



# **Roadmapping:** A Tool for States to Advance Load Flexibility and Grid- interactive Efficient Buildings

*NASEO-NARUC Grid-interactive  
Efficient Buildings Working Group*

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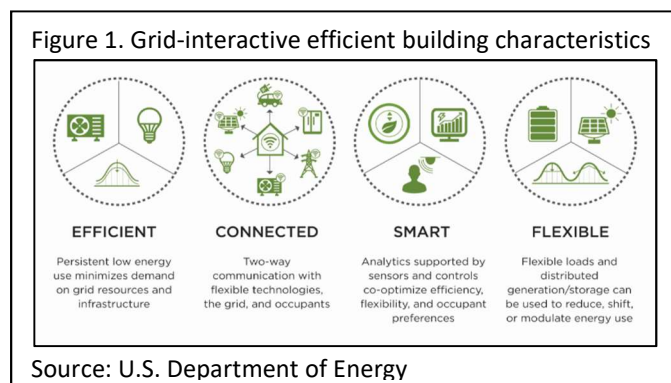
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## Introduction

The electricity system is changing rapidly. Variable renewable generation is quickly expanding in many parts of the United States. Distributed energy resources (DERs)—including energy efficiency, demand response (DR), onsite generation, and thermal and electrical energy storage—are growing. Electric vehicles (EVs) are poised to enter into the mainstream while electrification of space and water heating appears to be on the rise. These changes are making the electricity system and its management more complex.

In the face of these changes, states need to devise policies, plans, programs, and regulations to ensure that the electricity and broader energy systems meet the needs of their residents. States face the imperative of delivering safe, reliable, and affordable energy to households, businesses, and institutions. At the same time, they seek to meet other policy objectives; to reduce emissions and adverse environmental impacts, to buttress energy resilience and security, and to pursue economic development.



Fortunately, the ferment in energy technologies brings opportunities along with the challenges. New technologies allow flexible management of building and facility energy loads to benefit occupants, owners, and the grid alike. Sensors, analytics, and smart controls enable the existence of Grid-interactive Efficient Buildings (GEBs), buildings that integrate and optimize DERs in conjunction with the electric grid to provide benefits to building owners and occupants as well as to the operation of the electricity system.<sup>1</sup>

GEBs are *energy efficient*, are *connected* to allow two-way communication of signals between buildings (and their operators and occupants) and the grid, are *smart*, and are *flexible* to allow rapid adjustment of loads and tapping of DERs to provide grid and building services. (See Figure 1.)

Flexible load management in GEBs can enhance energy efficiency while enabling multiple DERs to work in concert with each other and the grid. It can lower peak demand, moderate the ramping of demand, and provide grid services to lower electricity system costs and improve operations. Load flexibility supports integration of variable renewable generation and the lowering of emissions. By reducing grid stresses and strengthening distributed energy capabilities, GEBs can improve energy resilience at multiple levels—onsite, locally, and grid-wide.

Greater optimization of the significant energy demand and supply functions that buildings offer has far-reaching electricity policy and regulatory implications for State Energy Offices, Public Utility

<sup>1</sup> U.S. DOE [Grid-interactive Efficient Buildings: Overview](#) along with a summary GEB factsheet [Grid-interactive Efficient Buildings: Factsheet](#) offer excellent overviews.

Commissions, utilities, and building owners, and investors. The fundamental questions that arise from this opportunity are:

- How can facility interactions with the grid be optimized?
- How can states fashion policies, programs, and regulations to advance such optimization through GEBs?
- What are the roles for states, facility owners and operators, utilities, product and service providers, and others?

To help states approach these questions, the National Association of State Energy Officials (NASEO) and the National Association of Regulatory Utility Commissioners (NARUC) established the NASEO-NARUC Grid-interactive Efficient Buildings Working Group, with the support of the U.S. Department of Energy (DOE) Building Technologies Office and the Pacific Northwest National Laboratory (PNNL).<sup>2</sup> The Working Group supports state learning and exchange about load flexibility and GEBs; helping states to understand technologies and applications, identify opportunities and impediments, and discern interests, priorities, and concerns.

Complementing a U.S. DOE GEB factsheet and overview, NASEO wrote "Grid-interactive Efficient Buildings: State Briefing Paper."<sup>3, 4</sup> The paper provides a brief overview of GEBs and related flexible load management then focuses on policy, regulatory, administrative, and technical topics to help states and other stakeholders discern benefits of and challenges to advancing GEBs and load flexibility. The NASEO paper concludes with a section outlining various actions states can pursue. It recommends that states develop roadmaps to assess their contexts, identify opportunities and hurdles, develop and prioritize options, and plan actions to advance flexible load management and implementation of GEBs.

This document notes various actions that states and sometimes localities can take to advance their opportunities to benefit from GEBs. It then suggests steps states should consider in developing a GEB roadmap.

### Actions States Can Take

There are many potential activities and steps that states and, sometimes, localities can take to advance opportunities to benefit from GEBs. Many are illustrated in Appendix A in condensed (Table A-1) and extended (Table A-2) forms.<sup>5</sup> The tables are not comprehensive, nor do they suggest that all listed actions should be undertaken. States should tailor actions based on their own situations. However, three major categories of activities are likely universally applicable:

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<sup>2</sup> NASEO-NARUC Grid-interactive Efficient Buildings Working Group, <https://naseo.org/issues/buildings/naseo-naruc-geb-working-group>

<sup>3</sup> NASEO, 2019, "Grid-interactive Efficient Buildings: State Briefing Paper" <https://naseo.org/data/sites/1/documents/publications/FINAL-GEB-NASEO-report-full.pdf>

<sup>4</sup> U.S. DOE [Grid-interactive Efficient Buildings: Overview](#) and [Grid-interactive Efficient Buildings: Factsheet](#).

<sup>5</sup> Tables are drawn and modified from L. Schwartz, 2019, "NASEO-DOE Webinar - Action Steps for States: Moving Towards a Future with Demand Flexibility" (<https://naseo.org/event?EventID=6927>) and also appear NASEO, 2019, op cit.

1. Gather information and identify opportunities,
2. Develop and implement strategies to integrate demand flexibility,
3. Accelerate adoption.

As the tables note, multiple entities can be positioned to take the actions, such as the State Energy Offices (SEOs), Public Utility Commissions (PUCs), and other state and local agencies. “Other” agencies include bodies with policy and regulatory purview (e.g., agencies responsible for building codes, environmental regulation, zoning and land use, economic development) as well as those that operate buildings and facilities (e.g., general services departments, school districts, public colleges and universities, housing authorities, public hospitals, corrections departments). Utilities, other grid operators (including independent system operators [ISOs] and regional transmission organizations [RTOs]), and, of course, building and facility owners are also critical actors. For all the listed potential actions, multiple entities can have roles.

But with so many potential activities that can be performed, how can states identify and prioritize actions to undertake; and with what resources, in what sequence, and performed by who? A roadmapping exercise enables states to assess their options and develop a plan. Importantly, roadmap development should include a robust stakeholder engagement process to enable input of important information and perspectives, assure a fair hearing of diverse interests, and inform and educate stakeholders and the broader public about the importance of GEBs and load flexibility to help meet important public policy objectives. Good stakeholder engagement can also enhance the authority and credibility of the resulting roadmap too.

There are multiple approaches to roadmapping. The best approach may vary depending on a state’s context. However, there are some common steps to consider. The next section discusses those.

### Roadmapping Steps

It makes sense for states to start by taking stock of their situations and priorities. This may be done as part of or prior to embarking on a roadmapping exercise. What are state electricity and energy system needs and objectives? What are the opportunities and potential for GEBs to help meet those objectives? Which policies, programs, planning processes, and regulations support or impede use of load flexibility? Are there physical or policy/regulatory pilot projects in-state or elsewhere that offer relevant experience and lessons? What are roles for public agencies and private stakeholders? Have other steps supportive of load flexibility already been undertaken?

States and localities should be informed and deliberate in considering actions to support GEBs and use of load flexibility for energy management. States should consider developing a plan or roadmap to identify and address opportunities and hurdles to advancing load flexibility. While there is no single right format or formula for roadmapping, there are some common steps to consider. These steps are

analogous to those recommended for developing state energy plans in NASEO’s State Energy Planning Guidelines.<sup>6</sup>

While the Guidelines are oriented toward comprehensive energy plan development, the approaches and steps are largely applicable to roadmapping exercises where complex technical, economic, policy, regulatory, and legal matters interact. They are also useful where diverse stakeholder input is important not only for obtaining information and perspective but also for earning stakeholder “buy-in” that can facilitate pursuit of next steps.

The following are from the Guidelines and modified for roadmapping:

- Step 1: Establish a Requirement and Scope for a Roadmap
- Step 2: Convene the Roadmapping Team
- Step 3: Develop a Vision for the Roadmap
- Step 4: Collect and Analyze Data and Information
- Step 5: Garner Public Input and Feedback
- Step 6: Recommend Goals and Actions to Meet the Vision
- Step 7: Draft the Roadmap
- Step 8: Finalize, Adopt, and Implement the Roadmap
- Step 9: Conduct Outreach and Education
- Step 10: Monitor Progress and Update the Roadmap

While the steps are listed in sequence, good practice allows for flexibility and iteration. Some steps may be performed concurrently. State processes and roadmaps will need to be tailored for each state’s context, including state goals and intents and resource availability.

The roadmap should identify barriers and gaps to be overcome (some examples are listed in Table 1). It should identify and recommend policy, programmatic, and regulatory options and approaches to pursue (see examples in Table 2). These can include, among others, performing research and studies, seeking or developing analytic methods, altering planning processes, pilot projects, state or public building policies, promoting voluntary actions, and revising regulations. Regulatory changes that can be considered are not limited to public utility rate structures and rules. They can include other types of regulations, such as building codes and performance standards, appliance standards, building benchmarking and disclosure rules, land use and zoning rules, and environmental regulations. Some actions may be done administratively by agencies and/or directed via Governors’ Executive Orders. Some may occur through PUC proceedings and orders. Others may require state legislation. Local legislation and executive actions are required for city and county level actions. And private voluntary initiatives should not be underestimated. The roadmap should identify priorities, time-frames, and sequences of actions too.

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<sup>6</sup> NASEO, 2018, “NASEO’s State Energy Planning Guidelines: Guidance for States in Developing Comprehensive Energy Plans and Policy Recommendations” [https://naseo.org/Data/Sites/1/sepguidelines\\_2018\\_final.pdf](https://naseo.org/Data/Sites/1/sepguidelines_2018_final.pdf)

Table 1. Potential Demand Flexibility Barriers

Technical, economic, achievable potential not characterized (e.g., by market sector, operating mode, grid services provided)
Consumer value proposition not well-known
Rate design, program incentives, market compensation mechanisms may not be aligned for demand flexibility (e.g., inadequate inclusion of time and locational value)
Disincentives, lack of financial motivation for utilities to use buildings as energy assets
Building energy rating, labeling, targets, performance policies and programs, etc. based on total energy and/or energy use intensity (EUI), not on demand flexibility
Insufficient metrics, tools to evaluate building demand flexibility performance
Benefit-cost analysis methods for grid modernization investments (e.g., AMI, advanced distribution management systems, DER management systems) inadequate
Insufficient integration of demand flexibility programs in utility, state, jurisdiction (e.g., EE, DR, RE, storage programs uncoordinated)
Lack of coordination between utilities and RTOs/ISOs (e.g., double-counting potential and conflicting rules, roles and responsibilities)
Constraints on third-party aggregation of DERs
Enhancements needed to economic valuation methods for planning and analysis
Data access provisions and data privacy concerns
Interoperability hurdles for software and equipment
Barriers to entry for DERs to compete in organized wholesale markets for energy, capacity and ancillary services, even if DERs can meet grid service requirements
Demand flexibility poorly or not recognized in distribution system planning, resource planning, transmission planning, energy efficiency, and other utility planning processes
DER-specific issues:
<i>Storage</i> – Unmonetized value streams; may not be recognized as offering multiple grid services; utility ownership restrictions; market v. rate-based service; duration and cycling requirements
<i>Distributed generation</i> – Interconnection standards and procedures; standby rates; compensation; treatment in state resource standards and organized wholesale markets; facility owner unfamiliarity
<i>Demand response</i> – Lack of defined need; valuation and pricing; dispatchability; AMI not deployed
<i>Energy efficiency</i> – split incentives (e.g., landlord-tenant, builder-owner); upfront costs; payback period and owner tenure; information gaps; savings calculation methodologies

Source: Derived and modified from L. Schwartz, Lawrence Berkeley National Laboratory<sup>7</sup>

<sup>7</sup> L. Schwartz, op cit.



Table 2. Some Opportunities to Overcome Barriers

<b>Studies — e.g., consumer preferences, cost-effective achievable potential</b>
<b>Pilots — e.g., test new rate and program designs, develop performance data</b>
<b>Enhanced analytical methods and practices — e.g., for valuation, performance assessment, labelling/ratings</b>
<b>State and public facilities — e.g., lead-by-example building standards and procurement, resiliency and public purpose microgrids valuation and integration</b>
<b>Model standards — e.g., for data access and privacy; interoperability</b>
<b>Programs for residential and commercial buildings — e.g., programs and incentives to pilot or implement grid-interactive functionality; incentives for grid-interactive building management systems</b>
<b>Financial incentives for utilities — e.g., performance incentive mechanisms; shared savings; multiyear rate plans (performance-based regulation)</b>
<b>Energy and electricity system planning — e.g., include demand flexibility, flexibility in distribution system planning; integrate distribution, resource, and transmission planning; include demand flexibility in state energy plans</b>
<b>Building energy codes — e.g., “GEB-ready,” time dependent valuation in cost-effectiveness, load management provisions</b>
<b>Appliance standards — e.g., grid-interactive features, time dependent valuation of cost-effectiveness</b>
<b>Zoning — e.g., land use incentives and concessions for grid-interactive developments to reduce distribution system stresses and investment needs</b>
<b>Voluntary programs, certifications, and labels — e.g., building and product certifications and labels (LEED, ENERGY STAR, etc.) consideration of grid-interactive features and functionality</b>
<b>Governor’s executive orders — e.g., start new programs, coordinate across state agencies, set targets</b>
<b>PUC proceedings — e.g., rate design updates, utility financial incentives, grid-service markets, regulatory “sandboxes”, funds for innovation and pilot projects</b>
<b>State legislative action — e.g., remove barriers to third-party aggregation while preserving consumer protection, mandate data access for consumers and their designated third parties, establish electricity system and environmental policies (such as “clean peaks”), authorize supportive State Energy Office and PUC actions</b>

Source: Derived and modified from L. Schwartz, Lawrence Berkeley National Laboratory<sup>8</sup>

The following section discusses each roadmapping step.

<sup>8</sup> L. Schwartz, op cit.

## Roadmapping Step Details

A state GEB roadmap should be:

- Adaptable, meaning that it considers risks and uncertainties, including changing socioeconomic conditions; technologies; energy prices; business models; environmental impacts; and safety, security, and resilience concerns, among others,
- Guiding, by providing a framework for state policymakers and officials as well as others to make informed decisions, and
- Strategic, in providing a plan of action offering options and recommendations for making measurable progress toward achievable goals.

As noted, 10 steps, based on state energy planning guidelines, provide a framework adapted to roadmapping. Although presented in sequence, flexibility and iteration are good practice with the process, scope, and content dependent on each state's context.

Each step's purpose can be encapsulated as follows:

- **Step 1: Establish a requirement and scope for the roadmap** to define its intent, giving it influence and authority.
- **Step 2: Convene the roadmapping team** that reflects pertinent stakeholders to guide roadmap development.
- **Step 3: Develop a vision** to reflect the roadmap's purpose and objectives.
- **Step 4: Collect and analyze data and information** to understand the current situation, identify data and analytic gaps, consider possible futures, and identify opportunities and challenges.
- **Step 5: Garner public input and feedback** to collect insight from consumers, businesses, industry, and other stakeholders.
- **Step 6: Recommend goals and actions** to achieve the vision and objectives of the roadmap.
- **Step 7: Draft the road map** to provide a clear representation of the roadmapping process and recommended actions.
- **Step 8: Finalize, adopt, and implement the roadmap** to ensure that it meets the objectives laid out in its requirement and scope and that it establishes a strategy for meeting the roadmap's intent.
- **Step 9: Conduct outreach and education** to assure stakeholder and public awareness of the roadmap and the actions and strategies it recommends.
- **Step 10: Monitor progress and update the roadmap** to assess accomplishments and progress and to make needed modifications as conditions change or new data and analyses may illuminate.

Roadmapping processes can vary in many ways, including in the structure of the roadmapping team, roadmap contents, degree of detail, data and analyses used, number and scope of recommended

actions, length, and means of distribution. However, the steps suggested here can be applied to each state’s GEB roadmap or, indeed, roadmapping generally.

Step 1: Establish a Requirement and Scope for the Roadmap

The roadmapping process may be initiated through a top-level state authority such as a Governor’s Executive Order, legislated statute, or agency directive. Some considerations for initiating a roadmapping activity are:

- Establishing a requirement for a roadmap.
- Identifying a roadmapping team.
- Determining resources needed to develop the roadmap.

*Establishing a requirement for a roadmap:* A Governor or Legislature may authorize and direct the development of a roadmap through an Executive Order or enabling legislation. The Executive Order or legislation should indicate the rationale and purpose for undertaking a roadmap. The Executive Order or legislation will generally assign responsibility to a lead agency, such as a State Energy Office, to develop the roadmap and may also identify supporting agencies and bodies. It will generally include a timeframe for overall roadmap development (e.g., three months to one year) and may specify the time horizon for the roadmap to consider (e.g., 5, 10, or 20 years).

A roadmap exercise may, at times, be undertaken under an agency’s existing authority. However, roadmapping required by Executive Order or statute may be viewed as possessing greater authority and influence and may garner greater attention and participation from key stakeholders. The recommendations of a Governor- or Legislature-initiated roadmap may also carry greater weight than one viewed as originating as an agency initiative.

States should consider existing authorities, intents, and gubernatorial and legislative interests as well as likely resource availability in deciding to initiate a roadmap. Table 3 notes pros and cons of different initiation routes.

Table 3: Pros and Cons of Various State Energy Plan Initiation Methods

Initiation Method	Pros	Cons
<i>Statute</i>	Long-lasting; difficult to undo	May be difficult to pass; needs sponsor(s) to assist with passage
<i>Executive Order</i>	Relatively easy to implement	Can be changed/revoked by following administration
<i>Agency Directive</i>	Very easy to implement	Agency may not have proper statutory authority to act on its own to create a roadmap

Source: NASEO

*Identifying the roadmapping team:* Executive Orders and legislation generally designate an agency to lead the development of the roadmap and may identify pertinent agencies and stakeholders to serve on a roadmapping team. Alternatively, the lead agency may assemble the team. The team is typically a subset of state agencies and the broader public stakeholder base that, in this case, is interested in topics pertinent to GEB and, more broadly, the use of load flexibility.

Identifying appropriate stakeholders for the team is critical. If the team is large and includes diverse stakeholders, management of the group may become more challenging. However, broader involvement may strengthen the roadmap and give its findings and recommendations greater authority. Table 4 identifies various stakeholders pertinent to GEBs.

Table 4. Key Potential Stakeholders for GEB Roadmapping Teams

Public Sector	Private Sector
<ul style="list-style-type: none"> <li>• Governor’s office</li> <li>• Key energy legislator(s)</li> <li>• State Energy Office (SEO)</li> <li>• Public Utility Commission (PUC)</li> <li>• Environmental agencies</li> <li>• Related agency directors</li> <li>• Local government and tribal leaders</li> <li>• Military installation representatives</li> <li>• Consumer advocates</li> <li>• Research entities</li> </ul>	<ul style="list-style-type: none"> <li>• Utilities and other grid operators</li> <li>• Building owners and operators</li> <li>• Energy service and product providers</li> <li>• Major industry groups</li> <li>• Business leaders</li> <li>• Financial institutions</li> <li>• Private academic/research institutions</li> <li>• Energy-focused non-governmental organizations (NGOs)</li> <li>• Environmental NGOs</li> <li>• Others: civic groups, faith-based groups, community groups</li> </ul>

Source: NASEO

The roadmapping team should maintain regular and open communication with the Governor, Legislature, and other designated authorities throughout the process.

*Determining the resources needed to develop a roadmap:* A budget and timeline for roadmap development should be determined before roadmapping commences. The budget and timeline may be

identified in the authorizing legislation or Executive Order. Otherwise, the roadmapping team will need to identify and acquire the budget and establish the timeframe with guidance from state leadership.

States may pay for roadmapping through state appropriations, utility assessments or public benefit charges, foundation funding, and other sources. Federal programs may also support GEB roadmapping. For example, the U.S. DOE administers the U.S. State Energy Program, from which each state derives formula funding to support their state-identified energy priorities. This is the only cost-shared program administered by U.S. DOE that provides funds directly to the states for the Governor-designated State Energy Office to allocate in designing and implementing energy efficiency and renewable energy programs and demonstration projects. At times, competitive awards may also be made available from the U.S. DOE.

In-kind resources may be available, such as from public and private research institutions and universities. At times, philanthropies may fund studies and analyses performed by research institutions and consultants that can feed into the roadmap. Other private sector stakeholders may also offer data, studies, and expertise. However, the roadmapping team should be cautious to assure that third-party and externally provided data and analyses are objective, balanced, and of requisite quality, and to guard against perceptions of bias. The U.S. DOE's National Laboratories can also be an important technical assistance resource supporting research and analytical steps of roadmapping.<sup>9</sup>

The scope of the roadmap will help to define the timeline and related milestones (discussed further under Step 2). The total cost of the roadmapping process will depend on timeline, scope, use of consultants, and outreach and distribution.

#### Step 2: Convene the Roadmapping Team

The second step in this process is to convene the roadmapping team. Sub-steps to consider include:

- Defining and assigning roles and responsibilities.
- Establishing a structured process for meetings and input.
- Setting timelines and milestones.
- Determining how to manage resources.

While roadmapping team structures may vary, the key is to have an organized, effective, and engaged group with diverse subject matter expertise and market perspectives. Taking time early to establish a systematic process and division of responsibilities will allow more time and effort to be dedicated to developing the roadmap rather than addressing procedural issues.

*Defining and assigning roles and responsibilities:* At the initial meeting of the roadmapping team, the lead agency may designate specific leadership roles for the members if these roles are not already

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<sup>9</sup> For example, information about Lawrence Berkeley National Laboratory's technical assistance can be found at <https://emp.lbl.gov/research/technical-assistance-states>.

defined. Roles may help delineate leadership in the event of gridlock in the decision-making process. Each role should have well-defined responsibilities. For example, a secretary could be assigned to keep records of meeting discussion and decisions, which may prove helpful when engaging the public and assuring process transparency. Team members may also be assigned specific topics or sections of the roadmap.

Beyond responsibilities for developing substantive content of the roadmap, duties might include organizing meetings, leading meetings, logging action items, and taking meeting minutes. Staff from participating state agencies or team-member organizations may be brought in to support administrative duties, logistics, and/or facilitation.

The team may also want to develop a roadmap website to publicly share meeting minutes, input collected, analyses, and drafts of the roadmap and of related materials as they become available.

*Establishing a structured process for meetings and input:* The team should consider setting up a system for decision-making (e.g., identifying voting versus non-voting members, consensus voting) and communications (e.g., in-person meetings, virtual meetings, or a combination of both). Throughout the roadmapping process, team members' input will need to be collected, vetted, and prioritized. Early agreement on how to make decisions will maximize the effectiveness of the team.

Once the roadmapping scope is established, teams may create workgroups bringing together team members with certain expertise and background in review and address particular topical areas. Separate workgroups can allow the roadmapping team to collect information, perform or review analyses, and draft recommendations across a variety of sectors or topics concurrently. The working groups can then report their findings and suggestions to the full team for review.

If the roadmap is required under statute or initiated by the Governor or Legislature, the team should also hold an initial meeting with that authority to discuss the scope and outlook for the roadmap. In addition, scheduling recurring check-ins throughout the process with the authority will keep them apprised and ensure the roadmap is on track and in line with their expectations.

*Setting timelines and milestones:* While an overall timeline (due date) for the roadmap should already be established, the team should develop clear timelines for components and processes within the roadmap development process with critical milestones defined. Working back from the expected due date of the roadmap and identifying target points for completion of certain activities and achievement of milestones will help keep the process on track. Timelines will vary depending upon the states' resources, priorities, and needs. As noted, some steps may occur in parallel, yet some may also be iterative. A Gantt chart may be useful to establish the roadmapping project timeline and track progress.<sup>10</sup>

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<sup>10</sup> A Gantt chart is a bar chart that lays out the steps of a project with their expected start and end dates, as well as the work breakdown structures for each step. An example of a Gantt chart can be found at [http://www.ct.gov/opm/lib/opm/pdpc\\_energy/arra/ea\\_arra\\_pmp\\_v01\\_2009\\_10\\_09\\_final\\_pdf\\_complete.pdf](http://www.ct.gov/opm/lib/opm/pdpc_energy/arra/ea_arra_pmp_v01_2009_10_09_final_pdf_complete.pdf), p. 15.

*Determining how to manage resources:* The team should be aware of and monitor the resources allotted to the roadmapping process. Upfront consideration for key expenses (e.g., contractor costs to collect and analyze data, outreach activities, processing public input, state agency director and staff time) will promote the efficient use of resources. Identifying a team member to serve as treasurer or accounting director may improve the tracking of resources and budgets.

### Step 3: Develop a Vision for the Roadmap

Sub-steps may include:

- Developing a focused vision statement(s) describes the overall objective of the roadmap. Vision statements are typically only a sentence or two in length.
- Determining an outlook period for the vision statement.

The vision is the guiding statement or set of statements that drive the remainder of the roadmap’s development. The initial prompt for roadmap development—through an Executive Order, legislation, or other means—may establish a scope or vision for, in this case, GEB, use of load flexibility, or, perhaps, broader grid-interactive issues. The roadmapping team should assess whether this scope is realistic and if any amendments are necessary (or possible). Otherwise, the team will develop the vision statement(s) for the roadmap.

A focused vision statement(s) describes the overall objective of the roadmap. Vision statements are typically only a sentence or two in length. The roadmap’s directions should support achieving the vision.

The roadmap vision should reflect particular outlook periods (i.e., is the team considering a 5-year, 10-year, or 20-plus-year outlook?). However, in developing the roadmap, the team should consider short-, medium-, and long-term steps to recommend for achieving the vision.

In the case of state comprehensive energy planning, vision statements often include declarative statements such as:

- “Demonstrate state leadership”
- “Expand economic opportunities”
- “Save taxpayers money”
- “Lower energy costs”
- “Reduce risks and vulnerabilities”
- “Increase security, reliability, and resilience”
- “Capitalize on emerging technologies”
- “Reduce adverse environmental impacts”

Some variations of these may be able to capture high-level state objectives for GEBs and load flexibility. For example:

- “Promote load flexibility to reduce costs, enhance resilience, and reduce emissions”

#### Step 4: Collect and Analyze Data and Information

Examples of sub-steps include:

- Collection of both quantitative data and qualitative information, including policy, regulatory, and administrative factors.
- The team will contemplate potential future states through projections and scenarios, leading to development of recommendations for steps to meet policy goals and the roadmap’s vision(s).

In Step 4 lies the heart of roadmapping. In this step, the roadmapping team will take stock of the current situation by collecting data and information and performing analyses. The team will also contemplate potential future states through projections and scenarios, leading to development of recommendations for steps to meet policy goals and the roadmap’s vision(s).

This step includes collection of both quantitative data (e.g., electricity demand, peak demand, costs, emissions), including projections (e.g., future demand and costs), and qualitative information, including policy, regulatory, and administrative factors (e.g., utility rate structures, rules affecting non-utility provision of grid services, inventory of financing programs and mechanisms). The policy, regulatory, and administrative factors may include quantitative components, such as renewable portfolio standard or clean peak standard requirements, emission goals, or funding available through state-supported funding mechanisms.

Analyses of current data and future projections will determine roadmap recommendations. Some of these recommendations may focus on the need for additional data and analyses (e.g., better understanding and projections of demand and DER implementation at the distribution level; achievable potential of GEB in the state; more granular emissions profiles of generation) and better tools, metrics, and analytic methods (e.g., energy resilience valuation, cost-effectiveness determinations for DERs, GEB performance metrics). Other recommendations will come from analysis of existing data and information, for example, suggesting policy or regulatory changes, or recommending GEB pilot projects.

The breadth and scope of the roadmap may be constrained by budget, time, and, indeed, data and information availability. Some roadmaps may, by design or due to resource and data constraints, stay at a high level, offering a general sketch and providing broad recommendations. Others may be more detailed, noting at a more granular level the state’s current and projected conditions and offering more particular recommendations.

The types of information and data to be collected and considered are manifold. To the extent possible they should include future projections and may include multiple scenarios. A non-exhaustive list of data and information types includes:



- Demographic and economic trends and projections, including regional and local economic growth and attention to underserved and disadvantaged communities;
- Residential, commercial, industrial, and institutional building stock and projected construction, renovation, and demolition rates;
- Current and projected electricity demand profiles by state, utility, region, and, if available, more granularly;
- Building load shape profiles which show how building types use energy hourly or in other granular time periods;<sup>11</sup>
- Current and projected generation trends, including renewable and non-renewable generation types and distributed generation assets,
- Transmission and distribution investment needs and, if available, identification of areas of existing or projected stresses, congestion, and other constraints;
- Current and projected costs of energy technologies and their operation;
- Current and projected electricity and energy-related emissions;
- Projected penetration of DERs and their costs and capabilities;
- Projected electrification trends, including for electric vehicles and charging infrastructure;
- Current electricity system structures, regulation, and governance, including:
  - utility types (investor-owned, cooperative, public power),
  - utility structures (vertically integrated, restructured, other),
  - markets (ISO/RTO, energy imbalance; policy imposed—e.g., renewable energy certificates, clean peak certificates, emission allowances),
  - regulatory and rate structures (time-of-use, peak and critical peak charges, DER provisions, shared savings, performance-based compensation, etc.);
- Environmental impacts and current and projected environmental requirements;
- Performance of existing GEB and flexible load management projects and programs in-state or elsewhere.

Information and data collection and subsequent analyses may be performed by state staff or by contracted experts or some combination of these. Experts may be contracted from the private sector, non-profit policy research centers (i.e., think tanks), or academic institutions. The U.S. DOE’s National Laboratories may be able to provide technical assistance to help identify and assess data, estimate GEB potential opportunity and impacts, and in other ways support roadmapping data and analytic needs.

Data sources can include official federal, state, and local government data; utilities (some data of which may be filed with the PUC but others not); studies by academic institutions, federal laboratories, and research centers; and from industry, non-profit organizations, and others.<sup>12</sup> Certain utility and other

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<sup>11</sup> The National Renewable Energy Laboratory and its research partners are collaborating on a multiyear study to develop a data set of end-use load profiles representing all major end uses, building types, and climate regions in the U.S. building stock. See <https://www.nrel.gov/buildings/end-use-load-profiles.html>.

<sup>12</sup> The U.S. Energy Information Administration (EIA) and Federal Energy Regulatory Commission (FERC) are among federal providers of energy and electricity system data. See the EIA State Energy Data System <https://www.eia.gov/state/seds/>.

data may only be available from non-public entities. However, external and third-party data and analyses should be treated with caution to assure objectivity, balance, and requisite quality and to avoid perceptions of bias.

Engagement of utilities, energy service and product providers, building owners and operators, consumer advocates (including those focused on disadvantaged communities), other industries, environmental groups, other stakeholders, and the public at-large will be important for gathering information and data. It will also be critical for assuring the transparency and credibility of the roadmapping process. (Stakeholder and public engagement is discussed in more detail in the next step.)

#### Step 5: Garner Public Input and Feedback

Key themes include:

- Public communication includes both outreach and gathering feedback.
- Considering multiple communication approaches including a website, public meetings, printed materials, webinars, and surveys.

An important part of the roadmapping process is public communication, which includes both outreach and gathering feedback. Communication will elevate the roadmap's visibility, attract valuable input, facilitate public support, and improve government transparency and accountability. Broad acceptance for the roadmap will be essential for its success. Organized and facilitated engagement allows the public to be heard on the pertinent policies, programs, and solutions. In the case of GEB roadmapping, particular attention should be paid to such stakeholders as building owners, building operators/managers, consumer advocates, and tenant associations.

Public communication approaches will vary by state. Some may seek early public input prior to drafting roadmap goals and recommended actions. Others may wait until a draft is available to request public feedback. A state may combine these approaches to engage the public throughout the process; some may define specific comment periods while others may have an open-ended input approach. Online formats are often used for public input. However, in-person public forums can allow robust engagement, though scheduling should consider time constraints imposed by work and family duties. Printed materials are also useful. Also, some rural and disadvantaged communities have poor broadband coverage which should be considered when engaging such communities. Budget will affect such engagement decisions; multiple in-person public forums can be costly.

The Minnesota Combined Heat and Power (CHP) Action Plan offers a good example of a roadmap-type activity where stakeholder engagement was critical to the process.<sup>13</sup> The action plan team engaged stakeholders and the general public in multiple, persistent, and varied ways, including through surveys, public meetings, comment periods, webinars, and web publications.<sup>14</sup> (In addition, a germane

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<sup>13</sup> Minnesota Department of Commerce, 2015, "Final Combined Heat and Power Action Plan (Unabridged Report)" <http://mn.gov/commerce-stat/pdfs/CHP%20pdfs/final-unabridged-chp-action-plan-2015.pdf>

<sup>14</sup> NASEO, 2016, "Minnesota Combined Heat and Power Action Plan Case Study"

Minnesota PUC Generic Proceeding also yielded relevant input to the action plan.) The stakeholder engagement and public input provided valuable information and perspective that complemented research and analytical work performed by state staff and contractors.

#### Step 6: Recommend Goals and Actions to Meet the Vision

Sub-steps may include:

- Deciding if goals will be brief and “high-level” or detailed and numerous.
- Identifying who should undertake the recommended actions, including leading and supporting agencies and organizations.
- Establishing how to monitor progress in implementing the recommendations individually and for the roadmap as a whole.

The next step is for the roadmapping team to recommend goals and actions that point the state toward meeting the roadmap’s vision. The recommended goals and actions may vary in number, depth, and breadth depending on the scoping and vision of the roadmap.

Some roadmaps may offer “high-level” recommendations while others may be more detailed. There may be few or many recommendations. However, the roadmapping team should consider organizing their recommended goals and actions into a limited number of realistically accomplishable priority items.

For example, the aforementioned Minnesota CHP Action Plan established six priority areas. Each priority area was associated with an objective under which there was a plan describing and providing timelines for one or more activities and associated tasks. The priority areas and their activities were categorized as near-, medium-, or long-term items.<sup>15</sup> Table 5 offers an illustration (though focused on CHP, not GEB or load flexibility).

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<sup>15</sup> Minnesota Department of Commerce, op. cit.

Table 5. Minnesota CHP Action Plan Action Plan Summary Recommendations

**Final Action Plan Summary Recommendations**

Number ID	Priority Areas	Action Items	Timing
I	<a href="#">CHP Evaluation Methodology and Criteria</a>	<a href="#">Establish CHP Energy Savings Attribution Model and Project Evaluation Criteria</a>	Near-Term (2015-2016)
II	<a href="#">Mapping CHP Opportunities</a>	<a href="#">Map CHP Opportunities at Wastewater Treatment Facilities and Public Facilities</a>	Intermediate-Term (2016-2017)
III	<a href="#">Education and Training Needs and Options</a>	<a href="#">Expand Education and Training Resources on Commerce’s Website</a>	Near-Term (2015-2016)
IV	<a href="#">CHP Ownership Problems and Solutions</a>	<a href="#">Leverage Existing Financing Programs Applicable to CHP</a>	Near-Term (2015-2016)
V	<a href="#">CIP CHP Supply-Side Investments</a>	<a href="#">Examine Electric Utility Infrastructure Policy</a>	Long-Term (2015-Onward)
VI	<a href="#">Standby Rates</a>	<a href="#">Continue Discussion Through PUC’s Generic Proceeding</a>	Long-Term (2015-Onward)

Source: Minnesota Department of Commerce

For a roadmap focused on GEB or on broader load flexibility, recommended goals and actions can vary in nature and scope. Examples of some actions a roadmap may recommend include:

- Studies of GEB potential, benefits, and costs.
- Pilot GEB projects, including for public buildings.
- Policy and regulatory pilots to try new rate and program designs.
- Creating financial incentives for load flexibility.
- Better inclusion of load flexibility and DERs in electricity system planning processes.
- Improving practices for valuation, performance assessment, and labelling or rating of buildings for load flexibility.

Some other actions can be found in Table 2 previously presented.

Some recommendations may call for data, metrics, analytical, and methodological improvements. These could include, for example, identifying or developing ways to value load flexibility, establish GEB performance metrics, estimate a state’s GEB potential, or calculate DER cost-effectiveness.

Other goals and recommendations may address policy, programmatic, or regulatory matters. Examples include aligning energy efficiency and demand response programs with each other and other DERs, modifying time-of-use or demand charge rates, clarifying the regulatory status of electricity storage, establishing a clean peak type standard, clarifying the definition of utility vis-à-vis small generators and other DERs, including time differentiation in energy efficiency policies and programs, and establishing GEB pilot demonstrations, among many others.

It is important that the roadmapping team identify who would undertake the recommended actions, including leads and supporting agencies and organizations. Estimated fiscal and funding impacts should be identified too. Potential supporting entities may be identified as well, such as National Laboratory technical assistance.

Some of the recommended actions may occur under a state’s executive branch authority, where Executive Order or existing agency authorities can be employed. Others may lie within PUC or another independent regulatory jurisdiction. Still others may require legislative action. The roadmap can also recommend measures under local government jurisdiction or to be voluntarily considered by the private sector.

The team should also establish how to monitor progress in implementing the recommendations individually and for the roadmap as a whole. Which measures and metrics should be tracked? What constitutes successful completion of the recommended actions? Who will evaluate, track, and report on progress, and with what resources? (See Step 10 below.)

#### Step 7: Draft the Roadmap

Roadmap writers may consider the following:

- Emphasizing accessibility through clear writing and presentation understandable by non-specialist audiences.
- Offering the roadmap in a range of detail, from an executive summary to a more detailed “extended summary” to the full roadmap as well as providing access to technical appendices and other detailed materials.

The specific content of a roadmap will vary by state in accord with its context and scope.

The roadmapping team should emphasize accessibility through clear writing and presentation understandable by non-specialist audiences. Often a foreword, perhaps “from the Governor,” is offered. Typically, an executive summary provides a succinct delivery of the roadmap’s purpose and vision, approach, findings, and recommendations sufficient to convey the essence of the roadmap quickly to decisionmakers and the public. The executive summary should be designed to be a standalone document. It can be as a basis for developing an even shorter news release, web landing page, brochure, or similar product.

The main roadmap body should cover the roadmap’s authority, requirement, and scope; its intent and vision; the roadmapping process, including stakeholder and public engagement; data and information gathered and analyses performed and consulted; and recommended goals and actions, including measures of progress, criteria for success, and (perhaps) potential for a future roadmap revision. Acknowledgements of contributors, glossary, and bibliography and references are generally included too. Appendices providing details of datasets used, analyses performed, meeting minutes and participants, and other pertinent information can be attached to the roadmap directly and/or stand as separate ancillary documents.

If the full roadmap document is lengthy, the team may wish to consider offering an abridged version or “extended summary” as an intermediate level of detail between the executive summary and full roadmap.

#### Step 8: Finalize, Adopt, and Implement the Roadmap

Sub-steps may include:

- Delivering the roadmap to state leadership.
- Determining implementation assignments.

This step focuses on the finalization and adoption of the roadmap. Generally, the roadmapping team will complete the written roadmap and present it to the Governor and/or Legislature, in accordance with authorization of the roadmap. There may also be an official acceptance or approval step by the Governor or Legislature. Roadmap authorization may also mandate delivery of the roadmap to particular legislative leaders, agency directors, or others.

The roadmapping team or lead agency should respond to any final questions and, as warranted, defend or amend the roadmap. Once approved, the roadmap should be made publicly accessible, and the state may begin to implement recommendations of the roadmap.

The task of implementing certain recommendations may be assigned to the Governor’s Office, the State Energy Office, Public Utility Commission, or other state agencies. Some recommended actions may require state legislation. The State Energy Office may serve as the lead in coordinating actions and engaging with decision makers to implement recommendations. Stakeholders may also use the plan as a tool to influence policy development in the Legislature, Governor’s Office, or state PUC proceedings.

#### Step 9: Conduct Outreach and Education

Some key factors include:

- An outreach strategy to help the state to tailor its information to target audiences and build local understanding and support for the roadmap.
- Providing materials that accommodate varying levels of expertise and interest.
- Considering multiple formats and media for outreach.

The state should provide the roadmap to key stakeholders, state agencies, local governments, utilities, businesses, industry, the media, and the public. An outreach strategy will help the state to tailor its information to target audiences and build local understanding and support for the roadmap. Building owners, building operators/managers, commercial and residential tenant associations, consumer advocates, low-income community advocates, and small business associations may be among stakeholders warranting particular attention especially with regard to GEB’s value proposition.

States should consider multiple formats and media for outreach, including electronic and printed documents, web pages, and video. The roadmapping team should accommodate varying levels of interest and expertise among the public and stakeholders by providing plain language, easily accessible summaries and other materials (press releases, infographics, interactive web graphics, and video) for non-expert audiences while making available more technical content (including technical appendices and data) for experts.

Public briefings and presentations at conferences, workshops, and other venues provide additional ways to showcase the roadmap and its recommendations. The roadmapping team should seek and respond to media inquiries too.

The extent of the outreach strategy will depend on the roadmapping budget. For limited budgets, a website is a cost-effective form of communication.

#### Step 10: Monitor Progress and Update the Roadmap

Key activities may include:

- Assigning the lead agency (e.g., the State Energy Office) with the task of tracking and monitoring roadmap progress.
- Evaluating, tracking, and monitoring progress toward implementing the recommended actions.
- Considering options to update or modify the roadmap at future points.

The roadmap is not an end. It is an early action that identifies and recommends actions, in this case to support implementation of GEBs and, more broadly, application of load flexibility to meet multiple state and societal objectives. The state should evaluate, track, and monitor progress toward implementing the recommended actions. Before the roadmap is released, a lead agency (e.g., the State Energy Office) should be assigned the tracking and monitoring task.

The roadmapping team or lead agency should develop a strategy to monitor roadmap implementation and progress. Each goal and recommended action in the plan should, to the extent possible, include verifiable metrics to enable clear measurement of progress.

Public reporting can help to build accountability and transparency. Progress can be displayed through a roadmap website that tracks and monitors milestones, timelines, and other developments. The agency monitoring progress for the roadmap should examine activities, policies, programs, and results under the purview of other state agencies as well as other pertinent entities, such as utilities, local governments, building operators and their trade associations, and research institutions.

The state should consider developing a means to update or modify the roadmap at future points. Times and contexts change, including technologies, market conditions, state priorities, and economic conditions. New data, metrics, and tools may become available to allow better analyses that can inform

recommendations and priorities for action. Also, monitoring of roadmap progress may indicate needs to alter timelines, priorities, and expectations; to make course corrections.

## Conclusion

As described in this document, there are many things that states can do to advance opportunities for and remove hindrances to GEBs and the application of load flexibility. But how can states identify and prioritize actions to undertake; and with what resources, in what sequence, and performed by whom?

The issues concerning GEBs, load flexibility, and wider DER implementation dwell at the intersection of complex technical, economic, policy, regulatory, and legal matters. It is also an area where diverse stakeholder input is important not only for obtaining information and perspective but also for earning stakeholder “buy-in” (or at least mitigate opposition) for policies, programs, and regulations.

Roadmapping can enable states to assess their options and develop priorities in an informed manner based on a deliberate process of considering state objectives, taking stock of current contexts, engaging stakeholders and the public, gathering and analyzing data and information, and considering potential futures.

A roadmap identifies barriers and gaps to be overcome. It should identify and recommend policy, programmatic, and regulatory options and approaches to pursue. The roadmap should identify priorities, timeframes, and sequences of actions and their performers too.

There is no single ideal formula or format for a roadmap to address GEBs and application of load flexibility. Roadmap visions, scopes, depth, breadth, and length will vary by state context and resource availability. However, this document suggests a series of steps and considerations drawn from analogous state energy planning guidelines, but also informed by roadmaps, action plans, and similar exercises, that state may wish to consider for identifying and prioritizing actions for furthering GEBs and realizing the multiple benefits of load flexibility.



## Appendix A. Actions States Can Take Tables

Table A-1. Key Actions States and Localities Can Take to Advance Demand Flexibility (condensed)

	Who can take action?							
	Gov. Office	PUC	SEO	Other Agencies*	City/County	Utilities	RTO/ISO	Bldg. owners**
<b>1. Gather Information and Identify Opportunities</b>								
• Consider how demand flexibility can support goals	•	•	•	•	•	•	•	•
• Inventory options and select opportunities for early action	•	•	•	•	•	•	•	•
• Participate in pilot projects and share best practices		•	•	•	•	•		•
<b>2. Develop and Implement Strategies to Integrate Demand Flexibility</b>								
• Develop a roadmap to advance demand flexibility	•	•	•	•	•	•	•	•
• Develop mechanisms to allow building owners, operators and occupants to earn compensation for providing grid services		•	•			•	•	•
• Conduct outreach and education about opportunities and benefits		•	•	•	•	•	•	•
<b>3. Accelerate Adoption</b>								
• Assess and remove barriers to demand flexibility in buildings providing grid services***	•	•	•	•	•	•	•	•
• Update economic valuation methods for DERs as energy assets for utility programs, plans and procurements***		•				•		•
• Establish practices for robust and cost-effective assessments of demand flexibility performance***		•	•	•	•	•	•	•
• Regularly assess and report on progress	•	•	•	•	•	•	•	•

\*For example, state departments or agencies responsible for general services, building codes, environment, economic development, transportation, and financing authorities

\*\*Best opportunities for owners and operators of privately owned buildings to support state and local activities

\*\*\*Subject of forthcoming SEE Action reports.

Source: Derived and modified from L. Schwartz, Lawrence Berkeley National Laboratory<sup>16</sup>

<sup>16</sup> L. Schwartz, op cit.

Table A-2. Key Actions States and Localities Can Take to Advance Demand Flexibility

	Who can take action?							
	Gov. Office	PUC	SEO	Other Agencies*	City/County	Utilities	RTO/ISO	Bldg. owners**
<b>1. Gather Information and Identify Opportunities</b>								
<b>Consider how demand flexibility can support goals</b>								
<ul style="list-style-type: none"> <li>Catalog ways demand flexibility can help achieve energy-related goals (e.g., resilience and reliability, energy affordability, emissions, energy efficiency, integrating variable renewable generation, electrification, energy security, grid modernization) and other aims (e.g., economic development, critical infrastructure)</li> </ul>	•	•	•	•	•	•	•	•
<ul style="list-style-type: none"> <li>Establish team to consider how demand flexibility can contribute to achieving these goals</li> </ul>	•	•	•	•	•	•	•	•
<b>Inventory options and select opportunities for early action</b>								
<ul style="list-style-type: none"> <li>Catalog existing pilots, standards, programs, procurements, policies and regulations that address demand flexibility</li> </ul>		•	•	•	•	•	•	•
<ul style="list-style-type: none"> <li>Consider ways to further integrate demand flexibility (e.g., lead by example, building operator training, energy savings performance contracting, benchmarking and transparency, DER incentives, smart cities, performance standards for existing buildings, state building energy codes and appliance standards)</li> </ul>	•	•	•	•	•	•	•	•
<ul style="list-style-type: none"> <li>Identify planning processes that can address demand flexibility goals (e.g., integrated resource planning, efficiency and other DER planning, planning for distribution systems, transmission expansion, grid modernization, transportation electrification, resilience, energy security) and initial integration steps</li> </ul>		•	•	•	•	•		
<ul style="list-style-type: none"> <li>Identify DER requirements that may need updating to enable demand flexibility (e.g., revising energy efficiency resource standards to also target peak demand savings, modernizing demand response requirements, requirements for participating in electricity markets)</li> </ul>	•	•	•	•	•	•		
<b>Participate in pilot projects and share best practices</b>								
<ul style="list-style-type: none"> <li>Identify opportunities to collaborate on test beds for individual buildings, campuses, and commercial developments to gain experience, validate demand flexibility performance, and demonstrate value to the utility system and building owners and operators</li> </ul>		•	•	•	•	•		•
<ul style="list-style-type: none"> <li>Conduct pilots for public buildings and campuses to test demand flexibility technologies and microgrids</li> </ul>		•	•	•	•	•		•
<ul style="list-style-type: none"> <li>Test approaches for hard to reach audiences, including low-income households and small and medium commercial buildings</li> </ul>		•	•	•	•	•		•

• Share results across the jurisdiction and in regional and national forums		•	•	•	•	•		•
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Who can take action?							
Gov. Office	PUC	SEO	Other Agencies	City/County	Utilities	RTO/ISO	Bldg. owners

**2. Develop and Implement Strategies to Integrate Demand Flexibility**

**Develop a roadmap to advance demand flexibility**

• Engage key stakeholders (e.g., third-party program administrators, DER service providers, DER aggregators, contractors, consumer representatives, trade associations for building owners and operators, energy service companies) and use public meetings to discuss strategies	•	•	•	•	•	•	•	•
• Establish principles (e.g., related to cost-effectiveness, consumer and utility system benefits, equity, resilience)	•	•	•	•	•	•		
• Create a comprehensive and collaborative approach with steps to advance demand flexibility through programs, planning processes, standards, policies and regulations (e.g., through a Governor’s executive order, MOU across agencies, multistate partnership)	•	•	•	•	•	•		
• Estimate benefits and costs to determine cost-effective achievable potential of demand flexibility for residential and commercial buildings and best opportunities for action		•	•	•	•	•	•	•
• Make a public commitment toward achieving this potential with specific multiyear targets	•	•	•	•	•			
• Develop interim and long-term metrics for measuring progress	•	•	•	•	•	•		
• Update roadmap on a regular schedule (e.g., every three years)	•	•	•	•	•	•	•	•

**Develop mechanisms to allow building owners, operators and occupants to earn compensation for providing grid services**

• Establish multiyear funding assurances for utility programs. Establish payment methods for DER aggregators and customers		•				•		•
• Consider performance-based incentives for utilities to encourage use of buildings as energy assets toward meeting generation and delivery needs		•				•		•
• Review retail electric rates for embedded incentives and disincentives for demand flexibility in residential and commercial buildings		•				•		•
• Work across states to encourage wholesale electricity markets to enable buildings to provide a broader suite of grid services by updating participation requirements and compensation methods		•	•				•	•

**Conduct outreach and education about opportunities and benefits**

• Partner with utilities, utility consumer groups, energy services companies, DER aggregators, building owner and management organizations, trade associations, and other stakeholders to develop and disseminate educational materials		•	•	•	•	•	•	•
• Create user-friendly, online resources such as how-to guides and establish online forums that answer common questions			•	•	•	•	•	•
• Organize webinars and in-person trainings with utilities and stakeholder groups			•	•	•	•	•	•

	Who can take action?							
	Gov. Office	PUC	SEO	Other Agencies	City/County	Utilities	RTO/ISO	Bldg. owners
<b>3. Accelerate Adoption</b>								
<b>Assess and remove barriers to demand flexibility in buildings providing grid services*</b>								
• Identify technical barriers (e.g., requisite building technologies and utility systems, cybersecurity, lack of integrated design and system approaches)		•	•	•	•	•	•	•
• Identify financial barriers (e.g., cost-effectiveness, inadequate compensation through utilities or markets, upfront cost)	•	•	•	•	•	•	•	•
• Identify regulatory, market and other institutional barriers (e.g., restrictions on DER aggregation and participation, lack of compensation mechanisms, data access provisions and data privacy concerns, siloed DER programs, procurement provisions)	•	•	•	•	•	•	•	•
• Identify other barriers (e.g., split incentives for building owners and tenants, lack of motivation and energy focus for building operators, workforce training needs)	•	•	•	•	•	•	•	•
• Determine which barriers are critical to address and prioritize / develop strategies to overcome them	•	•	•	•	•	•	•	•
<b>Update economic valuation methods for DERs</b>								
• Update economic valuation methods for DERs (e.g., as energy assets, providing grid services, reducing capacity needs) in utility programs, plans and procurements*		•				•		•
<b>Establish practices for assessments of performance</b>								
• Establish practices for robust and cost-effective assessments of demand flexibility performance*		•	•	•	•	•	•	•
<b>Assess and report on progress</b>								
• Regularly assess and report on progress	•	•	•	•	•	•	•	•
• Track and report to stakeholders annually on metrics identified in the roadmap		•	•	•	•	•	•	
• Identify new opportunities to improve demand flexibility implementation and performance and update the roadmap		•	•	•	•	•	•	•
• Use a variety of channels to share information, such as presentations at established events, social media, and online dashboards and maps		•	•	•	•	•	•	•
• Provide recognition for building owners and operators, government agencies, utilities and regional grid operators for outstanding projects and programs that advance demand flexibility	•	•	•	•	•	•	•	•

\*For example, state departments or agencies responsible for general services, building codes, environment, economic development, transportation, and financing authorities

\*\*\*Subject of forthcoming SEE Action reports.

Source: Derived and modified from L. Schwartz, Lawrence Berkeley National Laboratory<sup>17</sup>

<sup>17</sup> Ibid.