topics of interest related to the GMAC. Once everyone who has pre-registered has provided comment, others may speak, as time allows.
- Please state your name and affiliation before delivering your comment.

GMAC Minutes Review and Voting



Meeting Minutes

- Calling for vote to finalize:
 - > October 30, 2025 GMAC meeting minutes

Are there any requests for edits to the minutes?

On behalf of the Council, the Chair may approve the minutes as distributed/as amended.

GMAC EDC Representatives Update



Thank you, Digaunto Chatterjee and Andrew Schneller!

 Digaunto and Andrew will be stepping down as EDC representatives on the GMAC. Thank you both for your great work and collaboration!

Welcome, Jen Schilling and Dan Marceau!

 The GMAC welcomes Jen Schilling, representing Eversource, and Dan Marceau, representing National Grid, as EDC designees.

December GMAC Stakeholder Session





Please join the GMAC & EEA for

THE FUTURE GRID FROM A MUNICIPAL LENS

Learn how MA will modernize and proactively plan our electric grid, and engage in breakout sessions to help identify priority topics for the GMAC.

NEW CUSTOMER CONNECTIONS WORKSHOP

Join EEA's guided discussion on challenges and opportunities in connecting new electric customers to the grid.



UMASS AMHERST

| GMAC Event: | 9:00 AM to 1:00 PM

EEA Workshop: 2:30 PM to 4:00 PM

Register Here: https://bit.ly/FutureGridEvent

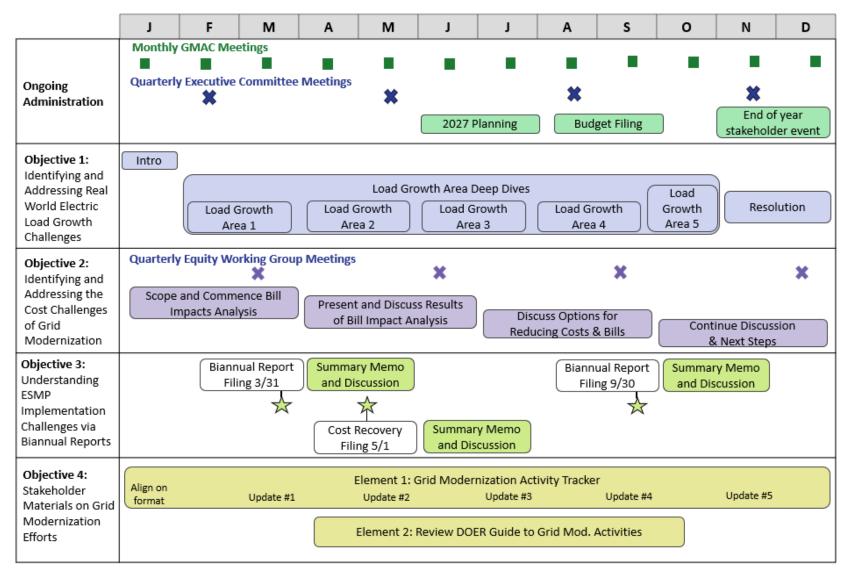
- We are looking forward to the western MA stakeholder event "The Future Grid from a Municipal Lens" on December 12th at UMass Amherst.
- Thank you to the GMAC members supporting the event as moderators, panelists, and facilitators.
- We kindly ask GMAC members to serve as discussion leaders during the facilitated discussion.
- If you haven't registered yet, please do so here: <u>https://bit.ly/FutureGridEvent</u>

Can GMAC members raise their hand if they plan to attend?

2026 Workplan Overview



- As a reminder, the GMAC approved a 2026 workplan at the last GMAC meeting. Meeting dates have been finalized and Zoom links have been sent.
- Slide 8 provides an overview of monthly meeting topics.
- Slide 9 provides draft agendas for the first quarter of 2026.
- Consultant Update: DOER is in the final stage of procuring a GMAC consultant for CY26 and will notify the GMAC as soon as it is finalized.







Q	Date	Obj. 1: Load Growth Impacts	Obj. 2: Grid Cost Challenges	Obj. 3: ESMP Implementation	Other
Q 1	1/29	EDC Load Forecasting Overview			
	2/26	Area 1: Base Loads/Large Loads/Data Centers			Review Obj. 4 Progress
	3/26	Area 1: Base Loads/Large Loads/Data Centers	EWG Discusses & Prepares Bill Impacts Analysis		
	4/30	Area 2: Buildings		March Biannual Report Filing Observations/Discussion	
Q 2	5/28	Area 2: Buildings		Annual Cost Recovery Filing Observations/Discussion	Review Obj. 4 Progress
	6/25	Area 3: Demand Response	EWG Report Out on Bill Impacts & Intro to Cost Effective Investments		CY27 Strategic Planning
	7/30	Area 3: Demand Response			CY27 Strategic Planning
Q 3	8/20	Area 4: Transportation			Review Obj. 4 Progress
	9/24	Area 4: Transportation	Discuss Options for Reducing Costs & Bills		CY27 DPU Budget Filing
	10/29	Area 5: DERs			Review Obj. 4 Progress
Q	11/19	Drafting GMAC Resolution		September Biannual Report Filing Observations/Discussion	
4	TBD	GMAC Public Stakeholder Session: Readout of ESMP Implementation and GMAC Work			
	12/17	Finalizing GMAC Resolution		End of Year ESMP Implementation Observations/Discussion	





Date	Topic	Learning Goals	Draft Meeting Agenda
Jan 29	EDC Load Forecasting Overview	 Why are forecasts central to the ESMPs? How do the EDCs forecast load growth at a high-level? What lessons have been learned through the development of the first ESMPs? What policy, market, or technological factors could lead to significant changes in the load growth the EDCs forecast? What are the differences between load forecasts and demand assessments? 	 Admin & ESMP Updates EDC Introductory Presentation Overview on why the ESMPs rely on forecasts and how the EDCs create forecasts Review 2024 ESMP forecasts + any updates from biannual report Understand differences between forecasts and demand assessments Highlight key challenges or uncertainties with forecasting load growth GMAC Discussion – Led by: (to invite) Jim Stanislaski and Andy Sun The GMAC will identify an initial set of key questions on load growth areas and schedule deep dives in the proceeding months. Discuss invitations to external speakers who may provide useful additional context.
Feb 26	Area 1: Base Loads/Large Loads/Data Centers	 How do the EDCs define, track, and proactively plan for step loads and data centers? How are municipal and regional plans integrated into the planning process? Who are the "right" stakeholders to reach to get input on forecasts? What impact will data centers have on the grid? 	 Admin & ESMP Updates EDC Presentation Brief presentations from the EDCs on current understanding of step/spot load planning and forecasting Discuss interaction with municipal/regional planning processes EEA Presentation – New Customer Connections & Data Centers Discuss EEA new customer connections initiatives and stakeholder engagement efforts on data centers MassEcon Presentation Discuss report on high demand for business development GMAC Discussion – Led by: (to invite) Larry Chretien and Jonathan Stout
Mar 26	Area 1: Base Loads/Large Loads/Data Centers	 How do large C&I customers and EDCs interact? What are the bottlenecks for large load interconnection? What can GMAC do to address bottlenecks? 	 Admin & ESMP Updates C&I Industry Presentation (to invite) Councilor Jonathan Stout GMAC Observations and Discussion – Led by: (to invite) Larry Chretien and Jonathan Stout Discuss load growth presentations and potential GMAC actions to address bottlenecks

ESMP Activities Updates



- 1. ESMP Phase II
 - 1. Long-term cost recovery
- 2. IEP Working Group
- 3. LTSPP (DPU 25-20)
- 4. Other

Key Upcoming Dates		
IEP Stakeholder Working Group Listening Session	12/9	
IEP Stakeholder Working Group Listening Session	12/11	
GMAC In-Person Stakeholder Session	12/12	

^{*}Stay up to date on ESMP activities via the Activity Tracker!

Are there any updates on these items?



Integrated Energy Planning

IEP Stakeholder Working Group Update

GMAC Meeting, December 4, 2025







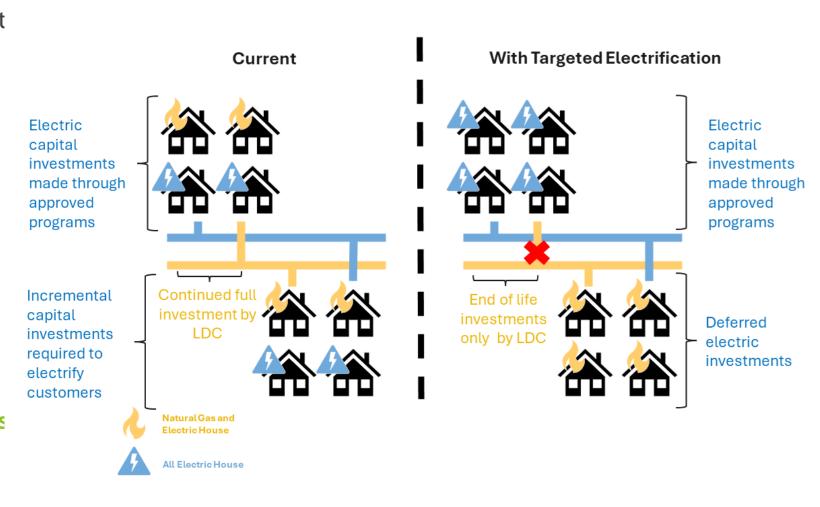
Agenda

- ► What is IEP?
- ► Review 2025 IEP Stakeholder WG Topics
- ▶ 2026 Work Plan

December 2025 GMAC Meeting

What is IEP?: The Challenges with Today's Electrification

- Many current electrification effort are carried out through electrification programs, which often prioritize optimizing customer cost but not system cost.
- As more and more customers transition, this results in dual infrastructure which is becoming increasingly expensive to maintain.
- Integrated Energy Planning (IEP)
 coordinates investment activities
 between gas and electric systems
 as well as other electrification
 efforts.



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December 2025 GMAC Meeting

A vision of IEP

As the Commonwealth moves towards its electrification goals for heating and transportation, the energy utilities and other stakeholders recognize that this transition to electrification can be done more affordably if IEP allows three things to be planned in coordination to foster an orderly transition while maintaining safe and reliable service:

- 1. Targeted customer adoption of electrification in specific locations and timeframes;
- 2. Electric system investments to ensure sufficient capacity for electrification-driven load growth; and
- 3. Strategic decommissioning of gas infrastructure, including asset retirement, maintenance, and investment planning.

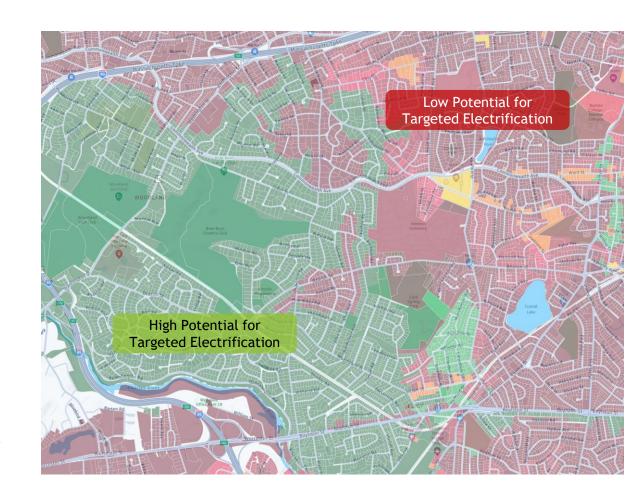
Such an orderly transition mitigates challenges such as spreading the costs of maintaining the current gas system across fewer and fewer customers over time, potentially burdening those customers during the transition and the cost of maintaining two networks.

The primary objective of IEP is to maintain safe and reliable service in a cost-effective manner while supporting the Commonwealth's ambitious decarbonization and energy efficiency goals, rather than directly pursuing greenhouse gas emissions, which are the focus of other programs.

December 2025 GMAC Meeting

What this might look like

- Develop Capabilities (technology, process, people, data)
 - Pilots/NPAs to provide customer and other implementation insights (shorter-term)
 - Develop ranking methods that appropriately account for local factors (medium-term)
 - Coordinate gas and electric planning across affiliates and nonaffiliates to optimize networks and demand-side solutions (longer-term)
- Drive Policy & Regulatory Landscape/Enablers to support targeted transition efforts
 - New frameworks for cost allocation and recovery
 - Coordination with EE
- Engage Communities to secure customer commitment
 - Community outreach plans (shorter-term)
 - Community-centric energy planning (longer-term)



2025 IEP Working Group Objectives & Timeline

Over the course of 6+ months, the objectives of this Working Group are to (a) provide an overview of "current state" of electric and gas planning processes; (b) invite stakeholders to share and discuss their visions for IEP; and (c) sharpen the picture of the "future state" of IEP and the enablers that will allow it to flourish.

Meeting Date	Meeting Type	Topic
Thursday, May 29	IEP Stakeholder Session #1 (3hrs)	IEP Guiding Principles
Thursday, Jul 24	IEP Stakeholder Session #2 (3hrs)	IEP in Action
August 19 & 21	Public Listening Session (1 hr)	Readout of IEP Stakeholder Sessions 1 and 2
Thursday, Sep 18	IEP Stakeholder Session #3 (3.5 hrs)	Equity considerations in IEP
Thursday, Nov 13	IEP Stakeholder Session #4 (3.5 hrs)	2026 Work Plan and Next Steps
December 9 & 11	Public Listening Session (1 hr)	Readout of IEP Stakeholder Sessions 3 and 4 and looking ahead

2026 Work Plan

The working group established a mutually agreed upon set of topics and goals for 2026. The EDCs collaborated with stakeholders to gather early input, integrate feedback, and deliver a final plan.

Structure:

- ▶ Up to six 3-hour meetings, with facilitator; potential for additional work in topical sub-groups
- ▶ Public listening sessions at mid- and end- of year

Goals:

Develop collaborative action plans that resolve key barriers to IEP

Candidate IEP enablers/barriers topics:

- Municipal and community engagement & the role of municipal/community leaders in IEP
- Funding and cost allocation solutions
- Regulatory alignment (e.g., with EE, ESMPs, CCPs, GSEP)

Advance near-term progress that informs the development of IEP

Candidate near-term progress topics:

- Explore IEP related questions with EE Advisory Council ahead of next EE 3-Year Plan
- Evaluate applicability of programs in other jurisdictions
- Explore collaboration with public housing stakeholders for candidate near-term work
- Share learnings from ongoing utility efforts

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2026 Priorities for Integrated Energy Planning

December 4, 2025

Jenny Goldberg, Integrated Energy Planning Manager

DOER Integrated Energy Planning Priorities for 2026

IEP is key to enabling building sector emission reductions while minimizing overall system costs.

- DOER, AGO, OET, & MassCEC developed a set of recommendations for the Working Group (July 2025)
 - EDCs' 2026 Workplan explores some of these recommendations, including:
 - Who should lead certain aspects of IEP development (ex. EDCs, LDCs, state agencies) and where should these conversations take place?
 - How should the IEP interact with existing planning processes (ex. GSEP, ESMPs, 3 Year Plans)?
- Additional 2026 IEP Workplan Highlights:
 - Engage EEAC prior to development of the next 3 Year Plan
 - Opportunities for other stakeholders to provide input on certain IEP topics (ex. giving EJ organizations the opportunity to provide input and guidance on equity in IEP)
- DOER's 2026 IEP Considerations
 - How to align milestones/timelines for IEP development and implementation with MA's affordability & climate goals?
 - EDC & LDC technical and analytical capabilities



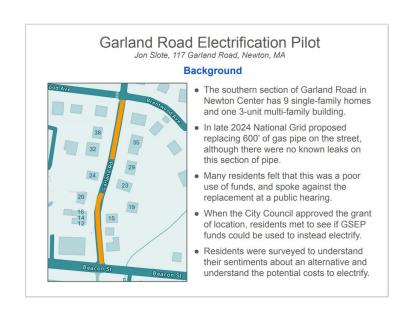
How Can GMAC Support IEP Success?

GMAC can facilitate necessary engagement between a broad range of stakeholders to advance IEP, including municipalities and communities

- GMAC has established municipal engagement as a priority and has experience engaging leaders from municipalities who want to electrify and advance climate goals and affordability.
- Customer engagement and education is key to the gaselectric transition and targeted electrification.
- Coordination between gas utilities, electric utilities, municipal governments, and customers is challenging but key to advancing IEP.

Example of Municipal IEP Engagement in Action: Newton

- City councilors and local activists took an interest in avoiding new gas system investments.
- National Grid (gas) and Eversource (electric) are now collaborating with Newton on IEP.



May 2025 Presentation from a Newton resident





Thank You!

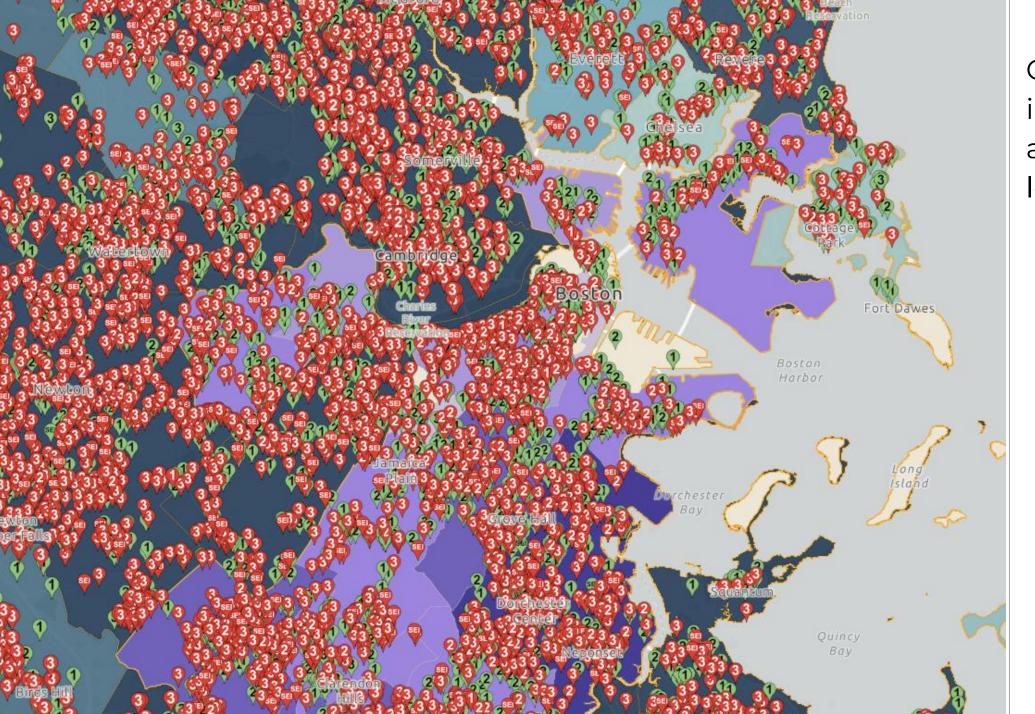
Additional Perspectives from IEP Working Group Members



- Melissa Lavinson, MA Office of Energy Transformation
- Mary Gardner, MA Office of the Attorney General
- Meg Howard, MassCEC
- Kyle Murray, GMAC Representative

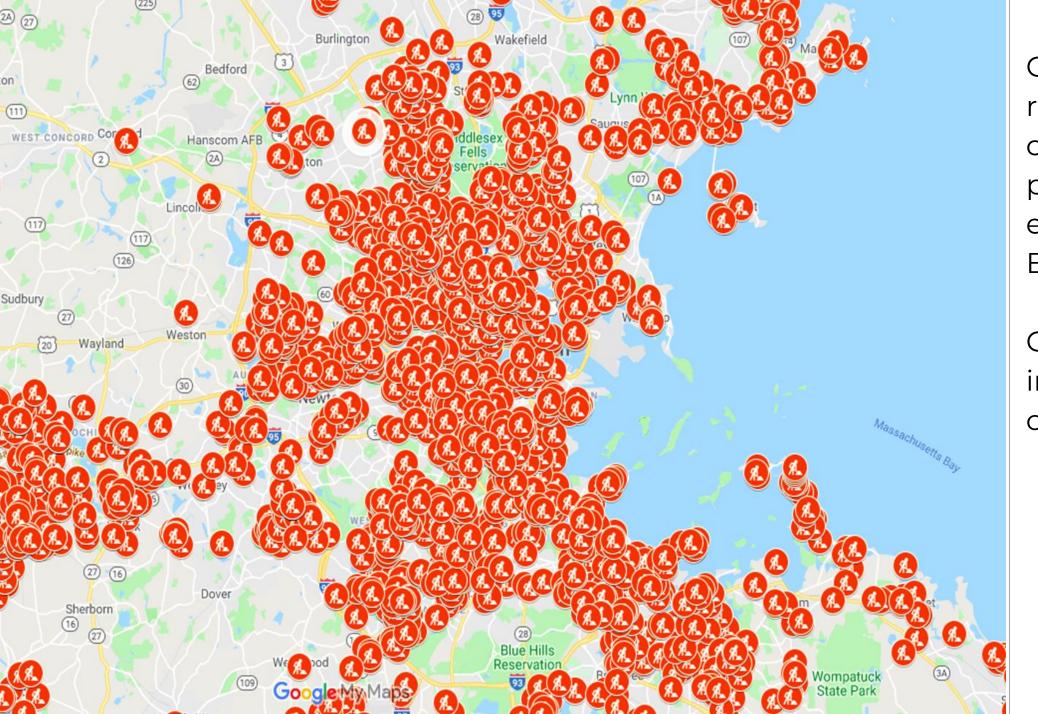
Geothermal Energy Networks (GENs) and their Relevance to the Electric Grid Planning Process

HEET
Presented by Isabel Varela | Dec 4, 2025



Our gas infrastructure is aging and leaking methane

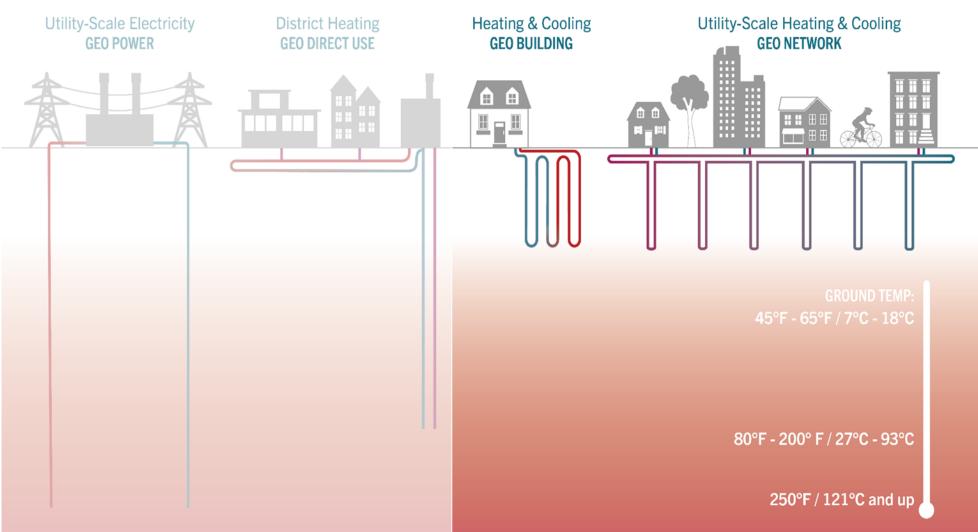




Gas Pipe replacement currently projected to exceed \$30 Billion

Currently we are investing in an old system



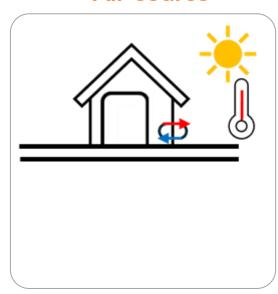


All Geothermal Technologies provide STABLE non-intermittent energy

Ambient Geothermal is the EVERYWHERE ENERGY

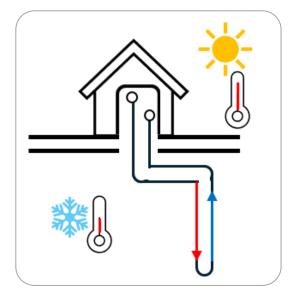


Air-source



- Air temperature
 - varies daily and seasonally
- COP: 1 to 3
 - COP 1 when too cold outside

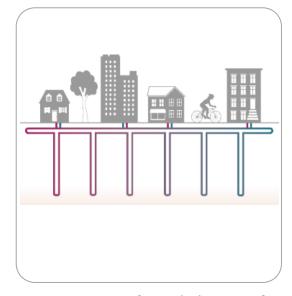
Ground-source



- Subsurface temperature
 - constant year round
 - cooler in summer
 - warmer in winter

• COP: ~ 3.5 to 4.5

GENs



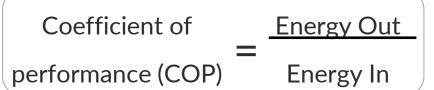
- Increased efficiency by sharing energy amongst buildings and added thermal inertia in the loop
- COP: ~ 3.5 to 8.9

Heat pump efficiency differences

Heat pumps transfer heat from one place (source) to another (sink)

They are very efficient

On the coldest day, GSHP often use ½ or less of electricity compared to ASHP





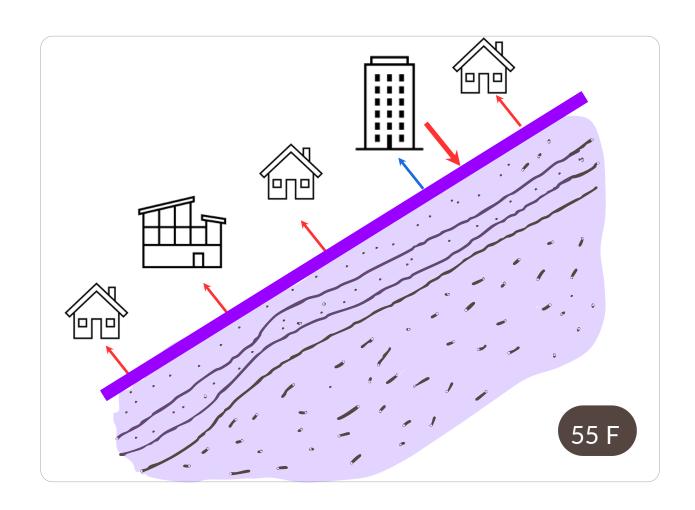


Geothermal Networks (single pipe ambient temperature loop) provide

SYNCHRONOUS cancellation of thermal needs which improves system efficiency

Effect observed at Framingham Spring 25'



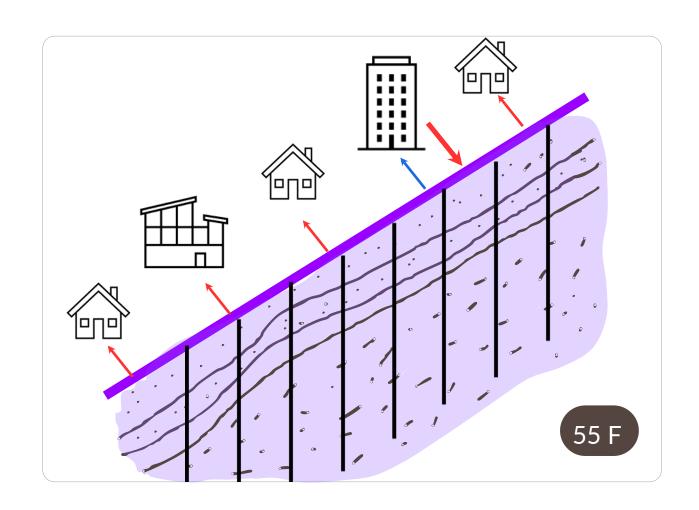


Geothermal
Networks (single
pipe ambient
temperature
loop) provide

SYNCHRONOUS cancellation of thermal needs which improves system efficiency

Effect observed at Framingham Spring 25'



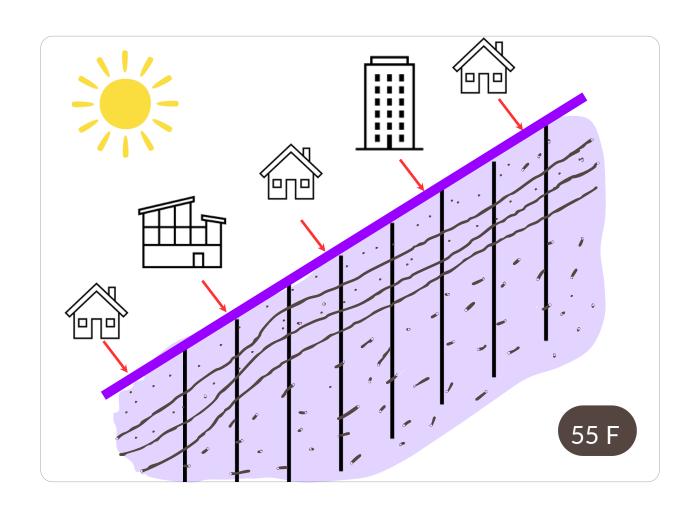


Geothermal Networksprovide

Thermal storage or asynchronous cancelation of thermal needs

improves efficiency



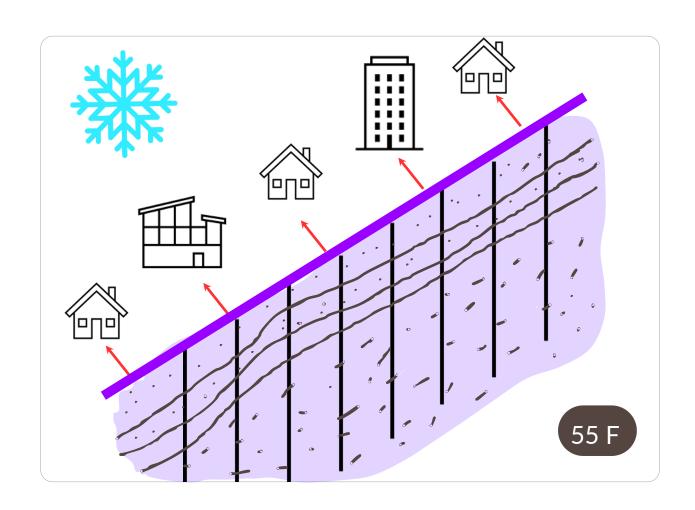


Geothermal Networksprovide

Thermal storage or asynchronous cancelation of thermal needs

improves efficiency





Geothermal Networksprovide

Thermal storage or asynchronous cancelation of thermal needs

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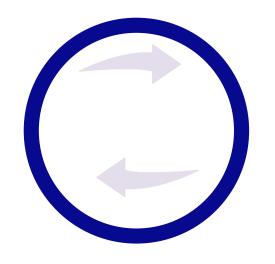
BUILDINGS:

(GEOTHERMAL HEAT PUMP)

Geothermal Network Main Components

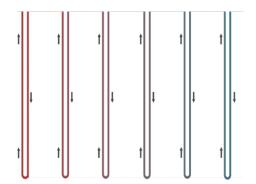
Each component is OLD TECH

Together they are NEW TECH



DISTRIBUTION LOOPS:

(THERMAL ENERGY NETWORK)



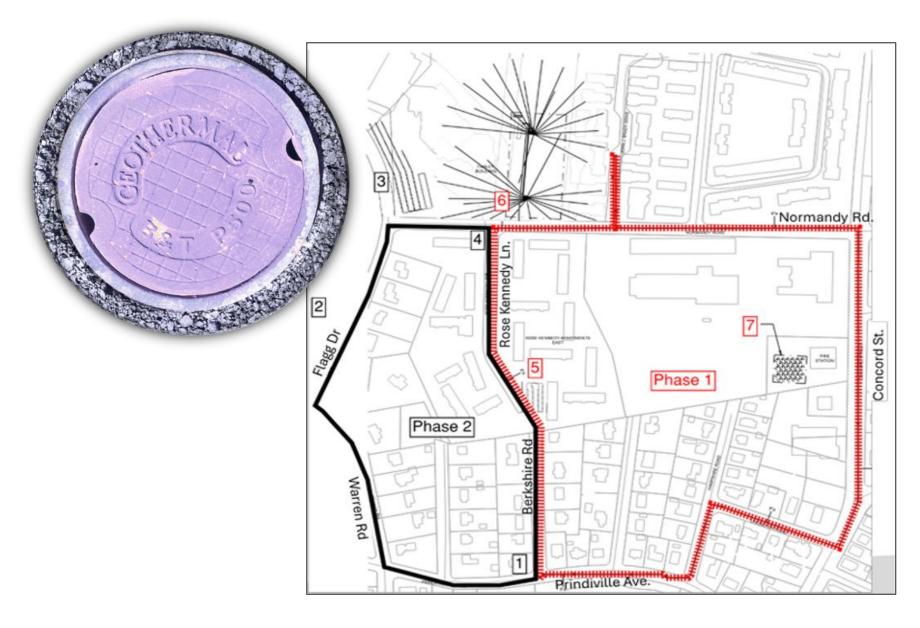
THERMAL RESOURCES:

(GEOTHERMAL BOREHOLES)

Also...

WASTEWATER EXCHANGE INDUSTRIAL WASTE HEAT LAKES, RIVERS, PONDS OTHER THERMAL...





Framingham Geothermal Network set to Grow:

HEET, with partners, are just entering the construction phase of a U.S. DOE Award.

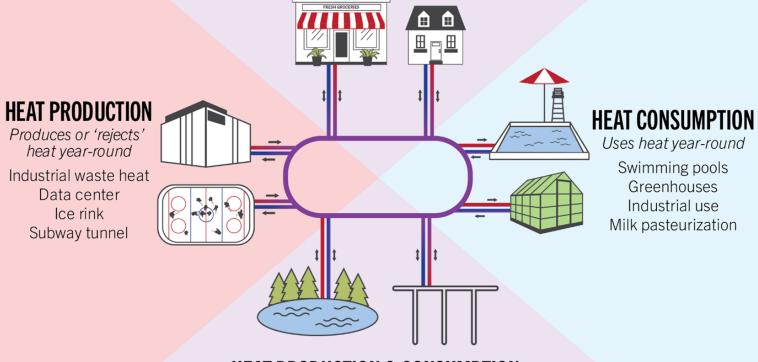
The initial design, which doubles the load of the network, indicates the potential to cut the construction cost per ton in half.





HEAT PRODUCTION & CONSUMPTION: VARIABLE DEMAND

Commercial buildings Residential buildings Municipal buildings



HEAT PRODUCTION & CONSUMPTION: FLEXIBLE SUPPLY

> Bodies of water Boreholes Bedrock Sewer systems



Geothermal Network (single pipe ambient temperature loop) Schematic

Magavi, Z., Alberto Escobar, A., and Varela, I. (2024). A Definitional Taxonomy for (Geo)Thermal Energy Networks, GRC Transactions, Vol. 48.



heat year-round

Data center

Ice rink

Subway tunnel

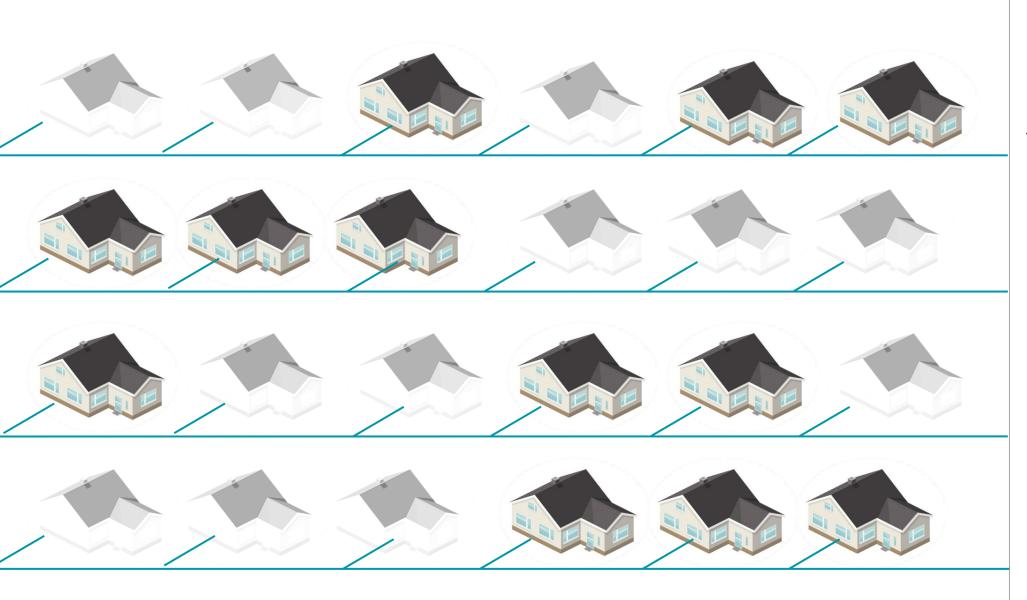
Average Bottom Temperatures (deg C) 1912-2022 42.8 -Temperature (C) 10.0 7.5 5.0 42.4 -2.5 Newton 0.0 42.2 --70.4 -70.8 -70.6 -71.2 -71.0

Geothermal Networks can leverage untapped thermal sources

According to NOAA data, Boston
Harbor is 3.4
degrees Celsius
warmer than in
1912.

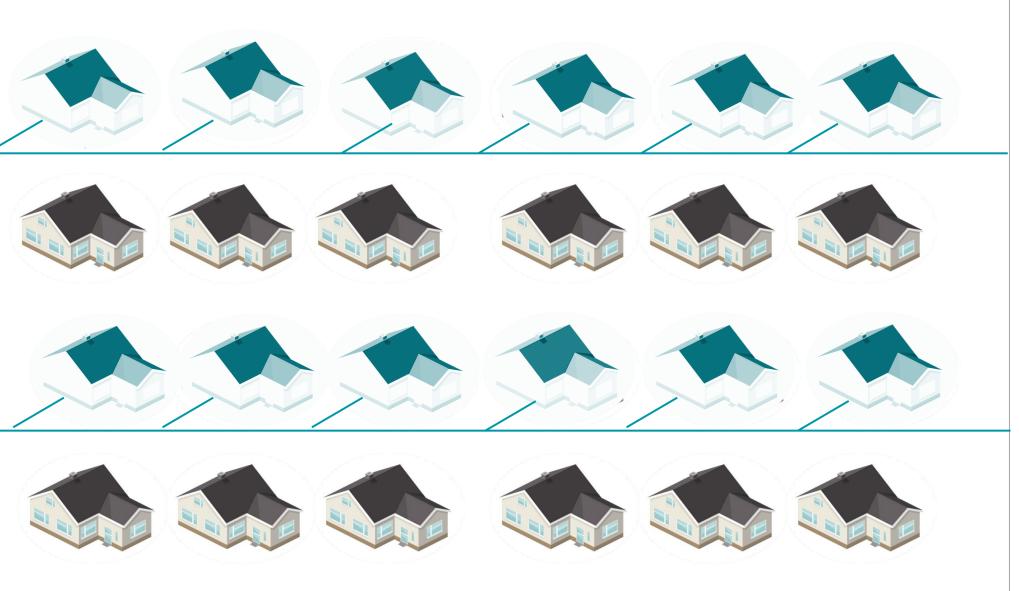
That is roughly enough heat for over 1 Million homes annually





Building by
Building
Electrification off
of gas network
triggers utility
death spiral





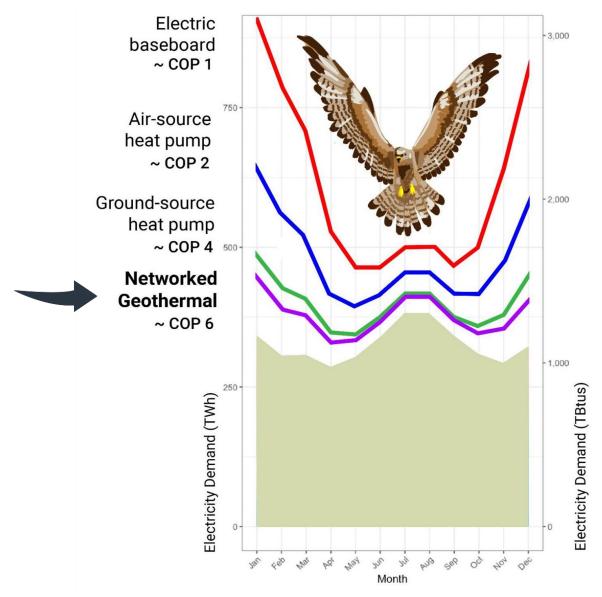
Gas to Geo Electrification:

Customers stay with utility, energy bills stay low

It's a modular and scalable approach

The World Bank is doing feasibility studies at the 10,000 building scale for 7 countries





GRID IMPACT:

The Falcon Curve Showing future U.S. Building Electric Use

GENs reduce the projected winter peak electricity demand



Buonocore, J. J., Salimifard, P., Magavi, Z., & Allen, J. G. (2022). Inefficient Building Electrification Will Require Massive Buildout of Renewable Energy and Seasonal Energy Storage. *Scientific Reports*, 12(1), 11931–11931. https://doi.org/10.1038/s41598-022-15628-2

The 2050 Benefits from Deploying Geothermal Heat Pumps



Eliminate the need for up to 43,600 miles of new interregional transmission infrastructure – equivalent to 44 SunZia transmission projects



Reduce up to 410 GW of nationwide generation capacity requirements – bolstering seasonal US grid resilience



Eliminate more than 7 gigatons of carbon – equivalent to all U.S. emissions produced in 2022

Porse, Sean U.S. DEPARTMENT OF ENERGY

OFFICE OF ENERGY FEFICIENCY & RENEWARI F ENERGY

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Impact on the

Flectric Grid of

of GHP

Mass Deployment

Cumulative U.S. savings > \$1 Trillion

CO2E SAVED

7.34 MMTs

FEWER TRANSMISSION

LINES 38% reduction



LESS GENERATION REQUIRED

13% reduction



FUEL COST SAVINGS

\$19 Billion/year



CHEAPER WHOLE SALE ELECTRICITY

12% reduction





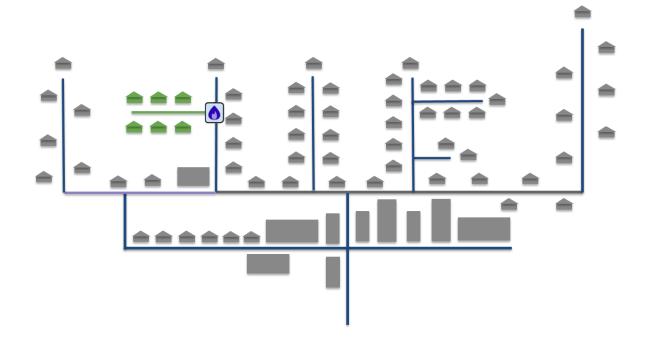


Liu, X., Ho, J., Winick, J., Porse, S., Lian, J., Wang, X.,, Liu, W.,, Malhotra, M., Li, Y.,, & Anand, J.,. Grid Cost and Total Emissions Reductions
Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States. United
States. https://doi.org/10.2172/2224191

GRID IMPACT of Geothermal Heat Pump 'Mass' Deployment



HEET Proposal for a Managed Transition for Building Energy Modernization by Street Segments



Goal Develop a tool to support optimization of the transition.

Can the rollout of Geothermal Networks be optimized for

costs, timing, disruption, affordability, electric grid impacts, emissions, fair access



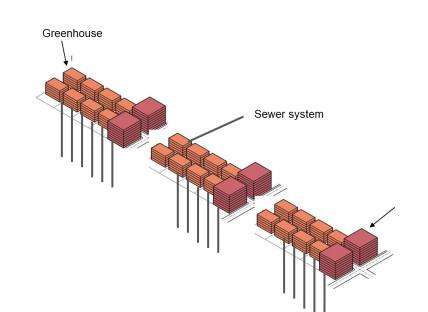


Also informed by

- Building stock and thermal loads
- > Geology
- Street infrastructure repair plans
- Density of buildings

Core data needed

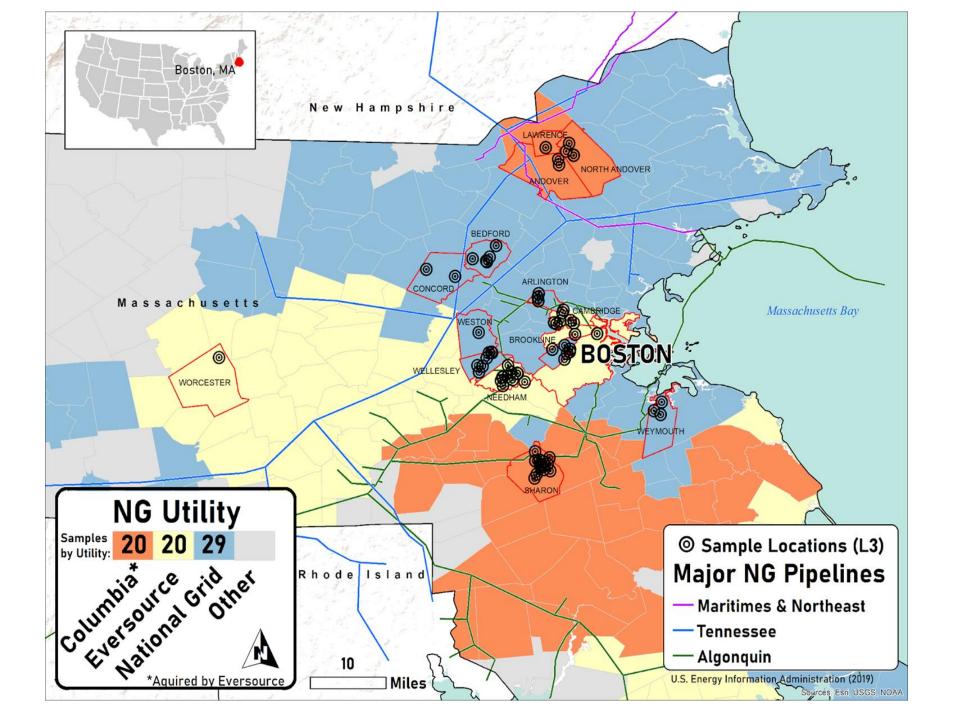
- Gas pipeline distribution system
 pipe diameter, pressure, replacement year and cost.
 Mains vs end of lines or rung of ladder
- Electric grid system hosting capacity
 ID locations where substations would be needed
 - Map large thermal sources and sinks Lakes, rivers, harbor, data centers, ice rinks, swimming pools, etc



Can the rollout of Geothermal Networks be optimized?

Yes! with access to energy infrastructure data





Example of "island" in gas grid:

City of Cambridge



Thermal Energy Network Legislation

MA: 2021, 2022, 2024, **2025**

MN: 2021, 2024, **2025**

NY: 2022, **2025**

CO: 2023, 2024

WA: 2024, 2025

MD: 2024

VT: 2024

CA: 2024

NJ: 2024 (study)

ME: 2025 (study)

CT: 2025

TX: 2025

IL: 2025

As of 11/6/2025







BUILDING DECARBONIZATION

Filed Legislation 2025



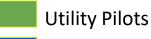


32 Gas utilities interested in Geothermal Networks

26 US gas utility projects filed

As of 3/17/2025





Utility NetGeo Collaborative







HEET licenses all materials for open sharing & adapting under Creative Commons CC BY-AS 4.0

#ThinkThermalTogether

Geothermal Networks (single pipe ambient temperature loops) provide

affordable, resilient, local, modular, stable, scalable thermal energy while minimizing electricity consumption and unlocking the utility model

the electric grid is one of the main beneficiaries of geothermal networks!







Break

Please be ready to start again in ~5 minutes

Grid Modernization Advisory Council



Facilitated Discussion

Grid Modernization Advisory Council

Facilitated Discussion Questions



- 1. Follow-up questions to the HEET presentation. For example, how do networked geothermal systems affect the electricity grid, grid modernization investments, and the ESMPs?
- 2. Follow-up questions to the EDC presentation. For example, how are the EDCs spending the IEP funds?
- 3. How will IEP be accounted for in the next cycle of ESMPs?
- 4. How is the IEP stakeholder working group evaluating the implications of IEP on electricity and gas costs, rate and bill impacts, and affordability?
- 5. How is the IEP stakeholder working group investigating ways to address impacts on EJ communities in the IEP?
- 6. Should gas LDCs play a role in ESMP planning and, if so, what role?
- 7. What lessons from the gas NPA framework discussions and proposal can be transferred to the discussion of NWAs in ESMP planning?
- 8. How can the GMAC, or individual GMAC members, support the IEP stakeholder working group? How should communication flow between GMAC and IEP?

Grid Modernization Advisory Council Slide 51

Close and Next Steps



Upcoming meetings:

Date	Time	Meeting	Topic
December 12 th	9:00 – 1:00 PM	Public Event	The Electric Grid Through a Municipal Lens Pt. 2
December 18 th	9:30 – 10:30 AM	ExCom	2026 Planning – Agendas for GMAC meetings
January 29 th	1:00 – 3:00 PM	Council	Intro to Forecasting/Obj. 1 Load Growth Areas

Thank you all for a productive year! Wishing you all a happy holiday season. ©







Grid Modernization Advisory Council Slide 52