Massachusetts Grid Modernization Advisory Council

Meeting Presentation

August 28, 2025

Agenda & Roll Call

Item	Time
Administrative Items • Welcome, Roll Call, Agenda • Public Comment Period • Meeting Minutes Review and Approval • Review of Strategic Planning Timeline • EWG Membership • GMAC 2nd Stakeholder Session Proposal	1:00 – 1:20
Updates on ESMP Activities	1:20 – 1:25

Resilience Presentations
• **State Resilience Planning Efforts (15 mins)**
  • *Sarah Alexander, EEA: ResilientMass*
  • *Deanna Moran, CZM: ResilientCoasts*
  • *Sarah Cullinan and Corrin Moss, MassCEC: 40101(d) Grid Resilience Projects*
• **DOER Presentation (15 mins)**
• **Rhizome Presentation (10 mins)**
	1:25 – 2:05

Break	*2:05 – 2:10*
Facilitated Discussion (Amy McGuire and Chris Modlish)	2:10 – 2:50
Other Discussion Areas	2:50 – 2:55
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:
  - July 31, 2025 GMAC meeting minutes
  - August 14, 2025 Executive Committee meeting minutes.

Are there any edits for either set of minutes?

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

Reminder: Strategic Planning Process

GMAC Member Survey ✓
- Collect council member perspectives

→

Small Group Discussions ✓
- Discuss strategic plan elements

→

September 18th Full Council Meeting
- Discuss draft 2026 Strategic Plan

→

October 30th Full Council Meeting
- Vote on strategic plan

- DOER and Synapse are drafting a proposed 2026 Strategic Plan to be discussed in September.
- The proposed plan will be posted online and emailed to GMAC members in advance of the September 18th GMAC meeting.
  - **Please review this prior to the meeting and come prepared to share your thoughts.**
- Feedback from the September meeting will inform a final 2026 Strategic Plan, consultant work plan, and DPU budget request.
- The DPU budget request for consulting services and operating expenses will be submitted on November 7th.

Any questions?

EWG Membership

- The Equity Working Group is comprised of at least 7 members:
  1. Voting Councilors or their designees:
     a) The Department of Energy Resources (DOER),
     b) Office of the Attorney General,
     c) Two or more Councilors selected by the GMAC.
  2. Two voting members representing organizations that are not represented on the GMAC, selected by the GMAC,
  3. One representative of the EDCs
- Per the EWG charter, members serve 2-year terms.
  - **Members 1(c) – 3 are up for reappointment by September 14, 2025. The Chair is also up for reappointment.**
  - Members 1(a) and 1(b) above shall be permanent members of the Equity Working Group.
- EWG members were asked to notify the EWG Chair if they plan to step down and/or nominate a candidate. **No notifications have been made.**
- **The GMAC will vote to appoint EWG membership and an EWG Chair at the September 18th GMAC meeting.**

	Current Member	Representation
1(a)	*Julia Fox*	*Department of Energy Resources*
1(b)	*Chris Modlish*	*Massachusetts Office of the Attorney General*
1(c)	Kathryn Wright*	Barr Foundation, GMAC representative, ***Chairperson**
1(c)	Kyle Murray	Acadia Center, GMAC representative
1(c)	Larry Chretien	Green Energy Consumers Alliance, GMAC representative
2	Mary Wambui	Planning Office for Urban Affairs, external organization representative
2	Jolette Westbrook	Environmental Defense Fund
3	Erin Engstrom	Eversource, EDC representative

Do GMAC members have any questions or member nominations?

The Future Grid From a Municipal Lens – Second Event

EVENT OVERVIEW

🗓️ **Recommended Date:** December 11th **or** 12th

🗓️ **Recommended Time:** 9 – 12:30 PM
(8:15 AM networking)

📍 **Venue:** UMass Amherst or UMass campus in Springfield

🎯 **Target Audience:** Municipal leaders

👥 **Expected Attendance:** 100 - 130

AGENDA OUTLINE

(Full agenda on next slide)

1. *Networking*
2. Welcome, Keynote, Opening Remarks
3. EDC Panel: What is in the ESMPs?
4. *Break*
5. Municipal Lightning Round + Panel Q&A
6. Facilitated Breakout Discussions
7. Report Out
8. Close and Next Steps
9. *Optional: Virtual Tour of a Substation*

- We propose hosting another "The Grid From a Municipal Lens" for our second stakeholder session.
- See changes to this second event below (informed by participant, GMAC, and ExCom feedback).

PROPOSED CHANGES

- Remove the first panel to allow for more breakout discussion time.
- EDC panel to include one GMAC representative.
- One section to include 4-5 municipal representatives in western MA who will provide overviews of challenges they are facing with electrification.
  - Western MA attendees from July will be invited to speak + other recommended contacts.
- Report out on breakout discussions at end of event.
- Invite the EDCs to provide an optional presentation on substations.
- Invite the EDC community managers in western MA

Do GMAC members have feedback on the agenda?

Is there a preference for December 11th/12th?

Time	Min	Proposed Agenda
8:15	*45*	***Networking***
9:00	25	**Welcome, Keynote Address, Opening Remarks** • Keynote speaker TBD • GMAC Chair provides introduction to ESMPs/GMAC
9:25	45	**Panel: What is in the ESMPs?** • EDC + GMAC member representatives discuss ESMPs as strategic plans, approved investments and implementation of programs
10:10	*15*	***Break***
10:25	25	**Municipal Lightning Round** • 4-5 western MA municipal reps present 1 slide of a challenge and/or success their community is facing while navigating electrification
10:50	25	**Q&A – Municipal Lightning Round** • GMAC member facilitates audience Q&A based on municipal presentations
11:30	40	**Facilitated Breakout Discussions** • Municipalities share their questions and insights about grid modernization in their community
12:10	15	**Report Out**
12:25	5	**Close and Next Steps**
12:30	*30*	***Optional: Virtual Tour of a Substation*** • *EDCs provide optional presentation on how a substation operates and provide context of what upgrades are happening to substations in local communities.*

ESMP Activities Updates

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

Key Upcoming Dates	
EDC comments on ESMP long-term cost recovery	**9/10**
IEP Stakeholder Working Group meeting	**9/18**
Resilience Metrics (DPU 24-53) Technical Session	**9/22**
1st ESMP biannual report filed	**9/30**
Intervenor comments on ESMP long-term cost recovery	**10/8**
Reply comments on ESMP long-term cost recovery	**11/5**
IEP Stakeholder Working Group meeting	**11/13**
IEP Stakeholder Working Group listening sessions	**12/9 + 12/11**

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

Are there any updates on these items?

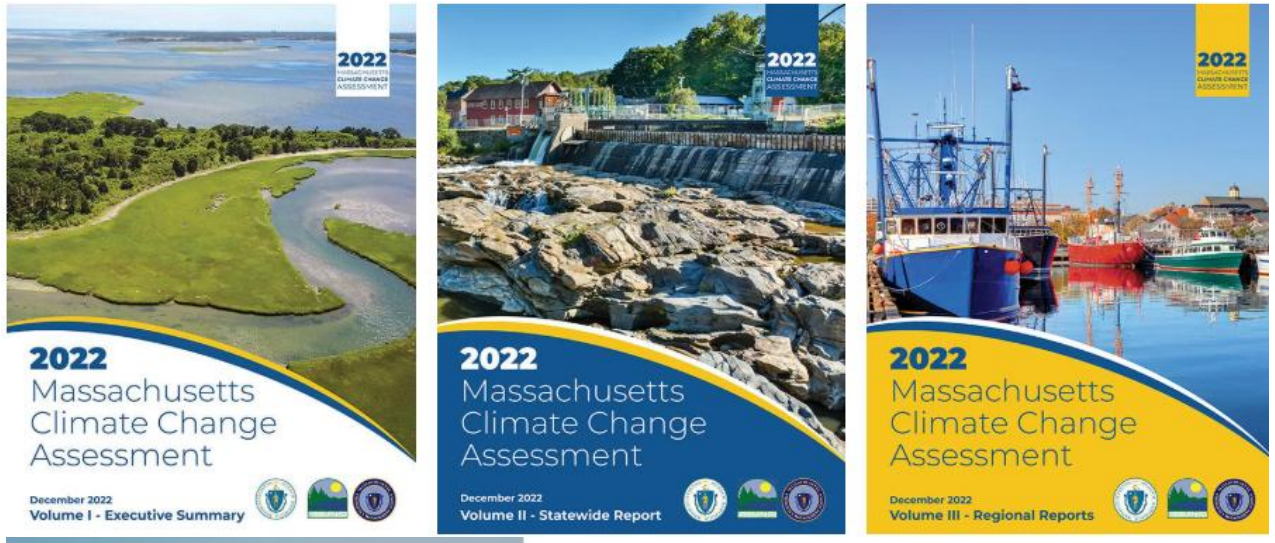
State Resilience Planning Efforts

Coordinated Climate Adaptation & Resilience in Massachusetts

2022

Massachusetts Clean Energy and Climate Plan
Cross-Sectoral Approach to implementing
Net-Zero by 2050

2022

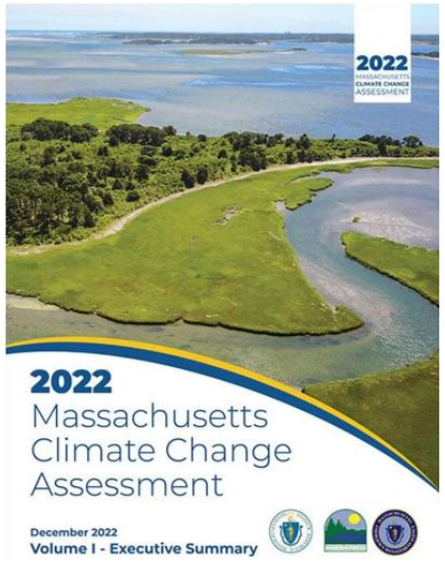


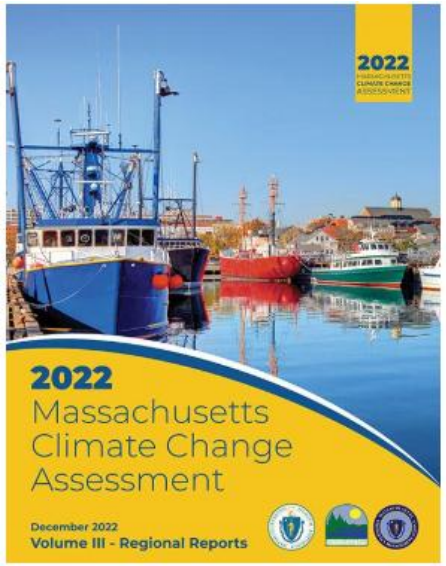
Analysis of Mass' 37 top climate hazard and impacts, statewide & regional assessments

2023

Comprehensive planning effort that results in a mitigation and adaptation strategy; strategies to address risk across sectors.

https://resilient.mass.gov/





Priority statewide impacts from the 2022 MA Climate Assessment

HUMAN

Health and Cognitive Effects from Extreme Heat, including premature death and learning loss in children.

Health Effects from Degraded Air Quality, including childhood asthma cases and premature death due to the climate impact on particulate matter and ozone air quality.

Emergency Service Response Delays and Evacuation Disruptions from extreme storms, leading to injuries, loss of life, and urgent need for health, safety, and traffic first responders.

Loss of life or injury due to high-vulnerability dams, hurricanes, wildfires, extreme flooding, or extreme temperatures.

Disproportionate impacts on unhoused populations from extreme temperatures or extreme flooding.

INFRASTRUCTURE

Damage to Inland Buildings from heavy rainfall and overwhelmed drainage systems.

Damage to Electric Transmission and Utility Distribution Infrastructure associated with heat stress and extreme events.

Damage to Rails and Loss of Rail/Transit Service, including flooding and track buckling during high heat events.

Damage or loss of unreinforced masonry buildings due to earthquakes.

Damage to infrastructure, utilities, and buildings in liquefaction zones due to earthquakes.

Damage or loss to homes and critical facilities in the wildland urban interface.

NATURAL ENVIRONMENT

Freshwater Ecosystem Degradation due to warming waters, drought, and increased runoff.

Marine Ecosystem Degradation because of warming, particularly in the Gulf of Maine, and ocean acidification.

Coastal Wetland Degradation from sea level rise and storm surge.

Forest Health Degradation from warming temperatures, changing precipitation, increasing wildfire frequency, and increasing pest occurrence.

Loss of biodiversity, habitats, and native species due to climate change impacts.

GOVERNANCE

Reduction in State and Municipal Revenues, including a reduced property tax base due to coastal and inland flood risk.

Increase in Costs of Responding to Climate Migration, including planning for abrupt changes in local populations.

Increase in Demand for State and Municipal Government Services, including emergency response, food assistance, and state-sponsored health care.

Inability to carry out mission and services due to damage, disruption, or loss of state assets and services.

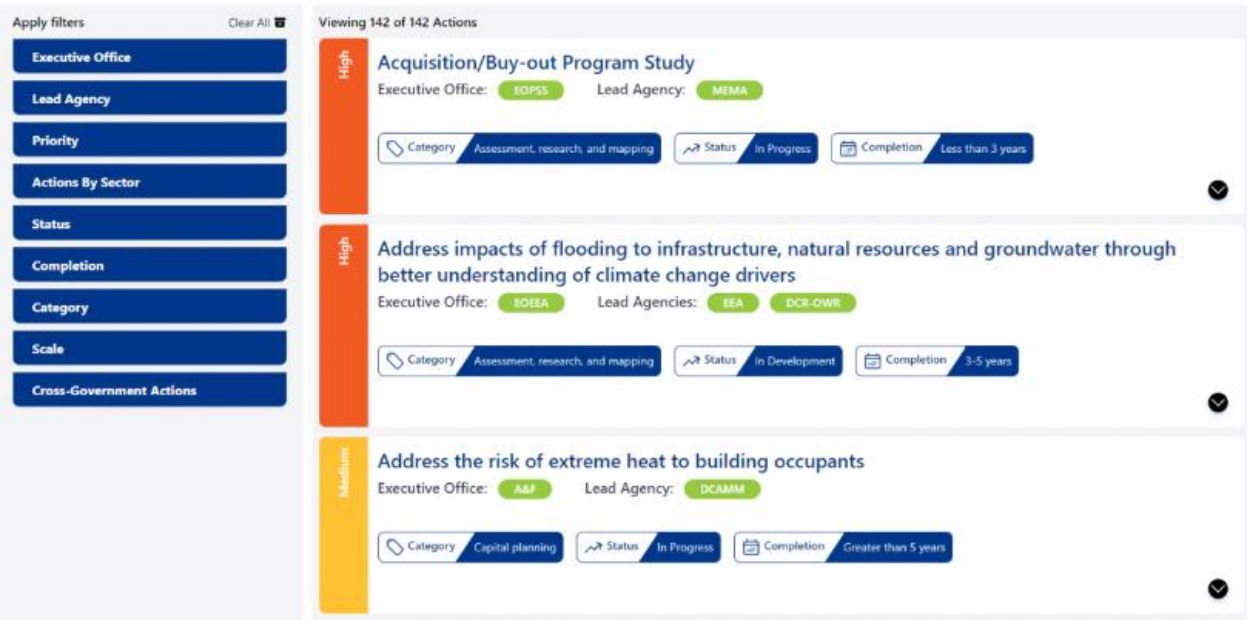
ECONOMY

Reduced Ability to Work, particularly for outdoor workers during extreme heat, as well as commute delays due to damaged infrastructure.

Decrease in Marine Fisheries and Aquaculture Productivity from changing ocean temperatures and acidification, which leads to decreased catch and revenues and impacts on related industries.

Reduction in the Availability of Affordably Priced Housing from direct damage (e.g. flooding) and the scarcity caused by increased demand.

Damage, disruption, or loss of coastal infrastructure such as seaports, airports, and maritime industries.



ResilienceMass Plan

- **2023 ResilientMass Plan** (resilient.mass.gov), *implemented by inter-agency ResilientMass Action Team (RMAT)*
  - Whole of government
  - Centers equity and environmental justice
  - Grounded in science
  - 150+ agency and cross-government actions to address priority impacts
  - Living plan

- **Key actions underway**
  - ResilientMA Metrics
  - Resilience Finance Strategy (coming soon!)
  - Coastal resilience strategy
  - Expand evaluation of resilience in capital planning
  - RFQ for resilient infrastructure standards

ResilientMass Action Team

Climate Change Coordinators

- Administration & Finance (A&F)
- Education (EOE)
- Energy and Environmental Affairs (EEA)
- Economic Development (EOED)
- Health and Human Services (HHS)
- Labor & Workforce Development (LWD)
- Public Safety & Security (EOPSS)
- Technology Services & Security (EOTSS)
- Housing and Livable Communities (HLC)
- Mass Dept of Transportation (MassDOT)
- Massachusetts Bay Transportation Authority (MBTA)
- Veterans' Services (VET)

Agency Action Partners by Sector

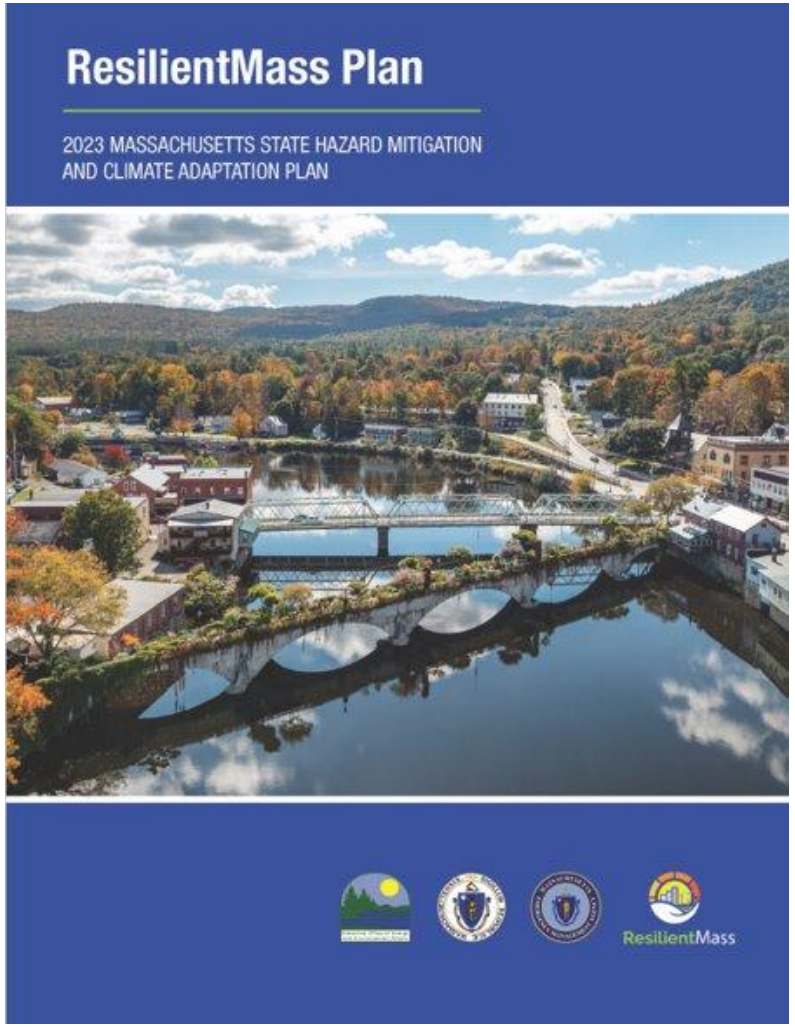
Economy Sector
AGR; CZM; CPRO; DCR; DEP; DFG; DLS; DPU; EEA; EOE; EOED; LWD; MDAR; MOTT

Human, Health & Safety Sector
A&F; CZM; DCAMM; DCR; DEP; DFG; DPH; DPU; EEA; EOED; EPS; HHS; TSS; MassDOT; MDAR; MEMA; MHC; MOTT

Infrastructure Sector
MBTA; DCR; DFG; DOT; DCAMM; EEA; DOER; EPS, TSS, DPU

Governance Sector
A&F; CZM; DCAMM; DEP; DFG; DLS; EEA; EOED; LWD; PSS; TSS; HLC; MDAR; MEMA

Natural Environment Sector
CZM; DCR; DEP; DFG; EEA; MDAR



https://www.mass.gov/info-details/2023-resilientmass-plan

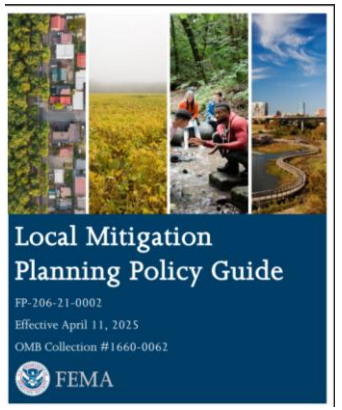
Local Connections

- ResilientMass Plan: Statewide Risk & Vulnerability Assessment to natural hazards and Climate Change

- Local Hazard Mitigation & Climate Adaptation Planning
  - Municipal Vulnerability Preparedness Program (MVP)
  - Connections between Utility and local planning

- Grant Funding

MVP
Municipal Vulnerability Preparedness

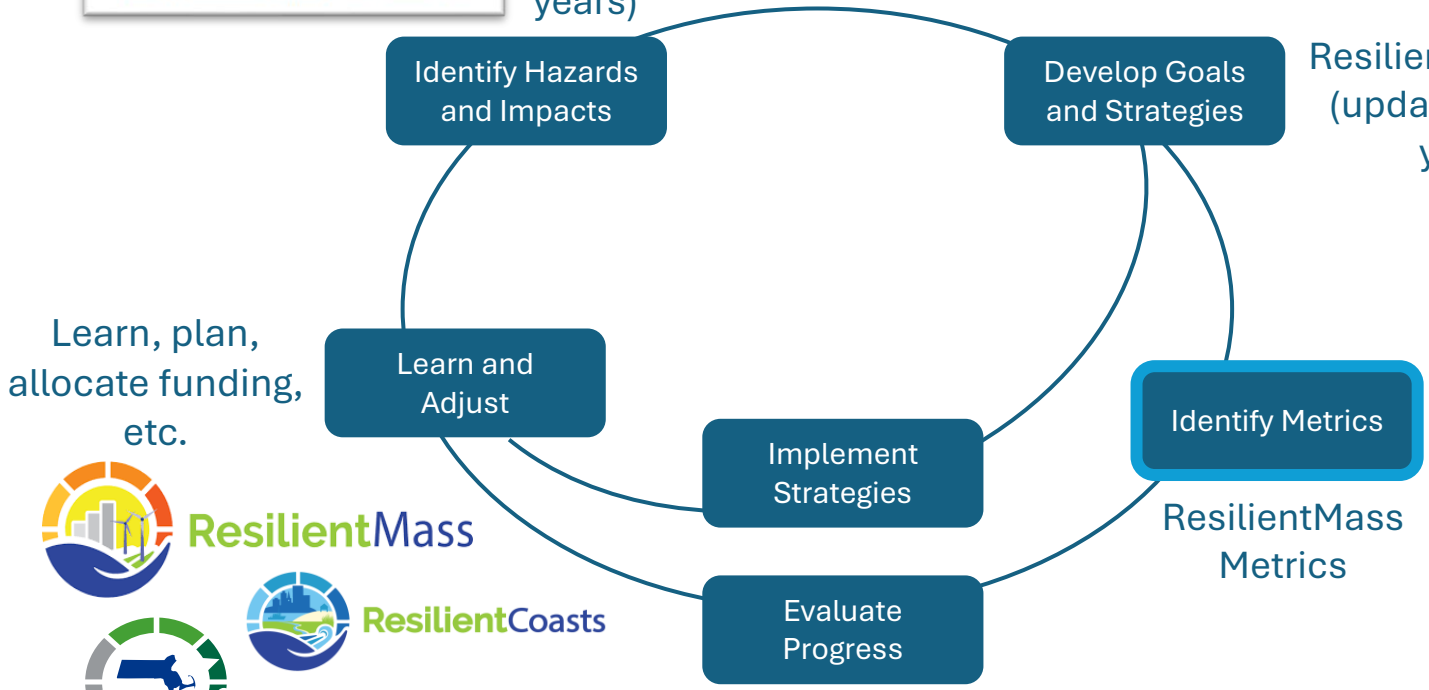


Climate Resilience PLAYBOOK

ResilientMass Metrics is part of a larger cycle of resilience building efforts in Massachusetts

Climate Assessment (updated every 5 years)

ResilientMass Plan (updated every 5 years)



Learn, plan, allocate funding, etc.

ResilientMass

ResilientCoasts

MVP
Municipal Vulnerability Preparedness

ResilientMass Metrics

Data collection and reporting via annual Dashboard and Climate Report Card

See: https://www.mass.gov/info-details/resilientmass-metrics

Thank you!

Please reach out with any questions or feedback

Sarah.Alexander@Mass.gov

ResilientCoasts

Managing impacts of coastal hazards across the Commonwealth

CZM

ResilientCoasts

August 28, 2025
GMAC Meeting

98 CURRENT AND FUTURE COASTAL COMMUNITIES

A 50-YEAR FRAMEWORK FOR COASTAL RESILIENCE

Coastal Resilience Districts

To inform regional collaboration.

Near-term Adaptation Areas

To inform where to prioritize taking action.

Coastal Typologies and Coastal Resilience Measures

To inform how to take action to increase coastal resilience.

10 Proposed State Strategies &
70 Proposed Near, Medium, and Long-term Actions

To be implemented across state government by various agencies/secretariats

For more information and access to the full plan, visit **mass.gov/info-details/resilientcoasts-initiative**

Grants for Enhancing Massachusetts Grid Resilience & Reliability Program

FEDERAL GUIDELINES

- Formula funding enabled by BIL, Section 40101(d). MassCEC is MA designee.

Eligible Applicants:
- Electric grid operators
- Electricity storage operators
- Electricity generators
- Transmission owners or operators
- Distribution providers
- Fuel suppliers
- Other relevant entities as determined by the Secretary of DOE

Eligible Activities:
- Weatherization tech and equipment, undergrounding
- Equipment hardening & veg management
- Pole and conductor/cable replacement, reconductoring
- Fire-resistant tech and prevention systems
- Monitoring & control
- Storage and microgrids for resilience
- Adaptive protection
- Advanced modeling

MA PROGRAM DETAILS

- MassCEC and DOER developed the grant program to:
  - Improve energy reliability and resilience
  - Support decarbonization efforts
  - Advance environmental justice
  - Create good-paying, clean energy jobs
- Applications were open to all eligible entities/activities; Building-level resilience and innovative projects were encouraged
- MassCEC strongly encouraged projects designed by and with communities

PROGRAM STATUS

- MA was awarded FY22-FY24 funding allocations, totaling $13.5M
- Grants for all available FY22-FY24 funds have been recommended to DOE
- Projects to be announced late summer/early fall
- BIL defined five total years of funding. FY25-26 has not been announced, but we anticipate a maximum additional amount of program funding up to $7M.

Projects range from pole replacement, vegetation management, and reconductoring, to FLISR, microgrids, and long-duration energy storage

Benefits will include reduced cost for ratepayers, increased reliability to support electrification, enhanced resilience for critical facilities, and modernized infrastructure to accommodate decarbonization

MASSACHUSETTS
DEPARTMENT OF ENERGY RESOURCES

Advancing Grid Climate Resilience

Climate Vulnerability Assessments in Resilience Planning and Investment

August 28, 2025

Presented by
Julia Fox & Yaritza Peña

Table of Contents

What does climate resilience mean for the grid?

A resilient electric grid is designed to prepare for, withstand, respond to, and recover from disruptions caused by climate hazards.

PREPARE – Incorporate climate vulnerability assessments (CVAs) and new grid technology into planning and investment decisions

WITHSTAND – Design and harden infrastructure against climate hazards

RESPOND – Maintain service during climate-driven events and leverage distributed energy resources, microgrids, and storage to keep critical loads powered

RECOVER – Restore service quickly after climate-related outages and prioritize reconnection for vulnerable populations and critical facilities

ESMP Orders Summary

The DPU finds that targeted resiliency investments are eligible for recovery through the interim mechanism, subject to certain project selection and documentation requirements.

Approved Term Spending Caps for Resilience Investments

Unitil

Proposed: $5 million
Approved: $5 million

EVERSOURCE

Proposed: $225 million
Approved: $25.05 million

- DPU adjusted undergrounding budget from $216.5M to $19M due to lack of rationale for increased undergrounding investment

EDC Investment Proposals

UNITIL

- 700-1800' of Targeting Undergrounding
- 2 Miles Spacer Cable Installation
- Developing/Automating Circuit Ties

EVERSOURCE

- 32 Undergrounding Projects
- 3 Aerial/Spacer Cable Projects
- 3 Reconductoring Projects
- 15 Resiliency Tree Work (RTW) Projects

*National Grid did not propose investments and instead pursued resilience investments via base distribution rates

ESMP Phase I Requirements

- Use historical performance data including major outage data to identify and prioritize locations for investment
- EDC coordination to analyze cost-effectiveness of investments to prioritize least-cost solutions
- Address the needs of critical facilities and consider municipal input
- Investment selection must be informed by CVA results
- Standardize forecasting windows and climate scenario parameters
- Standardize prioritization processes

ESMP Phase II Requirements

- Report project-level cost efficiency for each targeted resiliency project
- A chart documenting ESMP and non-ESMP resilience investments completed in the same reporting period
- Demonstrate accounting of critical facilities and municipal input
- Complete or modify CVAs to meet DPU requirements
- CVRP will be applied to second term of ESMP filings

Climate Vulnerability Assessment (CVA)

What Are They?

A framework that identifies climate hazards to the grid, evaluates system vulnerabilities, and assesses potential impacts to determine the resiliency of the system and inform those locations in need of hardening and resiliency investments

Where They Came From

Compliance with G.L. c 164 Section 92B

The ESMP provisions of the Climate Act require plans to prepare the grid for climate impacts. Utilities conducted CVAs to identify climate hazards and inform resilience planning.

DPU Requirements

The DPU also required that CVAs address:

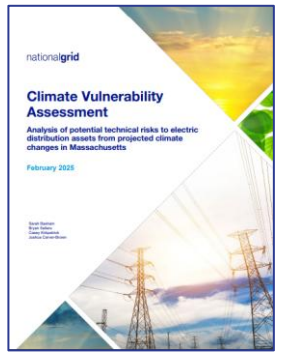
1. a **standardized** set of climate hazards and climate change scenarios parameters
2. the risk level associated with the hazard's probability of occurrence under the climate change scenario studied
3. the cost of the targeted resiliency investment
4. potential resiliency benefits, which could include improved electric grid performance, avoided restoration costs, avoided outage costs, and community benefits
5. impacts to **critical facilities and EJ populations**
6. a prioritization process to implement resiliency investments based on the assessment

EDC CVA Status

National Grid: Completed and publicly posted CVA in Feb. 2025

Eversource: CVA is complete and in review. Working on aligning their report with other EDCs.

Unitil: Collaborating with other EDCs to establish CVA framework and begin drafting the report late 2025.



ESMP Timeline

CVAs must be completed for resiliency investments to be eligible for cost recovery

CVAs were developed as a part of ESMP Phase I
CVA updates expected at biannual ESMP reporting
CVA framework required in cost recovery filings

Climate Vulnerability & Resilience Plan (CVRP)

What Are They?

A plan that bridges the findings of the CVAs and the resilience investments made by EDCs. CVRPs will translate CVA results into targeted strategies and investments that strengthen the grid against climate risks

Where They Came From

2024 Climate Act - Amendment of G.L. c 164 Section 92B

Following the ESMP Phase I Order, the Legislature amended Section 92B (c) to require EDCs to prepare CVRPs that include specific criteria specified in the stature.

Requirements

CVRPs should be prepared every 5 years and include:

1. an evaluation of climate science and projected climate-related risks for the service territory
2. an evaluation and risk assessment of potential impacts of climate change on existing operation, planning and physical assets
3. identification, prioritization and cost-benefit analysis of adaptation options to increase asset and system-wide resilience over time
4. implementation timeline for making changes in line with the findings of the study
5. a community engagement plan with targeted engagement for EJ populations

ESMP Timeline

CVRP requirement is applicable to the second term ESMP filings in 2029

Between now and 2030, the focus is on improving CVAs and resiliency planning processes, using annual filings and GMAC discussions to build toward strong CVRPs for the next ESMP cycle and beyond.

Why It Matters

The CVRP requirement enhances the need for EDCs to improve and standardize their resiliency investment planning process prior to investmenst being borne by ratepayers.

CVA & CVRP Side by Side

CVRPs can use findings from the CVA to guide decision-making and targeted resiliency planning over time. The goal is to evolve the CVAs biannual reporting into a foundational resilience planning tool using the CVRP framework.

	CVA The Caterpillar	CVRP The Butterfly
Timeline	Updates required in biannual ESMP filings, next filing Sept 2025	Every 5 years, first filing with next phase of ESMP 2030
Focus	Assessment of climate hazards and system risk, costs and benefits	CVA + Long-term planning and operational response
Outcome	Identify biggest grid hazards and at-risk communities to inform resiliency investment priorities	Integration of CVA into infrastructure investments and planning
Data	Establishes the risk baseline and system resilience investment needs	Applies CVA insights to strategic adaptation plans
Community Resilience	Emphasis on EJ communities and impacts to critical facilities	Includes an actionable EJ engagement plan

DPU expects that the Companies will continue to refine their resiliency planning processes and incorporate lessons learned from the CVAs in developing their CVRPs for the second ESMP term

DPU Order 24-53

Establishing Resiliency Performance Metrics

- Inquiry opened by DPU to revise current Service Quality Standards
- Seeks to develop resiliency-focused performance metrics in response to climate change impacts on the system
- Expands performance metrics beyond “blue-sky” reliability (SAIDI, SAIFI) to reflect customer level and system level performance during low-frequency, high-impact weather events
- Proposes to track resiliency performance metrics separately for critical customers and equipment to assess how well EDCs support broader community resilience
- Seeks to eventually develop baseline performance benchmarks and penalties

Resilience Metrics + ESMP

Order 24-53 supports ESMP Resilience goals by…

- Encouraging EDCs to make investments that improve grid resilience
- Reinforcing expectations that ESMP resiliency investments should go above and beyond routine reliability investments
- Establishing metrics that will help assess performance under severe weather conditions and further demonstrate effectiveness of resiliency investments
- Supporting integration of climate resiliency into grid planning
- Providing transparency and accountability for resilience outcomes tied to ratepayer- funded investments through the ESMP

DPU Technical Conference for 24-53 on 09/22

Potential GMAC Actions

The GMAC should consider how resilience fits into its 2026-2029 strategic plan. Potential actions inspired by GMAC member survey results include:

Increasing level of engagement

1 **Monitor CVA/CVRP implementation through the biannual reports**

- Biannual reports include:
  - Update on finalizing climate vulnerability risk assessments,
  - Describe and explain any adjustments to the proposed portfolio of targeted resiliency investments included in its ESMP in these proceedings; and
  - Explain the basis for those adjustments
  - Each company will provide a description of its planned targeted resiliency investments along with costs, regardless of core or ESMP classification
- Provide feedback to EDCs on resilience planning and implementation

2 **Provide stakeholder education on resilience planning**

- Create accessible education materials on CVAs/CVRPs
- Host stakeholder session with resilience focused discussion

3 **Establish GMAC resilience subcommittee**

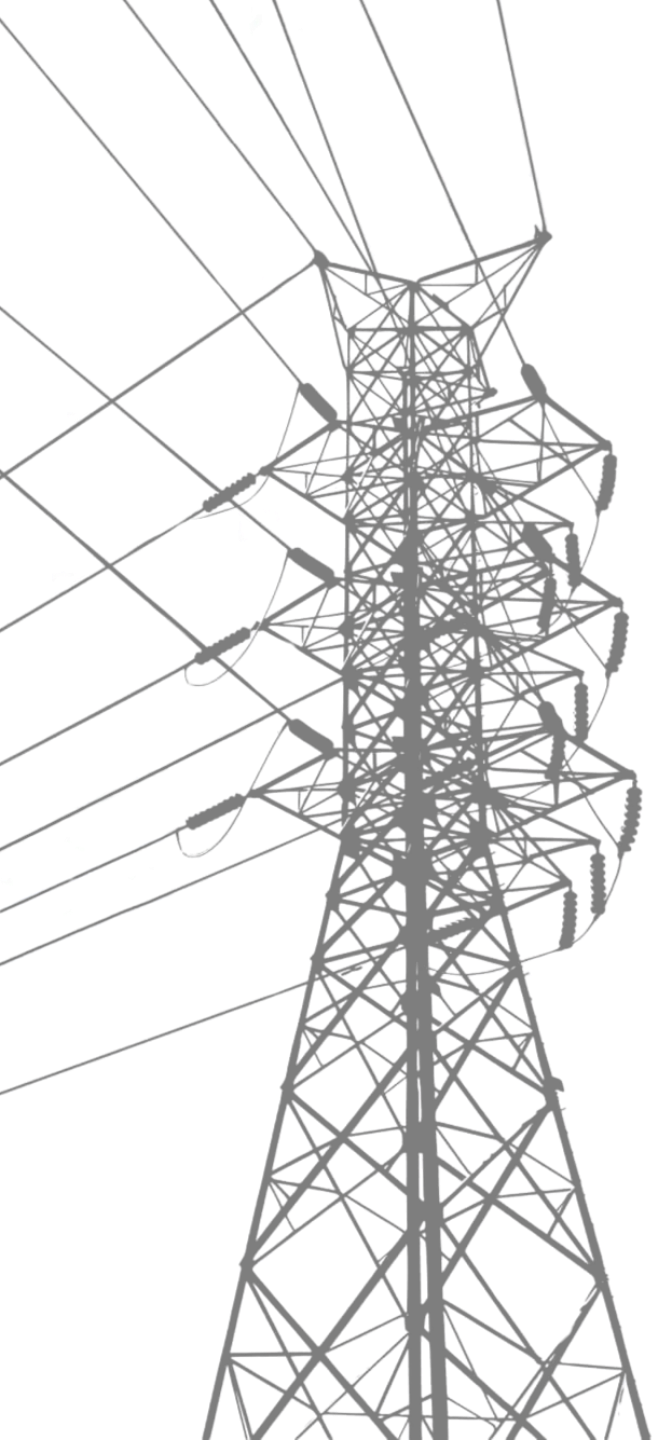
- Subcommittee reviews and provides recommendations related to resilience plans and provides updates to GMAC
- The subcommittee could include EDC resilience planners, MA Office of Climate Science, additional experts, and interested stakeholders

4 **Establish full GMAC workstream on CVA and CVRP implementation**

- Deep dives in forecasts and resilience investment portfolios
- Produce resolution on resilience recommendations such as forecasting windows and climate hazards and scenario parameters

MASSACHUSETTS
DEPARTMENT OF ENERGY RESOURCES

Thank You!



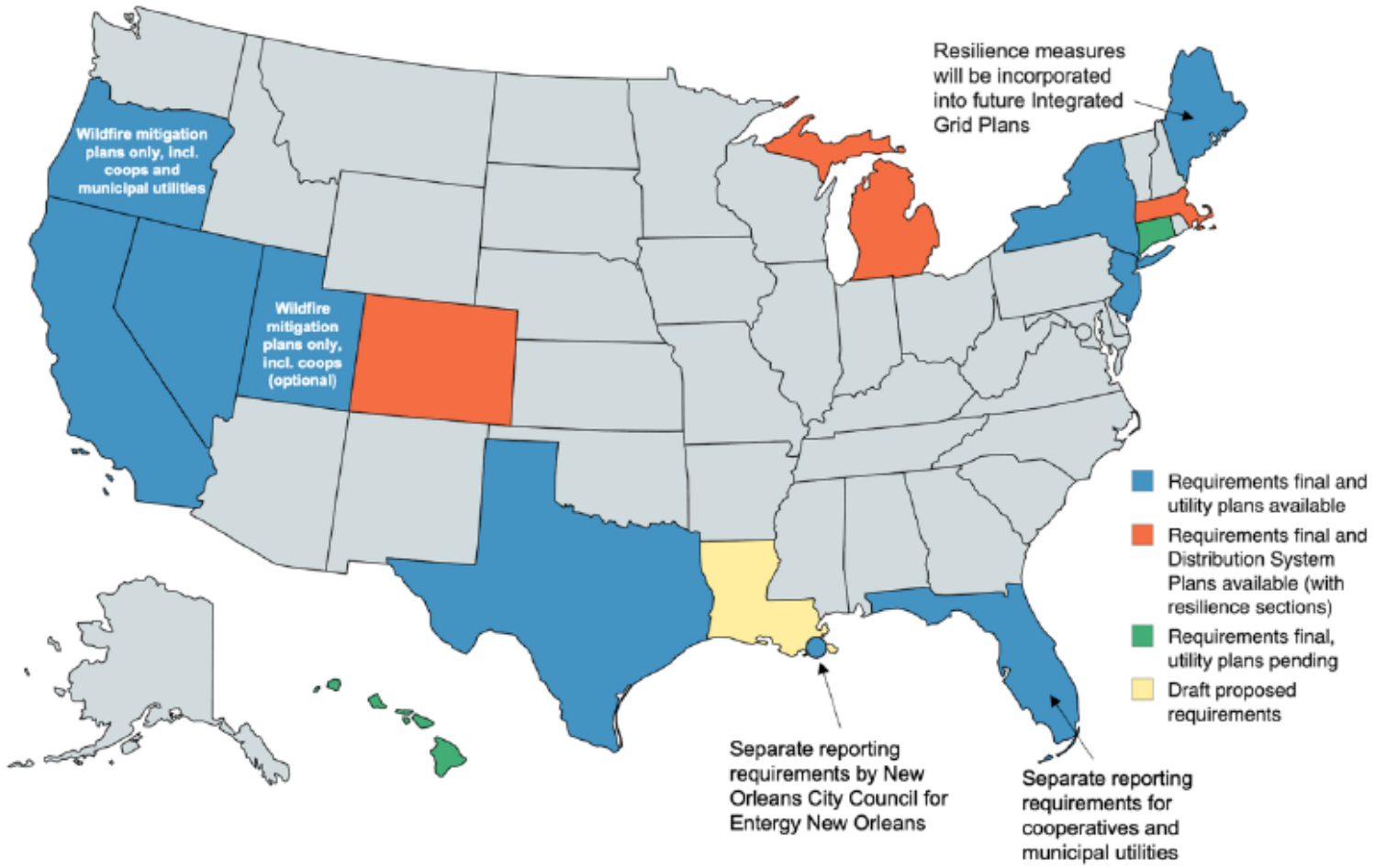
RHIZOME

Planning for a More Resilient & Equitable Future

Massachusetts Electric Sector Modernization Plans
Grid Modernization Advisory Council

August 28, 2025

Many states have been developing resilience planning requirements for regulated utilities due to increasing climate risks



RHIZOME

Pillars of a Resilience Framework

1. Risk Assessment

- Likelihood and consequence of system failure from extreme weather
- Incorporate climate projections

2. Cost Benefit Analysis

- Incorporate Value of Lost Load, Restoration Costs, and Critical Customers
- Use historical performance where applicable

3. Scenario Planning

- Present alternative scenarios of investments
- For various climate scenarios (SSP 2-4.5/2-8.5)

4. Tracking Metrics & Investment Performance

- Track reliability, resilience, risk metrics
- Report on investment performance, especially after a storm

5. Equity

- Incorporate analysis of social impacts
- % benefit of investments per social metric

6. Cost Recovery

- Recover costs for investments that meet criteria from 5 previous pillars
- Recover costs for supporting investments such as tools, models, and technology

RHIZOME

Integrating Resilience into System Planning

	BEFORE	AFTER
RISK	• **Assessed vulnerability based on historical storm impacts**, especially Superstorm Sandy. • Used **basic reliability and asset performance data** to guide upgrades, with **limited climate modeling.**	• Incorporates **downscaled climate projections** into multi-hazard risk assessments. • Applies a framework that **filters strategies based on feasibility and system-wide co-benefits**.
PLANNING	• Hardening was **reactive** and relied on **asset age, condition, and outage history as triggers.** • Prioritization relied on **BCA without factoring climate exposure** or community vulnerability.	• Aligns investment with **risk and resilience value** (e.g., targeting at-risk substations and feeders). • **Uses climate projections and hazard mapping**, organizes **Climate Resilience Working Groups.**
EQUITY	• Equity was **not formally considered**; no tracking of impacts on disadvantaged communities.	• Tracks **capital deployment and reliability in EJ communities**, supported by Working Group.
METRICS	• Metrics **focused on project completion** rather than resilience or recovery outcomes.	• Uses **implementation- and outcome-based metrics** to evaluate effectiveness.

Source: "Resilient by Design Utility Strategies for Climate-Ready Distribution Systems" (July 2025)

Metrics and Valuation

Metrics – Tracking Effectiveness Over Time

Outcome Metrics

- **Network Resiliency Index (NRI):** Score combining outage duration, frequency, and recovery time.
- **Storm Response Performance:** Average restoration time for comparable events
- **Outage Duration & Frequency**: SAIDI/SAIFI/CAIDI
- **Failure Rates**: % of assets in hazard-prone zones that fail during major events, before/after intervention.
- **Equity Outcomes**: Difference in outage frequency and duration between EJ and non-EJ communities.

Implementation Metrics

- **Physical Upgrades Completed:** Count and % of targeted feeders hardened, substations elevated, or equipment replaced.
- **Automation & Control Devices:** Number of sectionalizers, reclosers, and switches installed or upgraded.
- **Undergrounding Mileage**
- **Resilience Spending in DACs:** % of total capital deployed, mapped and tracked over time.
- **Schedule Adherence** (% of projects delivered on/before time)

Pre- and post-event performance **data fed into CCVS updates and hazard models**; disparities between actual and projected values **lead to recalibration** of design standards, asset rankings, and prioritization logic.

Valuation – Prioritizing for Investment

Core Economic Methods

- **Hazard-Specific Avoided Outage Costs** – Avoided Customer Minutes Interrupted × Value of Lost Load
- **Risk-Spend Efficiency (RSE)** – Measure risk reduction per dollar spent, factoring in probability × consequence of failure before and after intervention
- **Benefit–Cost Ratios (BCRs)** – Capture avoided O&M and quantified co-benefits
- **Scenario-Based Portfolio Analysis** – Test portfolios under multiple climate futures to maximize benefit

Advanced Approaches

- **Equity-Weighted Prioritization** – Give heavier weight to projects delivering outsized benefits to EJ areas
- **Long-Term Resilience Alignment** – Ensure projects are effective across 10-, 20-, and 30-year horizons
- **Multi-Hazard Scoring** – Assign added value to interventions mitigating more than one hazard type
- **Co-Benefit Valuation** – Quantify ancillary gains (e.g., DER hosting capacity) even when not fully monetized in BCA

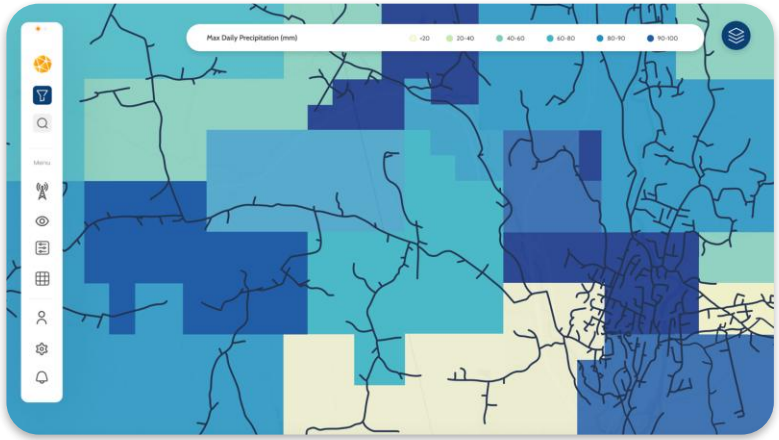
A project advances to capital programming only if it **demonstrates measurable hazard-specific risk reduction** (via metrics), and **meets or exceeds cost-effectiveness and co-benefit thresholds** (via valuation).

Source: "Resilient by Design Utility Strategies for Climate-Ready Distribution Systems" (July 2025)

Rhizome's AI-Based Software Solutions

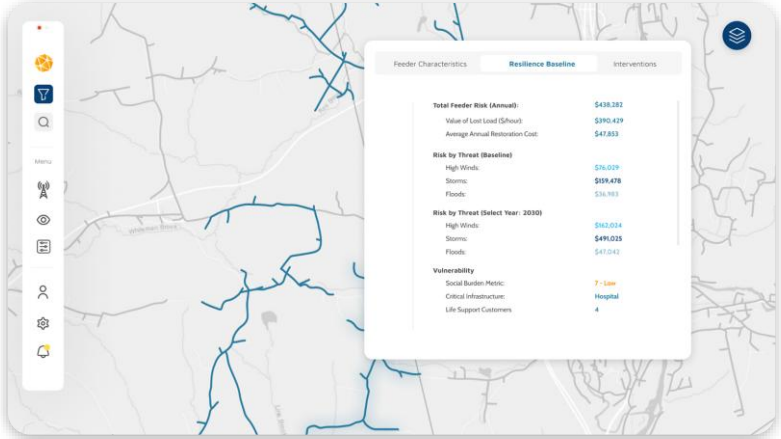
gridCAVA

Asset-based **climate change** vulnerability



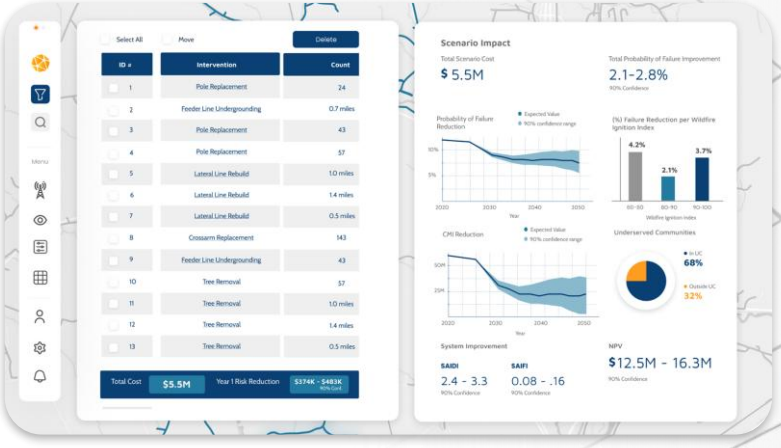
gridADAPT

A **climate resilience planning** application



gridFIRM

A long-term **wildfire risk planning tool**



Project → Extreme weather frequencies; forecasts for reliability/resilience.

Assess → Vulnerabilities on a digital representation of T&D system

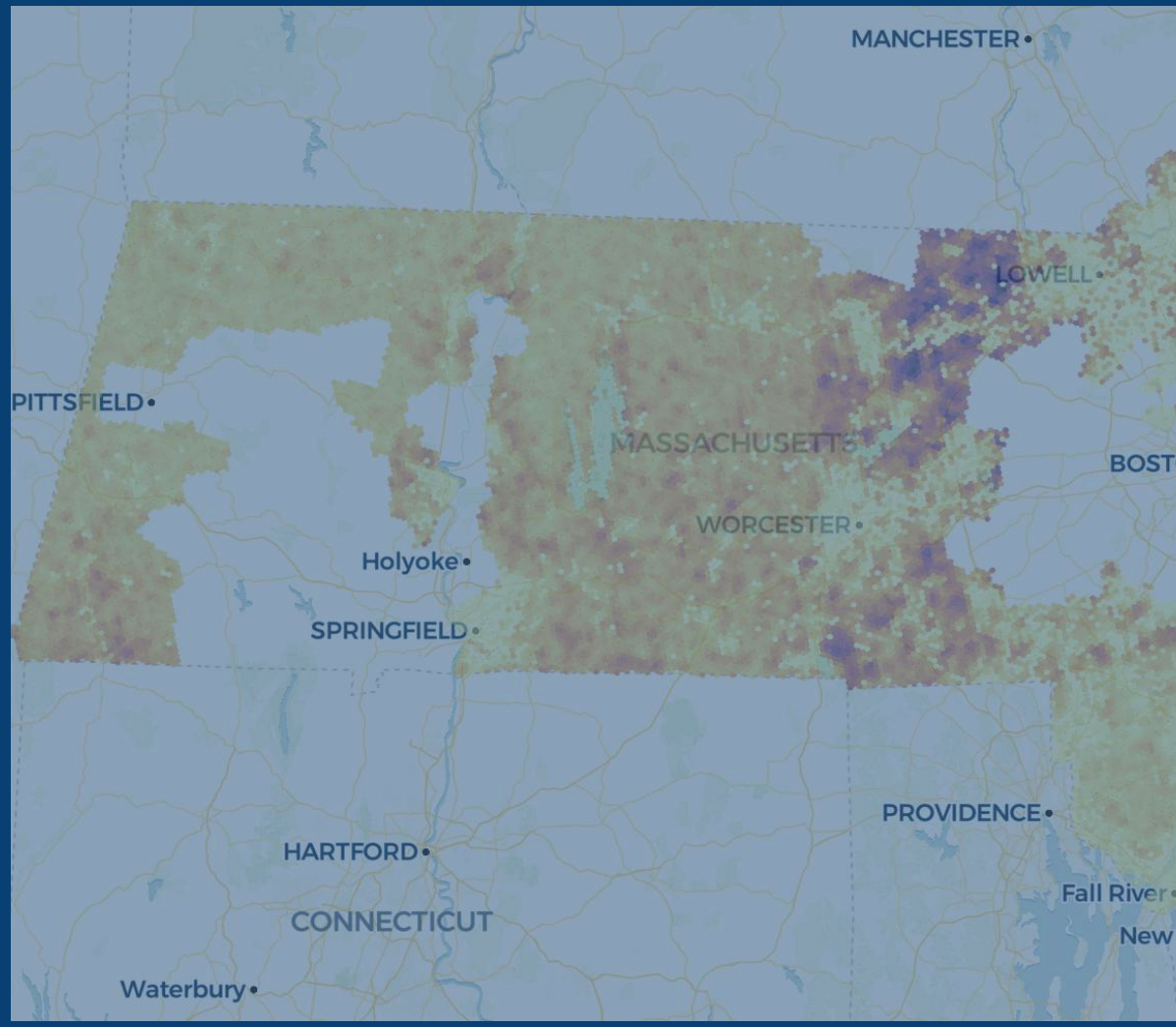
Optimize → Plan infinite scenarios to optimize risk reduction and social parameters

Justify → Capital investments to regulators through defensible cost-benefit analyses

CenterPoint Energy · Portland General Electric · Seattle City Light · Vermont Co-Op Electric · NREL · EPRI · Climate Ready Power · Capgemini · Black & Veatch · RHIZOME

Case Study: National Grid

- Based in Massachusetts and New York (US)
- Looking to be proactive about identifying early signs of wildfire risk in the Northeast
- Wanted to assess the intersection of asset risk, wildfire hazard, and climate change

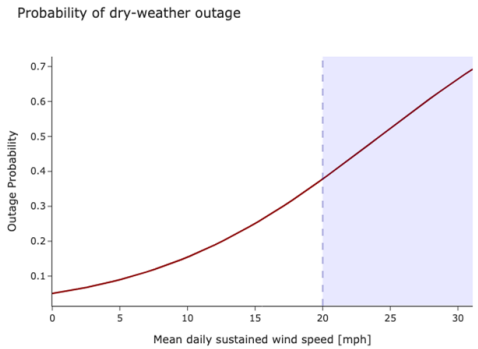


Implementing gridFIRM with National Grid

How do we understand relative risk across a system? How do we target areas for potential investment?

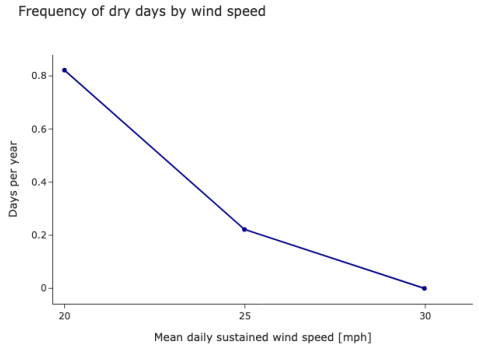
Likelihood of Utility-Related Fire Ignition

Fragility on fire-weather days



+

Fire-weather days per year



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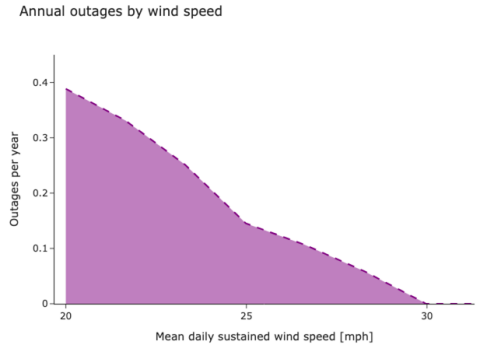
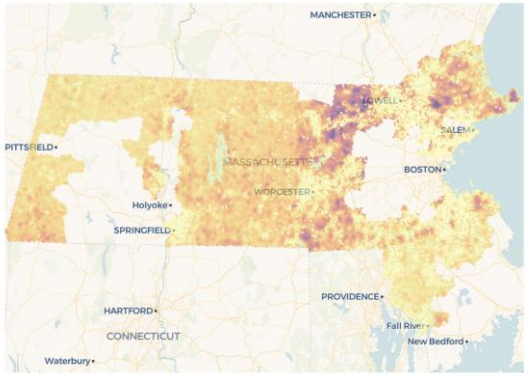
Expected total failures during fire-weather

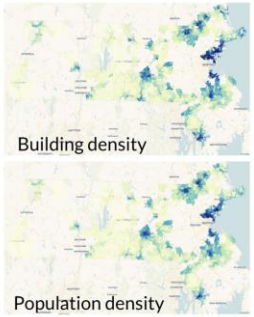


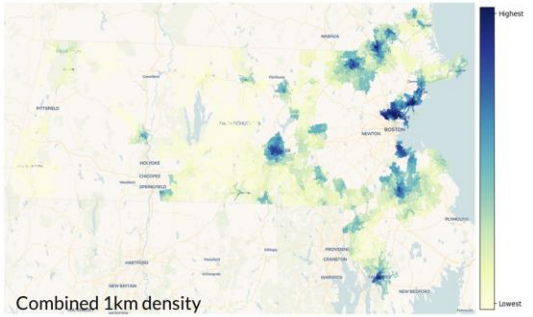
Consequence of Ignition

Wildfire Hazard Potential

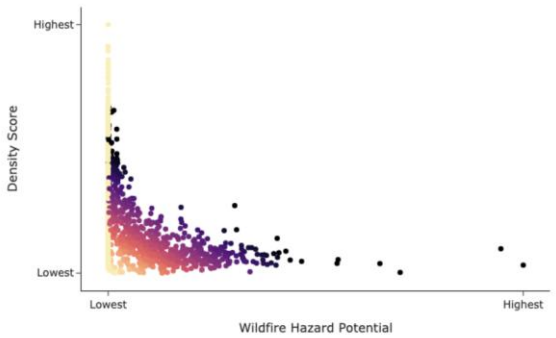


Population and Building Density





Combined Consequence Score



Risk = Likelihood x Consequence

Resilience by Design

- **Why It Matters**
  - Extreme weather & emerging threats are increasing outage costs ($64.8B/year avg., 27 billion-dollar disasters in 2024).
  - $500B investment gap to harden U.S. grid against climate impacts.
  - 15 states + New Orleans now mandate some form of resilience plan.
- **What Works**
  - Integrated – Embed resilience into DSP, capital planning, ops strategy.
  - Data-Informed – Use probabilistic risk models, asset vulnerability mapping, climate projections.
  - Equity-Centered – Include EJ overlays, DAC-specific metrics, community co-design.
  - Iterative – Update plans regularly with new data, lessons learned, stakeholder feedback.
  - Measurable – Track leading (tech deployed) + lagging (outage minutes avoided) metrics.
- **Recommendations**
  - For Utilities
    - Merge resilience with core planning functions.
    - Leverage AI/ML + scenario modeling for precision.
    - Set measurable resilience goals.
    - Engage communities early & often.
  - For Regulators
    - Require risk-informed plans on regular cycles.
    - Provide flexible guidance to allow innovation.
    - Standardize metrics & reporting.
    - Encourage cross-utility + cross-agency coordination.

Link to White Paper

RHIZOME

Break

Please be ready to start again in ~5 minutes

Facilitated Discussion

Led by Councilors Amy McGuire and Chris Modlish

GMAC Discussion Questions

Questions for EDCS:

How do EDCs distinguish resilience investments from reliability investments?

How do the EDCs weigh costs of resilience investments with resilience benefits?

How are the EDCs coordinating with state and community resilience planning efforts?

Do members have other questions for the EDCs based on the resilience presentations?

Questions for discussion:

How are you thinking about resilience?

What does grid resilience mean to your constituents?

- How much priority would you give to it?

How does resilience relate to equity?

- What should be done to make equitable resilience investments?

What are your thoughts about the state resilience planning efforts?

Close and Next Steps

- The next GMAC meeting is September 18th from 1 – 3 PM.
- Schedule for remainder of the year:

Date	Time	Meeting	Topic
September 5th	9 – 12:30 PM		*National Grid Substation Tour - #37 Station in Everett*
September 12th	9:30 – 12 PM		*Eversource Substation Tour- Cambridge Kendall Sq.*
September 18th	1 – 3 PM	GMAC	Discuss draft 2026 Strategic Plan
October 9th	9:30 – 10:30 AM	ExCom	Discuss 11/7 CY26 DPU Budget Request proposal
October 10th	10 – 11:30 AM	EWG	• Revisit distributional equity analysis • Review 2026 Strategic Plan • Community benefits agreements in light of siting reform
October 30th	1 – 3 PM	GMAC	• Vote on 2026 Strategic Plan • Review first ESMP biannual report
December 4th	1 – 3 PM	GMAC	Integrated Energy Planning
December 11th or 12th	*9 – 12:30 PM*	*Public Event*	*The Electric Grid Through a Municipal Lens Pt. 2*
December 18th	9:30 – 10:30 AM	ExCom	*TBD*

Appendix

ResilientMass Presentation
Additional Information

Climate change is impacting MA communities

RISING TEMPERATURES[1]

23–29 high heat days per year expected by **2050** and annual average temperature increase of **5.9 to 7.9°F.**

Those most likely to be affected from high heat include unhoused populations, those working outdoors, the elderly, infants, individuals with chronic diseases (e.g., asthma), and environmental justice and other priority populations.

Extreme temperatures are projected to increase annual transportation infrastructure maintenance costs by over **$140 million** by the end of the century.

CHANGES IN PRECIPITATION[2]

By **2070,** Massachusetts is expected to receive **12–42%** more winter precipitation.

Environmental justice and priority populations live near commercial and industrial buildings that have a **57% higher risk of flood** damage than the rest of the Commonwealth.

Annual economic flood damage is estimated to increase by **$9.3 million** by **2030** across the Commonwealth.

COASTAL FLOODING[3]

Massachusetts is planning for sea level rise by up to **2.5 feet by 2050** compared to present day (2008) if global emissions are not significantly reduced. Both tidal and storm-related flooding are projected to increase.

Risks and consequences from inundation will be more significant among sensitive assets such as hospitals, schools, prisons, care facilities, and underground and at-grade living quarters.

Coastal flooding is projected to cause over **$52 million** in damage annually to state-owned coastal properties, a **550%** increase from today.

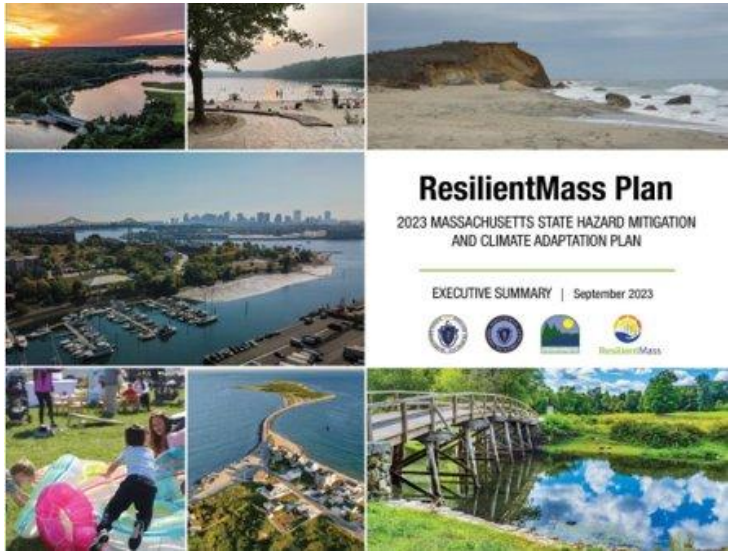
SEVERE WEATHER[4]

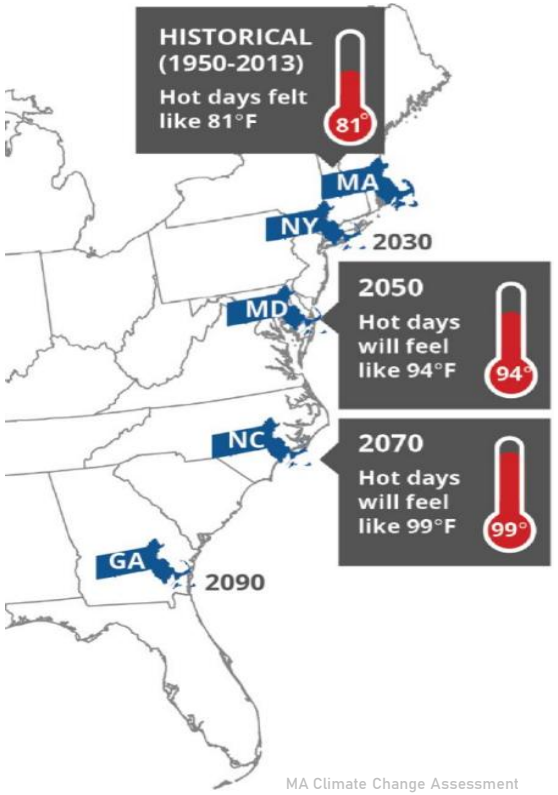
Includes strong winds, tornadoes, extreme precipitation, and droughts. Precipitation amounts from the heaviest storms in the Northeast has increased by **55%** since **1958.**

High winds are of particular concern to coastal areas, where wind speeds can reach **110+ miles per hour.**

Populations living or working outdoors will be increasingly exposed to dangers of more frequent and increasingly severe weather.

Lightning was responsible for **$20.4 million** in damage in Massachusetts between 2002 and 2022.[5]





MA Climate Change Assessment (2022)

Agency Action Strategy: Bridging Hazards, Impacts, and Actions

Governance Sector: Urgent Impact #6

Damage to Inland State and Municipal Buildings and Land

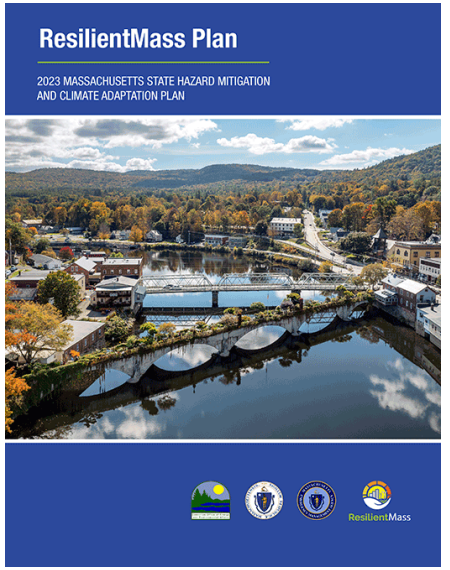
Risk to vulnerable state and municipal owned structures and other property from flooding, extreme heat, and extreme storms. Includes damage repair costs and service losses during closures.

Minimal Level of Consequence	Limited Disproportionality	Minimal Adaptation Gap
• Less than 10 state-owned major facilities fall in areas expected to experience significant inland flooding by the end of the century.	• None of the potentially impacted buildings are located in EJ block groups.	• Current facilities siting decisions are adequately addressing the risk of inland flooding.

Identification of impact and magnitude in MA Climate Change Assessment

↓

State agency actions in ResilientMass Plan



https://resilient.mass.gov

ACTION 10: Incorporate hazard and climate change vulnerability into capital planning, master planning, and facilities management functions

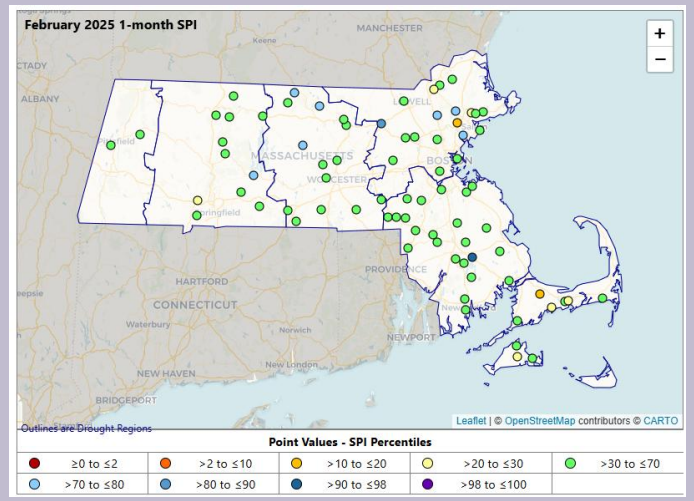
Incorporate climate change vulnerability, resilience, and adaptation standards into capital planning and at the outset of projects with client agencies. Complete the RMAT's Climate Resilience Design Standards Tool and DCAMM climate resilience assessments during project planning. Refer to these assessments during project design and master planning exercises to identify planning horizons and specific high-priority threats.

Continue to revise and update the existing DCAMM resilience assessment process as appropriate utilizing RMAT-supported climate data sets, and integrate climate change and natural hazard vulnerability information into an asset management system (CAMIS).
Other priority impacts addressed by action: This action has the potential to address elements of all priority impacts.

Scale	Lead(s) and Partner(s)	Hazard(s) Addressed
Statewide, state assets	Lead: DCAMM	All hazards
Goal(s) Addressed		**Timeframe**
3 and 4		5+ years

EEA studies & tools to understand future flood risk

Monitoring current conditions

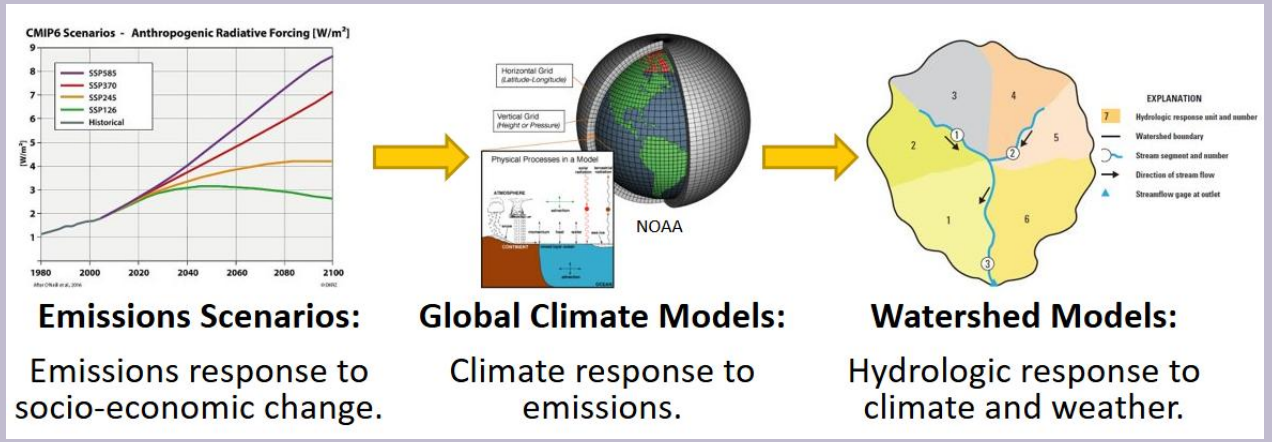


Massachusetts precipitation, streamflow, and groundwater monitoring network

Rating projects' climate risks & recommending design criteria

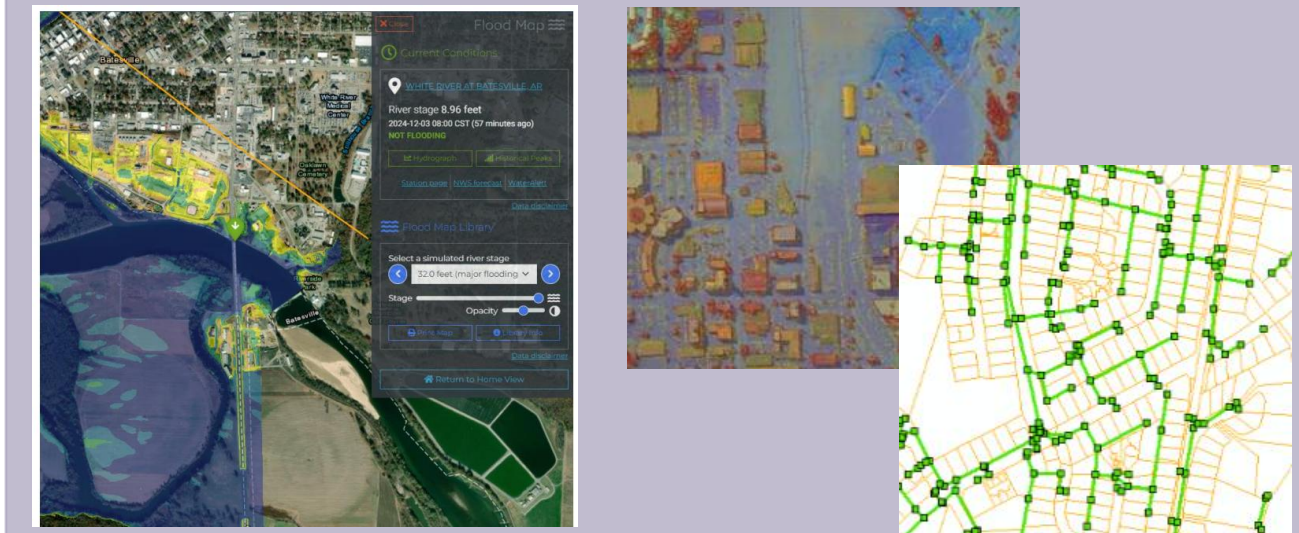
RMAT's Climate Resilience Design Standards Tool

Updating temperature and precipitation projections- and adding streamflow



Climate-Hydrologic Risk Project, Phase II

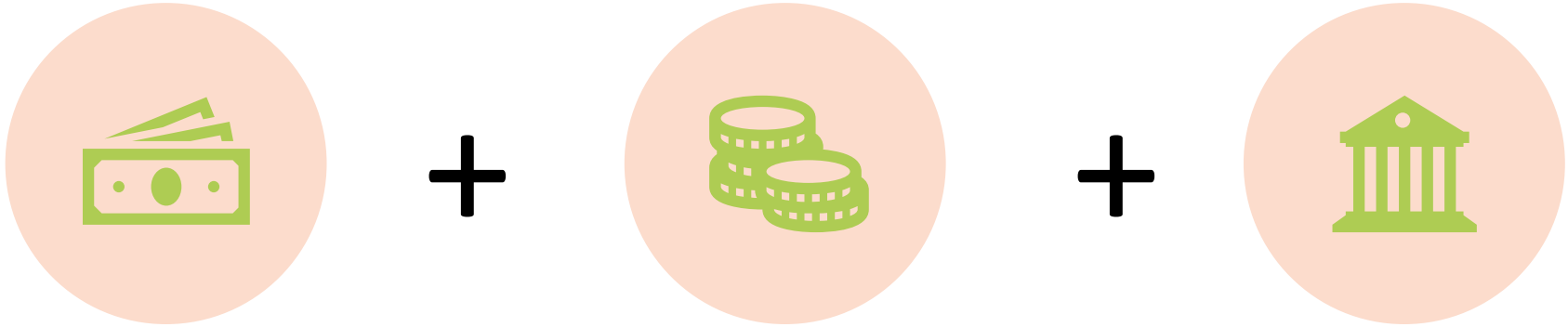
Mapping future river & stormwater flooding



MA-wide climate informed riverine & pluvial flood mapping

Funding local action:

Resilience Finance Strategy – coming soon!



REVENUE

Increase resources for resilience

FINANCING

Stretch dollars further to increase low-cost capital over time

INSTITUTIONS

Expand familiar, successful authorities for resilience

ResilientMass

New initiatives to accelerate and support local flood resilience action

- New Disaster Relief and Resiliency Fund
- $200M in Fair Share revenue to upgrade culverts and small bridges
- Development of resilient infra-structure and building standards

Appendix: GMAC Recommendations on Resilience

The GMAC made the following resilience related recommendations on the draft ESMPs:

- The EDCs should make their climate vulnerability assessments public. If the climate vulnerability assessments are not complete, the ESMPs should describe the expected timeline, date of completion, and method by which they will notify stakeholders of the finished assessments.
  - *National Grid's CVA is posted on their website. The EDCs will provide updates on their CVAs in the biannual reports.*
- The EDCs should standardize their climate change risk and planning tools, as well as forecasting windows and parameters.
  - *DPU directs the EDCs to use a common forecasting window and standardized set of climate hazards and scenario parameters unless the EDCs can justify the need for inconsistencies (Phase I Order, 260).*
- The ESMPs should include more details on their ongoing and proposed resilience priorities and climate adaptation measures, including the cost estimates of their resilience investments.
  - *Targeted resiliency investments will be identified and described in the biannual reports. The EDCs will also submit annual cost recovery filings for ESMP investments.*
- The ESMPs should justify incremental, newly proposed reliability and resilience investments using quantitative data such as improvements to SAIDI/SAIFI, as well as using benefit-cost analyses. The ESMPs should describe how the EDCs are coordinating their climate vulnerability assessments and their approaches for managing climate vulnerability.
  - *DPU expects the EDCs to coordinate on the development of processes and practices to prioritize and deploy targeted resiliency investments in a cost-effective manner (Phase I Order, 261).*
- The EDCs should incorporate local and regional heat island modeling into the plans and use this to inform near- and long-term action.
  - *The EDCs will consider this recommendation for ESMP Section 10 for implementation in the next ESMP cycle (EDCs' response to GMAC Recommendations).*