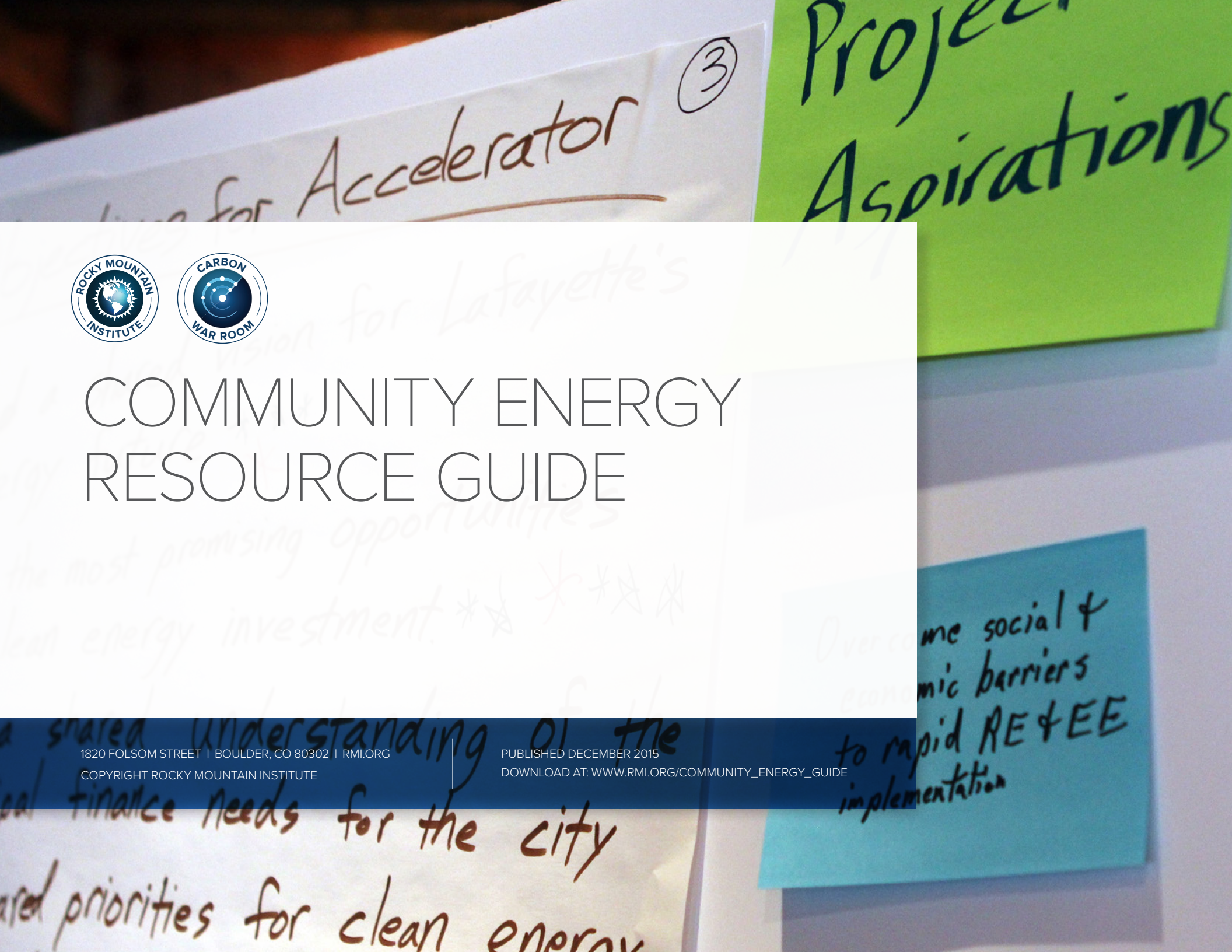

COMMUNITY ENERGY RESOURCE GUIDE

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ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. In 2014, RMI merged with **Carbon War Room (CWR)**, whose business-led market interventions advance a low-carbon economy. The combined organization has offices in Snowmass and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

TABLE OF CONTENTS

01. Introduction 04

02. Planning Process Overview 07

03. Leading the Charge 11

04. Stakeholder Collaboration and Community Engagement 14

05. Analyzing the Energy Landscape 20

06. Selecting Tactics and Strategies 28

- *A. Broad Enablers 31*
- *B. Buildings 34*
- *C. Electricity and Energy Supply 40*
- *D. Transportation 48*
- *E. Industry 56*

07. Conclusion 60

08. Endnotes 62

INTRODUCTION

01

01. INTRODUCTION

COMMUNITIES ARE AT the forefront of the energy transition: citizens are increasingly asking their cities to develop and act on ambitious plans, and community leaders are seeing the social, political, and economic benefits of doing so. Even so, no standard roadmap or methodology exists to help communities transform their energy use. The purpose of this resource guide is to be that roadmap, and provide that methodology.

This guide is meant to help those U.S. communities with a desire to create a comprehensive energy action plan that will accelerate the use of cost-effective renewable energy resources and energy efficiency while significantly reducing climate impacts and fossil fuel-related emissions. Such a plan can enhance resiliency, reduce fuel-import risk, provide primary-fuel cost hedging, improve environmental performance and public health, and increase local investment and job opportunities. These plans can be effective in the domains of building efficiency, transportation and land use, and electricity and energy supply.

Ultimately, cities and communities are in a unique position to set ambitious clean energy and sustainability goals. Achieving those goals has the potential to not only address climate change and diversify energy portfolios away from fossil fuels, it can capture energy dollars traditionally exported elsewhere and reinvest them locally.

HOW THIS GUIDE CAN HELP

We recognize that community energy practitioners will undertake these efforts for a variety of reasons; our primary focus in writing this guide is to provide practical support to these practitioners whatever their motivation. In preparing this resource guide, RMI synthesized findings from previous RMI community engagements (including those with Fort Collins, CO; Palo Alto, CA; Duluth, MN; the states of New York, Connecticut, and Minnesota; Arizona State University; and several others), as well as the findings of several other leading organizations and practitioners mentioned throughout this guide.

This resource guide is intended to be a reference tool for ongoing community-level energy work. It is not a typical report. As such, we recommend reading the main introduction first and then the introduction and key takeaways for each chapter to familiarize yourself with this guide. This should give the reader a good sense of where to find the in-depth information and additional resources in each chapter that suits their individual needs.

The intended audiences for this resource guide are, broadly, community leaders, stakeholders, and business leaders in communities, cities, and states of all sizes.

What To Expect In This Guide

- **Practical guidance for local decision makers, practitioners, and leaders**
- **A plan or process that may be adapted to your community**
- **Examples of leading and/or innovative initiatives and strategies (but not a comprehensive list)**
- **Tools, studies, and external resources for planning, analyzing, selecting, and evaluating tactics and strategies**
- **New ideas to spur uptake and implementation**

This guide is practical and practitioner oriented, and gives us and so many other U.S. communities a process to follow, along with great examples of tools and resources to put our community in a position of leadership.

—JODI SLICK, CEO,
ECOLIBRIUM 3, DULUTH, MN

01. INTRODUCTION

WHAT MAKES A COMMUNITY ENERGY PLAN SUCCESSFUL?

The Department of Energy's *Guide to Community Strategic Energy Planning* notes that the essential characteristics of a solid, successful plan are that it be:

- Comprehensive;
- Integrated into significant and ongoing community efforts; and
- Proactive and ambitious in nature (yet achievable).

To this we add that it must be strategically aligned with capacity for action. Often, though certainly not always, the principal agent for cost-effective action and innovation is in the private sector. Those plans which clearly identify economic and private-sector opportunities along with enabling policy mechanisms can be especially helpful. Plans which seek to align with broader community concerns or ambitions such as environment, climate, resiliency, leadership in innovation, risk reduction, and sustainability are, similarly, much more likely to gain significant traction. Finally, we encourage communities to collaborate with the private sector on demonstration projects as a means to expand the community's perspective and comfort level and nurture innovation.

Examples of Community Energy Plans

The following list shows examples of community energy plans that are pushing the boundaries of what is possible. These plans are a selection of recommendations, and not a comprehensive list or an endorsement. Communities may wish to consult some of these plans to see how other cities are conducting and communicating their vision, goals and process to stakeholders.

- **Austin, TX**
- **Berkeley, CA**
  - **2014 update**
- **Boston, MA**
- **Cambridge, MA**
- **Chicago, IL**
- **Fort Collins, CO**
  - **2014 update**
- **New York City, NY**
- **Minneapolis, MN**
- **Palo Alto, CA**
- **Portland, OR**
- **Washington, D.C.***

*draft plan

PLANNING PROCESS OVERVIEW

02

IMAGE: THINKSTOCK - SEANPAVONEPHOTO | CHATTANOOGA, TN

02. PLANNING PROCESS OVERVIEW

DEVELOPING A TRANSPARENT AND COLLABORATIVE PLANNING PROCESS

Community energy planning depends as much on the process of planning as it does on the finished plan. In fact, excellent, ambitious plans that are created without a transparent and collaborative process will often fail to be adopted by the community. At the same time, rather unremarkable plans that are created in a collaborative and transparent way can often be adopted and lead to meaningful change. A good planning process is the most important prerequisite for success. A planning process should articulate a shared energy vision for the community, facilitate collaboration with community stakeholders, and be transparent in its process and results.

There are many effective ways to run a community planning process. One such approach is described here. The key is to follow a process that generates a shared vision and is conducted collaboratively and transparently.

KEY TAKEAWAYS:

- **A great process is more important than a great product—it is more likely to lead to impact**
- **A great process will be transparent and collaborative and lead to a shared vision**
- **At the end of a planning process, a community should have developed local capability (e.g., knowledge, a committed leadership team) in addition to a plan**
- **A planning process can take as much as twelve months**

Below is a set of steps to consider during a community planning process. In many cases, the process will be iterative. Ultimately though, a comprehensive approach, from inception to adoption and implementation, will be critical for the community energy action plan to be robust.

From inception to adoption, a community planning process can take six to twelve months. Implementing the community energy action plan may take longer. Communities may choose to build in milestones for revisiting, evaluating, and updating the energy action plan over time.

At the conclusion of a well-run process, in addition to a community energy plan, a community will have a backbone of stakeholders invested in a successful outcome to the plan, and a shared vision among community members. These assets can be as valuable, or more so, than the plan itself. Targeting these outcomes in addition to the actual plan will make subsequent engagement work easier.

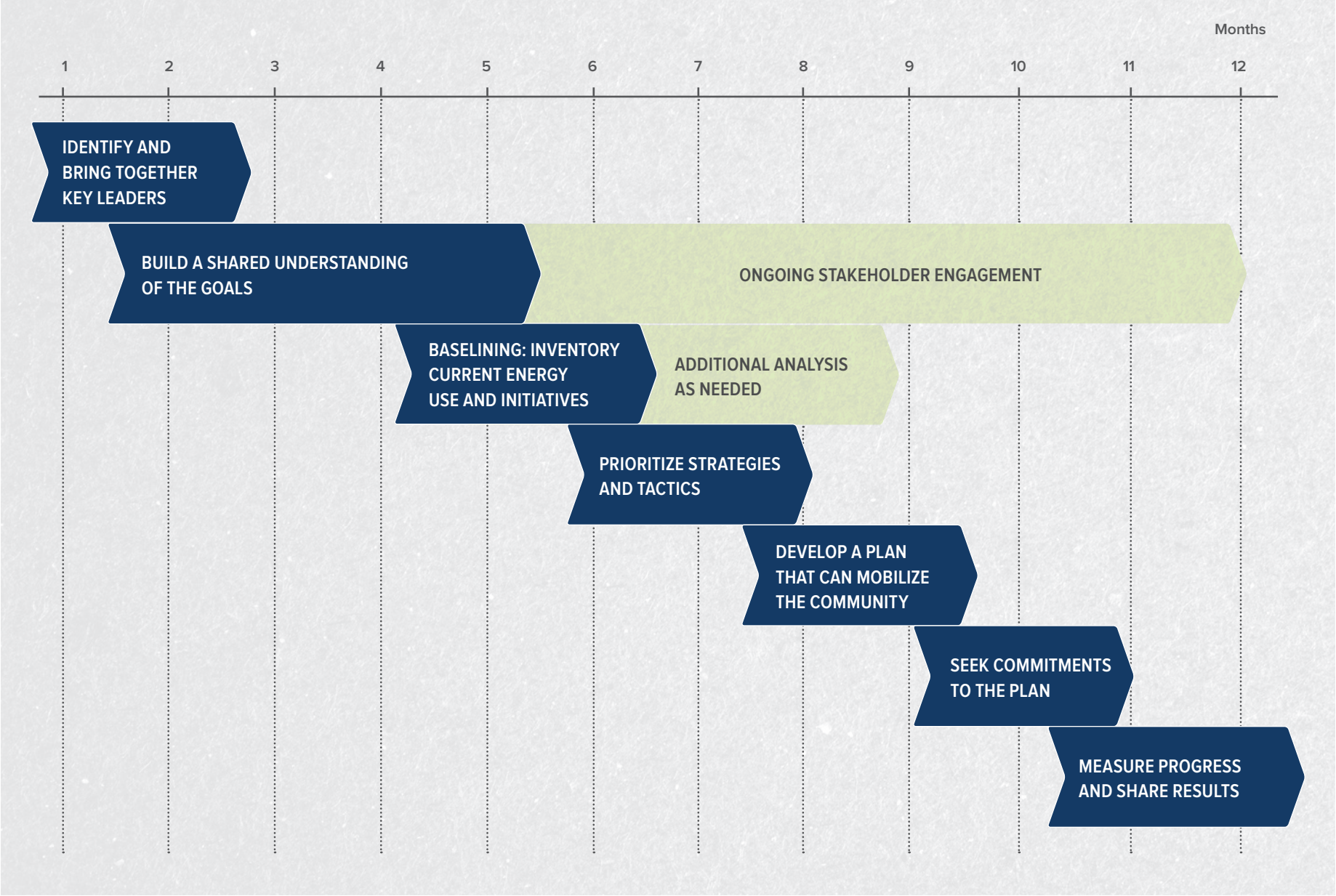
02. PLANNING PROCESS OVERVIEW

KEY ELEMENTS OF COMMUNITY ENERGY PLANNING

ELEMENTS OF COMMUNITY ENERGY PLANNING	EXAMPLE ACTIVITIES
IDENTIFY AND BRING TOGETHER KEY LEADERS	• Assemble a small group of individuals with a shared interest in advancing a community energy action plan • Secure the support of a few key leaders, seek third-party consultants, and collect their input
BUILD A SHARED UNDERSTANDING OF THE GOALS	• Organize a collaborative workshop for key stakeholders to coalesce around a vision, strategies, goals, and next steps
BASELINING: INVENTORY CURRENT ENERGY USE AND INITIATIVES	• Understand current energy use, energy expenditures and associated greenhouse gas emissions, and investment and job opportunities • Map related initiatives in order to leverage and to build upon success
PRIORITIZE STRATEGIES AND TACTICS	• Select strategies and tactics to achieve the community's goals for its energy future
DEVELOP A PLAN THAT CAN MOBILIZE THE COMMUNITY	• Establish a plan that will empower the community to achieve the envisioned energy future and solicit community feedback
SEEK COMMITMENTS TO THE PLAN	• Adopt a plan via appropriate avenues (e.g., city-council vote, business commitments, county-commission vote, or another appropriate avenue) • Execute strategy and tactics within the specified timeframe
MEASURE PROGRESS AND SHARE RESULTS	• Monitor progress and periodically release results to the community and other interested parties

02. PLANNING PROCESS OVERVIEW

COMMUNITY ENERGY ACTION PLAN TIMELINE (12 MONTHS)



LEADING THE CHARGE

03

03. LEADING THE CHARGE

IN ANY COMMUNITY, change cannot happen without dedicated leaders. Identifying and developing leaders is therefore the first step in community energy planning. Think broadly about who is a leader; do not limit the effort to energy or environmental professionals or city staff. Ultimately, the leadership team will be most effective if it is representative of the community's constituencies and interests.

In this section, we describe the process of leading the community energy planning initiative. Initially, a few **catalysts** come together informally. Over time, this core group expands and becomes a formal **leadership team** (i.e., a core stakeholder team). In turn, a **backbone organization** (i.e., committed central staff), **technical advisors**, and **facilitators** support the leadership team, and **champions** carry the initiative forward.

KEY TAKEAWAYS:

- **Dedicated leadership is a community's most important asset—time needs to be spent identifying and cultivating potential leaders**
- **Leadership teams will be more effective if they are representative of their constituency (e.g., inclusive of the business community, neighborhood groups, or other groups in addition to city or NGO leadership)**
- **An initial leadership team can expand to include advisory councils in order to build more community ownership**
- **Leadership will be more effective if supported by dedicated staff, either from the city, a backbone organization, or a committed local business**

Effective leaders, cross-sector collaboration, and dedicated staff are critical to the success of the community energy action plan. While we describe an ideal leadership-team structure and approach in this section, other collaborative processes may be better suited to your community's needs.

THE LEADERSHIP TEAM

Many community energy plans start when a small group of catalysts—visionaries and change makers within organizations, businesses, and communities—come together informally with the shared goal of an improved energy future. Over time, this core group of catalysts expands its membership and becomes a formal leadership team. The leadership team acts as the board of directors for the community energy initiative, providing vision and strategic direction to the backbone (central staff) and technical advisors and facilitators, which may include consultants and/or contractors.

Ideally, the leadership team has broad cross-sector representation. However, professional affiliation may be less important than strong vision and conviction for an improved energy future. The leadership team should have a mix of bold thinkers and pragmatic doers. In order for the leadership team to make decisions quickly and adapt to a changing landscape, the number of team members should remain somewhat small. Be sure that the leadership team mutually agrees upon a decision-making structure, accountability measures, and a regular meeting time.

Backbone Support Organizations

One method of involving support staff is creating a new backbone support organization. According to research from the *Stanford Social Innovation Review*,[1] collective efforts to solve complex social problems are most successful when there is a "backbone," an organization with dedicated staff (separate from the organizations participating in the leadership team) that provides supporting infrastructure for the entire community initiative. Importantly, the backbone has its own (modest) budget to ensure that the initiative is staffed and adequately resourced for the duration of the planning period. It is also important that the backbone support organization remain independent of local politics and avoid city budget cycles.

03. LEADING THE CHARGE

SUPPORT STAFF

It is critical to have dedicated support staff whose role is to carry out the day-to-day work of the community energy planning process. Support staff may be city or county staff, local nonprofit professionals, or even committed volunteers. Support staff responsibilities include coordinating among leadership team members, stakeholders, and champions; handling logistics and administrative matters; and managing project deliverables. Funding for the support staff may be available through state or federal grants, the city budget, or foundation grants.

TECHNICAL ADVISORS

Often, communities will need assistance from technical experts to manage data and conduct analyses. These experts may be city staff, nonprofit professionals, or researchers from local universities; they may also be hired third-party professionals. (See Section 5: Analyzing the Energy Landscape for guidance on hiring technical advisors through requests for proposals [RFPs])

FACILITATORS

As the leadership team begins stakeholder collaboration and broad community engagement, it may be necessary to hire professional facilitators to organize and run the community energy workshop and engage additional stakeholders. If needed, facilitators can run important internal meetings for the leadership team and backbone. To better understand the role of facilitators, see the Organizing a Community Energy Workshop subsection in Section 4: Stakeholder Collaboration And Community Engagement.

CHAMPIONS

Your energy initiative will be more effective with the strong endorsement of a few champions—influential community leaders, business leaders, utility executives, and elected officials. Garnering such support early will lend legitimacy, visibility, and resources to the community energy strategy. An official endorsement can come in many forms, including an executive order, a memorandum of understanding (MOU), or an internal staff directive. Ideally, these champions will play at least a nominal role in the leadership team. Cultivate support and input from these champions from the start.

STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

04

04. STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

EFFECTIVE STAKEHOLDER collaboration and broad community engagement is a critical part of the community energy planning process. Holding a community energy workshop early in the process and again at key decision points allows key community leaders to come together and can serve as a catalyst for launching and sustaining the community energy planning process publicly. Innovative ideas may emerge from the workshop, in addition to champions and citizen advisors who may help shape and carry the community energy plan forward through adoption and implementation. Broader community engagement can help inform the plan and increase public support.

This section describes how to select participants for the community energy workshop, how to design the workshop, the role of facilitators, and follow-on work after the workshop ends. The section concludes with a brief discussion of broader community engagement strategies.

KEY TAKEAWAYS:

- **The community energy workshop can serve as a catalyst for publicly launching the community energy planning process**
- **Participants should come from diverse backgrounds—not only energy and climate fields—and be representative of your community's different constituencies**
- **Stakeholder buy-in is critical to the plan's ultimate success. As such, the workshop should be held during the early phases of the planning process**
- **The workshop should create real space to collaborate; limiting the agenda to progress updates, sharing of early results, or generating buy-in on a preconceived idea will likely not lead to a truly collaborative outcome**
- **The workshop's objectives should be created thoughtfully, and the workshop should be designed to fit your community's unique needs**
- **Where possible, involve trained facilitators to help steer the workshop**
- **The community energy workshop is just one method for stakeholder engagement. Additional community engagement approaches, such as holding focus groups or creating a citizen advisory committee, can be helpful to sustain community support, help with important design decisions, sharpen messaging, and support adoption of the plan**

ORGANIZING A COMMUNITY ENERGY WORKSHOP

A community energy workshop is a participatory working session in which stakeholders identify key priorities and concerns, converge around a vision for a community energy future, set new goals or review existing goals, and select tactics and strategies for further analysis. The workshop can take place in a single day or two to three days, depending on your community's needs.

SELECTING PARTICIPANTS

Ideal participants come from organizations that are:

- Working in energy/electricity supply, transportation, buildings, industry, or agriculture
- Positioned at the leading edge
- Supported by senior leadership to participate in the community energy workshop
- Positioned to drive action because of expertise, funding, or reputation

In addition to professional affiliation, the participants' personalities matter.

Ideal individuals have:

- Comfort with risk, iteration, ambiguity, and experimentation
- A sense of urgency
- A demonstrated ability to lead groups towards shared outcomes

Addressing whether a person has the desired "heart and mind" is challenging. For many leadership teams, getting the right individual to participate may be as or more important than getting the right organization to participate.

Aim to have 20 to 50 participants, depending on the size of your community, and five to ten facilitators (one or two facilitators per breakout group).

04. STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

COMMUNITY ENERGY WORKSHOP TIMELINE (4 MONTHS)

Identify Objectives, Assemble Team, and Plan Logistics	Invite Stakeholders and Prepare	Convene Stakeholders	Follow-up and Execute Next Steps
2 months	**1 month**	**1–2 days**	**1 month +**
Determine workshop objective and desired outcomes, set agenda, secure funds, recruit facilitators, and plan logistics	Secure RSVPs, finalize logistics, and prepare facilitators' guide and pre-read document	Hold workshop and document outcomes	Send debrief document to stakeholders and execute immediate next steps

WORKSHOP TIMING

The workshop should be held before a full action plan is developed, since stakeholder ideas and buy-in are critical to the plan's ultimate success. When possible, convene around an event, such as a major infrastructure upgrade, to create a sense of urgency. This will make the community energy action plan relevant and the goals time-bound.

Defining Workshop Objectives and Outcomes

At the outset of planning the community energy workshop, the leadership team should clearly define the workshop's objectives and desired outcomes and communicate those to facilitators and participants. This will guide the workshop agenda and also help to attract participants to the workshop.

Creating a Common Knowledge Base: Elements of an Effective Pre-read

In order for a community energy workshop to be successful, participants must begin with a common knowledge base that includes an understanding of the current energy landscape. This can be accomplished with a pre-read document. An effective pre-read document, distributed well in advance of the workshop, is concise and includes a few essential elements:

- *Community snapshot* – high-level statistics, such as population and per capita income
- *Utility fuel mix* – from the utility's integrated resource plan
- *Energy consumption* – by energy source, household, and sector (buildings, transportation, industry)
- *Energy expenditures* – per household and by sector
- *Greenhouse gas inventory* – by sector
- *Related policies, initiatives, and goals* – other renewable energy and energy efficiency efforts in the community
- *Recent energy-related developments* – in the community and the broader region
- *Peer communities* – that the community would like to benchmark themselves against

The Role of Facilitators

To ensure a successful workshop, consider hiring professional facilitators. Facilitators may be knowledgeable about the content being discussed, but they should not have a vested interest in the specific outcomes of the workshop. Rather, they should be concerned with creating an inclusive and productive process in which all participants are heard and the stated objective of the workshop is achieved. The lead facilitator should play a major role in the design of your workshop.

Designing the Workshop

The workshop objectives and desired outcomes should directly inform the workshop agenda. Objectives should be grounded in the community's current energy landscape and the needs of the leadership team and participants alike. Outcomes should be designed to address how participants should be positioned to take action by the end of the workshop.

To keep people engaged and excited, design a mix of formats, including plenary sessions, breakout groups, and time for individual reflection. Allow for some unstructured time so that participants can reflect and exchange ideas as well.

04. STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

EXECUTING A COMMUNITY ENERGY WORKSHOP

	7:30–8:00am	**Continental Breakfast**
ALL	8:00–9:15am	**Introduction and Ground Rules** *Facilitators introduce agenda, present the essential elements from the pre-read to ensure there is a common knowledge base, and establish ground rules for workshop participation. Breakout groups assigned.*
1 2 3 4	9:15–10:20am	**Breakout 1: Community Energy Priorities and Concerns** *Participants share their priorities and concerns regarding the community's future energy landscape. Facilitators identify areas of convergence and divergence.*
ALL	10:20–10:50am	**Plenary Report-out** *Breakout groups share outputs from first breakout session with the full plenary.*
	10:50–11:00am	***Break***
1 2 3 4	11:00–12:00pm	**Breakout 2: Visioning and Preliminary Goals** *Based on their shared priorities and concerns, participants begin developing a vision for the community's energy future and goals to help achieve this vision.*
ALL	12:00–12:45pm	**Lunch**
ALL	12:45–1:30pm	**Open Ideas** *Participants have the opportunity to address topics not covered by the workshop's agenda (e.g. waste, agriculture, water-energy nexus).*
1/2 3/4	1:30–2:00pm	**Cross-Collaboration Clinic** *Breakout groups pair up to share vision and preliminary goals and receive feedback.*
	2:00–2:10pm	**Break**
1 2 3 4	2:10–3:40pm	**Breakout 3: Vision and Goals, and Next Steps** *Based on clinic feedback, breakout groups refine their vision and goals and determine immediate next steps.*
ALL	3:40–4:30pm	**Report Out and Wrap-up** *Facilitators conclude the workshop and encourage individuals to commit to and share next steps. Facilitators solicit verbal feedback on the workshop and distribute an anonymous survey for participants to complete.*

04. STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

When planning breakout groups, consider grouping the participants by knowledge of, or interest in, one of four typical energy groupings—electricity and energy supply, building and home efficiency, transportation, and industry/agriculture. In this way, workshop participants can contribute their respective knowledge and discussions can be focused on challenges and solutions unique to a particular sector.

When planning content, consider the "diverge-emerge-converge" approach to collaborative group work. During the initial divergent phase, participants brainstorm and share ideas openly without critiquing them. Then, during the emergent phase, participants explore ideas more closely, identify themes, and begin to experiment with new proposals. Finally, in the convergent phase, participants prioritize ideas and make decisions. At this phase, facilitators should ask everyone to make a personal commitment as to how they will carry the work forward, and then consider asking for volunteers to share those commitments with the larger group at the end of the workshop.

Debriefing The Workshop

At the conclusion of the workshop, conduct a brief survey to understand what participants gained from the experience and what could be improved in future stakeholder collaboration. Facilitators and the leadership team may share a summary of workshop outcomes with participants and other interested parties.

Carrying The Momentum Forward

Encourage participants to discuss the workshop results and the community energy action planning process with their networks and commit to specific next steps. Be sure to solicit their ideas about how to engage the broader community and build support. You may decide to involve particularly enthusiastic and capable participants into the leadership team or as part of a citizen advisory committee.

04. STAKEHOLDER COLLABORATION AND COMMUNITY ENGAGEMENT

BROAD COMMUNITY ENGAGEMENT

The community energy workshop is just the beginning of the broader community engagement that a successful community energy action plan requires.

Community Engagement Approaches and Methods

Depending on your community, the level of community engagement may vary from informing the community about your plan to empowering the community to make decisions. Potential engagement methods include focus groups, town hall meetings, public comments, and webinars.

As you decide whom to involve, consider stakeholder mapping. Determine which stakeholders are supporters, persuadable actors, marginal actors, and opponents, and devise a strategy accordingly.[2]

ADOPTING THE PLAN

The community energy action plan will be easier to adopt if it has broad community support and the public endorsement of local leaders. Determine the appropriate venue for formally adopting the plan (e.g., city council resolution, ballot referendum, mayor's letter of support, etc.). The leadership team and the backbone should ensure that support for the plan endures regardless of changes in leadership. Communities may also consider asking for voluntary commitments from companies toward certain objectives or goals in the plan.

Dedicated leadership is a community's most important asset in an energy plan. Time needs to be spent identifying and cultivating potential leaders.

JAMES MANDEL, PRINCIPAL, ROCKY MOUNTAIN INSTITUTE

RMI Insights From Fort Collins: Creating A Citizens Advisory Committee

During the Fort Collins 2014 Climate Action Plan Update process, the city council passed a resolution calling for a citizen advisory committee to develop a plan for the city to achieve greenhouse gas reduction goals.[3] The citizen advisory committee included subject matter experts and members from city boards and commissions, environmental and social services organizations, businesses, and the local university. The citizens advisory committee was guided by a set of principles, advised by technical experts, including Rocky Mountain Institute, and assisted by a professional facilitator.

Resources

- "Gather: The Art and Science of Effective Convening"
- Reos Partners
- Lego Serious Play
- "The Art of Facilitation"
- DOE's *Guide to Community Energy Strategic Planning*, "Step 2: Identify and Engage Stakeholders,"
- DOE's *Guide to Community Energy Strategic Planning*, "Step 5: Develop Energy Goals and Strategies"
- National Coalition for Dialogue and Deliberation, *Resource Guide on Public Engagement*

ANALYZING THE ENERGY LANDSCAPE

05

IMAGE: THINKSTOCK - KCBERMINGHAM | PORTLAND, OR

05. ANALYZING THE ENERGY LANDSCAPE

THE ROLE OF DATA AND ANALYSIS

Technical and/or economic analysis may serve as a critical and important bridge between a community's current energy landscape and a future, coordinated energy vision. Consider what information is important for your community to get started: what are the questions in our current energy landscape or future energy vision that demand data, now? Are there questions that have eluded teams before and, if so, why?

In this section, various analytical approaches are described. Some communities may only need to do a brief, high-level estimate of what is possible in order to get started. Others may want to build from that initial work and do deeper analyses soon thereafter. It's important to strive for doing the right amount of analysis, at the right time, with the right people involved, and to consider what will work best for your community (e.g., including utilities in projections of future renewable energy estimates for electricity supply is essential to building trust in the numbers and support). Estimating future impacts around energy is not a foolproof exercise; the farther out the prediction, the more likely the numbers will be off. However, going through the analytical process is often a useful and meaningful exercise in and of itself, in that the process better informs the questions asked, the goals considered, and the like. While quality analytics are very helpful in guiding the decision-making process, they can also stymie progress in a never-ending cycle of "getting the numbers right."

In the next section, Selecting Tactics And Strategies, we note that many leading communities do such analyses, but also rely heavily on test initiatives (a.k.a. pilots) to test the cost-effectiveness of programs. The value of a test initiative is in the capacity to quickly stop, adjust, and get "right" a program that works best for your community. In the process of adjusting test initiatives (such as by borrowing a successful initiative from another community), the community has the chance to pilot and adjust an initiative quickly for maximum impact and cost-effectiveness.

KEY TAKEAWAYS:

- **Understand the importance of the right data, at the right time, with the right people involved**
- **Start with an assessment of the current energy landscape and communicate it well; then consider a higher-level, what's-possible approach in defining the opportunity**
- **Do more in-depth analysis as appropriate**
- **While several possible steps that a community could take to analyze the energy landscape are included here, not all of these may be necessary to successfully move forward.**
- **Some communities may make quick estimates by benchmarking to other communities; this may provide enough information to get started**
- **Aim for transparency and collaboration with key stakeholders to the maximum extent possible**

TAKING A FIRST PASS: MAKING QUICK ESTIMATES BASED ON OTHER COMMUNITIES

Before beginning any data collection or analysis, it is useful to make some high-level estimates about what is possible. That is, what is the size of the prize, and where are the biggest opportunities? This type of information can allow community leaders to make a decision about whether to proceed with deeper analysis, or to begin taking action with a test initiative or pilot.

One way to approach this analysis is to pick communities with similar characteristics and within a similar geographic area as a comparison. If none have done any energy-related analyses, choose a different community where such an analysis has been completed (see the examples of community energy plans in the introduction). Make adjustments for obvious items such as electricity generation mix, population, and other key differences. This information can be used to develop an estimate and a compelling narrative around the overall value and feasibility of moving forward.

05. ANALYZING THE ENERGY LANDSCAPE

DATA COLLECTION: UNDERSTANDING THE CURRENT ENERGY SITUATION

It is critical to ascertain where energy is being used in the community. By creating a shared understanding of where energy is currently being used, you can begin to address the costs of energy supply, where those energy dollars go, what the impacts are to emissions or other critical environmental or community concerns, and what the future looks like under both a business-as-usual scenario and your goal scenario. Then, both the leadership team and potential stakeholders will have an essential baseline of understanding and likely a more informed idea of where to focus efforts during the community's energy transition.

A community may start with an assessment of the current energy landscape and an essential short list of critical data points, as this process will often reveal first-pass insights about potential goals or strategies to consider. Also, updating this data annually will help your community measure progress. As you begin gathering data, consider how the data inform your potential goals and strategies, and how those strategies, in turn, will affect the data over time. See the next section, Selecting Tactics And Strategies, for more information on this piece of the planning process.

Resources

- EIA's State Energy Data System (SEDS)
- ACORE state renewables profiles

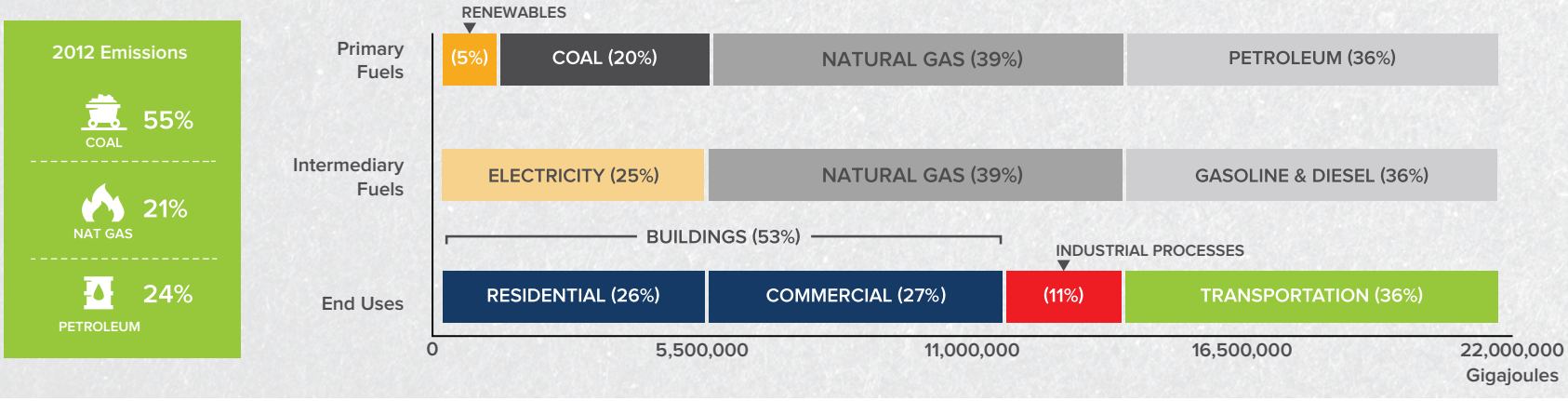
COMMON DATA POINTS

Collecting baseline data about energy use in the community can inform goals and objectives related to energy. Some of the most important and common data for a community energy profile include:

Energy Profile Data

- Energy consumption data broken down by end-use sector (transportation, residential and commercial buildings, city and public sector, industry, electricity generation, heating, water, and waste) in MMBtu (millions of British Thermal Units, the standard measure)
- Load profiles for residential and commercial buildings that are indicative of the area's general energy use
- Industrial-load data for major, local, industrial energy users
- Local transportation-fleet characteristics (vintage, efficiency, and vehicle type)

2012 FORT COLLINS ENERGY PROFILE



Source: "FC GHG and RE Data 2005-2012.xls"; City of Fort Collins, 2012. "Community Greenhouse Gas Emissions Inventory Quality Management Plan 2005-2011," City of Fort Collins, Environmental Services, October 2012. Available at http://www.fcgov.com/climateprotection/FC GHG Quality Management Plan

05. ANALYZING THE ENERGY LANDSCAPE

Electricity Generation and Utility Data

- Existing grid-mix by generation type (coal, natural gas, hydro, and non-hydro renewables)
- Utility type (publicly owned [muni/co-op] vs. investor-owned utility)
- Current policies and rates applicable to renewable energy or distributed energy resources (e.g., net energy metering, capacity-based incentives, performance based incentives, local tax incentives)

Energy Cost Information

- Average electricity rates in $/kWh (typically residential, commercial, and industrial)
- Utility tariff structure
- Average prevailing heating costs (residential, commercial, and industrial)

Local Efficiency and Renewable Resource Profile

- Efficiency opportunity estimates
- Wind and solar resource potential
- Potential for converting waste to energy
- Potential for using biomass

These data are generally available through local electric and gas utilities, state and local transportation agencies, regional planning associations, local departments of public works, state energy agencies, public utilities commissions, and local budget and procurement offices, among other entities. Where local data is lacking, the Energy Information Administration's (EIA's) State Energy Data System and the ACORE State Renewables Database may be used for proxy data (see the Resources box). Where data is unavailable, we recommend using the approach described previously, and making estimates based on what is available for other communities.

Once this baseline data has been collected, a community can then make some calculations to further understand energy use and its impacts in the community, such as:

Projections for Energy Growth

- Using projections from the Energy Information Administration (EIA) and incorporating population change estimates within the community

Impacts of Energy Spending

- Percent of Gross State Product (GSP) spent on energy;
- Percent of household income spent on energy (many communities value keeping more energy dollars local rather than shipping those dollars out of the community)
- Projections for changes in fuel cost

Greenhouse gas emissions associated with energy use, or other appropriate environmental or public-health impacts of concern to the community (in RMI's work with China, for instance, air quality is a prime concern for many families on a daily basis)

LOOKING FORWARD: ANALYZING POTENTIAL FUTURE SCENARIOS

Given a clear understanding of where energy is currently used in the community, potential future energy scenarios can be analyzed. In RMI's experience, it is important to first ascertain what is possible before giving consideration to potential constraints (be they economic, political, or otherwise). The reason for this is that, often, perceptions of constraints are biased by presumptions about what's possible to begin with. Then, later in the process, consider assessing strategies, tactics, or projects in logical bundles with an appropriate cost-benefit-analysis approach, expressed as a net present value (NPV). In any analysis, a community may test scenarios around different levels of renewables penetration, efficiency uptake, infrastructure- and electric-system-reliability considerations, sector- and economy-wide energy costs and savings, potential fuel price increases, local energy dollars potentially reinvested locally, and the like.

In order to perform this forward-looking analysis, a community has several options. There may be people within the community or city staff who have the time and experience to complete the analysis. If there is a local university or nonprofit organization, they may be able to offer assistance. Several modeling approaches and modeling tools are described in this section; some of these are available for a community to license and use to model its own scenarios. Alternatively, a community could hire a third-party consultant to complete the analysis. With any modeling and analysis, it is important to remember that the results depend on the quality of the input data and the assumptions made, as well as on the robustness of the model itself.

05. ANALYZING THE ENERGY LANDSCAPE

SUGGESTIONS FOR HIRING CONSULTANTS/CONTRACTORS THROUGH AN RFP

Before issuing a request for proposal (RFP), make sure that a third-party analysis is actually necessary. In many cases, a high-level analytical exercise, or an estimate based on benchmarking to other communities, is enough to create an initial plan and begin testing initiatives. For suggestions on how to create a new initiative or how to adopt an initiative from another community, see the next section, Selecting Tactics And Strategies.

If an RFP is pursued, here are some suggestions for creating a strong RFP that will solicit the type of help that a community needs:

- Include a guiding question in the RFP such as, "In 2025, what do we want our energy profile to look like?"
- Specify the questions that need answering, and make clear that the responses should say how the respondent will answer each question. This includes the respondent offering their expertise in modeling, and outlining which tools they envision using
- Emphasize clarity; all recipients should know exactly what they're tackling
- Provide as much data as possible within the RFP to raise the level of the responses. Be specific as to the scope of the project, and how the issuing community will support the team
- Indicate a preference for whole-systems thinking where the question being asked deserves it. For example, in some cases it may make sense to ask respondents how they will explicitly link multiple sectors together
- Include a clear plan for deliverables; state what will be expected in the near-term and over the course of the engagement
- Stay goal oriented; the RFP should reference existing energy goals or a pathway toward goals

ANALYTICAL APPROACHES

Various analytical approaches exist for estimating future impacts and cost-effectiveness and are presented below (a list of methodologies and publicly available tools is provided at the end of this section). Communities may also benefit from exploring RMI's methodology from Reinventing Fire, which takes our typical aspirational, what's-possible approach and has been used by several leading communities to consider aggressive goals.

Reinventing Fire Methodology

Published by Rocky Mountain Institute in 2011, *Reinventing Fire: Bold Business Solutions for the New Energy Era,* is a blueprint for the U.S. to reduce its reliance on fossil fuels between now and 2050 by transitioning to greater energy efficiency and renewable energy resources and, in so doing, grow the economy by 158% with an estimated $5 trillion in net-present-value savings over business as usual. *Reinventing Fire's* methodology includes several different scenarios, the results of which can be compared. These scenarios are based on a base case of the current energy landscape, and include:

- **A business-as-usual (BAU) scenario**, based on the base case, projections for growth, and implementation of renewables based on current policies and programs
- **Multiple transition scenarios**, varying in assumptions about adoption rates of technologies, new policies, and improvements in energy efficiency

In addition, a key component of the *Reinventing Fire* methodology was to assess technical potential first, then evaluate economic costs and benefits. Utilizing this approach allows a community to first understand what is technically possible, without jumping to conclusions, and then determine which of the technical pathways makes economic or other strategic sense. The methodology and assumptions are available for each sector of the economy and are available in the Resources box at the end of this section, as well as a list of alternate methodologies that can form the basis of an analysis.

Conducting a Cost-Benefit Analysis

The economics of a community energy action plan are often critical to its success, and thus a cost-benefit analysis of major initiatives may be conducted. Net-present-value (NPV) calculations are a widely accepted methodology. NPV analysis may be conducted at the individual-initiative level, as well as "bundled" levels of transportation, electricity, building efficiency, and the like. An NPV may also be calculated at the very highest level—the comprehensive plan itself (such as a comprehensive energy and sustainability city action plan). Costs and benefits may also be considered that include

the number of jobs created, public health and environmental benefits, and emissions reductions benefits. Additionally, it is very useful to assess the cost of inaction, which may in fact be a more costly option than choosing to implement a new energy plan.

COMMUNICATING TECHNICAL RESULTS

After collecting data or completing analysis, that information may be communicated effectively to stakeholders in the community. Communication of progress and results to a broad audience is key to the success of any community effort. Tips for effective communication include:

Transparency

Sharing just the results may not be enough; including information about the process is also important. For example, a community may see great success in incorporating energy efficiency in municipal buildings, resulting in energy and dollar savings and other benefits. Sharing these results may be interesting for community members, but sharing information about how they actually made the efficiency improvements and financed them will allow this success to scale to other types of buildings throughout the community and beyond.

Using Common Terms

It is important to share results in terms that community members can easily grasp. For example, sharing an amount of dollar savings is important, but it may be helpful to compare that amount to a common amount that community members are familiar with, such as the average household income, so that they can understand the scale of the savings involved. This suggestion may apply to other information besides dollar savings as well, such as comparing energy savings to average energy use today, or to similar communities. In addition, energy or dollar savings can be translated into other relatable metrics, such as the equivalent number of cars taken off the road, homes heated, jobs created, and the like.

Sharing Results Visually

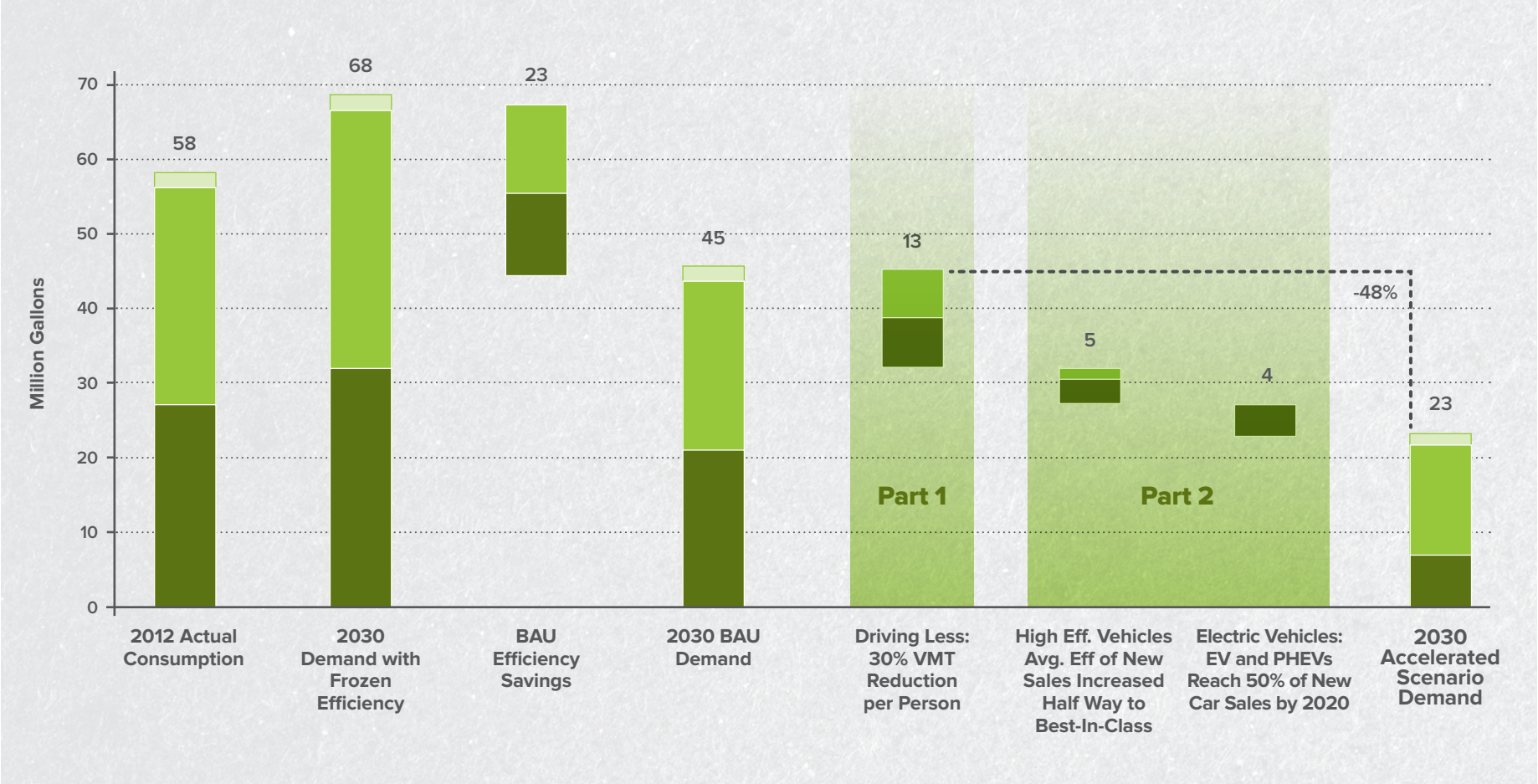
Sometimes the most effective way to share information is through compelling graphics. It is important that graphics be accurate and clearly readable by community members. One type of helpful graphic is a waterfall chart, where the impact of various community initiatives can be seen on one graph. An example from RMI's *Reinventing Fire* is included here.

EXAMPLE OF COMMUNICATING KEY OUTCOMES: FORT COLLINS, CO

- **Accelerate target date for carbon goals** (80% below 2005 levels) to 20 years.
- **Realize a net benefit of $265 million** for the community.
- **Reduce annual cash outflows** from the community to pay for coal and natural gas by close to $50 million
- **Increase local investment** by $30 million per year
- **Add 400-500 jobs.**

05. ANALYZING THE ENERGY LANDSCAPE

EXAMPLE OF A WATERFALL GRAPH: FORT COLLINS, CO, TRANSPORTATION SCENARIOS



This transportation energy reduction potential estimate for Fort Collins is based on a detailed, national-level analysis conducted by Rockey Mountian Institute for Reinventing Fire.

05. ANALYZING THE ENERGY LANDSCAPE

RESOURCE SPOTLIGHT: DOE Cities-LEAP

The Cities Leading through Energy Analysis and Planning (Cities-LEAP) is a new project through the Department of Energy (DOE) that helps cities incorporate energy data and analysis into their decision making. Cities-LEAP allows communities to set energy or climate goals, make decisions grounded in data, implement energy strategies, and learn from other communities. This is an important project because many communities need to capture the energy landscape, model future scenarios, and then communicate those results to critical stakeholders in a meaningful way. Most communities either hire a consultant or create this analysis from scratch, and methodologies vary widely. RMI is hopeful that this project will help to standardize a crucial step in this process at minimal or no cost for communities. Two Cities-LEAP infographics illustrate the programs and resources currently available to support communities in energy analysis and planning:

- **Landscape of Local Energy Programs**
- **Local Energy Planning Tools**

Resources

Below are examples of additional analytical resources communities may explore. This list is not exhaustive, nor an endorsement of any particular tool.

Integrated approaches:

- **EnergyPLAN simulates the operation of national energy systems including the electricity, heating, cooling, industry, and transport sectors. It is developed and maintained by the Sustainable Energy Planning Research Group at Aalborg University, Denmark. The model is used by several researchers, consultancies, and policymakers worldwide and is available as freeware.**
- **Center for Climate Strategies provides support for planning, design, analysis, and implementation of actions in energy supply and use, residential and commercial activities, industrial production, transportation and land use, agriculture and forestry, water and waste management, and financing.**
- **RMI's *Reinventing Fire* analysis maps pathways for running a 158%-larger U.S. economy in 2050 with minimal fossil fuels. See RMI's Reinventing Fire basic approach and RMI's Reinventing Fire analytical methodology.**
- **DOE's Cities-LEAP helps cities incorporate energy data and analysis into their decision-making (in development).**

Building-portfolio-level tools:

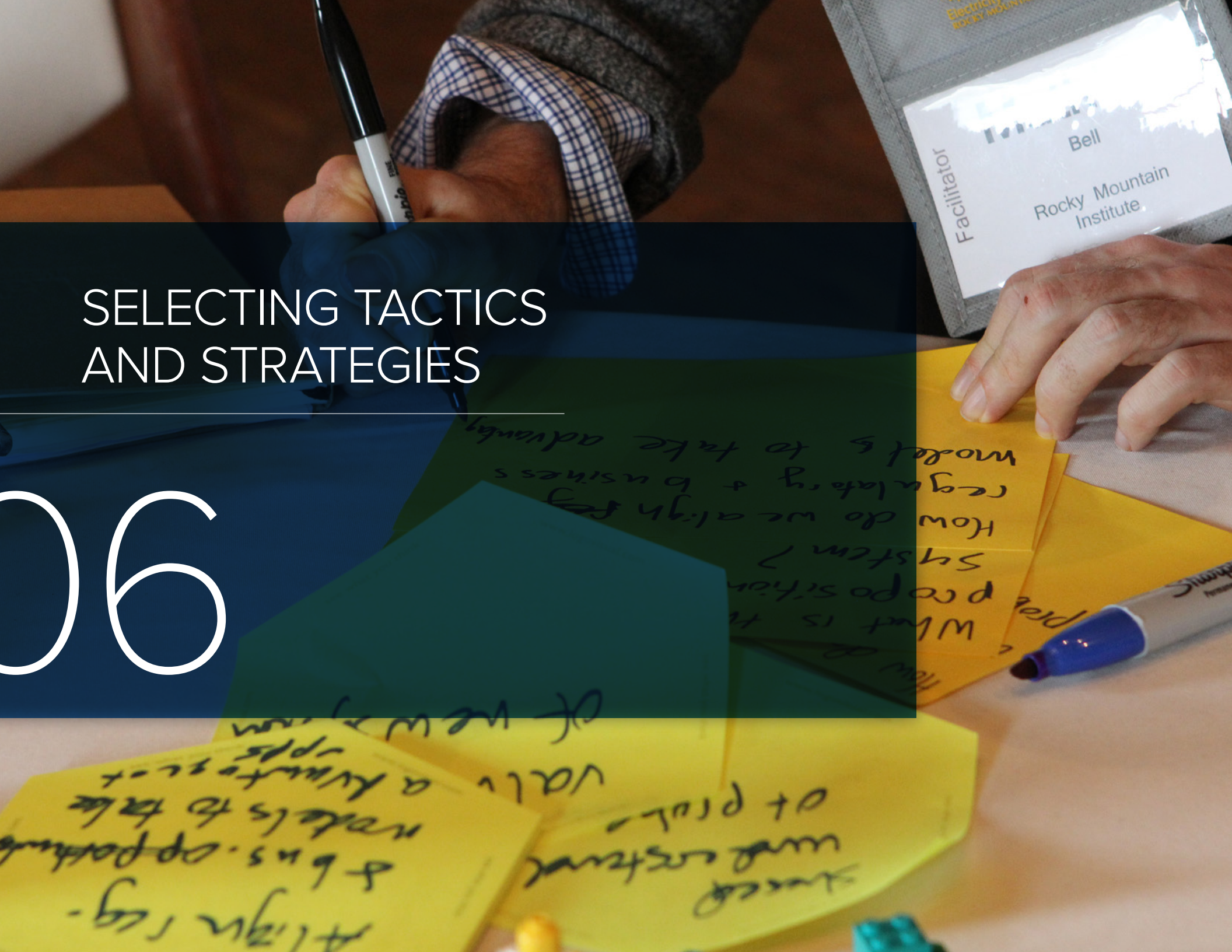
- **Energy Star Portfolio Manager can be used to benchmark energy performance for commercial buildings, industrial plants, and commercial building design.**
- **Portfolio screening software that uses meter data and analytics to deliver insights to customers for large numbers of buildings. Vendors include First Fuel, Retroficiency, and others.**

Electricity supply models:

- **Tools that provide analysis for integration of wholesale power, system reliability, environmental constraints, fuel choice, transmission, capacity expansion, and key operational elements. Vendors include ICF's IPM Model, GE's MAPS Model, and others.**

Transportation modeling:

- **Comprehensive modeling of transportation systems, including analyzing and estimating impacts of a wide range of sustainable infrastructure improvements and operating policies. Vendors include Cube, Caliper, and others.**



SELECTING TACTICS AND STRATEGIES

06

06. SELECTING TACTICS AND STRATEGIES

INTRODUCTION TO TACTICS & STRATEGIES

Communities may consider a number of tactics and strategies related to improving energy use in each of four main end-use sectors: buildings, electricity, transportation and industry/agriculture. Some of the tactics and strategies presented in each section of this resource guide are newly emerging and innovative ideas, while others are considered leaders in current practice. While examples have been provided, the subsections on different economic sectors below do not provide a comprehensive list of options. Rather, one should consult the Resources boxes for further information on any particular strategy or sets of strategies.

Please note that some examples of tactics and strategies are adoptable by communities independently, while some are options that can only be pursued by working with other communities (for example, to create enabling state legislation for community-solar or community-choice agreements). We felt it was important to call out these latter options since they are important and impactful, though they do require additional effort where the framework has not already been adopted by the state. Each subsection discusses the general landscape and framework, goal setting, and some leading examples of practice, and seeks to identify key insights and next steps.

Finally, it is very important to consider programs and projects where the private sector may play a leading role; a few examples are provided. More specifically, communities may consider:

- Collaborative goal-setting with industry
- Voluntary or required private-sector goals as part of the plan
- Public-private partnerships and public demonstration pilots
- Rewards for top private-sector achievers or innovators

KEY TAKEAWAYS:

- **Most people will only remember and react to the specific recommendations coming out of a community energy plan—this is the most visible part of your plan**
- **Strategies and tactics must meet two tests: (1) allow your community to achieve its goal; and (2) be achievable by your community. Balancing ambition with local constraints is critical**
- **Strategies and tactics should be specific, including responsible stakeholders, enabling actions such as new legislation and policy, and detailing clear initial steps that folks can take to get started**
- **Specific timelines, costs, and benefits (economic and environmental) will help people evaluate the recommended strategies and tactics**

INITIAL SCREENING AND SELECTION OF STRATEGIES AND TACTICS

To initially screen strategies and tactics for a community energy plan in order to identify those that are most likely to meet the goals of the community, the leadership team can use a screening matrix (see example). The screening matrix allows users to quickly estimate a number of essential criteria based on known information. The leadership team may also perform this exercise with stakeholders to inform the initial selection of strategies and tactics. Ultimately, the action plan should include a bundle of strategies and tactics that complement one another. After an initial screen, more detailed analysis involving impacts, costs, and benefits may be necessary; this would then inform the final selection of tactics and strategies in an iterative process. Section 3, Analyzing The Energy Landscape, provides guidance and tools for further analysis. Research on tactics and strategies is ongoing (and databases need updating regularly), but several sources for identifying opportunities exist:

- **RMI's experience** from comprehensive planning and analysis with the City of Ft. Collins, Colorado
- **Urban Sustainability Directors Network**
- **The Innovation Network for Communities**
- **ICLEI** Local Governments for Sustainability
- The **C40** Cities Climate Leadership Group

Also see the Resources boxes in each of the subsections here: broad enablers, buildings, electricity, transportation, and industry

06. SELECTING TACTICS AND STRATEGIES

EXAMPLE SCREENING MATRIX

STRATEGY/TACTIC	POTENTIAL TO REDUCE CO_2	POTENTIAL TO DISPLACE FOSSIL FUELS	ANTICIPATED BENEFITS RELATIVE TO COSTS	SYNERGY W/ EFFECTIVE CURRENT INITIATIVES	SHORT-TERM EASE TO IMPLEMENT (POLITICAL OR FINANCIAL CAPACITY, ETC.)	LONG TERM POTENTIAL FOR TRANSFORMATION OR IMPACT
Example 1	Moderate	Low	Moderate	Moderate	High	Low to Moderate
Example 2	High	High	High	Low	Low	High
Example 3	High	High	Unknown	None	Low	High

CONSIDERATIONS FOR PROGRAM DESIGN

As you move from selecting strategies and tactics to designing an initiative or program, community participation will become more critical. The model below is helpful for visualizing this process.

BROAD ENABLERS

06A

A NUMBER OF BROAD initiatives are underway throughout the U.S. that enable and impact transformation in multiple sectors. Before exploring the subsections on buildings, electricity, transportation, and industry, this subsection describes broad enablers or platforms that cut across multiple sectors to advance renewables and efficiency. By their very nature, the examples cited here also create co-benefits, such as significant local investment, clean energy jobs, reduced emissions, and more. Although the examples that follow are not community-specific tactics and strategies per se, they are worth noting because communities may work together, work with their state, or work with other organizations to achieve greater transformation over time.

KEY TAKEAWAYS:

- **Broad enablers can include cross-cutting initiatives taken by the community (e.g., the creation of a Green Bank or other financing vehicle), or can happen outside of the community (e.g., federal or state legislation)**
- **Mandates such as renewable portfolio standards and energy efficiency resource standards can set a crucial, high-level state goal that deploys significant private-sector capital and provides local momentum for action**
- **Financing approaches such as Green Banks, on-bill repayment/financing mechanisms, and PACE can often help initiatives to scale much faster than they would otherwise**
- **New utility regulatory models such as performance-based ratemaking and integrated utility service can help align incentives between utilities and communities.**

For example, two well-crafted policies in particular support broad adoption of renewable energy and energy efficiency while enabling the private sector in the process: state renewable portfolio standards (RPS) and energy efficiency resource standards (EERS). Both have established track records and practices, and both deploy significant private capital to meet state goals. There is a significant relationship between states with well-crafted and coordinated policy goals and communities with significantly higher levels of renewables and efficiency deployment (especially when coupled with federal tax incentives). Opportunities exist for communities to work with their states to refine, leverage, and improve these programs.

06A. BROAD ENABLERS

GREEN BANKS

Emerging green banks are public or quasi-public financing institutions that provide low-cost, long-term financing support to renewable energy and energy efficiency projects by leveraging public funds to attract private investment and support more projects. The Coalition for Green Capital notes that green banks stimulate demand, leverage public funds with private funds, attract much greater private investment to clean energy and efficiency markets, streamline the project underwriting process, and accelerate adoption.[4] The Connecticut Green Bank was one of the first examples—along with the New York Green Bank—demonstrating the power of this coordinated approach in deploying significantly more efficiency and renewables projects in communities. Green Banks can offer loans, debt guarantees, and other financial products to help private-sector bankers fund more clean-tech deals—whether for solar, wind, smart-grid technology, energy storage, or efficient buildings.

EMERGING FINANCING MECHANISMS

On-bill financing (OBF) allows the utility to incur the cost of an energy efficiency upgrade or renewable energy system to a property, which is then repaid on the utility bill. On-bill repayment (OBR) options require customers to repay the investment through a charge on their monthly utility bill as well, but the upfront capital is provided by a third party, not the utility. OBR/OBF options allow for a streamlined, low-hassle process, and in some cases the loan is transferable to the next owner of the home or building. Some utilities are considering this option as part of a broader suite of integrated energy services for customers. Communities can discuss deploying such a financing mechanism with their utility. Both the Department of Energy and the nonprofit Natural Resources Defense Council maintain an OBR/OBF resources site.

Property assessed clean energy (PACE) financing programs allow for financing of up to 100% of an energy project's costs and a repayment term of up to 20 years via an assessment added to the property's tax bill. PACE financing stays with the building upon sale and—like OBR and OBF—offers the potential additional values of streamlined processes and reduced customer hassle. State and local governments sponsor PACE financing to support local, private-sector jobs, promote broader economic development, and promote renewables and efficiency. Connecticut operates a successful PACE program as a community economic development tool. The nonprofit PACENow has assembled a PACE resource kit for communities.

NEW UTILITY REGULATORY MODELS

Communities may benefit from the consideration of various initiatives underway that aim to reform the traditional utility regulatory model in order to better value and more efficiently incorporate newer technologies, customer choice, distributed renewable energy resources (such as rooftop solar), and energy efficiency.[5]

New York's Reforming the Energy Vision process—as well as similar initiatives in California and Minnesota—is leading the charge on how to integrate significantly higher amounts of distributed energy resources (DERs) onto a grid historically built around centralized assets like large power plants. Decoupling initiatives, lost-revenue adjustment mechanisms, and incentive rates of return are employed by other states toward similar goals.

Performance-based ratemaking proposals—such as Minnesota's leading e21 initiative—also address concerns over traditional utility cost-of-service regulation and rates. Proposed performance-based ratemaking plans are aimed at minimizing costs and maximizing reliability while including customer choice, environmental performance, distributed renewables, and efficiency resources in planning—along with an important utility incentive for meeting these goals. The Regulatory Assistance Project (RAP) has recently published an informative report to assist states and communities: Smart Rate Design for a Smart Future.

06A. BROAD ENABLERS

OTHER EMERGING MODELS: INTEGRATED UTILITY SERVICE

An integrated utility service (IUS) model is being explored by Ft. Collins Utilities with the help of Rocky Mountain Institute and other collaborators (some other U.S. utilities are also experimenting with various aspects of the model). With an IUS, the utility would offer a suite of DERs, such as energy conservation and/or solar offerings to its customers through third-party contractors. Although the utility would likely see less revenue from electricity use (since grid demand in homes and buildings would be reduced), the utility could expand its offerings by managing additional value-added energy services. Customers would pay for the energy measures over time on their electricity bill, likely with net bill savings. This model benefits from streamlined adoption and reduced hassle factor as well, in a similar manner to PACE, OBR, and OBF programs. For a municipal utility, this particular initiative is (potentially) entirely led by and accountable to the community.

Resources

- RAP's Smart Rate Design for a Smart Future
- NREL's RPS resource page
- ACEEE's Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs
- Coalition for Green Capital
- Connecticut Green Bank
- New York Green Bank
- NRDC's OBR/OBF resource page
- DOE's On-Bill Repayment (OBR) Resources
- PACENow PACE program resources & information
- Connecticut PACE program
- GTM's report Regulating the Utility of the Future: Implications for the Grid Edge
- RMI Outlet article "Building the Grid of the Future"
- ACEEE's Performance Incentives for Utilities
- Minnesota's E21 Initiative
- RMI's Outlet article on the Integrated Utility Service Model
- Edison Foundation's State Electric Efficiency Regulatory Frameworks

BUILDINGS

06B

BUILDING EFFICIENCY

According to the U.S. Department of Energy, 41% of total U.S. energy consumption was in residential and commercial buildings, with the majority required for space heating and cooling, followed by lighting. Collectively, buildings are roughly estimated to contribute about 30% of greenhouse gas emissions. Energy efficiency remains one of the largest opportunities and one of the most cost-effective options for meeting community, company, and organizational sustainability goals.

This subsection highlights some key strategies and tactics that are making progress or are innovative in their approach. This is not a comprehensive list, and the reader should consult the Resources box at the end of this subsection and the preceding Broad Enablers subsection for further options and information. The State & Local Energy Efficiency Action (SEE Action) Network offers energy-efficiency and policy-program resources, discussion forums, and technical assistance to state and community energy decision makers. The American Council for an Energy Efficient Economy's (ACEEE) City Energy Efficiency Scorecard is another planning tool that allows cities to score and compare themselves in efficiency.

KEY TAKEAWAYS:

RMI has identified the following levers for communities in advancing efficiency in publicly and privately owned buildings:

- **Encourage new energy efficiency models and partner with the private sector to pilot innovative strategies**
- **Consider well-designed energy challenges (beyond code) to reward—and learn from—innovation**
- **Make energy use transparent in all public buildings and consider requiring all buildings (or those which are bought, sold, or leased) to benchmark and disclose as well**
- **Adopt current, best-in-class codes for new construction and major renovations and ensure compliance**
- **Work with the state to adopt or increase energy-efficiency resource standards for utilities**
- **Enable easy-to-access, streamlined, low-cost financing for retrofit projects**
- **Offer training and education options such as a green-building resource center or city-sponsored seminar on energy-savings performance contracts**
- **Cities may lead by example and consider a transparent retro-commissioning program for public buildings that communicates findings and offers suggestions to the broader community**

06B. BUILDINGS

SETTING GOALS AND REVISITING STANDARDS

Setting aspirational, community-wide energy-efficiency goals in residential and commercial buildings (and industrial, if applicable) is essential to any community energy action plan. For example, many communities who participate in the Department of Energy (DOE) Better Buildings Challenge have set a goal of 20% energy reduction across their public and private sector building portfolios by 2020. Other communities have set goals based on an analysis of the potential contribution of building efficiency toward climate goals, or by analyzing the total cost-effective potential of building efficiency in the state or city. This latter approach—a "what's possible" approach—is employed by RMI when working with communities and is discussed further in section 5, Analyzing the Energy Landscape.

Communities may also consider setting up a local system for learning and sharing best practices. A good example is the City of Houston's Green Building Resource Center, which is conveniently co-located with the building permit office and code enforcement division. As part of this process, for instance, communities could encourage large building-portfolio owners and managers to consider low-cost, high-impact energy conservation measures while simultaneously evaluating a subset of buildings for deep retrofits.

Low-cost measures have the advantage of being easily implemented in the majority of a large building portfolio, allowing for the capture of bulk and "easy" savings as early as possible. Deep retrofits, on the other hand, should be "right-timed," because maximizing efficiency and profitability is generally dependent on integrating aggressive efficiency measures with planned, major equipment or envelope replacement, or major tenant turnover.[6] This integrative process often yields projects with substantially more savings and lower operating costs compared to the like-kind replacement of just one major component. Some deeper retrofits can actually end up costing less than routine renovations. This is, in part, because deep retrofits provide value beyond energy cost savings—such as improved employee health and productivity, reduced maintenance and non-energy operations costs, and increased property value. These additional values are often neglected in assessing retrofit opportunities, leading to underinvestment in retrofits.

A classic RMI case study of this integrated design and deep retrofit value is our work with the Empire State Building, where energy-efficiency improvements resulted in an avoided $17 million for the chiller plant retrofit and provided the added benefit of increasing rent revenue by $22 million annually—far outweighing the $4.4 million in annual energy savings.[7]

Community-led Energy Challenges

Connecticut

The Connecticut Zero Energy Challenge is an annual design and build competition that awards cash prizes to its winners, while educating and demonstrating how to build high-efficiency homes to the community. The DOE has recently created Zero Energy Ready Homes standards, which are verified by a qualified third party and are at least 40–50% more energy efficient than a typical new home.

Atlanta

As part of Atlanta's first sustainability plan, Power to Change, the Mayor's Office of Sustainability is working with all city departments and stakeholders to reduce building energy use. Through the Atlanta Better Buildings Challenge (BBC), the city is also working with businesses and nonprofits to implement a comprehensive energy-upgrade program for downtown buildings to meet the goal of improving energy performance a minimum of 20% by 2020. Over 400 buildings, representing 94 million square feet across the public and private sectors, have signed up for the Atlanta BBC to date. Participating buildings are reported to be reducing energy use by over 2% per year and are on track to meet the community's 20% goal.

06B. BUILDINGS

CODES: UPDATING AND GOING BEYOND

Some leading communities have adopted the latest (2012 or 2015) International Energy Conservation Code (IECC), which addresses cost savings, reduced energy usage, and environmental impacts, and offers both prescriptive and performance-based compliance paths. Also, for many communities, stepping up code compliance represents a significant opportunity.

The City of Dallas is one of the first jurisdictions to pass comprehensive green building standards that apply to both new residential and commercial construction. DOE's Building Technologies Program offers a comprehensive guide to help communities establish voluntary or mandatory green-building programs.

VOLUNTARY BEHAVIORAL-EFFICIENCY PROGRAMS

Duke Energy's innovative Smart Energy in Offices utility-run energy-efficiency program uses an innovative team-based approach that helps property managers, building operators, and tenants minimize workplace energy use. The relatively low-cost program (compared to many traditional utility energy-efficiency programs) includes action campaigns, games, and friendly competitions to motivate behavioral change, and is reported to have achieved 5–6% energy-use reduction in Uptown Charlotte, NC.[8] This program targets what has traditionally been one of the most reluctant sectors to adopt efficiency more aggressively—the commercial office-space sector. ACEEE maintains a resource on behavioral and human dimensions for energy-efficiency program development or improvement that is available for communities.

PERFORMANCE METRICS

Improvements in building efficiency at the community scale may be measured by the number and percentage of buildings that are certified to a standard, such as the most recent IECC modern building code (states and jurisdictions often adopt this intact or with modifications), the IgCC (International Green Construction Code), LEED (Leadership in Energy & Environmental Design) green building standards, or Energy Star standard for homes or buildings. Cities may also track and report reductions in annual energy use and energy cost savings across city-owned buildings, and the like. For existing buildings, communities might track energy use intensity or Energy Star-score improvements for those buildings benchmarking and reporting energy data (whether through mandatory or voluntary ordinance) as well as tracking aggregated energy savings, avoided costs and pollution, and others.

The index of energy use intensity (EUI), often expressed as kBtu/square foot/year, is a basic metric of building energy performance which is used to compare buildings of the same type or use.[9] For existing U.S. buildings, Energy Star Portfolio Manager is a good place to start; it allows scoring and benchmarking. Asset and financial managers may track and improve their Energy Star score and EUI over time and compare performance across building portfolios. Note that site-level energy audits, measured to the appropriate ASHRAE standard for commercial buildings or BPI standard for residential buildings, are a site-specific assessment of energy use, and are a more appropriate method of detailed evaluation for specific energy conservation measures at the individual-building level.

GOING RETRO

The average reduction in energy cost that results from a retro-commissioning (RCx) building project is 16%, according to a 2009 study by Lawrence Berkeley National Laboratory.[10] RCx may be thought of as an operations and maintenance building tune-up (without capital improvements). The study also found that simple financial payback periods from RCx projects seldom exceed one year and normally provide a year-on-year return of 91% or more. Along with efficient lighting retrofits (such as to LED) and basic envelope improvements (such as air sealing), RCx is one of the most affordable and cost-effective systematic efficiency improvements a portfolio of buildings can undergo, but the process is often underappreciated. A community may adopt an RCx program for their buildings and share their program and results with community building owners and operators in a "lead by example" and shared-learning model. There are several guidelines for RCx, including a retro-commissioning guide by Energy Star.

It's worth noting that RCx measures can be bundled with slightly deeper-cutting and longer payback measures in order to maximize energy savings achieved under a company-mandated internal rate of return (IRR) or payback threshold. One potential bundling measure is a targeted energy audit. Many opportunities for deep-retrofit benefits are lost simply because they are not right-timed with the replacement of a system (whose age and/or condition is unknown), and often a proactive audit of these systems is not financially attractive because there are no directly attributable energy savings. Bundling a targeted audit with a planned RCx project alleviates this concern and in essence pays for the targeted audit's incremental cost.

06B. BUILDINGS

ENERGY AUDIT AND TRANSPARENCY ORDINANCES

The City of Austin Energy Conservation Audit & Disclosure Ordinance is a local law that requires energy audits and disclosure for all residential and commercial buildings—including multifamily dwellings—triggered by the time of sale for residential buildings and annual reporting for commercial buildings.[11] In another example, Santa Fe's Residential Green Building Code requires a Home Energy Rating System (HERS) energy rating for all new homes. Importantly, disclosure in the latter program is tied to the building permitting process, and the program also includes HERS permit-provider training and engages with local contractors to build support (which often yields higher compliance rates). Finally, coupling energy-disclosure requirements with rewards for top energy performers (monetary and/or public recognition) offers another attractive policy combination for communities to consider.

Given the success of appliance energy labels and the transparency of posted grades for restaurant cleanliness in some cities, there may also be opportunity for communities to create local energy-labeling requirements which post disclosed energy use relative to a standardized benchmark (such as Portfolio Manager's Energy Star score) for all public buildings, especially since taxpayers pay for the energy use in these buildings.

PROJECT FINANCIAL STRATEGIES FOR COMMUNITIES

An energy savings performance contract (ESPC) is a mature financial mechanism signed between a facility owner and an energy service company (ESCO). An ESPC is used to pay for energy-efficiency upgrades with associated project-energy savings without tapping organizational capital budgets, and often with little or no down payment. Although there are concerns that ESPCs tend to favor equipment replacement and large capital projects (rather than RCx approaches, for instance), they are nevertheless a time-tested and cost effective method for completing significant energy upgrades. With ever-improving contracting guidelines, ESPCs can adequately address the needs and goals of many customers. This financing mechanism has traditionally served municipalities, universities, schools, and hospitals and has been used extensively to improve public buildings.

The Building Owners & Managers Association (BOMA) offers the BOMA Energy Performance Contracting Model (BEPC) to support building owners and operators in executing sophisticated energy-efficiency retrofits to existing buildings. Communities may consider convening and sponsoring a workshop on ESPC's for the benefit of public sector organizations and inviting their respective property managers, engineers, and a member of the senior leadership.

Leading companies and organizations that capture efficiency as part of their operational strategy do so by evaluating projects for energy costs, maintenance costs, and an important suite of energy and non-energy benefits. RMI's Deep Retrofit Value Practice Guides for owner-occupants and for investors offer methodologies to assess and present the value beyond energy cost savings of deep-retrofit investments. As described in the guides, it is important to use the right metrics when considering energy costs and other financial impacts. Too often, simple cash payback is used to judge a project, when a more meaningful metric, such as annualized return on investment (ROI) or net present value (NPV), would be more meaningful and would account for asset hold time and ongoing, annual financial benefits, including the time value of money.

In addition, it is important to consider the full range of available financial incentives, including federal and state incentives, to enhance the economics of efficiency projects (see the DSIRE incentive database in the Resources).

For more information on the role of green banks, PACE, and on-bill repayment as emerging strategies to finance efficiency projects, refer to Emerging Financing Strategies in the earlier Broad Enablers subsection.

06B. BUILDINGS

PUBLIC/PRIVATE JOINT VENTURE: COMMUNITY DISTRICT ENERGY SYSTEMS

Arlington County, Virginia, and St. Paul, Minnesota, are both recognized as champion cities in the U.S. for their district-energy cooling and/or heating systems. Cities without these may consider commissioning a new one for areas with large loads and density such as downtowns, hospital and business districts (and they can also be used successfully in high-density residential areas). A recent United Nations Environment Programme (UNEP) district energy report notes that one of the most cost-effective means for reducing greenhouse gas emissions and primary energy demand is a modern district-energy system, especially one that incorporates combined heat and power (CHP, or co-generation). The analysis finds that modernizing district-energy systems can reduce heating and cooling primary-energy consumption by up to 50%.[12] Since many systems are developed and/or operated by private-sector companies for communities, this opportunity also represents a unique public/private partnership. Co-benefits include cost savings from avoided and/or deferred investment in power-generation infrastructure, peak-load reduction, local investment and tax revenue, and local employment.

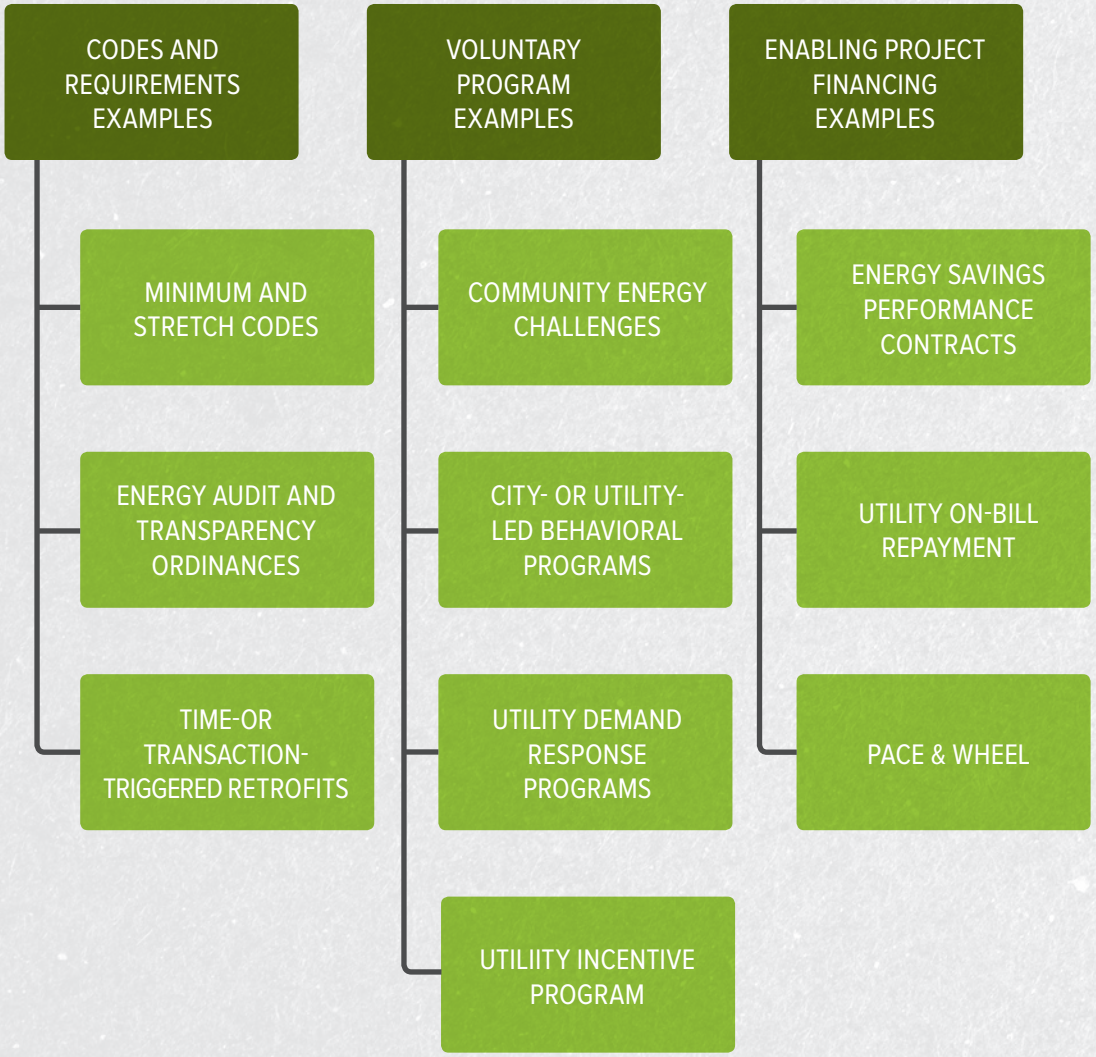
BUILDING PORTFOLIOS IN COMMUNITIES

Communities may wish to assess large portfolios of public buildings for efficiency improvements, and may wish to collaborate with the private sector entities interested in the same. There are several ways to analyze and plan the phasing of retrofit measures across large portfolios of buildings. First, relative performance comparisons can be made across the portfolio, and packages of improvements can be applied broadly to groups of similar buildings. As part of this process, right-timed deep retrofits which coincide with capital improvement projects can be considered to increase return on investment. Further, a select few buildings might be considered for innovative pilot projects.

The emergence of new analytical software tools is helping to make portfolio-scale energy assessments easier and more cost effective, both for cities and for other large portfolio owners. RMI examined the use of these software tools to support the portfolio-assessment process and concluded that these new analytical software tools are helping to make portfolio-scale energy assessments easier, although the process does present challenges as well.[13] Private-sector companies selling such tools include First Fuel, Retroficiency, and others. Communities considering portfolio analytics for public buildings may wish to interview a select few providers and conduct a pilot to assess cost effectiveness and potential before committing to a larger portfolio.

06B. BUILDINGS

POTENTIAL COMMUNITY OPTIONS FOR INCREASING ENERGY EFFICIENCY IN BUILDINGS



Resources

- SEE Action Network Resource Site
- ACEEE City Energy Efficiency Scorecard
- DOE Better Buildings Challenge
- City of Houston Green Building Resource Center
- RMI Empire State Building Retrofit case study
- U.S. EPA Energy Efficiency Tools and Resources
- International Energy Conservation Code
- DOE Building Technologies Office
- DOE's Going Beyond Code
- City of Dallas Green Building Ordinance
- CT Zero Energy Challenge
- DOE Zero Energy Ready Homes
- Atlanta's Power to Change
- Atlanta's Better Buildings Challenge
- Duke Energy's Smart Energy in Offices
- IgCC
- LEED
- Energy Star
- ASHRAE standards of commercial energy audit
- BPI standards of home energy audit
- Energy Star RCx guide
- ECAD Ordinance (Austin)
- Santa Fe (NM) Residential Green Building Code
- BEPC Model for performance contracting
- RMI's Deep Retrofit Value guides for Owner-Occupants and for Investors
- Database of State Incentives for Renewables & Efficiency (DSIRE, also includes Federal incentives)
- UNEP's District Energy in Cities
- UNEP's Unlocking the Energy Efficiency Retrofit Investment Opportunity (for commercial real estate)

ELECTRICITY AND ENERGY SUPPLY

06C

COMMUNITY ELECTRICITY PLANNING GUIDE

One key component of community sustainability planning is an electricity supply goal. Since electricity generation, transmission, distribution, and consumption accounted for approximately 31% of U.S. greenhouse gas emissions in 2013,[14] the composition of resources used to supply a city with electricity often represents a significant opportunity for both emissions reductions and bill savings.

But while some communities across the country may share common values of incorporating more renewables and efficiency into their energy supply, local utilities and the electric-generation mix can vary substantially by region, state, and city. This means community goals, as well as the available levers to achieve those goals, are shaped by both local interests and the nature of the existing electric system.

This subsection therefore provides insight on how to evaluate opportunities to increase the renewable electricity supply in your community. You may use this as a tool to drive meaningful progress toward achieving your community's broader sustainability goals. This subsection also provides examples of successful solutions pursued by communities throughout the United States. The end of the subsection also includes a Resources box with links to additional information on all the topics covered.

KEY TAKEAWAYS:

- **Understanding the current utility ownership and regulatory environment serving your community is an important first step to identifying options**
- **Understand the current energy supply mix and know where your electricity comes from**
- **Set electricity supply goals for your community and note how they are similar to or different from state goals**
- **Identify existing and potential levers of change from the examples described below, including green tariffs, community/shared solar, competitive retail supply, community choice aggregation agreements, enhanced franchise agreements, etc.**

SETTING A BASELINE

Before setting a specific renewable electricity target, it is helpful to understand the local utility-ownership structure, regulatory environment, state law, and generation mix. Setting a baseline will help to identify the menu of options available to increase efficiency and renewable electricity in the community. The relative percentages of renewables (including hydro), nuclear, coal, and natural gas change depending on a variety of factors. These include locally available fuel (e.g., abundant hydro in the Pacific Northwest and coal in the Southeast), state environmental regulations, and other political preferences. Understanding the local environment and defining the baseline will therefore ensure that goals exceed the status quo while capturing the full benefits available from existing programs.

06C. ELECTRICITY AND ENERGY SUPPLY

Multiple levers are available to communities interested in increasing efficiency and renewables. Potential solutions include both utility and non-utility levers. Utility levers include efficiency rebates, green tariffs, community solar, net metering, and competitive retail supply. Non-utility levers include self-generation, which can be on-site, or via an off-site power purchase agreement (PPA); community choice aggregation; and renegotiation of franchise agreements. The latter option may include a community choosing to "municipalize," that is, to purchase electric distribution assets from an investor-owned utility and operate a municipal utility (and conversely, the sale of existing municipal-utility assets to a local investor-owned utility is also an option). A third option for communities served by either investor-owned utilities or by cooperatives with long-term supply agreements from generation and transmission utilities is an "enhanced franchise agreement" that includes targets for achieving specific community goals. Examining these options can help identify the specific levers that meet community needs. See the solution boxes throughout this subsection for more information on each of these options.

In order to understand the full slate of options available, it is necessary to understand the ownership structure and regulatory model of the local utility. The ownership structure determines the way in which state law and regulations apply to the utility, which in turn determines which levers are available to customers and to communities. The table here outlines the most common ownership structures and regulatory models in the United States. For a broader discussion, see *Regulatory Assistance Project: Electricity Regulation in the US: A Guide* in the Resources box of this subsection.

TABLE 1: WHAT TYPE OF UTILITY SERVES MY COMMUNITY? EXAMPLES OF COMMON UTILITY OWNERSHIP AND REGULATORY MODELS

UTILITY OWNERSHIP STRUCTURE	REGULATORY ENVIRONMENT	DESCRIPTION	DESCRIPTION
INVESTOR-OWNED UTILITY	Vertically integrated: regulated by state public service commission	Utility owns all generation, transmission, and distribution infrastructure and sells electricity directly to end-use customers.	EEI Map of Investor-Owned Utilities
INVESTOR-OWNED UTILITY	Deregulated—state public service regulates delivery of electricity, generation is procured by competitive suppliers	Utility owns transmission and distribution infrastructure and delivers electricity to customers. Customers can choose from competitive suppliers that own or buy generation and create specific products to attract customers.	EEI Status of Electricity Restructuring by State
PUBLIC POWER UTILITY	Regulated by city council or other elected board	Utility owns distribution infrastructure, either owns or purchases generation and transmission, and sells electricity directly to end-use customers	Utilities Commission, APPA Database of Public Power
COOPERATIVE UTILITY	Regulated by member-owners	Utility owns distribution infrastructure, either owns or purchases generation and transmission, and sells electricity directly to end-use customers.	NRECA Member Directory, NRECA Electric Cooperatives at a Glance

Note that this table is not exhaustive

06C. ELECTRICITY AND ENERGY SUPPLY

THE ROLE OF RENEWABLES

The availability of renewable resources varies by utility and by region. Certain regions have access to low-cost wind power while other areas require expensive transmission lines to access the wind. Similarly, some communities may have extensive roof space available for rooftop solar photovoltaics while other communities with many high-rise buildings may be challenged by shading that reduces solar-generation capacity. And critically, state renewable portfolio standards and incentives for distributed generation (including net energy metering) may apply differently (or not at all) to investor-owned utilities than to municipal or cooperative utilities. Investigating the specific rules applicable to your community is a key step in outlining successful clean-electricity goals.

The implication for electricity-supply planning is that neighboring communities may ultimately embark on diverging paths. For example, the Renewable Portfolio Standard in Minnesota requires the state's largest investor-owned utility (IOU), Xcel Energy, to ensure 31.5% of its sales are from renewable sources by 2020.[15] However, other IOUs in the state (Minnesota Power, Otter Tail Power, Alliant Energy, and Northwestern Wisconsin Electric) must provide 26.5% of sales from renewable sources by 2025. And municipal and cooperative utilities must deliver 25% of sales from renewables sources, also by 2025. The statute also defines specific targets for wind and solar (including both central and distributed solar) which vary by utility, potentially making incentives available or unavailable for these technologies.

As a result, renewable electricity goals and the strategies available to achieve those goals will differ. Whereas, in states without renewable portfolio standards, a 10% community-renewable-electricity target may be a significant goal, states with high renewable portfolio standards[16] (such as Vermont's 75% by 2032 or Hawaii's 100% by 2045) offer the opportunity for communities to set much more ambitious goals that focus less on the utility's total generation mix and more on local energy-efficiency and distributed-generation solutions that can enhance statewide goals.

HOW DO COMMUNITIES SET ELECTRICITY SUPPLY GOALS?

Given the variations in electricity supply across the United States, communities have multiple motivating factors driving the creation of electricity supply goals:

- Increase bill savings.
- Add more clean energy.
- Add more local generation.
- Improve reliability (decrease outages).
- Improve resilience (protection against extreme weather events and climate change).

Communities can access a wide variety of levers to achieve one or more of these goals. Available levers can be divided into three categories:

- Utility levers: levers that rely on available utility programs and incentives.
- Non-utility levers: levers that can be pursued irrespective of utility ownership structure or regulatory environment.
- Government levers: levers that require legislative or regulatory action.

IDENTIFYING EXISTING AND POTENTIAL LEVERS OF CHANGE

Communities have many options to achieve goals both in partnership with and separate from the incumbent utility. Utility-driven levers can offer the benefit of partnership with an experienced company with significant resources available to design and implement solutions. Non-utility levers offer flexibility and choice often unavailable from utility programs, which are designed to serve a broad spectrum of customers and may not share the specific goals of an individual community. Table 2 highlights common utility and non-utility levers available to communities:

06C. ELECTRICITY AND ENERGY SUPPLY

TABLE 2: UTILITY AND NON-UTILITY LEVERS AVAILABLE TO ACHIEVE COMMUNITY ELECTRICITY SUPPLY GOALS

UTILITY / NON-UTILITY / GOVERNMENT	LEVER	DESCRIPTION	EXAMPLES
Utility / Non-Utility	Efficiency Rebates	Efficiency rebates provide cash payments for equipment that meets eligibility requirements. Rebates can be provided by the utility or through the local, state, or federal government.	Xcel Energy, Avista Utilities, Federal Tax Credits for Consumer Energy Efficiency
Utility	Green Tariffs	Green tariffs enable customers to voluntarily purchase a higher percentage of their energy from renewable sources than is otherwise available from the utility's generation mix.	DOE Green Pricing database, Google Renewable Energy Tariffs
Utility / Government	Community / Shared Renewables	Community, or shared, renewables enable customers without the ability to install on-site renewables to invest in a share of the output of off-site renewable generation (typically solar or wind). The customer's share of the generation is used to offset usage on the customer's bill, either at the retail rate or another price. Community renewables may require enabling legislation but can also be offered by a utility without legislative action.	SEIA Shared Renewables, Map of Community Solar Policies, NREL Shared Solar, DOE Guide to Community Solar, SEPA Utility Community Solar Handbook
Utility	Net Metering	Net metering is a compensation mechanism, applied through a rider attached to a customer's utility tariff, which defines the value of excess solar power exported to the grid. Typically, excess generation receives a kWh credit equal to the customer's retail rate.	DSIRE Net Metering Policies, Solar ABCs Interconnection and Net Metering, SEIA Net Metering
Utility	Demand Response	Demand response programs offer incentives to reduce electricity consumption during expensive peak demand periods. This is done through direct load control or via price signals that fluctuate during the day. Implemented successfully, demand response can defer or eliminate the need to build new fossil fuel-fired power plants.	DOE Demand Response, EDF Saving Money with Demand Response
Utility / Government	Competitive Retail Supply	In 15 states plus Washington DC, customers have the option to choose the company that supplies (generates) their electricity. In these locations, competitive retail suppliers offer products designed to meet specific customer needs (e.g., low cost or 100% renewable). The state legislature and utility regulatory agency must deregulate utilities before competitive retail markets can develop.	EIA retail choice map, Competitive Electricity Markets in Texas: a Primer

Continued overleaf

06C. ELECTRICITY AND ENERGY SUPPLY

CONTINUED:

UTILITY / NON-UTILITY / GOVERNMENT	LEVER	DESCRIPTION	EXAMPLES
Non-Utility	Self-Generation (on-site or off-site PPA)	Customer options to self-generate some or all of their electric requirements. Generation can be on-site (e.g., rooftop solar or wind) or purchased from an off-site location via a power purchase agreement with a third-party project developer.	**Portland General Self-Generation, Business Renewables Center, EPA Solar PPA, NREL PPA Checklist for State and Local Governments, DOE On-Site Renewable PPAs, Google Green PPAs, WRI Corporate Renewable Energy Buyers' Principles**
Non-Utility / Government	Community Choice Aggregation	Community choice aggregation permits local governments to aggregate community demand and to procure generation from a provider other than the incumbent utility. The incumbent utility continues to provide transmission, distribution, and billing. Community choice aggregation must be enabled by state legislation.	**DOE Community Choice Aggregation, Marin Energy Authority, NOPEC Community Choice Lessons Learned & Best Practices**
Non-Utility	Enhanced Franchise Agreement	Franchise agreements permit utilities to use community rights-of-way to install the electric distribution network. Agreements typically last for 20 years or longer. Recently, some communities have explored options to re-negotiate franchise agreements to provide more local and renewable energy options	**City of Minneapolis Energy Utility Franchise Agreements**
Non-Utility	Municipalization	For communities served by an investor-owned or cooperative utility, forming a municipal utility is an alternative to renegotiating franchise agreements. To do so, a community must purchase all transmission and distribution assets from the incumbent utility and procure its own generation.	**City of Boulder Energy Future**

06C. ELECTRICITY AND ENERGY SUPPLY

SOLUTION BOXES

Self-Generation: Palo Alto, CA, and Georgetown, TX

Palo Alto Utilities,[17] a municipal utility, committed to 100% carbon-free electricity initially by purchasing renewable energy credits (RECs), and then committed to 100% sourced renewables using power purchase agreements (PPAs). This is being done at an expected incremental cost of less than ½ cent per kWh, while maintaining one of the lowest retail-electricity rates in California.

Georgetown Utility in Texas,[18] another municipal utility, signed a power purchase agreement with SunEdison to purchase 150 MW of solar power starting in 2016. Paired with a 144 MW wind power agreement from 2014, the renewable power contracts provide 100% renewable electricity at a lower overall cost than their previous wholesale power contracts and hedge against price volatility for energy produced by fossil fuels.

Enhanced Franchise Agreements: Boulder, CO, and Minneapolis, MN

In 2011, voters in Boulder approved a ballot initiative to not renew the expiring franchise agreement with investor-owned utility Xcel Energy.[20] Instead, the community elected to pursue alternative solutions, such as a partnership with Xcel Energy that included additional renewable energy or the formation of a municipal utility. To form a municipal utility, the city must buy the transmission and distribution infrastructure from Xcel Energy and procure generation from an alternative supplier. As of August 2015, the city continues to pursue municipalization options.

The City of Minneapolis considered and ultimately opted not to pursue a utility municipalization effort as a means to attain its sustainability and energy goals, and instead negotiated an enhanced utility-franchise agreement with Xcel Energy for electricity and CenterPoint Energy for natural gas.[21] The city used the negotiations to establish a landmark Clean Energy Partnership to achieve its goals for sustainable energy, improved air quality, equity and green jobs.[22] Minneapolis has set climate goals of a 15% reduction in greenhouse gases by 2015 and a 30% reduction by 2025 (based on a 2006 baseline). The partnership is a commitment between the City, Xcel, and CenterPoint to collaborate on innovative approaches toward these goals. Leadership and decision making for the new Clean Energy Partnership will come from a board, which will include representatives from Xcel and CenterPoint Energy, and the Minneapolis mayor, city council, and city coordinator.

06C. ELECTRICITY AND ENERGY SUPPLY

SOLUTION BOXES

Community Choice Aggregation

Community choice aggregation (CCA) is a legislatively-enabled policy that allows local jurisdictions to aggregate electricity demand to procure renewable energy supplies while maintaining the existing electricity-provider relationship for transmission and distribution services. States that have passed CCA laws include Illinois (2009), New Jersey (2003), California (2002), Ohio (1999), Massachusetts (1997), and Rhode Island (1997). Reasons that a community may choose to develop a CCA include the option to purchase more renewable power, reduce electricity cost, and/or provide power from more local sources. Most CCAs are "opt-out," meaning that customers have the option of continuing to take service from the incumbent utility if they choose. Notably, opt-out design results in much higher participation rates compared to traditional utility green-power programs. Participation rates for opt-out programs that offer additional renewable energy are approximately 75%, compared to less than 20% for utility green-pricing programs.[19]
The major consideration when developing a CCA option is whether or not the CCA can offer additional renewables (above the incumbent utility's generation mix) at an equivalent or lower price. The Center for Climate Protection is one organization that works with communities in California to set up successful CCA programs. For additional information on CCAs, including example communities, see the Resources box at the end of this subsection.

Green Tariffs

Large utility customers with a desire to source renewable energy for their facilities are finding that new renewable energy options, often provided by third parties, can be competitive with retail rates. Utilities, including vertically integrated utilities in regulated electricity markets, are exploring how to respond to rising demand from companies such as Google and Walmart for cost-effective renewable-energy supply.[23] One example is the Green Source Rider,[24] recently approved by the N.C. Utilities Commission. Under the Green Source Rider, Duke Energy will match qualifying large customers with renewable energy from Duke itself or third-party suppliers, and that energy will be in addition to the power generated to satisfy North Carolina's renewable portfolio standard. At this time, only large commercial and industrial customers adding new load of more than one megawatt (e.g., manufacturers, big-box retailers, or college campuses) are eligible, and the program is reported to have no cost impact on other customers. For more information on green tariffs, the World Resources Institute has recently completed a guideline, Green Tariff Design for Traditional Utilities.

Competitive Retail Markets

In fifteen states plus the District of Columbia, the state legislature has "deregulated" or restructured the retail electricity market (a.k.a. competitive retail markets). As a result, customers can choose from many electricity suppliers (transmission and distribution is still managed by one company in each region) that offer a wide variety of products to meet customer needs. A central website (such as Power to Choose in Texas[25]) allow customers to compare suppliers on price, renewable-electricity content, efficiency product offerings and other options.

06C. ELECTRICITY AND ENERGY SUPPLY

SOLUTION BOXES

Community Renewables

Community, or shared, renewables enable customers without the ability to install on-site renewables to invest in a share of the output of off-site renewable generation (typically solar or wind). The customer's share of the generation is used to offset usage on the customer's bill, either at the retail rate or another price set by utility regulators (such as the avoided cost of generation). In some areas, the utility directly provides customers with voluntary community-renewable options. In other areas, a third-party builds, owns, and operates community renewables, then contracts with customers to buy the output and works with the utility to interconnect the renewables into the distribution system. Community renewables may require enabling legislation but can also be offered by a utility without legislative action.

Streamlined Solar Permitting and Fee Reduction

The time and costs associated with installing residential rooftop solar systems can significantly impact the affordability of the project. Excessively long permitting processes and inspections can add thousands of dollars to the price of a solar system. Luckily, local governments can implement best practices in solar permitting, as San Antonio, TX, and San Diego County, CA have done, and thus enable faster adoption of residential solar.

Resources

- Regulatory Assistance Project: Electricity Regulation in the US: A Guide
- WRI's Green Tariff Design for Traditional Utilities.
- International Renewable Energy Agency – Renewable Energy Policy in Cities: Selected Case Studies
- ICLEI – Local Governments for Sustainability
- C40 – Cities Climate Leadership Group
- Union of Concerned Scientists – Benefits of Renewable Energy Use
- National Renewable Energy Laboratory – Renewable Electricity Futures Study
- Environmental Protection Agency – Assessing the Multiple Benefits of Clean Energy: A Resource for States
- MIT – Future of Solar
- Sonoma Clean Power
- Lean Energy – Community Choice Aggregation (CCA)
- Dept. of Energy – Community Solar Resource Page
- National Renewable Energy Laboratory – Status and Trends in US Voluntary Green Power Markets
- Solar Energy Industries Association – Third-Party Solar Financing
- Project Permit – National Solar Permitting Database
- Solar America Board for Codes and Standards – Expedited Permit Process Report
- SunRun – The Impact of Local Permitting on the Cost of Solar Power
- NY Times – Cities Weigh Taking Over From Private Utilities

TRANSPORT

06D

IN ALMOST ALL COMMUNITIES, the transportation sector is a major energy user and source of greenhouse gas emissions and air pollution. The hidden costs associated with driving single-occupancy vehicles in particular are quite large. Fortunately, communities are uniquely positioned to impact the transportation sector. Through planning, incentives, and other programs, communities can thoughtfully expand mobility options while reducing energy and climate impacts.

This section highlights leading strategies and tactics that communities around the country are pursuing to reduce climate and energy impacts from transportation, while expanding mobility options and increasing the livability of their cities. These strategies include multimodal transportation, transit-oriented development, and alternative fuel vehicles (AFVs).

KEY TAKEAWAYS:

- **When setting goals for the transportation sector, communities should consider two key levers: vehicle miles traveled in single occupancy vehicles, and fuel efficiency in miles per gallon**
- **Community transportation strategies should address reducing vehicle miles traveled by increasing multimodal transportation options and smart growth measures**
- **Communities should also aim to increase fuel efficiency (and associated fuel savings and air quality improvements) by encouraging the adoption of alternative fuel vehicles (AFVs), such as electric vehicles**

MAKING THE CASE

In most communities, transportation accounts for about one-third or more of energy use and greenhouse gas emissions, and is a primary contributor to air pollution. In many places, having too many vehicles on the road (75% of American commuters are solo drivers) results in congestion and prolonged commutes. The expansion of roads and parking also leads to a loss of green space in urban areas. To improve public health, increase the livability of the community, and reduce transportation's impact on the climate, some leading communities have developed strategies to improve transportation-related energy use.

Fortunately, communities are often uniquely positioned to improve and diversify mobility options through city planning and transportation policy, incentives, or infrastructure investments. This subsection highlights some of the successful strategies and tactics used by leading communities, along with innovative ideas being tested across the country. While this list of options is not exhaustive, we invite you to consult the Resources box for more information.

06D. TRANSPORTATION

THE REAL COST OF DRIVING

Per U.S. Department of Transportation data, transportation costs are the second largest expense for most households after housing, and range from an average expense of 20% of household income up to 25%. Where else might families prefer to spend a significant portion of their annual income?

In the U.S. each year, our cars alone collectively cost us well over $1 trillion, burn about 2 billion barrels of oil, and emit about 1.5 gigatons of carbon dioxide—one quarter of all U.S. emissions. The indirect societal cost of these vehicles, including pollution, lost productivity (sitting in traffic), land use for roads and parking lots, road construction and maintenance, and injuries and fatalities cost us another $2 trillion per year, bringing the annual total to a staggering $3 trillion.[26] Fortunately, there is a better way.

KEY LEVERS AND STRATEGIES

As communities work to set goals related to transportation energy use, they should consider two major levers:

- Reducing vehicle miles traveled (VMT) in single-occupancy vehicles; and
- Increasing fuel efficiency and lowering emissions by encouraging the adoption of more efficient alternative-fuel vehicles (AFVs), including hybrid vehicles, electric vehicles, and other vehicles not powered exclusively by gas.

REGIONALLY COORDINATED MASS TRANSIT

One of the most impactful ways to reduce single-occupancy vehicle trips is through regionally coordinated mass transit. Communities may coordinate transit (buses, light rail, commuter trains, trolleys, etc.) across regions to optimize ridership and reach more commuters, make real-time arrival and departure information available to their customers, and increase coverage in areas in which the population is growing, especially those within demographic groups that are less likely to own a personal vehicle. Public transit agencies can also move toward single-payment systems to make services more convenient and accessible. One option to reduce delays on buses is to create mobile device-enabled fare payments, rather than onboard payments.

Communities can also reduce costs, ensure better use of underutilized transit vehicles, and increase the quantity of riders per trip by taking advantage of recent advances in mobile-device and information technology to right-size and dispatch their transit vehicles according to customer demand rather than purely according to fixed schedules.

The Green Line Light Rail in The Twin Cities, MN

For the first time in more than six decades, a light rail line now connects downtown Minneapolis and downtown St. Paul. The Metropolitan Council, a regional planning and policy-making body and service provider for the Twin Cities metropolitan area, planned the Green Line. During the first six months of operation, the Green Line averaged more than one million rides per month, nearly surpassing ridership projections for 2030.[27] The line's East Bank Station at the University of Minnesota has witnessed the most daily riders, with 4,500 riders per day.[28] University students, faculty, and staff can ride the Green Line along three campus stations at no cost, and Metro Transit and the university both provide discounted passes for the light rail, buses, and other transit routes.

06D. TRANSPORTATION

OPEN TRANSIT DATA AND MOBILE TRANSIT APPS

In order to enable increased multimodal transportation, communities can facilitate interoperability of transportation data so that it is readily available and accessible to third-party mobile application developers. Multimodal transportation applications are shown to lead to increased ridership, shorter wait times, better-coordinated travel, and increased rider satisfaction on all forms of public and private transit.

Communities may warehouse data in a common format, make data available via an open application programming interface (open API), or simply ensure they are generating and reporting data according to existing data protocols, such as the general transit feed specification (GTFS), to ensure it is interoperable with data associated with other regional transit services. Data could include: bus timetables and real-time bus tracking; taxi, and for-hire vehicle tracking; car shares, bike shares, and other ride sharing services; real-time parking availability; and traffic and road conditions. In some leading high-tech communities, cities are hosting competitions among application developers (hack-a-thons) to make use of the data and demonstrate its value, raising the profile of the community energy strategy and attracting investment in data interoperability.

CAR, RIDE, AND BIKE-SHARE SERVICES

To reduce the need for owning personal vehicles, communities may attract commercial car-sharing companies like ZipCar, or nonprofit car-sharing organizations like eGo. Communities can also encourage carpool services, such as Carma, WaytoGo, Zimride, Uber Pool, and Lyft Line. Communities can provide regulatory clarity to transportation-network companies like Uber and Lyft by laying out the requirements for operating within their boundaries. So-called e-communities can also implement bike-sharing programs, as Charlotte, NC; Washington, D.C.; and Chattanooga, TN have done to encourage multimodal transportation. Bike shares can also solve the “last mile” problem related to public transit. Communities could integrate these car-share, ride-share, and bike-share services with other transit apps to maximize ridership.

INCENTIVES FOR CARPOOLS AND VANPOOLS

To encourage carpools and vanpools, communities may coordinate with local transportation agencies to offer a number of incentives. Communities might offer reduced tolls to carpools and vanpools—just during peak hours or at all times—and even allow carpool vehicles in the high-occupancy vehicle lane to proceed through the toll without stopping. In addition, communities can offer preferential, free, or reduced parking costs for carpools and vanpools, and also alternative-fuel vehicles. For example, San Francisco’s Golden Gate Bridge offers reduced toll rates and a designated lane and toll for carpools.[31]

Portland, Oregon Pioneers Open Transit Data

In 2009, with the help of Google and the nonprofit Open Trip Planner, Portland’s TriMet was the first public transit agency to open its mass transit schedules to the public through a web-based route planner and via an open application programming interface (API).[29] The Trip Planner promotes ridership by providing static and real-time data as well as route finding for city bus, MAX (regional light rail), WES (regional commuter rail), streetcar (city rail), biking, and walking. Passengers are also able to purchase tickets through the app.

The data and platform provided at low cost by the city lets users and developers organically find the best ways to put that information to use. Usage of Portland's mass transit systems increased significantly after the release of its data and its Trip Planner.[30]

Minneapolis-St. Paul’s MetroTransit offers free, reduced, and preferential parking for registered carpools and vanpools as well.[32]

06D. TRANSPORTATION

EMPLOYER INCENTIVES FOR ALTERNATIVE COMMUTING

Communities may encourage local businesses and organizations to take advantage of tax-free subsidies for employees who commute by mass transit, vanpool, or bicycle. These subsidies can take the form of either voluntary payroll deductions or vouchers. For employers, the taxable payroll is reduced, and for employees, the subsidy they receive is not included in their taxable income. Denver's Regional Transportation District (RTD) offers the EcoPass for employees, including automatic enrollment in the Guaranteed Ride Home®—a program that guarantees employees a free taxi ride home in case of schedule changes, illness, or emergencies.[33]

SMART-GROWTH POLICIES

Communities can adopt a number of smart-growth policies and designate smart-growth districts to facilitate transit-oriented development. Communities can increase investment in smart-growth infrastructure, such as sidewalks, crosswalks, bike lanes, dedicated bus and HOV lanes, and transit-oriented development (TOD) districts. Communities may also create pedestrian- and transit-only zones, like the City of Denver's 16th Street Mall.[34] Additionally, cities can create "bike highways," similar to the City of Minneapolis' Midtown Greenway, which is built on reclaimed railroad tracks.[35] Communities might also designate green space within the city and greenbelts around the city to maintain the natural environment and prevent urban sprawl. Finally, communities can develop vacant or underused land to prevent sprawl. Communities can also revise land use and building codes to reflect decreasing dependence on personal vehicles for mobility (due to the growth of multimodal mobility options and nationwide societal trends that point to decreased vehicle ownership). Communities can adopt Complete Streets policies, which require that new roads be designed to ensure the safety of all users—pedestrians, motorists, bicyclists, and transit riders of all ages and abilities.[36] In addition, communities can encourage mixed-use development by streamlining permitting.

REVISED PARKING POLICIES

In the U.S., the average estimated construction cost for a single off-street parking space is approximately $15,000, and the annual operations and maintenance cost is $450 or more.[37] However, the true cost of parking is not directly reflected in the price that drivers pay. Communities can install parking meters in their downtown areas and institute district permitting if they are not already in place. By more accurately capturing the true cost of parking, communities can capture additional revenue and redirect it toward public transit and electric-vehicle charging stations.

Communities can also reduce or eliminate minimum parking requirements for new development, in turn enabling a denser and more walkable, bikeable, and livable urban environment, much as Seattle has done. Alternatively, communities can allow developers to pay in-lieu fees instead of building off-street parking. Employers can also offer their employees cash for a foregone parking spot if they agree to use public transportation, bike, or walk to work. Alternatively, communities may convert underused, on-street parking spaces into "parklets"—small parks or extended sidewalks that improve walkability and enhance the streetscape,[38] as San Francisco and Philadelphia have done.

Integrated Transportation Planning Case Study: City Of Seattle

Seattle is one of the fastest-growing major cities in the U.S. and is preparing for the future with integrated planning. Over the next ten years, Seattle will experience shifts in demographics and technology, and is already working to realize its vision for a transformed, robust future of mobility. In the spring of 2015, the City of Seattle introduced Move Seattle, a ten-year, $835-million initiative that integrates multiple plans for mass transit, walking, biking, and freight.[39] Move Seattle is guided by a vision for a safe, affordable, innovative, interconnected, and vibrant transportation system for the city. Notably, Move Seattle's coordinated safety plan aims to eliminate serious and fatal crashes and reduce the risk of people being injured due to outdated infrastructure. Among its intended outcomes, Move Seattle aims to provide 72% of Seattle residents with all-day transit service within a ten-minute walk from their homes.

06D. TRANSPORTATION

DISRUPTING TODAY'S MOBILITY PARADIGM: MOBILITY AS A SERVICE

Emerging technologies and societal trends are creating an opportunity for a new mobility future in which electrified (and eventually self-driving) vehicles operate within transit-friendly, walkable, and bikeable cities. In contrast to mobility based primarily on personal vehicles that are available "just in case" for any potential need and sit unused 95% of the time, mobility can become a multimodal service that is offered when and where it is needed—"just in time." This shift to Mobility as a Service (MaaS) allows fewer vehicles to do the same job at a fraction of the cost, increasing access to mobility for all income levels.

ENCOURAGE ADOPTION OF ALTERNATIVE FUEL VEHICLES

In conjunction with an electricity strategy aimed at making electricity sources cleaner, communities can encourage the adoption of alternative fuel vehicles (AFVs). AFVs are powered by fuel sources other than conventional gasoline and include hybrid electric vehicles, electric vehicles, biodiesel-powered vehicles, and natural gas-powered vehicles. Compared with conventional vehicles, AFVs boast better fuel efficiency and can thus help reduce transportation-related energy use, fossil fuel expenditures, and associated greenhouse gas emissions.

ELECTRIFY COMMERCIAL AND MUNICIPAL FLEETS

Communities stand to save significantly and reduce transportation emissions by electrifying vehicle fleets. Today's mid-price electric vehicles (EVs) have a range of around 100 miles; within just a few years, affordable passenger vehicles boasting over 200 miles of range will be available, making electrification cost-effective and feasible for nearly all municipal fleets, campus fleets, delivery vehicles, taxis, airport shuttles, and subsidized carpools. For special-use vehicles that tend to make longer or more urgent trips, such as fire trucks, police vehicles, and ambulances, communities can today work to adopt hybrid electric vehicles which reduce idling emissions, or adopt longer-range electric vehicles as they become available in coming years. Communities may also electrify their own municipal fleets through third-party fleet services agents or directly bulk-purchase vehicles from automakers.

Indianapolis and Electric Vehicles

Indianapolis has been paving the way for electric vehicle adoption. Mayor Greg Ballard has embarked on a quest to electrify the city's entire fleet of vehicles and advance an EV car-sharing program. In 2015, the city's EV fleet—called the Freedom Fleet—will grow from 100 to 425 vehicles under an innovative public-private partnership. Vision Fleet Capital buys the cars and covers maintenance and fuel costs, much as a power purchase agreement would work in an electricity contract, while the city pays a total of $32 million over the seven-year lease. This arrangement will save Indianapolis $8.7 million relative to its current fleet spending. Indianapolis' EV car-sharing program will be the largest in the country, with 1,000 EVs available for rent through a French company, the Bolloré Group. The plan will save taxpayers thousands each year on fuel expenditures and the city 2.2 million gallons of gas over the next decade.[40]

06D. TRANSPORTATION

EV INFRASTRUCTURE

While the great majority of trips made within a community can be served today with commercially available electric vehicles utilizing home or work charging from a standard outlet, some community members will nevertheless be hesitant to purchase electric vehicles until more EV charging infrastructure is in place. To address this concern, cities may install public charging stations and ensure that they are in highly visible, clearly marked, and frequently visited places. Communities can require new parking garages to be EV-ready or incentivize on-street charging in new construction. Communities may also designate an "electric avenue" downtown with highly visible charging stations, preferred parking for EVs, and EV car-share stations. In addition to public charging stations, communities can establish partnerships with private charging companies.

REBATES AND INCENTIVES FOR AFVS

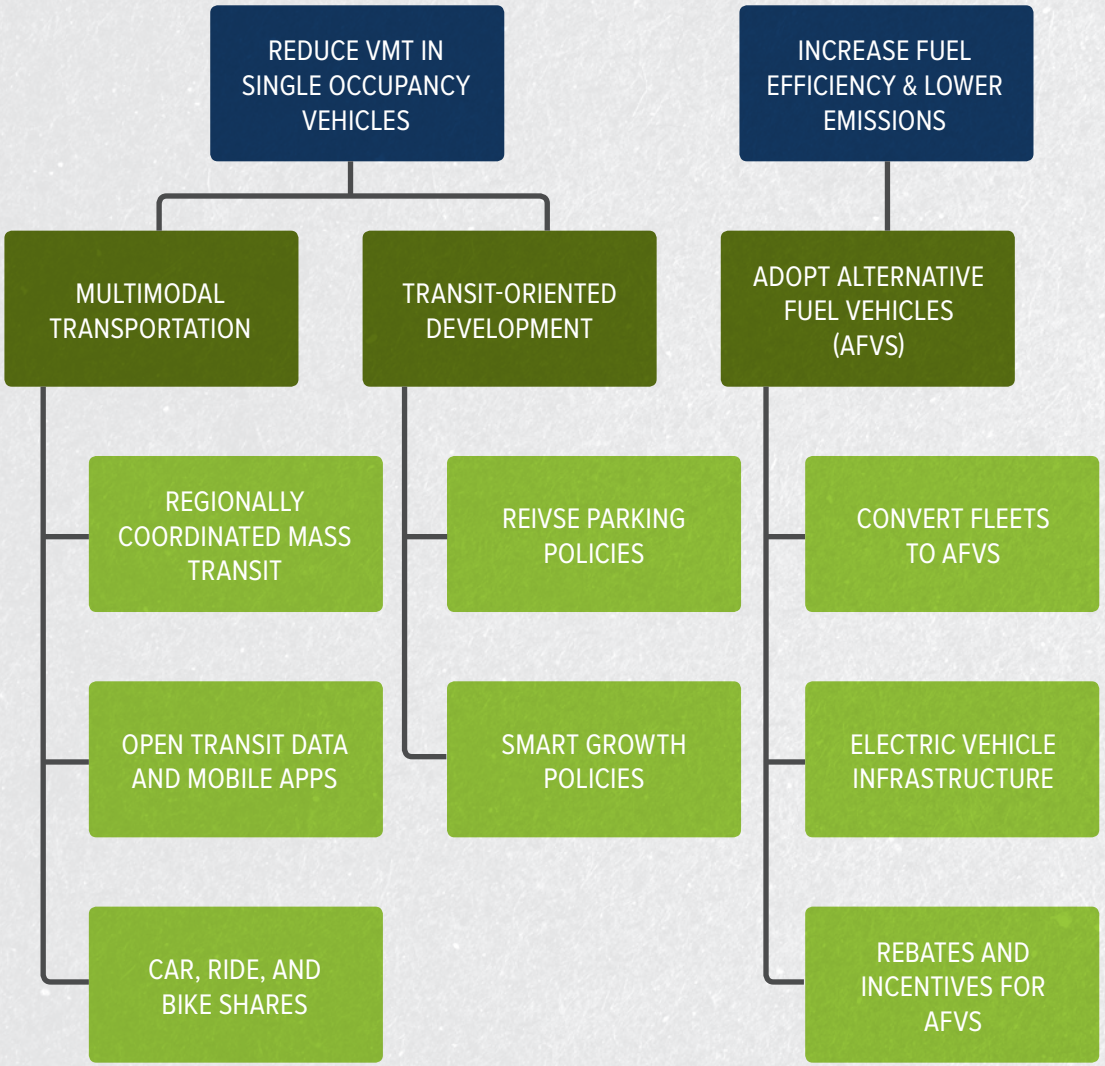
For consumers considering purchasing an AFV, many aspects are important, including the upfront capital cost of the vehicle and convenience factors. Communities may introduce financial incentives, like point-of-sale rebates, to reduce the price of AFVs, and can educate consumers about available state and federal tax incentives. Communities can also introduce an "EVs for clunkers" program, as British Columbia has done. British Columbia's renowned SCRAP-IT program allows people to retire older vehicles in exchange for credit toward a new EV.[41] Communities can also provide additional incentives for AFV users, such as access to preferred parking, reduced registration fees, AFV-only lanes, and reduced tolls and congestion pricing. Communities also may revise building and zoning codes, and streamline permitting processes to encourage charging stations at workplaces, campuses, multi-family housing complexes, and single-family homes.

Resources

- The Metro Green Line, Metropolitan Council
- The Innovative Transportation Index, Frontier Group
- Portland Trimet Service and Ridership Information
- Golden Gate Bridge Toll Rates for Carpools Minneapolis-Saint Paul Metro Transit Carpool Parking Permits
- EcoPass, RTD – incentives for public transit
- Denver 16th Street Mall – pedestrian mall
- Minneapolis Midtown Greenway – bike highway
- Complete Streets, Smart Growth America
- Parking costs, Victoria Transport Policy Institute
- The Value of Parklets – converting parking spaces to parks
- Move Seattle – integrated transportation plan
- Indianapolis EV program
- British Columbia SCRAP-IT ® Program
- EV City Casebook: 50 Big Ideas Shaping the Future of Electric Mobility
- ICLEI, Sustainable Transportation Options for Protecting the Climate," International Council for Local Environmental Initiatives
- Alternative Fuels Data Center, U.S. Department of Energy
- Smart Cities Open Data Guide, Smart Cities Council
- Clean Cities, U.S. Department of Energy

06D. TRANSPORTATION

A SAMPLE MENU OF OPTIONS FOR MOBILITY/TRANSPORTATION:



06D. TRANSPORTATION

INNOVATION SPOTLIGHT: RETHINKING PERSONAL MOBILITY

The City of Austin, Texas, together with Rocky Mountain Institute and the City of Denver, Colorado, have committed to working together over the next several years to develop innovative transportation and mobility solutions. A central component of this approach will be to leverage the power of emerging technology to expand transportation options, thereby improving safety while significantly reducing congestion, costs, commute times, and environmental impacts. The Austin-Denver relationship will be a first step toward developing an effective channel for other cities to adapt and replicate one another's solutions worldwide.

The multi-year collaborative program will engage employers, universities, and the private sector as the project team evaluates and actively engages around five primary tactics:

1. *Mobility-Oriented Development*: Supporting innovative land-use codes to encourage dense, multi-use developments that decrease the need to drive and enable alternative forms of transportation to improve quality of life.
2. *Interoperable Transit Data*: Establishing an interoperable transit data system that integrates a rich variety of public and private transit modes to deliver a seamless, convenient, and cost-effective mobility experience to users.
3. *Fleet Electrification and Optimization*: Reducing costs and increasing the efficiency of for-hire vehicle fleets through highly-utilized electric vehicles while working with local utilities to enable electric vehicles' inherent storage capacity to provide value to the electricity grid.
4. *Mobility as a Service*: Partnering with regional employers to identify and develop viable multimodal commuting solutions and new business opportunities among mobility service providers.
5. *Autonomous Vehicles*: Developing a commercialization-friendly regulatory framework for autonomous vehicles while initiating commercialization pilots for cities, campuses, and communities.

IMAGE: THINKSTOCK

INDUSTRY

06E

SETTING GOALS

Depending on the community, the industrial sector (including agriculture) may be a major user—or the largest user—of energy. This section highlights several approaches to improving energy use in industry and provides examples of successful innovation in redefining industrial energy use in communities. Goals in this sector could be set around reducing total energy use and energy expenditures, increasing process/output efficiency, and reducing negative climate impacts by switching to alternative processes and fuels.

COMMUNITY INTERACTION AND INFLUENCE WITH INDUSTRY

Each of the following subsections describes an area of potential improvement in the industrial sector. Each item is defined, potential barriers are presented, and examples from communities around the world are shared. However, it may not be obvious how a community can actually interact with local industry and have influence over their energy use and practices.

KEY TAKEAWAYS:

- **Ensure that local industry knows what is possible and give them confidence that the possible is achievable. This might include sending industry representatives to training events, or holding workshops for key local industries with relevant external experts.**
- **Facilitate integrative design across industries,[42] and promote industrial ecology as much as possible.[43] This might include facilitating an energy working group to identify and act on areas of overlap between local industries.**
- **Provide incentives to industry to incorporate more energy efficiency and renewables, and to collaborate with other local industries. This could take the form of expedited permitting processes for desired projects, supporting industry training or conference attendance, or offering tax or other incentives for achieving and demonstrating greater amounts of energy efficiency, for example.**

We have identified several distinct opportunities in the course of RMI's work with industry to improve energy use. While communities have varying degrees of influence on each of these components, the following pages provide additional context that communities can use to inform the use of the three main leverage points described above.

ENERGY EFFICIENCY

In 2011, RMI's *Reinventing Fire* analysis revealed a huge opportunity for energy efficiency in the U.S. industrial sector, and these improvements fall into four main categories:[44]

- Reducing the energy needed for basic processes
- Reducing the losses in energy-services distribution in a plant
- Reducing the losses in devices that convert energy into services
- Reducing the waste of energy that's discarded rather than reused

06E. INDUSTRY

However, there are real barriers to pursuing industrial-efficiency opportunities, including a lack of knowledge and low prioritization for efficiency by senior leadership and a desire to stick with the familiar current system and to minimize disruptions. These sentiments are often held without a full understanding of the financial implications of business-as-usual in relation to possible improvements in efficiency.

Two examples of energy-efficiency improvements in industry are:[45]

- Dow Chemical cut energy intensity of processes by more than 38% between 1990 and 2005, and saved $9.4 billion between 1994 and 2010 through energy-efficiency measures costing $1 billion
- DuPont made a commitment to cut its greenhouse gas emissions 72% during 1990–2004 (and is now expanding that cut by another 15%), using 7% less energy now than in 1990 despite 40% higher production

INTEGRATIVE DESIGN

Besides implementing conventional energy-efficiency measures, further savings are available from integrative design, where whole-system thinking often yields multiple benefits from one planned intervention and expenditure. This can make energy savings bigger and cheaper by focusing first on downstream requirements and leveraging compounding savings of energy and capital upstream.

There are significant barriers to successfully implementing integrative design approaches, particularly in retrofitting existing industrial facilities, including:

- The expense of dedicating design staff to pursue integrative design
- The ease of continuing the status quo
- Lack of interest in sharing data, energy, and other resources beyond the boundary of an individual facility

An example of a successful implementation of this approach can be found in the industrial ecosystem of Kalundborg, Denmark.[46] Here, the by-product of one enterprise is used as a resource by another enterprise, in a closed cycle. For example, organic waste from a company called Novozymes is made into agricultural fertilizer while smoke produced by an energy company is made into gypsum by a different company. This results in estimated savings of $10 million per year in operating costs, CO_2 emissions reduced by 240,000 tons each year, 3 million cubic meters of water saved through recycling and reuse, and 30,000 tons of straw converted to 5.4 million liters of ethanol.

Another example of successful integrative design is General Motor's vehicle assembly plant in Lansing, Michigan. This facility was built with a goal of pursuing additional efficiency above standard design while meeting a two-year simple payback period. Modeling software was used to separate the spaces into zones in order to achieve maximum reuse of waste energy, minimize throughput losses, and ensure effective production design. Compared to similarly designed new plants using cost-effective technology (but not an integrative design process), the Lansing facility uses 45% less energy and saves $1 million per year in energy costs.[47] With increased emphasis on efficiency during the design, the 223,000 m^2 (2.4 million ft^2) facility cost $800 million—comparing favorably to a similar Hyundai facility built in 2002 in Montgomery, Alabama. Overall, GM's focus on incorporating more efficient technologies and practices has saved the company $90 million per year in operational costs.[48]

Communities could move towards achieving the success seen in these two examples by inviting local industry to get together and share best practices and case studies.

06E. INDUSTRY

COMBINED HEAT AND POWER

Combined Heat and Power (CHP), also known as cogeneration, is defined as three things:[49]

- **The concurrent production** of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy.
- **A type of distributed generation,** which, unlike centralized generation, is located at or near the point of consumption.
- **A suite of technologies** that can use a variety of fuels to generate electricity or power at the point of use, allowing the heat that would normally be lost in the power generation process to be recovered to provide needed heating and/or cooling.

RMI's *Reinventing Fire* analysis found that raising U.S. CHP capacity to 240 GW would cut America's total CO_2 emissions by 12%.[50]

Barriers to increased use of CHP include:

- Potentially complex contractual arrangements with local utilities
- Reluctance to operate a power generation station instead of traditional boilers

In order to enable increased utilization of CHP, a community may consider encouraging collaboration with the U.S. Environmental Protection Agency's (EPA) CHP Partnership, which works with companies and organizations operating in the U.S. to promote the economic, environmental, and reliability benefits of CHP and provides tools and services to support development.[51] According to the EPA, CHP systems achieve fuel-use efficiencies of 60% to 80%, compared to typical, separate heat (boiler) and power (grid) systems with efficiencies in the 45% to 55% range, and result in reduced total fossil fuel use, greenhouse gas emissions, and other pollutants.

DEMATERIALIZATION

In general, dematerialization means doing more with less, by reducing the quantity of materials required to serve the needs of society.[52] Designing out waste throughout industrial products' value chains can save energy and money in the upstream process, all the way back to the mine or other raw-material source. Many products are discarded when they are out of style, broken, or superseded; but can instead be reused, repaired, remade, or recycled. Redesigning products to accommodate remanufacturing (updating parts, not remaking wholes) can create major new business opportunities while drastically lowering industrial energy needs to provide the same services. Several examples are highlighted here.

Communities can play a role in dematerialization through developing building codes that incentivize effective and efficient use of materials such as concrete and steel (like the requirements set by the Port Authority of New York/New Jersey for using recycled materials to replace traditional cement), and through engaging in thoughtful, long-term urban planning.[54]

New York City's One World Trade Center

New York City's new financial building, One World Trade Center, drastically reduced the material demands of construction while improving the overall quality and lifetime of the building. By using BASF's water-reducing admixtures, traditional cement with supplementary cementitious materials such as fly ash, slag, and other waste byproducts yielded a concrete mixture that reduced material use and cost while upgrading performance—compressive strength improved from 8,000 to 14,000 pounds per square inch. This stronger concrete had better thermal performance and reduced the heating and cooling needs of the building, leading to long-term and short-term savings. Overall, cement consumption dropped 40% compared to conventional designs, reducing green house gas emissions by 34 million pounds of CO_2 and saving over 150,000 gallons of water.[53]

06E. INDUSTRY

FUEL-SWITCHING

Most industrial processes require significant amounts of high-temperature heat. In most industries this heat is generated by burning coal, natural gas, or residual feedstocks, such as wood waste in papers mills or crude oil in refineries. Fuel switching, or replacing dirtier fuels with fuels that are cleaner, is an opportunity to reduce the environmental impact of local industry. For example, natural gas can replace coal for many uses, and, in certain applications, electricity generated from renewable sources can replace both natural gas and coal. As with other opportunities, there are barriers to fuel switching, many of which are associated with replacing existing equipment before its useful life ends and matching available resources with specific industrial demands. Again, collaboration and learning is crucial to innovation, and a community might work with industry to identify the potential for using different fuels and then share ideas or innovations among industries.

A POTENTIAL MENU OF OPTIONS FOR INDUSTRY:

ENERGY EFFICIENCY | INTEGRATIVE DESIGN | COMBINED HEAT AND POWER | DEMATERIAL-IZATION | FUEL-SWITCHING

Resources

- Integrative design definition and case studies
- Data center energy efficiency Case Study
- RMI analysis of fuel-switching options in industry
- RMI analysis of solar heating competitiveness
- U.S. Environmental Protection Agency CHP Partnership
- Lawrence Berkeley National Lab report on energy intensity
- Kalundborg, Denmark's industrial ecosystem lessons learned
- Singapore approach to shifting industry to pharmaceutical
- RMI Reinventing Fire Industry overview
- Dematerialization overview and examples
- Energy efficiency case study for data centers
- RMI analysis of fuel-switching options in industry
- U.S. Department Of Energy Advanced Manufacturing Office general resources
- U.S. Department of Energy Advanced Manufacturing Office CHP Technical Assistance Partnerships; offers on the ground help in each region of the country

CONCLUSION

07

IMAGE: THINKSTOCK | LUNAMARINA | HOUSTON, TX

07. CONCLUSION

THIS RESOURCE GUIDE provides suggestions for developing the pieces of a comprehensive energy plan for a community. The plan should include the vision and goals that have been set, the preliminary analysis outlining the current state and future possibilities of the community's energy landscape, and the implementation strategies and tactics that will help the community move toward its goals.

Every comprehensive energy action plan should include a clear implementation plan. The plan may include both near- and long-term activities. Whatever the desired outcome, the implementation plan should be designed to achieve it in the desired timeframe and with the appropriate people involved. Within the implementation plan, it is important to identify the appropriate action channel for each sector (electricity, buildings, transportation, and industry). Then, consider convening the relevant actors in each sector to align on an implementation strategy (e.g., developers and builders tasked with complying with new code provisions). It is also crucial to create a plan that has teeth, and holds people accountable for following through.

We hope this guide is useful for the energy action planning process in your community. Please direct inquiries about the guide to James Mandel **(jmandel@rmi.org)** or Christa Owens Michelet **(cmichelet@rmi.org)**.

Resources

- CESP Chapter 7
- "Financing Solutions" U.S. Department Of Energy
- Guide to Community Energy Strategic Planning, "Step 5: Develop Energy Goals and Strategies," U.S. Department of Energy


How to overcome
and External
Barriers?
What are the financial
models to lower
the total cost of
ownership
and then apply the
right technology
How do we align many
different self interests
state-wide
toward a common interest
in a clean energy future?
MEFF
How do we ensure
we develop adaptive
strategies / Frame work?
- MEFF
What are the
Mechanisms to Engage
And give Voice to

ENDNOTES

08

08. ENDNOTES

[1] John Kania and Mark Kramer, "Collective Impact," *Stanford Social Innovation Review*, Winter 2011, http://www.ssireview.org/articles/entry/collective_impact

[2] Stephen Yaffee and David Chadwick, University of Michigan, "Political Analysis for Collaborative Process Managers: Thinking Strategically about the External Environment," http://www.snre.umich.edu/ecomgt/lessons/stages/organizing_the_process/political/Political%20Analysis.pdf

[3] "Citizen Advisory Committee," City of Fort Collins, accessed April 2015, http://www.fcgov.com/climateprotection/cap.php

[4] "What's a Green Bank?", Coalition for Green Capital, accessed July 2015, http://www.coalitionforgreencapital.com/whats-a-green-bank.html

[5] *Regulating the Utility of the Future: Implications from the Grid Edge,* GTM Research, January 2015, http://www.greentechmedia.com/research/report/regulating-the-utility-of-the-future

[6] "Deep Energy Retrofit 101," Rocky Mountain Institute, accessed July 2015, http://www.rmi.org/retrofit_depot_101

[7] "Empire State Building Retrofit Surpasses Energy Savings Expectations," Rocky Mountain Institute, May 2012, http://blog.rmi.org/blog_empire_state_retrofit_surpasses_energy_savings_expectations

[8] Smart Energy in Offices," Duke Energy, 2014, http://smartenergyinoffices.com

[9] "U.S. Energy Use Intensity by Property Type (Technical Reference)," Energy Star Portfolio Manager, September 2014, https://portfoliomanager.energystar.gov/pdf/reference/US National Median Table.pdf

[10] Evan Mills, "Building commissioning: a golden opportunity for reducing energy costs and greenhouse gas emissions in the United States," *Energy Efficiency* (2011) 4:145-173, http://evanmills.lbl.gov/pubs/pdf/cx-enef-mills.pdf

[11] "Energy Conservation Audit & Disclosure Ordinance," Austin Energy, 2015, http://austinenergy.com/wps/portal/ae/programs/ecad-ordinance/energy-conservation-audit-and-disclosure-ordinance/!ut/p/a1/jZAxT8MwFIR_S4eMjo0rwGUzpgqhlEykIUvlJq-OpdSObKcR_HpSWChqoW876bt7usMlLnBp5F4rGbQ1sj3o8mZNKKOPgtA0uaWM8ETcL67zI6sZlyPw9hPI5tkDSfMs59lC

[12] "UNEP: Modernizing district energy systems could reduce heating & cooling primary energy consumption by up to 50%," International District Energy Association, March 2015, http://www.districtenergy.org/blog/2015/03/02/unep-modernizing-district-energy-systems-could-reduce-heating-cooling-primary-energy-consumption-by-up-to-50/

[13] Ellen M. Franconi, Michael J. Bendewald (RMI) and Caitlin E. Anderson (ME Engineers), "Analyzing Energy-Efficiency Opportunities across Building Portfolios," ACEEE Summer Study: Rocky Mountain Institute, 2014, http://www.rmi.org/Content/Files/ACEEE_2014-Analyzing_Building_Portfolios.pdf

[14] "Sources of Greenhouse Gas Emissions," United States Environmental Protection Agency, May 7, 2015, http://www.epa.gov/climatechange/ghgemissions/sources/electricity.html

[15] "Renewable Portfolio Standard," DSIRE, June 24, 2015, http://programs.dsireusa.org/system/program/detail/2401

[16] "Renewable Portfolio Standard Policies," DSIRE, June 2015, http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2014/11/Renewable-Portfolio-Standards.pdf

[17] "Carbon Neutral Portfolio," City of Palo Alto, accessed June 105, http://www.cityofpaloalto.org/gov/depts/utl/residents/resources/pcm/carbon_neutral_portfolio.asp

[18] "Georgetown Utility to Be Powered by Solar and Wind Energy by 2017," City of Georgetown, Texas, March 18, 2015, https://georgetown.org/georgetown-utility-to-be-powered-by-solar-and-wind-energy-by-2017

[19] "Community Choice Aggregation," United States Department of Energy, accessed June 2015, http://apps3.eere.energy.gov/greenpower/markets/community_choice.shtml

[20] "About the Boulder Energy Future Project," City of Boulder, Colorado, 2015, https://bouldercolorado.gov/energy-future/energy-future-about

[21] "Energy Utility Franchise Agreements," City of Minneapolis, Minnesota, October 17, 2014, http://www.ci.minneapolis.mn.us/energyfranchise/index.htm

[22] Minneapolis Clean Energy Partnership, accessed June 2015, http://mplscleanenergypartnership.org

[23] "Expanding Renewable Energy Options for Companies Through Utility-Offered 'Renewable Energy Tariffs,'" Google, April 19, 2013, http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf

[24] "Duke Energy Carolinas' Petition for Approval of Rider GS (Green Source Rider) Pilot Docket No. E-7, Sub 1043," Duke Energy Carolinas, November 15, 2013, http://www.duke-energy.com/pdfs/2013111501-addendum.pdf

[25] Power to Choose, accessed June 2015, http://www.powertochoose.org

[26] "Transportation and Housing Costs," U.S. Department of Transportation, Federal Highway Administration, January 3, 2014, http://www.fhwa.dot.gov/livability/fact_sheets/transandhousing.cfm

[27] "The Metro Green Line," Metropolitan Council, accessed April 2015, http://www.metrocouncil.org/Transportation/Projects/Current-Projects/Central-Corridor.aspx

[28] Frederick Melo, "The Green Line at 6 months: How's it doing?", TwinCities.com, December 16, 2014, http://www.twincities.com/transportation/ci_27151192/green-line-at-6-months-hows-it-doing

08. ENDNOTES

[29] Lindsey Hallock and Jeff Inglis, The Innovative Transportation Index: *The Cities Where New Technologies and Tools Can Reduce Your Need to Own a Car,* Frontier Group, February 2015, http://www.uspirg.org/sites/pirg/files/reports/Innovative_Transportation_Index_USPIRG.pdf

[30] "Trimet Service and Ridership Information," Trimet, October 20, 2014, http://trimet.org/pdfs/publications/trimetridership.pdf

[31] "Golden Gate Bridge Toll Rates, Carpools, DMV Clean Air Decals," Golden Gate Bridge Highway & Transportation District, July 1, 2015, http://goldengatebridge.org/tolls_traffic/toll_rates.php

[32] "Carpool Parking Permits," Metro Transit, 2015, http://www.metrotransit.org/carpool-permits

[33] "EcoPass," RTD, 2015, http://www.rtd-denver.com/EcoPass.shtml

[34] "16th Street Mall – Pedestrian Mall," Denver: The Mile High City, 2015, http://www.denver.org/listings/16th-Street-Mall---Pedestrian-Mall/4249

[35] "About the Greenway," Midtown Greenway Coalition, 2015, http://midtowngreenway.org/about-the-greenway

[36] "What are Complete Streets?", Smart Growth America, 2015, http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/complete-streets-faq

[37] "Transportation Cost and Benefit Analysis II – Parking Costs," Victoria Transport Policy Institute, August 2013, http://www.vtpi.org/tca/tca0504.pdf

[38] Danielle Dai, "From Parking to Park: Transportation Impact & Value of Parklets," DanielleDai.com, 2013, http://nacto.org/docs/usdg/from_parking_to_park_dai.pdf

[39] "Move Seattle," Seattle Department of Transportation, Spring 2015, http://www.seattle.gov/transportation/docs/MoveSeatte-FinalDraft-2-25-Online.pdf

[40] Brian Eason, "Indianapolis Mayor Greg Ballard plans 425 electric vehicles by 2016," IndyStar, October 28, 2014, http://www.indystar.com/story/news/politics/2014/10/28/mayor-greg-ballard-plans-electric-vehicles/18062225, and Katherine Tweed, "Unlikely City Claims Nation's Largest Electric Car Share," Greentech Media, June 13, 2013, http://www.greentechmedia.com/articles/read/unlikely-city-claims-nations-largest-electric-car-share

[41] "British Columbians Eligible to Receive $3000 Incentive towards Purchase of New Electric Vehicle," BC SCRAP-IT® PROGRAM, March 16, 2015, https://scrapit.ca/wp-content/uploads/2014/11/Release_ScrapItLaunch-Final.pdf

[42] "Integrative design to make big savings cheaper than small savings," Rocky Mountain Institute, accessed May 2015, http://www.rmi.org/keysolutionsindustry2

[43] "Sustainable development and industrial ecology," Nickolas J. Themelis, accessed June 2015, http://www.columbia.edu/cu/21stC/issue-2.4/themelis.html

[44] "Reinventing Fire: Industry," Rocky Mountain Institute, accessed June 2015, http://www.rmi.org/Industry

[45] "Climate: Eight Convenient Truths," Amory B. Lovins, last modified February 2010, http://www.rmi.org/Climate-+Eight+Convenient+Truths

[46] "Kalundborg Symbiosis," accessed June 2015, http://www.symbiosis.dk/en

[47] "GM opens first-ever LEED gold-certified plant," Reliable Plant, accessed June 2015, http://www.reliableplant.com/Read/2221/gm-opens-first-ever-leed-gold-certified-plant

[48] "GM Leads in Energy Reduction Challenge, Saves $90 Million," 3BL Media, last modified December 2012, http://3blmedia.com/News/GM-Leads-Energy-Reduction-Challenge-Saves-90-Million

[49] "Combined Heat and Power Basics," U.S. Department of Energy, accessed June 2015, http://energy.gov/eere/amo/combined-heat-and-power-basics

[50] "Estimates for combined heat and power and waste heat recovery," Rocky Mountain Institute, accessed June 2015, http://www.rmi.org/RFGraph-Estimates_CHP_waste_heat_recovery

[51] "Combined Heat and Power Partnership," U.S. Environmental Protection Agency, accessed June 2015, http://www.epa.gov/chp/aboutus/index.html

[52] "Dematerializing the Process: Roadmap to the Plant of Tomorrow," Mike Pemberton, last modified January 2008, http://www.pumpsandsystems.com/topics/dematerializing-process-roadmap-plant-tomorrow

[53] "One World Trade Center: A Surprisingly Sustainable Achievement," US Concrete TACA Short Course, accessed May 2015, http://www.tx-taca.org/members/files/2011/06/US-Concrete-TACA-presentation-w-videos-imbedded-02-18-13-R1.pdf

[54] "One World Trade Center – New York, New York," BASF, accessed June 2015, http://construction.basf.us/resources/project-profiles/id/5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