Charting a Path for Reliable, Resilient and Affordable Clean Energy: A Roadmap for Three Communities in Utah

Kate Bowman and Sarah Wright

Utah Clean Energy

NREL Technical Monitor: Sara Farrar

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
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NOTICE

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Charting a Path for Reliable, Resilient and Affordable Clean Energy

A Roadmap for
Three Communities in Utah

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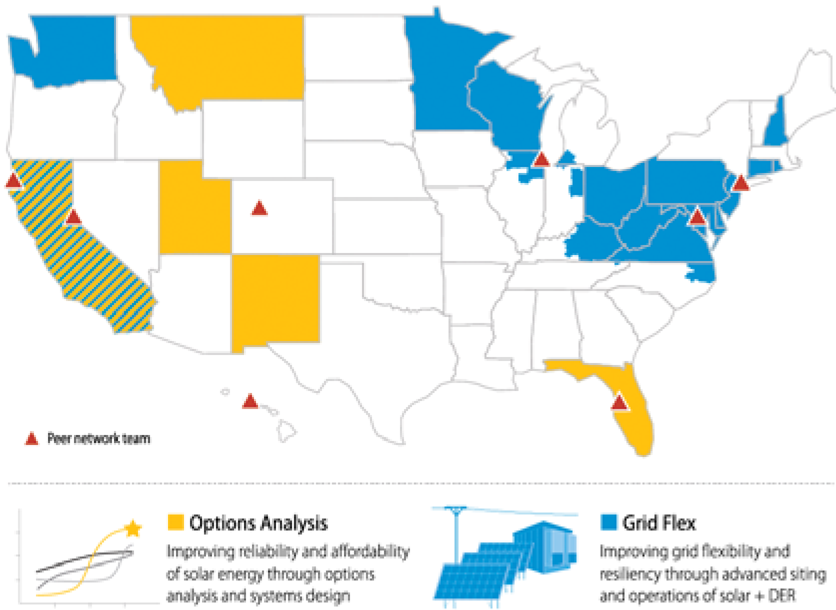
The strategies outlined in this Roadmap have been developed through collaborative discussions with project partners, but may not represent the opinions of or positions of all partner organizations and parties involved in the "Renewable Energy Impacts and Solutions in Utah" project. Rather, the strategies outlined in this Roadmap represent a suite of tools and actions that Salt Lake City, Park City, and the City of Moab can consider as each city works towards their community renewable electricity goals.

About the Solar Energy Innovation Network



The Solar Energy Innovation Network is a collaborative research effort led by the National Renewable Energy Laboratory and supported by the U.S. Department of Energy Solar Energy Technologies Office.

SOLAR ENERGY INNOVATION NETWORK
U.S. DEPARTMENT OF ENERGY

An innovative program design brings together teams of stakeholders from across the United States—including utilities, state and local governments, nonprofits, innovative companies, and electric system operators. With the support of technical experts from national laboratories and other research institutions, these teams work to implement innovative applications of solar and distributed energy resources in their unique locations and contexts. The solutions developed by the teams are demonstrated and validated in real-world contexts, making them ready for replication and scale.

Nine teams participated in the first round of the Solar Energy Innovation Network and were grouped into two cohorts, based on shared challenges and goals. The stakeholder teams participating in the Innovation Network are making rapid progress toward new, multi-technology solutions such as the pairing of PV and EVs, or the provision of grid services with PV and storage.

More information about the SEIN network is available at:
www.nrel.gov/solar/solar-energy-innovation-network.html

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

About the Roadmap

Three cities in Utah – Salt Lake City, Park City, and the City of Moab – set a goal to reach 100% net renewable electricity community-wide by 2030. Through the first round of the Solar Energy Innovation Network, these three cities teamed up with non-profit organization Utah Clean Energy and their utility, Rocky Mountain Power, to participate in the first round of the Solar Energy Innovation Network. The team sought to evaluate the potential to deploy distributed energy resources (including energy efficiency, demand flexibility, beneficial electrification, solar, storage, and electric vehicles) to support the cities' energy goals and complement utility-scale solar.

The team's project, entitled "Renewable Energy Impacts and Solutions in Utah," worked alongside the National Renewable Energy Laboratory (NREL) and the Rocky Mountain Institute to conduct a scenario analysis that evaluates the potential impact of distributed generation and energy efficiency through 2030. The Team also leveraged NREL research to estimate the potential additional future load that may be associated with beneficial residential electrification and electric vehicle adoption.

This Roadmap illustrates the results of the analysis, including forecasts for the potential impact of a variety of distributed energy resources under three different potential deployment scenarios. These scenarios represent a range of future conditions for energy use and distributed energy resources and can be used inform ongoing city and utility planning processes.

The Roadmap also identifies strategies to align deployment of distributed energy resources with the continued growth of utility-scale solar. The strategies outlined in the Roadmap have been developed through collaborative discussions with project partners, but may not represent the opinions of, or positions of, all partner organizations and parties involved in the "Renewable Energy Impacts and Solutions in Utah" project. Rather, the strategies outlined in this Roadmap represent a suite of tools and actions that Salt Lake City, Park City, and the City of Moab can consider as each city works towards their community renewable electricity goals.

While this Roadmap was developed to inform three communities as they progress towards their specific community energy goals, much of the analysis presented in the Roadmap was conducted for Utah as a whole. Other communities in Utah can use the scenarios and strategies outlined in the Roadmap to leverage the full potential of distributed energy resources to provide benefits to the community.

Utah Solar Energy Innovation Network Partners

UTAH CLEAN ENERGY

SALT LAKE CITY

PARK CITY

CITY OF MOAB UTAH

ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

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Introduction

In 2016, Salt Lake City became the first city to set out to achieve a clean energy goal in partnership with their investor-owned utility, Rocky Mountain Power. Park City and the City of Moab shortly followed suit. These three Utah cities aim to serve their communities with net 100% renewable electricity by 2030. This unique partnership with Rocky Mountain Power may serve as a guide for cities served by investor-owned utilities to exercise choice in their energy future and partner with their utility to access low-cost renewable energy resources.

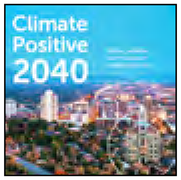
The three cities will achieve their 100% renewable energy goals through a combination of utility-scale renewable energy and distributed energy resources. Utility-scale resources, including solar in Utah and wind in neighboring Wyoming and Idaho, are less expensive than ever before and create a pathway for a swift and affordable transition to clean energy. At the same time, a portfolio of distributed energy resources can bring benefits home to the communities, including local jobs and investment, utility bill savings, and improved air quality. Distributed energy resources produce clean energy locally and cut energy waste, ensuring that the cities do not pay to procure utility-scale resources that are not needed in the long term. This Roadmap illustrates three scenarios that forecast the potential for a variety of distributed energy resources to play a role in the transition to clean energy.

The unique and transformative value of distributed energy resources lies in their potential to shift and shape energy demand to align with generation from renewable energy. Investments in a diversified portfolio of distributed energy resources (including energy efficiency, electrification of buildings, solar, storage, and electric vehicles) can shape energy usage throughout the day, aligning the energy needs of homes and businesses with times when Utah's plentiful solar resources are available.

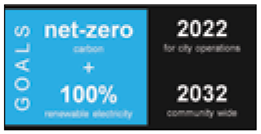
Portfolios of Distributed Energy Resources will enable the integration of larger amounts of utility-scale wind and solar on Utah's grid and facilitate a more affordable transition to a clean energy mix.

The partnership between Salt Lake City, Park City, the City of Moab, and Rocky Mountain Power represents a new opportunity for communities to work collaboratively with their utility to choose a clean energy future. The strategies outlined in this Roadmap can maximize the local community benefits of deploying distributed energy resources. The Roadmap also identifies opportunities for the cities and the utility to partner on innovative and creative solutions to drive adoption of distributed energy technologies in a way that provides benefits to the grid as a whole and improves the affordability of a transition to clean energy. Working together, the cities and Rocky Mountain Power can chart a path to advance distributed energy resources that provides residents and businesses the opportunity to cut energy costs, improve air quality, and create a model for other communities to do the same.

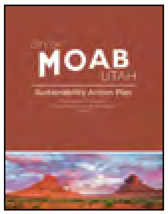
Community Energy Plans & Resources



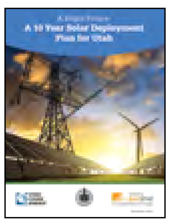
Salt Lake City: Climate Positive 2040
A platform for documenting progress towards the city's climate and energy goals. (March 2017)
www.slc.gov/sustainability/climate-positive/



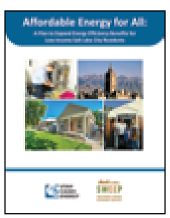
Park City: Community & Municipal Carbon Footprint
An inventory of greenhouse gas emissions and initial plans for emissions reductions
www.parkcity.org/home/showdocument?id=48660



Moab: Sustainability Action Plan & Community Energy Plan
An inventory of city sustainability metrics and goals (2019) and list of energy priorities for the city (2018).
www.sustainablemoab.com



A Bright Future: A 10 Year Solar Deployment Plan for Utah
Strategies to overcome barriers to continued solar market growth in Utah. (December 2016)
www.utahcleanenergy.org



Affordable Energy for All
A plan to expand energy efficiency benefits for low-income Salt Lake City Residents (August 2017
www.utahcleanenergy.org

Electric Transportation Roadmap
A best practices and clean air solutions guide for local governments in Utah. (January 2018)
http://www.slcdocs.com

Background

Salt Lake City, Park City, and the City of Moab have a long history of commitment to advancing sustainability in their communities and providing leadership on climate and clean energy. In 2004, the Environmental Protection Agency recognized Moab as the nation's first Green Power Community. In 2005, Salt Lake City participated in the U.S. Department of Energy's Million Solar Roofs program, and in 2007, Salt Lake City was designated one of 13 'Solar America Cities'. Salt Lake City, Park City, and the City of Moab have all achieved designation through SolSmart, a national program designed to recognize communities that have taken key steps to address local barriers to solar energy and foster the growth of mature local solar markets. The three cities are all participants in Rocky Mountain Power's Wattsmart Communities Program, a utility initiative to partner with local governments to increase energy efficiency at the community scale.

This Roadmap builds on a foundation of work and analysis completed by Salt Lake City, Park City, the City of Moab, and Utah Clean Energy to create community energy and greenhouse gas emissions inventories, evaluate strategies to advance clean energy and efficiency solutions, and build partnerships to accomplish their goals.

Roadmap Overview

Chapter 1 outlines the details of the communities' clean energy goals and presents baseline information about the communities' current energy usage. Community data provided in this chapter illustrates key differences between Salt Lake City, Park City, and Moab when it comes to demographics, geography, climate, population, and energy usage by sector. While the strategies identified to reach net 100% renewable electricity apply to all three cities, the unique characteristics of each community present different challenges and opportunities on the pathway to clean energy.

Chapter 2 describes the communities' climate goals and greenhouse gas emissions targets, including inventories of greenhouse gas emissions in each community. This chapter outlines the current resource mix used to serve the communities' electricity needs and introduces the unique partnership that Salt Lake City, Park City, and Moab have formed with Rocky Mountain Power to procure renewable electricity.

Chapter 3 provides an overview of a portfolio of utility-scale and distributed energy resources that can contribute to meeting the cities' net 100% renewable electricity goals. A combination of energy efficiency, distributed solar, electric vehicles, and beneficial electrification can produce local clean energy, cut energy waste, improve grid flexibility, and deliver air quality and greenhouse gas emissions reduction benefits to the communities. Case studies highlight examples of innovative projects in Utah.

Chapter 4 presents the results of a statewide analysis for Utah that evaluates the role of distributed energy resources in the transition to a clean energy future. Energy efficiency, distributed solar, electric vehicles, and beneficial electrification are each considered and evaluated for their potential to reduce community energy usage, provide clean energy, and reduce greenhouse gas emissions. The

analysis demonstrates that while distributed energy resources play an important role, utility-scale resources will serve as a foundational resource to meet the cities' renewable energy goals.

Chapter 5 presents action items and strategies to leverage distributed energy resources to enable continued integration of new utility-scale renewable energy resources at a lower cost. Local governments, the utility, residents, and businesses all have a role to play in the transition to net 100% renewable electricity. The action items outlined in this chapter describe strategies to spur continued growth of distributed energy resources and leverage their capabilities to improve demand flexibility, accelerating and improving the affordability of the transition to renewable energy.

Chapter 1

Community Characteristics and Energy Usage

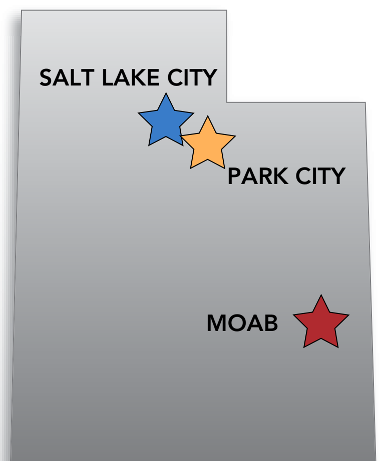
Salt Lake City, Park City, and Moab are the first three communities in Utah to set a goal of net 100% renewable electricity community-wide

Salt Lake City, Park City, and Moab are known around the world for their famed ski resorts, stunning red rock vistas, and as the home of the 2002 winter Olympics. From a metropolitan capital, to mining towns turned ski towns and mountain bike meccas, these three diverse communities share a common goal:

Achieve net 100% annual renewable electricity for the entire community by 2030.

Further, each city has also set a goal to achieve significant greenhouse gas (GHG) emissions reductions:

- **Salt Lake City**
  50% GHG reduction community-wide by 2030 and 80% GHG reduction by 2040
- **Park City**
  Net-zero carbon emissions for municipal operations by 2022 and community-wide by 2030
- **Moab**
  50% GHG reduction for municipal operations by 2027 and community-wide by 2032; 80% GHG reduction community-wide by 2040



The diverse demographic and geographic characteristics of Salt Lake City, Park City, and Moab will result in unique pathways to a clean energy future for each community

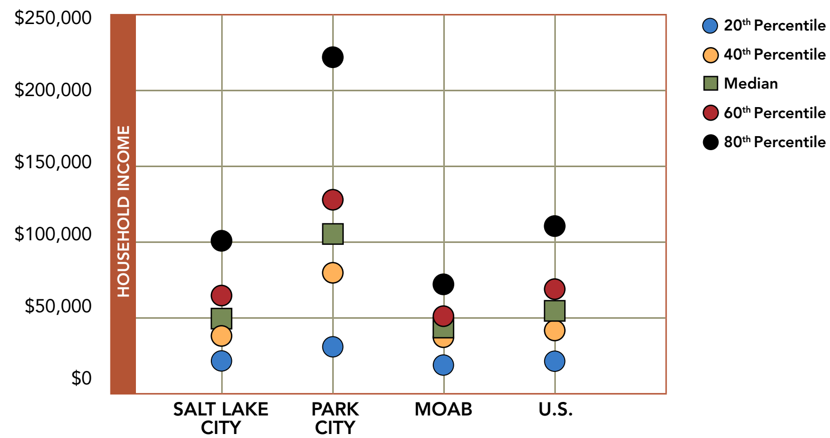
To achieve net 100% renewable electricity by 2030, each community must adopt strategies that are feasible, result in meaningful progress, and maintain the affordability of energy for residents and businesses. The demographic makeup of each community will determine which strategies are most effective and impactful to achieve community energy goals. The economic characteristics of each community are indicative of the capacity that residents and businesses have to lead the clean energy transition, and should also inform the creation of an action plan to mitigate costs for low-income residents or vulnerable populations.

Salt Lake City, the state capital, is a city of 200,000 and the hub of the Wasatch Front metropolitan area, itself home to 2 million people (85% of Utah's population). Proudly boasting "the Greatest Snow on Earth," Salt Lake City hosted the 2002 Winter Olympics. In recent years, Salt Lake City has experienced major growth in industries including healthcare and information technology.

Just 30 minutes away, Park City is nestled high in the mountains at 7,000 feet above sea level. Once a mining town, Park City is now home to two major ski resorts, and hosts over 75 special events (including the Sundance Film Festival) and over 3 million visitors each year.

Moab is located in southeastern Utah and at the entrance to Arches and Canyonlands National Parks. An estimated 1 million tourists visit Moab each year to take in scenic red rock canyons, explore a vast network of mountain bike and jeep trails, and partake in recreational activities from rafting to base jumping.

Figure 1: Income Distribution



Statistical Atlas. *Household Income in the United States.*
Based on data from the 2012-2016 American Community Survey.
https://statisticalatlas.com/United-States/Overview

	POPULATION	HOUSEHOLDS
Salt Lake City	**200,591**	**75,430**
Park City	**8,504**	**3,407**
Moab	**5,322**	**1,953**

U.S. Census Bureau. *QuickFacts*, Population Estimates, July 1 2018.
https://www.census.gov/quickfacts/fact/table/US/PST045218

Figure 2a: 2018 Total Community Energy Use

Figure 2b: 2018 Electricity Use by Sector

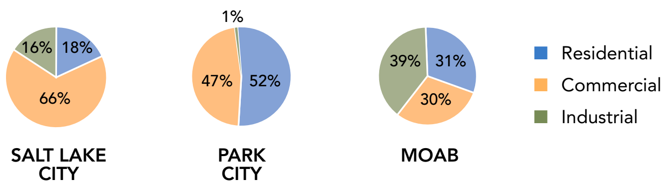
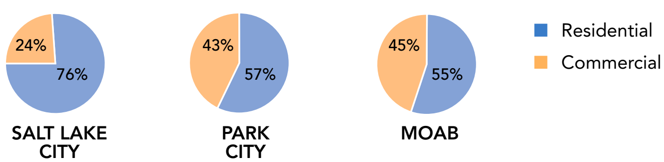


Figure 2c: 2018 Natural Gas Use by Sector



Utah community electricity data: Rocky Mountain Power
Utah community natural gas data: Dominion Energy

Community Energy Use by End-Use Sector

When considering strategies to achieve net 100% renewable electricity, identifying the end-use sectors responsible for electricity usage is key to target the biggest opportunities to improve energy efficiency and drive adoption of distributed energy resources.

Although the communities' energy goals specifically address electricity, in order to achieve their greenhouse gas emissions reductions goals, the cities will have to address carbon emissions due to natural gas usage in addition to electricity usage. Natural gas use by homes, businesses, and industry is responsible for 20% of greenhouse gas emissions in Utah.

Key takeaways:

- **Over two-thirds of electricity usage in Salt Lake City is attributable to commercial customers.**
- **More than half of Park City's electricity is used by the residential sector.**
- **Restaurants and bars, food and beverage stores, the hospital, overnight rentals, and tour companies are the largest energy consuming sectors in Moab.**

Community Residential Energy Use

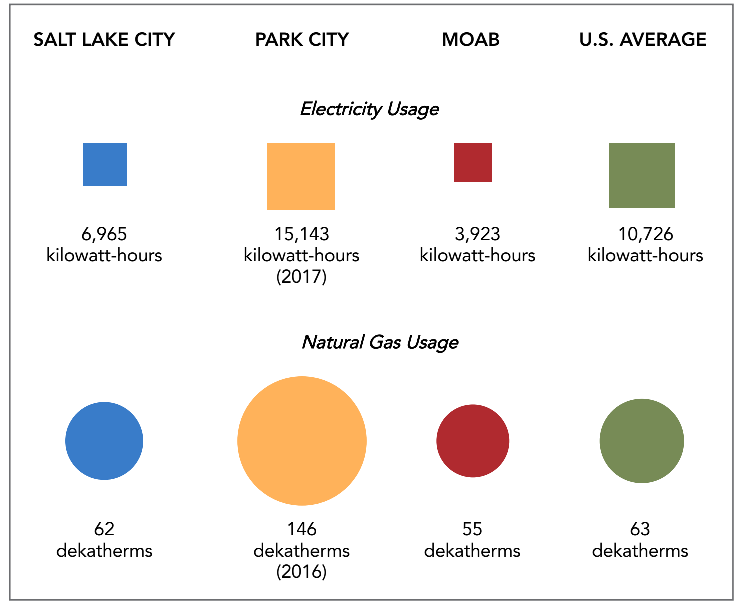
Many of the strategies in this Roadmap focus on opportunities to drive adoption of distributed energy resources or improve energy efficiency in the residential sector. Improving the efficiency of existing homes reduces overall energy consumption, helps residents save money on monthly utility expenses, and improves local air quality by reducing local use of natural gas space and water heaters. A detailed understanding of the characteristics of existing housing stock is important to prioritize strategies to drive energy efficiency and adoption of distributed energy resources. For example, the strategies that are most effective for reducing energy usage at multi-family high-rises in Salt Lake City may be less applicable to homes in Moab, and the opportunities to address energy usage in new construction are very different from the challenge of retrofitting existing homes and buildings.

As a key next step, Salt Lake City is evaluating the potential energy and cost savings from electrifying heating systems in buildings through the Building Electrification Initiative. A final report will be available in late 2019 and will include recommendations for effective implementation of highly efficient electric heating technologies in Salt Lake City, based on a detailed assessment of housing stock.

Key takeaways:

- **Park City homes have higher than average per-household energy usage, whereas homes in Moab use less than half as much electricity as the national average.**
- **Housing density is increasing in Salt Lake City and the majority of new construction is multi-family housing, but the city's housing is largely composed of single-family homes many of which are 100 years old or more.**
- **All three communities are experiencing growth, creating opportunities to ensure that new homes and buildings are built to ultra-efficient standards.**

Figure 3: 2018 Annual Average Household Residential Energy Use



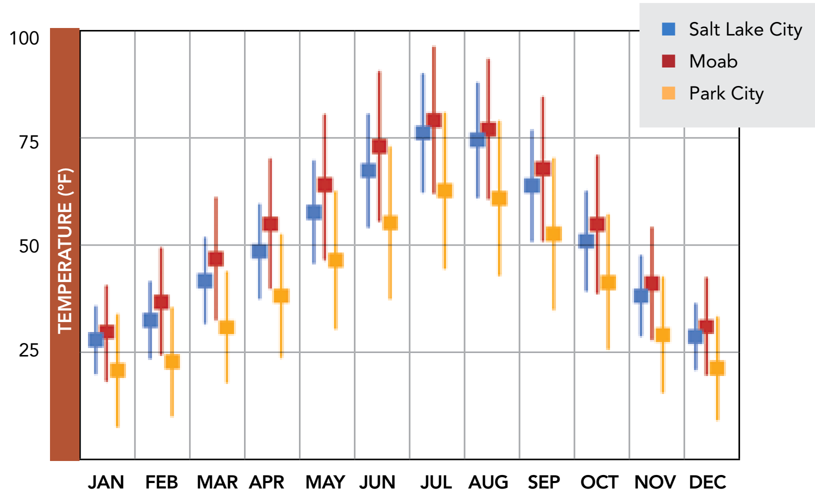
Utah community electricity data: Rocky Mountain Power
Utah community natural gas data: Dominion Energy

Energy Information Administration. *2015 Residential Energy Consumption Survey Data, Table CE2.1.* *https://www.eia.gov/consumption/residential/data/2009/index.php?view=consumption*

American Gas Association. *Table 6-13 Gas Industry Average Annual Consumption Per Customer by Class of Service.* *https://www.aga.org/contentassets/6894914d95e6467fae106015cbcb2abc/table6-2.pdf*

Community Residential Building Characteristics

Figure 4: Average Monthly Temperature, 1981 - 2010



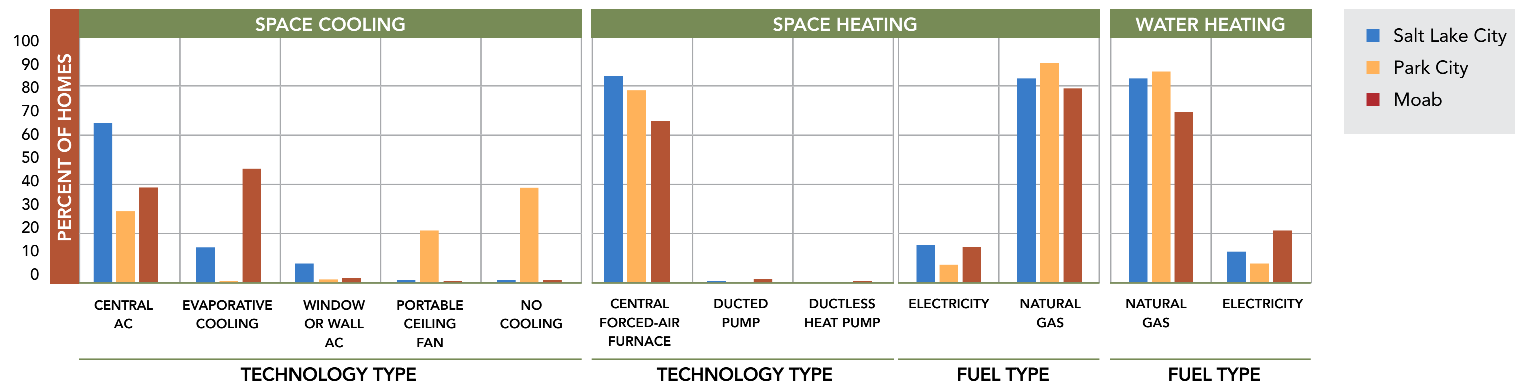
National Oceanic and Atmospheric Administration. *NOWData – NOAA Online Weather Data*. Average from 1981 – 2010. *https://w2.weather.gov/climate/xmacis.php?wfo=slc*

The opportunities for each city to pursue renewable energy and greenhouse gas emissions reductions are based on the characteristics of existing homes and buildings, which are driven by each city's unique climate.

Key takeaways:

- **79– 89% of homes use natural gas for space heating**
- **70 – 86% of homes use natural gas for hot water**
- **60% of Park City residents have space cooling, compared to 98% of Salt Lake City and Moab residents**
- **Adoption of heat pumps is currently very low, at 2 - 4%**

Figure 5: Residential Space Heating, Space Cooling, and Water Heating by Technology and Fuel Type



Residential Customer Survey. Rocky Mountain Power.

Chapter 2

Community Energy Goals and Current Resource Mix

The cities' renewable electricity targets are driven by their goal to significantly reduce greenhouse gas emissions in their communities. Electricity is responsible for 40% of greenhouse gas emissions in Utah, and so a transition to net 100% annual renewable electricity is a critical first step to achieve the communities' climate goals

Figure 6a: Utah Greenhouse Gas Emission by Sector

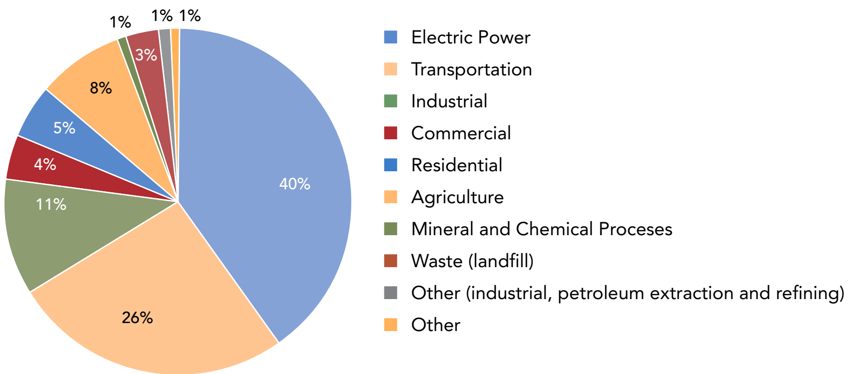
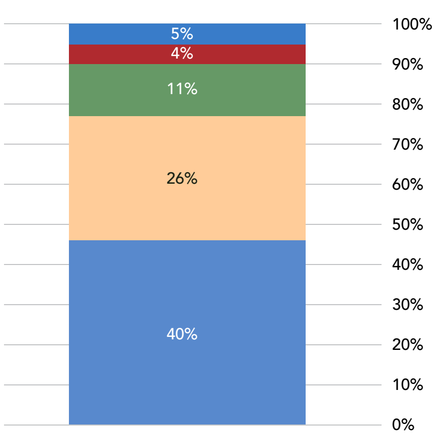


Figure 6b: Utah Greenhouse Gas Emission from Electricity, Natural Gas, and Gasoline - MMBtu



Utah consumers benefit from the nation's9th most affordable electricity prices, and yet Utah's electricity resource mix is the 6th most carbon-intensive in the country[1]. A transition to renewable energy in the electricity sector is key to meaningfully reduce greenhouse gas emissions while maintaining the low-cost and reliable energy Utahns have come to rely on. The next largest category of greenhouse gas emissions in Utah is transportation (26%), followed by natural gas use in homes, commercial buildings, and industry (20% total). For this reason, electric vehicles and the beneficial electrification of space and water heating in homes and businesses will also play an important role to achieve the cities' greenhouse gas emissions goals.

Data includes all emissions from power generation within Utah, including emissions from power generated locally that is exported for use in another state.

Emissions due to non-combustion sources (agriculture, mineral and chemical processes, waste, and other) are derived from the EPA Facility-Level Information on Greenhouse Gases Tool (2017) and USDA (2013) reports on non-combustion sources. Emissions due to combustion sources are derived from U.S. Energy Information Administration (2016) reports on combustion sources.

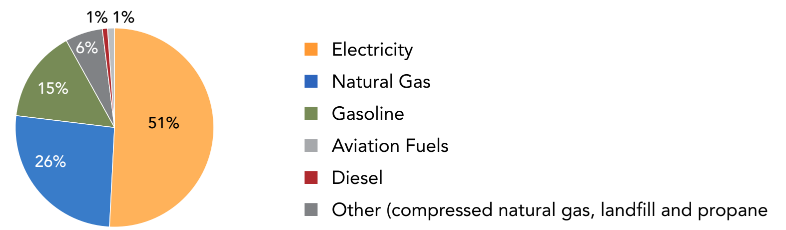
Level Information on Greenhouse Gases Tool (2017) and USDA (2013) reports on non-combustion sources. Emissions due to combustion sources are derived from U.S. Energy Information Administration (2016) reports on combustion

[1] U.S. Energy Information Administration. *Electric Power Annual, Table 2.10 Average price of electricity to ultimate customers by end-use sector, by state.* https://www.eia.gov/electricity/annual/ U.S. Energy Information Administration. *How much carbon dioxide is produced per kilowatt-hour of U.S. electricity generation?* https://www.eia.gov/tools/faqs/faq.php?id=74&t=11

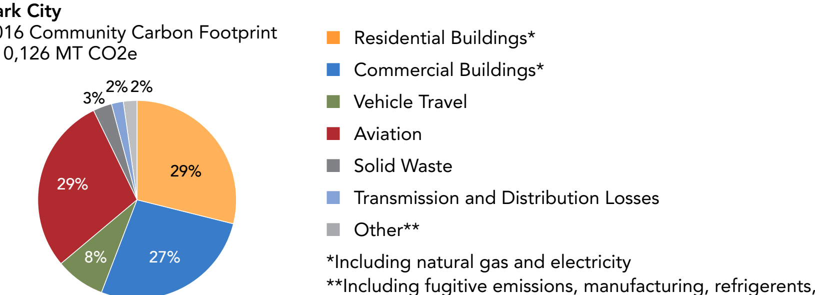
Salt Lake City, Park City, and the City of Moab have each identified a benchmark year for their carbon emissions reductions goals and created an inventory of their community-specific carbon footprint

Figure 7: Community Carbon Footprint - Greenhouse Gas Emissions Inventories

Salt Lake City
2015 Community Carbon Footprint
4,768,171 MT CO2e



Park City
2016 Community Carbon Footprint
510,126 MT CO2e



*Including natural gas and electricity
**Including fugitive emissions, manufacturing, refrigerents, wastewater, other fuel (non-road), agriculture

Moab
2016 Community Carbon Footprint
420,863 MT CO2e

* Vehicle travel includes vehicles driving through town

Salt Lake City and Moab will need to reduce greenhouse gas emissions by an average of 3% to 4% per year to achieve their goals; Park City's goal to achieve net-zero carbon emissions by 2030 requires an average annual 7.1% reduction of carbon emissions

ANNUAL GHG REDUCTION

Salt Lake City

50% GHG reduction community-wide by 2030	3.8 % per year
80% GHG reduction community-wide by 2040	3.0 % per year

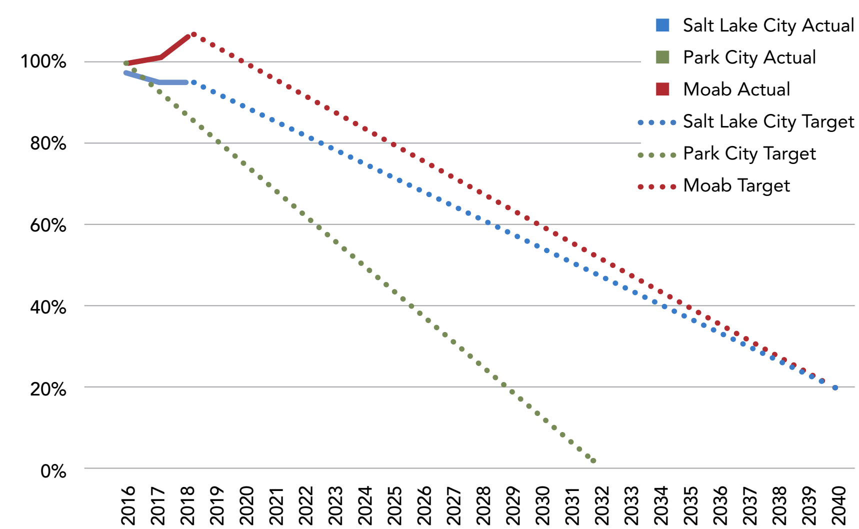
Park City

Net-zero CO_2 emissions community-wide by 2030	7.1% per year
Net-zero CO_2 emissions for municipal operations by 2022	

Moab

50% GHG reduction community-wide by 2032	4.0% per year
80% GHG reduction community-wide by 2040	3.7% per year
50% GHG reduction for municipal operations by 2027	

Figure 8. Greenhouse Gas Emissions Reductions (% of Baseline)



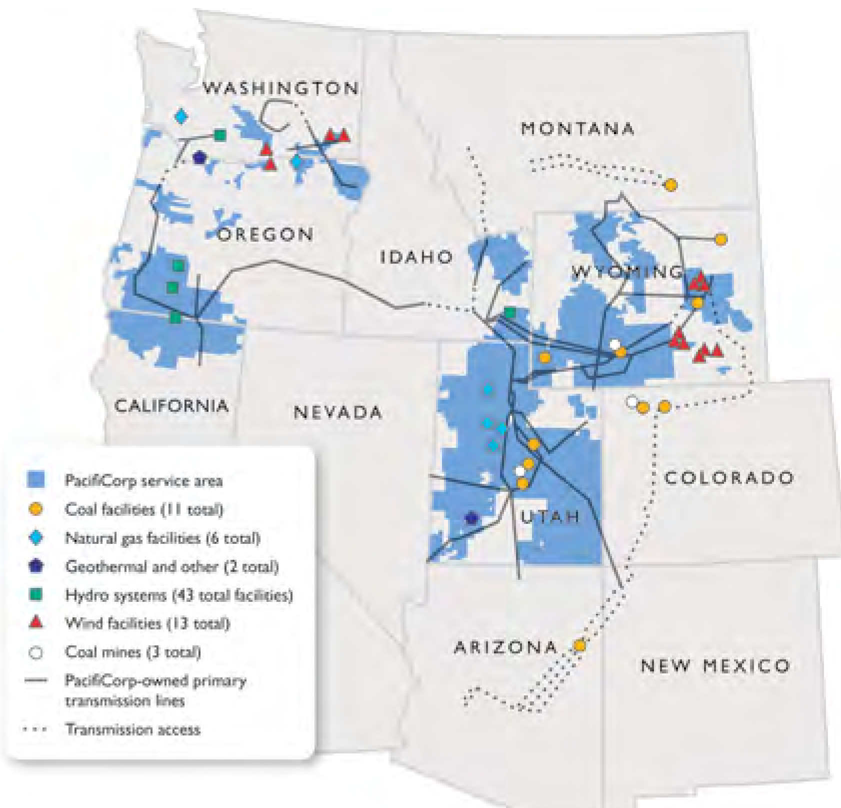
Salt Lake City, Park City, and the city of Moab are working with Rocky Mountain Power to accomplish their community renewable energy goals

Salt Lake City, Park City, and the City of Moab are all served by the investor-owned electric utility PacifiCorp, a subsidiary of Berkshire Hathaway doing business in Utah as Rocky Mountain Power. All homes, businesses, and government facilities in the three communities are served by Rocky Mountain Power, making utility partnership essential for the cities to meet their renewable electricity goals.

In 2016, the cities began working with Rocky Mountain Power to develop a framework for a city-utility partnership. Each city has since signed a Joint Clean Energy Cooperation Statement[1] with the utility, committing to work together towards the cities' clean energy goals. This partnership creates a pathway to allow the cities to diverge from Rocky Mountain Power's "business as usual" resource mix in order achieve net 100% renewable electricity by 2030.

As an initial step towards achieving their goals, Salt Lake City, Park City, and Moab have already installed rooftop solar and committed to advancing energy efficiency for city-owned buildings and facilities. Additionally, Salt Lake City and Park City are currently working with Rocky Mountain Power to procure utility-scale renewable energy resources to offset municipal energy usage

Figure 9. PacifiCorp Service Territory



City of Moab & Rocky Mountain Power. *Joint Clean Energy Cooperation Statement.* December 2018. *https://moabcity.org/DocumentCenter/View/2103/57-2018?bidId=*

United States Securities & Exchange Commission. *PacifiCorp Form 10-K.* Fiscal Year 2014. Page 8. *https://www.sec.gov/Archives/edgar/data/75594/000007559415000003/pacificorp123114form10-k.htm*

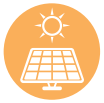
[1] Salt Lake City Corporation & Rocky Mountain Power. *Joint Clean Energy Cooperation Statement.* August 2016. *http://www.slcdocs.com/slcgreen/Climate%20&%20Energy/CooperationStatement.pdf*

Salt Lake City, Park City, and Moab are currently served by 16% renewable resources as a part of the PacifiCorp system, including wind, solar and geothermal energy

As of 2019, the cities are served by a proportional mix of PacifiCorp's total resource portfolio, which is markedly different than generation originating from Utah energy resources alone. In 2018, PacifiCorp's resource mix consisted of 7% hydropower and 16% wind, solar, and geothermal resources. PacifiCorp's 20-year resource plan calls for investments in additional renewable energy resources that will result in a cleaner electricity mix, but the scale and pace of PacifiCorp's transition is not sufficient to meet the cities' clean electricity goals by 2030. Working together with Rocky Mountain Power, the cities plan to diverge from PacifiCorp's "business as usual" resource mix in order to allow their communities' to achieve net 100% renewable electricity by 2030.

PacifiCorp projected system renewable energy additions through 2030

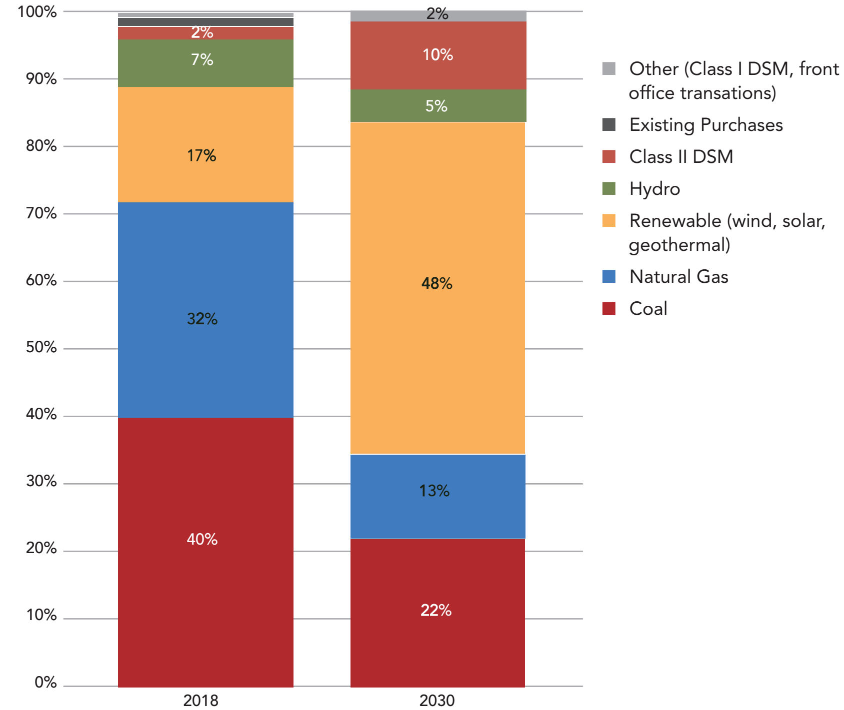
Wind
+ 3,000 MW



Solar
+ 3,200 MW

Storage
+ 1,500

Figure 10. PacifiCorp System Energy Mix, 2020 and 2030



PacifiCorp. *2019 Integrated Resource Plan*. October 18, 2019. Figure 8.44, page 257. *https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2019_IRP_Volume_I.pdf*

The Community Renewable Energy Act creates a pathway to accomplish the cities' net 100% renewable electricity goals

The Community Renewable Energy Act[1], passed in 2019, allows Utah communities served by Rocky Mountain Power to work with the utility to procure new renewable energy resources for their communities. Any local jurisdiction in Utah may opt-in to join the Community Renewable Energy Program by passing a local resolution before December 31, 2019. Five local governments in Utah have passed resolutions to work towards the Community Renewable Energy Act goals: Salt Lake City, Park City, Moab, Summit County, and Cottonwood Heights.

The Utah Public Service Commission is currently developing rules for the Community Renewable Energy Program.[2] Next, the participating communities and Rocky Mountain Power will file an application to initiate the Community Renewable Energy Program. After receiving Commission approval for the Program, Rocky Mountain Power will work with the participating communities to develop renewable energy or demand-side resources sufficient to meet the communities' goals of net 100% renewable electricity by 2030.

[1] Community Renewable Energy Act, H.B. 411 (2019).
https://le.utah.gov/~2019/bills/static/HB0411.html

[2] Docket No. 19-R314-01. Proposed Rulemaking Concerning Utah Code Ann. §§ 54-17-901 to -909, Community Renewable Energy Act.
https://psc.utah.gov/2019/04/03/docket-no-19-r314-01/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Chapter 3

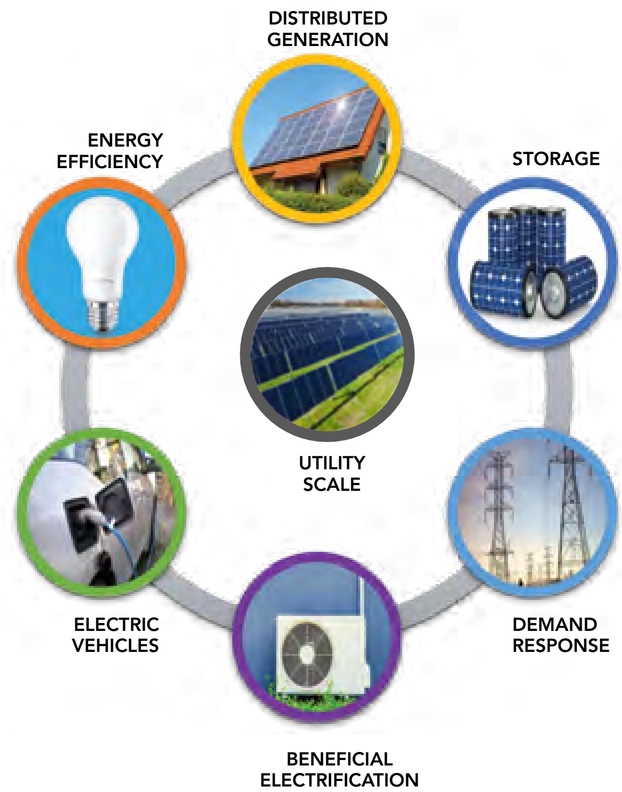
Resource Options

As the cities transition to net 100% renewable energy resources, a portfolio approach including both utility-scale and distributed energy resources can maximize the benefits of a clean energy future

Utility-scale resources will be essential to make the transition to net 100% renewable electricity by 2030, and Salt Lake City, Park City, and Moab are working with Rocky Mountain Power to procure utility-scale resources. As utility-scale solar grows, distributed energy resources can facilitate the grid flexibility needed to integrate even greater amounts of renewable energy across Utah and beyond. The cities can be good "grid citizens" by implementing distributed energy resources to provide grid benefits that enable the continued growth of utility-scale renewables.

Reliance on a portfolio of customer-side clean energy measures and technologies, in addition to utility-scale renewables, will enable the communities to leverage a wide variety of strategies to achieve their renewable energy goals while also maintaining reliability and affordability. Distributed energy resources sited locally in the community allow local residents and businesses to play an active role in a clean energy future and bring the benefits of clean energy home to their communities in the form of economic development, cost savings, and improved air quality.

Distributed Energy Resources



Distributed energy resources bring air quality, resiliency, and economic benefits home to the communities

Air quality

Energy use in homes and businesses is responsible for nearly 30% of air pollutants in Utah, and will become the single largest contributor to Utah air pollution by 2024. Vehicles are responsible for another 52%.[1] The adoption of electric vehicles and energy-efficient retrofits to electrify space and water heating in homes and buildings will both deliver immediate air quality benefits to local communities.

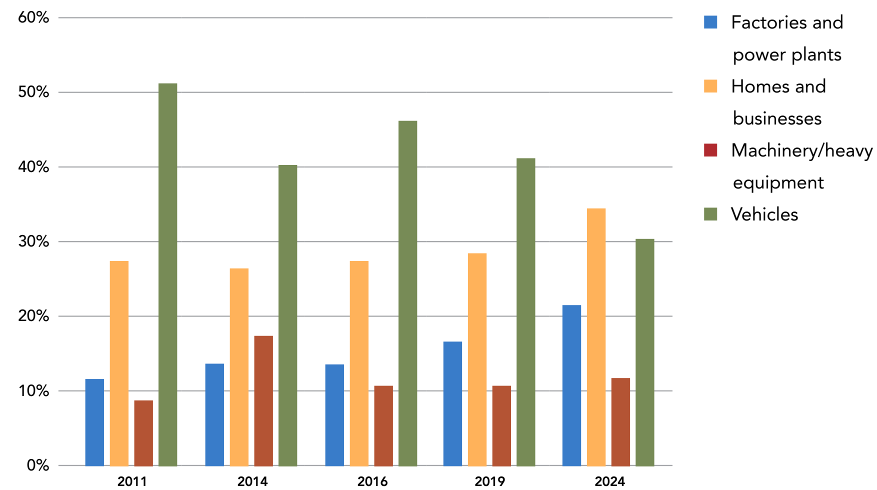
Resilience

When paired with energy storage, rooftop solar can be configured to provide emergency resiliency benefits by providing backup power when the grid is down. Solar and storage can be deployed at critical facilities to provide power for essential functions in the event of a blackout, or used to provide backup generation in conjunction with existing on-site generators, extending the life of the fuel stored for emergencies.

Jobs & Economic Development

Every $1 million invested in energy efficiency retrofits of homes and buildings creates 20 total jobs (including direct, indirect, and induced jobs)[2]. Adding 1 MW of distributed solar – enough to power about 167 homes – results in 38 full time jobs[3]. There are 31,798 energy efficiency[4] and 6,045 solar jobs in Utah as of 2018.

Figure 11. Contributors to Local Air Pollution Along the Wasatch Front



Source: Utah Division of Air Quality & Salt Lake Tribune. *Homes are a big part of Salt Lake City's air pollution problem. They also are the solution.* August 2019.

[1] Utah Division of Air Quality & Salt Lake Tribune. *Homes are a big part of Salt Lake City's air pollution problem. They also are the solution.* August 2019. *https://www.sltrib.com/news/environment/2019/08/26/homes-are-big-part-air/#gallery-carousel-4434589*

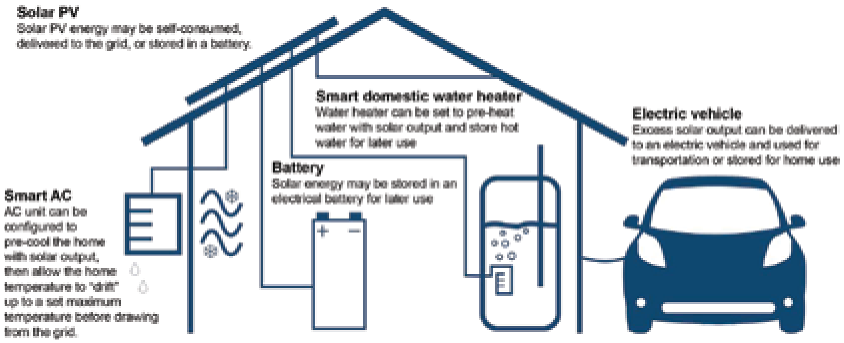
[2] American Council for an Energy-Efficient Economy. *Fact Sheet: How Does Energy Efficiency Create Jobs?* November 2011. *https://aceee.org/fact-sheet/ee-job-creation*

[3] National Renewable Energy Laboratory. *Jobs and Economic Development Impact Model (JEDI). https://www.nrel.gov/analysis/jedi/*

[4] National Association of State Energy Officials. *The 2019 U.S. Energy & Employment Report. https://www.usenergyjobs.org/*

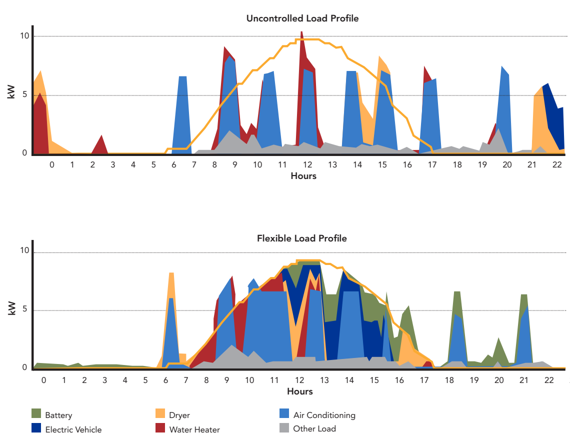
[5] The Solar Foundation. *Solar Jobs Census 2018: Utah. https://www.thesolarfoundation.org/solar-jobs-census/factsheet-2018-ut/*

Figure 12. Residential Opportunities for Demand Flexibility



Source: National Renewable Energy Laboratory. *Solar Plus: A Holistic Approach to Distributed PV.* May 2017. *https://www.nrel.gov/docs/fy17osti/68495.pdf*

Figure 13. Demand Flexibility Can Reshape Residential Energy Use



End-use customer technologies including batteries, electric vehicles, water heaters, air conditioning, and even dryers can provide demand flexibility to align energy usage with a typical solar generation profile, indicated by the yellow line.

Source: Rocky Mountain Institute. *Demand Flexibility: the Key to Enabling a Low-Cost, Low-Carbon Grid.* February 2018. *http://rmi.org/wp-content/uploads/2018/02/Insight_Brief_Demand_Flexibility_2018.pdf*

Distributed energy resources can be deployed to shift energy usage to times when low-cost renewable energy resources are available

Electric load-shifting, also called demand response or "demand flexibility," reduces the cost of the transition to a renewable energy future by shifting end-use customers' energy usage to align with generation from low-cost wind and solar resources. Demand flexibility can be used to reduce the amount of energy supply needed during peak load, the hours of the year when electricity demand is at its highest. Demand flexibility is an abundant and untapped resource: nearly 200 gigawatts of cost-effective load flexibility potential is available in the U.S. by 2030 – equivalent to 20% of peak load.[1]

[1] The Brattle Group. *The National Potential for Load Flexibility.* June 2019. *https://brattlefiles.blob.core.windows.net/files/16639_national_potential_for_load_flexibility_-_final.pdf*

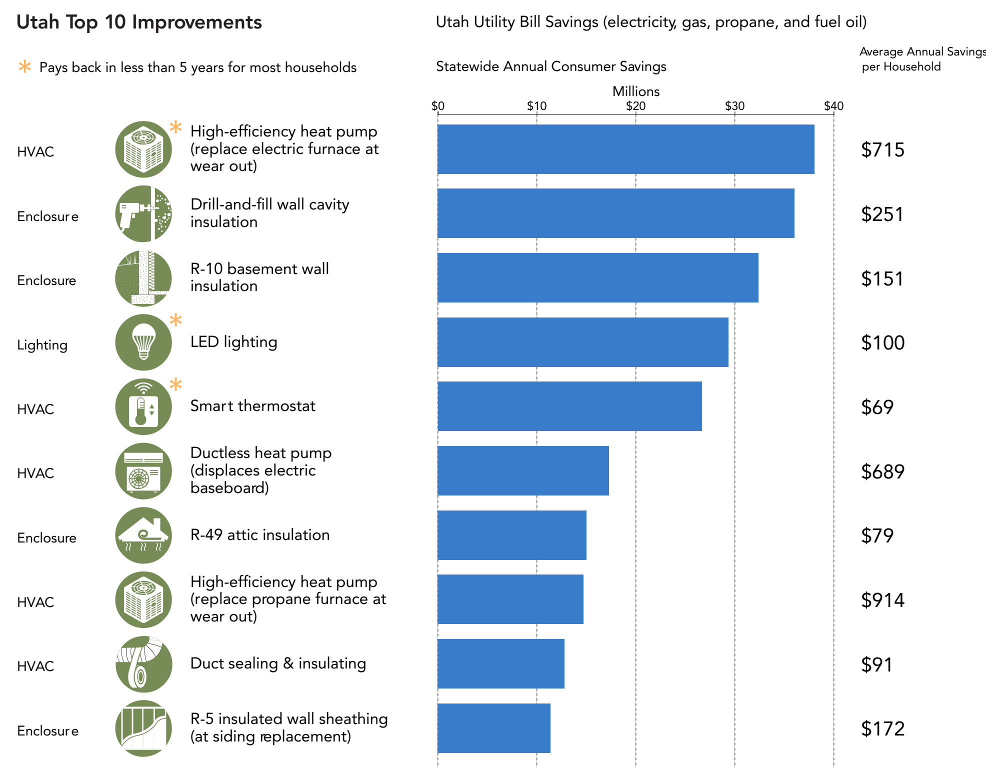
[2] Rocky Mountain Institute. *The Economics of Demand Flexibility: How "Flexiwatts" Create Quantifiable Value for Customers and the Grid.* August 2015. *https://rmi.org/insight/the-economics-of-demand-flexibility-how-flexiwatts-create-quantifiable-value-for-customers-and-the-grid/*

Energy Efficiency: Improvements and demand-side management can save residents and businesses money on their utility bills, reduce the need to procure new energy resources, and directly improve air quality

Energy efficiency includes improvements that reduce energy waste at homes and businesses, improve demand flexibility, and save consumers money.

Deep energy efficiency improvements in existing homes and buildings, designed to save 30 - 50% or more of the energy used onsite, are essential to meet the cities' carbon reduction goals. Deep energy efficiency retrofits are especially important to mitigate energy waste as electric load increases due to electrification. Deep energy efficiency retrofits also result in air quality benefits by limiting precursor emissions, especially nitrogen oxide emissions from natural gas space and water heating. Coupling building shell efficiency improvements with the growth of electrification improves the cost-effectiveness of investments in electrification measures.

Figure 14. The Ten Largest Opportunities for Total Utility Bill Savings for Homeowners in Utah



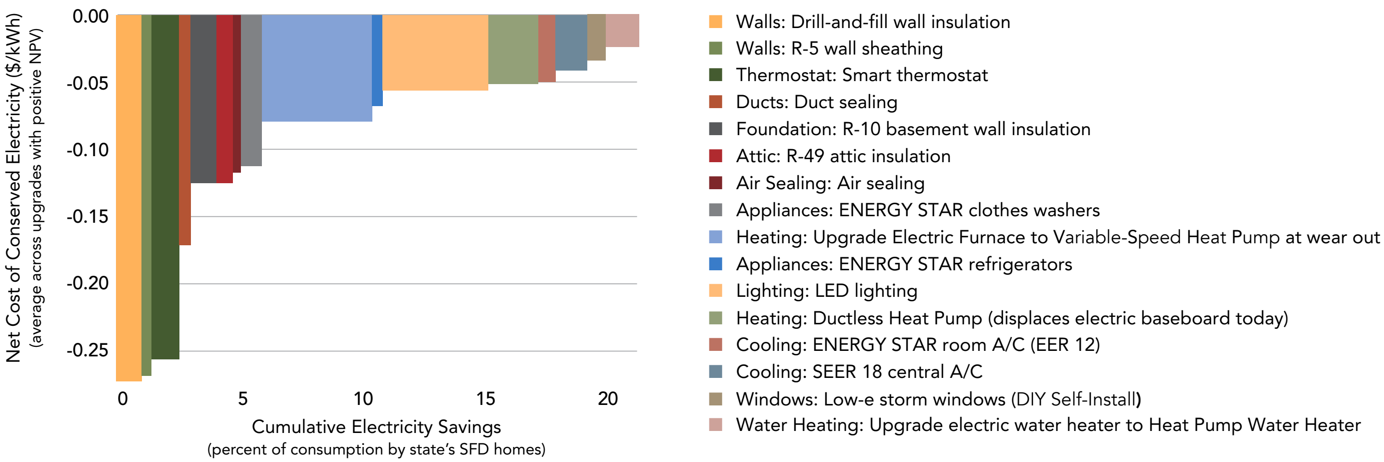
National Renewable Energy Laboratory. *Energy Efficiency Potential in the U.S. Single-Family Housing Stock.* *https://www.nrel.gov/docs/fy18osti/68670.pdf*

National Renewable Energy Laboratory. *ResStock State Fact Sheet: Utah.* *https://resstock.nrel.gov/factsheets/UT*

Energy Efficiency: Cost-effective energy efficiency upgrades would lower average utility bills for Utah households by $343 annually

Figure 15 presents a breakdown of 16 residential energy efficiency measures that result in net cost savings including the cost of implementing the upgrade and the benefit from electricity, gas, propane, and oil bill savings. A negative net cost indicates that the measure is cost-effective and will result in savings for homeowners. The width of each block illustrates the amount of energy that could be saved. Put simply, tall blocks are the most cost-effective to implement, and the wider blocks show measures that result in the greatest overall energy savings over the lifetime of each measure.

Figure 15. Electric Efficiency Supply Curve for Utah



National Renewable Energy Laboratory. *RessStock State Fact Sheet: Utah.* *https://resstock.nrel.gov/factsheets/UT*
National Renewable Energy Laboratory. *Energy Efficiency Potential in the U.S. Single-Family Housing Stock.* *https://www.nrel.gov/docs/fy18osti/68670.pdf*

Cost-effective package savings potential in Utah single-family homes

231.3 million dollars per year utility bill savings

8.6 trillion Btu per year gas, propane, and fuel oil savings

1.2 billion kWh per year electricity savings

296,986 cars of pollution reduction

Energy Efficiency Case Study: Salt Lake City recently completed construction of the first and second net-zero fire stations in the U.S.

Salt Lake City Fire Stations number 3 and 14 were completed in 2018. Both buildings were designed to produce as much energy as they consume on an annual basis. Each fire station relies on a variety of energy efficient design features to minimize energy usage, including passive solar to maximize natural daylight, triple-paned windows, ground source geothermal heat pumps, and fast-acting, energy efficient fire truck bay doors. The fire stations are 5 times more energy efficient than the typical fire station. A 110 kilowatt solar array on each building produces enough energy to offset the fire station's annual energy usage. The fire stations are also designed to use 20% less water for plumbing and 50% less water for landscaping compared to the typical baseline.

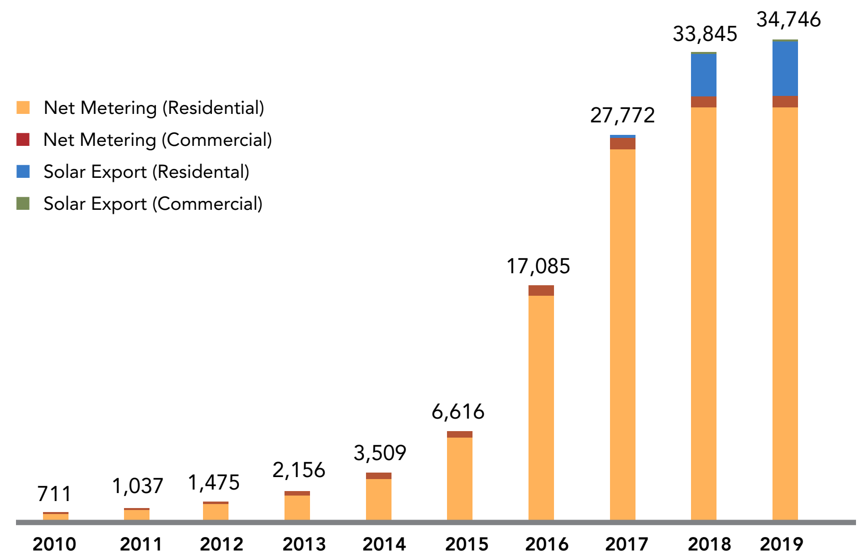
More information: ***Salt Lake City Sustainability Department, Salt Lake City Opens the First Net Zero Fire Station in the Country.*** **May 2018.** *https://slcgreenblog.com/2018/05/30/salt-lake-city-opens-the-first-net-zero-fire-station-in-the-country/*

Firehouse. Salt Lake City, UT, Station #14. November, 2018.
https://www.firehouse.com/stations/article/21076433/unplug-your-next-fire-station-salt-lake-city-ut-net-zero-energy#&gid=1&pid=2

Distributed Generation: Utah is one of the sunniest states in the country, and as the cost of solar technology has fallen, the number of homes and businesses with rooftop solar has grown

Utah has abundant solar energy resources, and growth in the rooftop and utility-scale solar markets has made Utah a top 10 state for solar energy generation. Distributed generation also brings benefits home to the community, allowing residents and businesses to lock in long-term savings on their utility bills and lower their carbon footprint. When paired with energy storage, distributed generation can also be used to improve the affordability of a transition to net 100% renewable electricity by shifting energy usage to better align with the availability of renewable resources. The majority of rooftop solar growth in the state has been in the residential sector, where investments in rooftop solar deliver energy bill savings and rate stability. Despite abundant roof space on commercial and industrial buildings, existing rate structures limit the cost-effectiveness of rooftop solar for these market segments. As of March 2019 there are 31,000 homes with rooftop solar in Utah, but just 3,800 businesses.

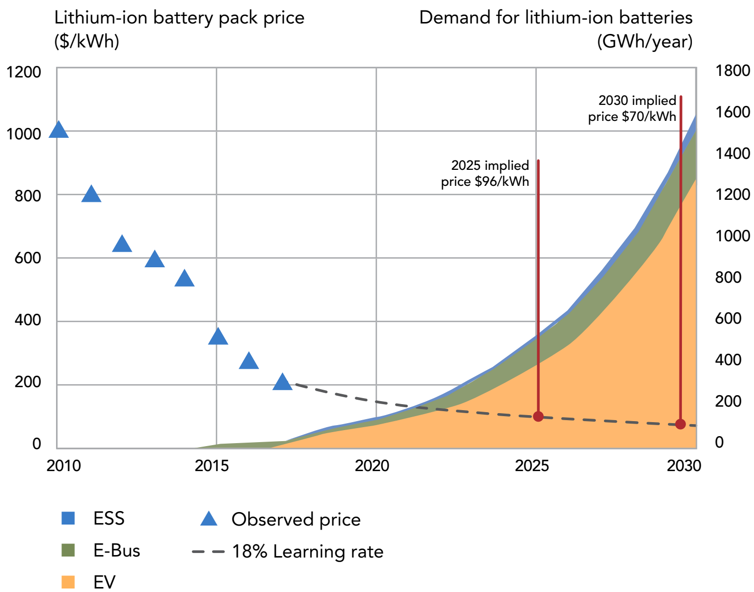
Figure 16. Homes & Businesses in Utah with Rooftop Solar Through March 2019



Rocky Mountain Power. *2018 Customer Owned Generation and Net Metering Report*. July 2019. *https://psc.utah.gov/2019/07/01/docket-no-19-035-29/*

Energy Storage: Energy storage will play a critical role in the transition to renewable energy, including utility-scale energy storage and customer-sited batteries. In both cases, energy storage provides grid services to facilitate integration of greater amounts of renewable energy

Figure 17. Lithium-ion Battery Pack Price Forecast



Source: Utah Division of Air Quality & Salt Lake Tribune. *Homes are a big part of Salt Lake City's air pollution problem. They also are the solution.* August 2019.

Energy storage can provide energy to meet peak load, provide ramping to integrate renewable energy resources, and voltage regulation to improve power quality. When located on the customer side of the meter and paired with rooftop solar, battery storage can also improve community resiliency by providing emergency backup power for homes, businesses, or critical facilities.

Energy storage comes in many forms, including a variety of battery chemistries. Lithium ion batteries are commonly used for both distributed and utility-scale energy storage. Flow batteries and pumped hydro energy storage are suitable for utility-scale storage. The cost of lithium ion batteries has plunged, falling 76% since 2012.[1] In utility-scale applications, batteries co-located with wind or solar can provide energy on demand. Lithium ion batteries paired with solar have become cost-competitive with fossil fuel resources in several markets in the U.S.

[1] Bloomberg New Energy Finance. *Electric Buses in Cities.* March 2018. *https://about.bnef.com/blog/electric-buses-cities-driving-towards-cleaner-air-lower-co2/*

Energy Storage Case Study: Soleil Lofts, a 600 unit apartment building complex in Herriman, Utah is equipped with solar and battery storage that can be operated by the utility, allowing the apartments to serve as a “virtual power plant”

Soleil Lofts is an all-electric, net-zero apartment community that features distributed solar located on the rooftop and on parking structures. Each apartment is also equipped with a Sonnen lithium-ion phosphate battery, totaling 5 megawatts of battery capacity and 12.6 megawatt-hours of capacity across the community.

Rocky Mountain Power has partnered with the project developer, Wasatch Group, to pilot utility management of the fleet of batteries. This innovative project will allow the utility to call on the fleet of solar and storage to manage daily peak demand and improve overall grid efficiencies, demonstrating the potential for an aggregated fleet of small distributed energy resources to provide grid-level benefits. In the event of a grid outage, the residents of Soleil Lofts can use the solar and storage to provide onsite emergency power. Soleil Lofts also offers 150 electric vehicle charging stations for residents.

Beneficial Electrification: Electrified space and water heating equipment can be combined with control and communications technologies to shift energy usage to times of day when renewable energy is available, providing demand flexibility and lowing costs for individual customers and for the grid. Electrification can be considered beneficial when it saves consumers money on their bills, improves management of the grid, or results in cleaner electricity generation. When combined with more renewable energy resources, beneficial electrification can be a "win-win-win" for customers, utilities, and the environment

Air source heat pumps are an energy-efficient alternative to both furnaces and air conditioners, resulting in fewer greenhouse gas emissions, especially when powered by renewable energy. Heat pumps are especially cost-effective in new construction or when used to replace both conventional heating and cooling at the same time. Air source heat pumps designed specifically for cold weather climates can perform at temperatures as low as -12 F, and dual-fuel heat pumps combine a heat pump with a gas furnace to provide highly efficient heating and cooling even on the coldest winter days. Air source heat pumps are available for homes with central ducting, or in ductless versions (known as a mini-split heat pump).

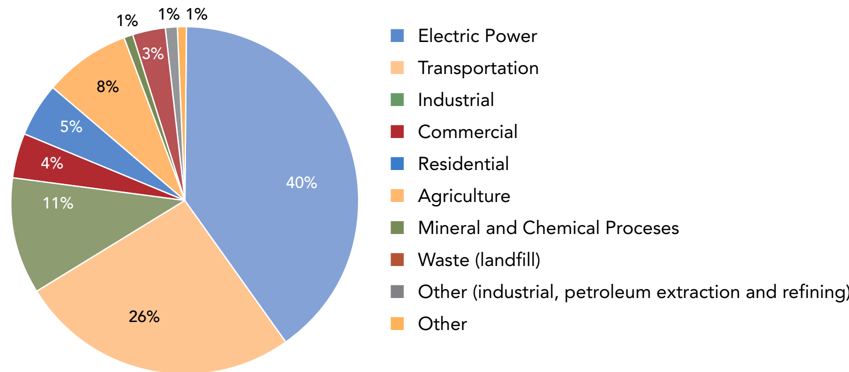
Controllable electric water heaters can shift energy use to times when low-cost renewable energy resources are available without impacting customer comfort. Controllable electric hot water heaters can "superheat" the water tank during the day, when solar energy is abundant, so that customers can return home to hot water without increasing evening peak energy usage.

Geothermal heat pumps, also known as ground-source heat pumps, transfer energy to or from the ground to heat or cool a home. Geothermal heat pumps require heat exchangers to be buried in the ground in trenches, and so are more practical for new construction.

Electric Vehicles: Electric vehicles and plug-in hybrid electric vehicles have reduced or zero tailpipe emissions, and result in overall reductions in greenhouse gas emissions when powered with renewable energy

Transportation is responsible for 26% of greenhouse gas emissions in Utah and 48% of air pollution the Salt Lake City metropolitan area, so electric vehicles (charged with renewable energy) represent an important opportunity to reduce greenhouse gas emissions by up to a quarter[1]. As of the start of 2019, less than half a percent of all light-duty vehicles in Utah were electric[2]. The growth of new vehicle models with longer ranges will spur accelerated adoption. Analysis in Chapter 4 evaluates forecasts of light-duty electric vehicles ranging from 7 - 20% of all vehicles on the road by 2030.

Figure 6a: Utah Greenhouse Gas Emission by Sector



The growth of electric vehicles has the potential to significantly increase electricity usage, and could increase peak energy usage as people return home in the evening and plug in their vehicle. Controlled electric vehicle charging and careful design of electricity rates is essential to promote charging strategies that balance customer needs with grid impacts. When developing and siting new charging stations, strategies to improve the flexibility and controllability of charging loads can help to improve affordability both for end-use customers and for new grid infrastructure to support electric vehicle charging.

[1] Energy Information Administration, 2016. See slide 17.

[2] Auto Alliance. *Advanced Technology Vehicle Sales Dashboard.* *https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/*

[3] Edison Electric Institute. *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030.* November 2018. *https://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20EV%20Forecast%20Report_Nov2018.pdf*

[4] National Renewable Energy Laboratory. *National PEV Infrastructure Analysis.* DOE/GO-102017-5040. September 2017. *https://www.nrel.gov/docs/fy17osti/69031.pdf*

Electric Vehicles Case Study: Electric transit buses on the road in Park City and Salt Lake City pave the way for pollution-free transportation

Vehicle transportation is responsible for 8% of Park City and 16% of Salt Lake City's greenhouse gas emissions, so electrified transit is a critical opportunity to reduce greenhouse gas emissions.

Park City has already replaced 13 diesel buses with electric models made by Proterra – 30% of the city's total fleet – and plans to fully electrify the rest of the fleet. The Utah Transit Authority and the University of Utah recently put five New Flyer electric buses on the road in Salt Lake City.

The first round of electric buses deployed in 2017 could travel 40 miles on a single charge, and the newest Proterra bus models on the road in Park City offer 250 miles of range per charge on a 425 kilowatt battery. The carbon footprint of electric buses is 20% lower than a diesel bus, even with the current electricity mix.[1]

Benefits of the new electric buses go beyond greenhouse gas emissions reductions: all-electric buses are quiet and produce no exhaust. Electric buses offer significant operational savings: the cost of charging is approximately half the cost of fuel for a traditional diesel bus.

[1] Deseret News. Op-ed: *Park City paves the way for electric city buses and cleaner air.* (Feb 2018).
https://www.deseret.com/2018/2/2/20639337/op-ed-park-city-paves-the-way-for-electric-city-buses-and-cleaner-air

Photo: Visit Park City

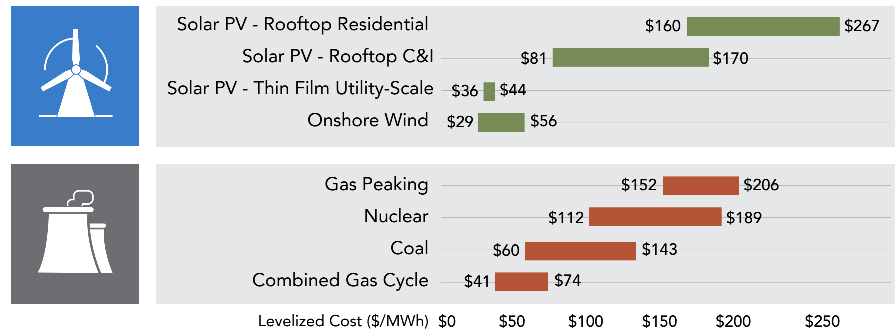
Utility-Scale Resources: The cost of utility-scale renewable energy resources is lower than ever before, driving increased deployment of wind and solar. As these renewable resources make up a larger portion of electricity generation, there will be a need for improved demand flexibility to align energy usage with wind and solar resources

Large utility-scale renewable energy projects will serve as the foundation of the communities' transition to renewable energy resources, even with ambitious investments in distributed energy resources.

Utility-scale renewable energy resources leverage economics of scale to generate power and deliver it to the grid more affordably, and the cost of utility-scale wind, solar, and batteries is lower than ever before. In fact, wind and solar energy are now among the most affordable sources of energy available: the cost of wind has dropped 49% and the cost of solar has dropped 85% since 2010.[1]

As the cities work with Rocky Mountain Power to procure utility-scale renewable energy, demand flexibility will facilitate the continued cost-effective integration of additional wind and solar resources.

Figure 18. Levelized Cost of Utility-Scale Energy Resources, Without Subsidies



Lazard. *Lazard's Levelized Cost of Storage Analysis, Version 4.0*. November 2018.
https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2018/

Bloomberg New Energy Finance. *New Energy Outlook 2019*. June 2019.
https://about.bnef.com/new-energy-outlook/#toc-download

Chapter 4

Distributed Energy Resource Scenario Analysis

Salt Lake City, Park City, and Moab developed a data-driven approach to evaluate the role distributed energy technologies can play in a net 100% renewable electricity future

Distributed Energy Resources Evaluated in this Analysis

ENERGY EFFICIENCY

Energy efficient buildings and technologies use less energy to perform the same tasks.

DISTRIBUTED GENERATION

Distributed generation (commonly rooftop solar) produces electricity at or near the location where it will be used.

BENEFICIAL ELECTRIFICATION

Electrification of technologies like space and water heating equipment can be considered beneficial when it saves consumers money on their bills, improves management of the grid, or results in cleaner electricity generation.

ELECTRIC VEHICLES

Vehicles propelled by electric motors produce no local tailpipe emissions and even lower overall emissions when charged with clean energy.

Analysis conducted for Utah illustrates the potential impact of the growth of a variety of distributed energy technologies statewide, including energy efficiency, distributed solar, beneficial electrification, and electric vehicles. This analysis provides a starting point for Salt Lake City, Park City, and the City of Moab to evaluate the role of distributed energy resources in a transition to net 100% clean electricity and glean insights specific to each city based on their demographic characteristics and energy usage trends.

Three scenarios evaluate a range of potential distributed energy resource adoption:

1. Business as Usual
This scenario assumes that current trends for the growth of energy efficiency and adoption of distributed energy resources continue.

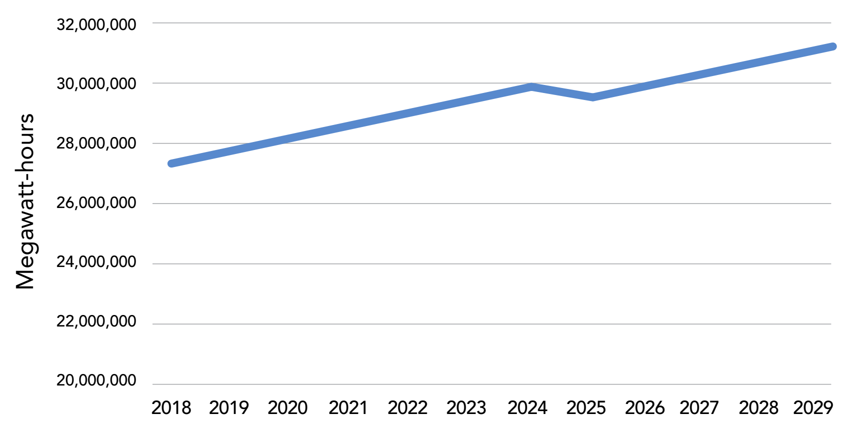
2. Medium
This scenario evaluates accelerated growth of cost-effective energy efficiency and distributed energy technologies.

3. Ambitious
This scenario evaluates accelerated growth of energy efficiency and distributed energy resources, in some cases including paradigm shifts or incentives to spur growth.

First, a Business as Usual forecast for future energy usage in Utah was developed based on a load forecast from Rocky Mountain Power's 2017 Integrated Resource Plan.

This forecast was used as a baseline to understand trends in energy usage through 2030 and create a "business as usual" scenario forecasting the growth of distributed energy technologies. This forecast also served as a baseline to develop the medium and ambitious scenarios and understand the potential impact of the accelerated growth of distributed energy resources on future electricity usage.

Figure 19. Utah Forcasted Retail Sales, 2018 - 2030

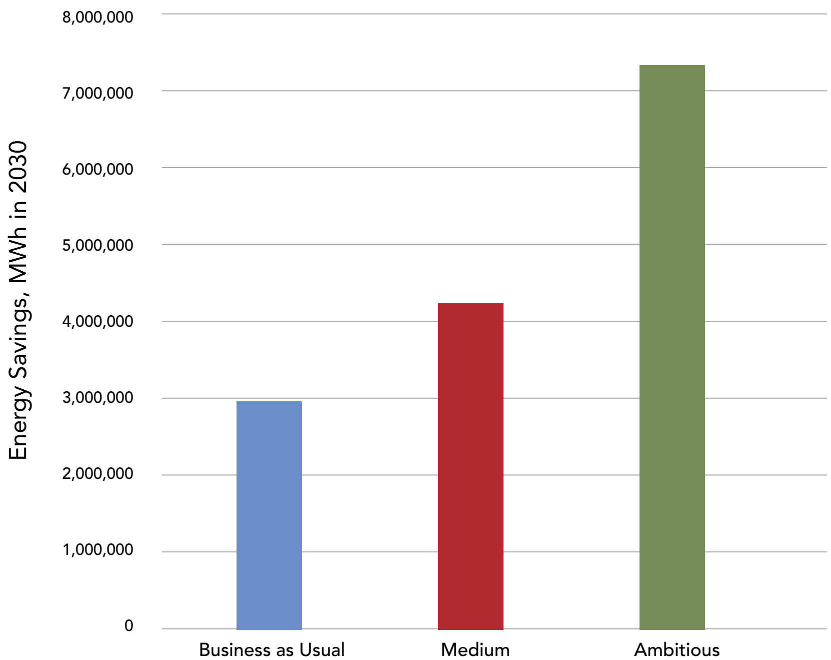


Note: This forecast is based on forecasted annual load growth before consideration of Demand Side Management resources as reported in the 2017 RMP IRP. Rooftop solar generation forecasts are applied as a reduction to forecasted load throughout in the 2017 IRP. To reflect forecasted load absent future investments in energy efficiency and rooftop solar, forecasted generation from the base case rooftop solar forecast has been added to the pre-DSM load growth forecast to produce the forecast shown above. This allows for the comparison of three different scenarios for energy efficiency and distributed solar, shown in slides 40 and 41.

Rocky Mountain Power. *2017 Integrated Resource Plan*. April 2017. *https://www.pacificorp.com/energy/integrated-resource-plan.html*

Energy Efficiency: The cities evaluated the potential for energy efficiency and demand-side management measures to mitigate future load growth.

Figure 20. Energy Efficiency Potential Savings, 2030



Deep energy retrofits of single-family housing stock could result in 2,914 to 7,347 gigawatt hours of energy savings in Utah in 2030.

Three energy efficiency scenarios were considered:

1. Business As Usual
A forecast of energy efficiency growth based on trends identified in Rocky Mountain Power's 2017 Integrated Resource Plan.

2. Medium
The economic potential of energy efficiency, including savings from programs that would result if all homes and businesses adopted the most energy efficient cost-effective commercially available measures (based on a Total Resource Cost test).

3. Ambitious
The technical potential of energy efficiency, including savings from energy efficiency and programs that would result if all homes and businesses adopted the most energy-efficient commercially available technologies and measure, regardless of cost.

This analysis only addressed energy efficiency opportunities in single-family housing stock, and does not capture the potential for greenhouse gas emissions reductions through commercial energy efficiency measures.

Note: Analysis assumes a 12 year measure life, which assumes that all efficiency measures will persist for the time period studied or are replaced with equally efficient technologies.

Distributed Generation: The growth of distributed solar generation reduces the amount of new utility-scale renewable energy resources needed to meet the cities' net 100% renewable electricity goals.

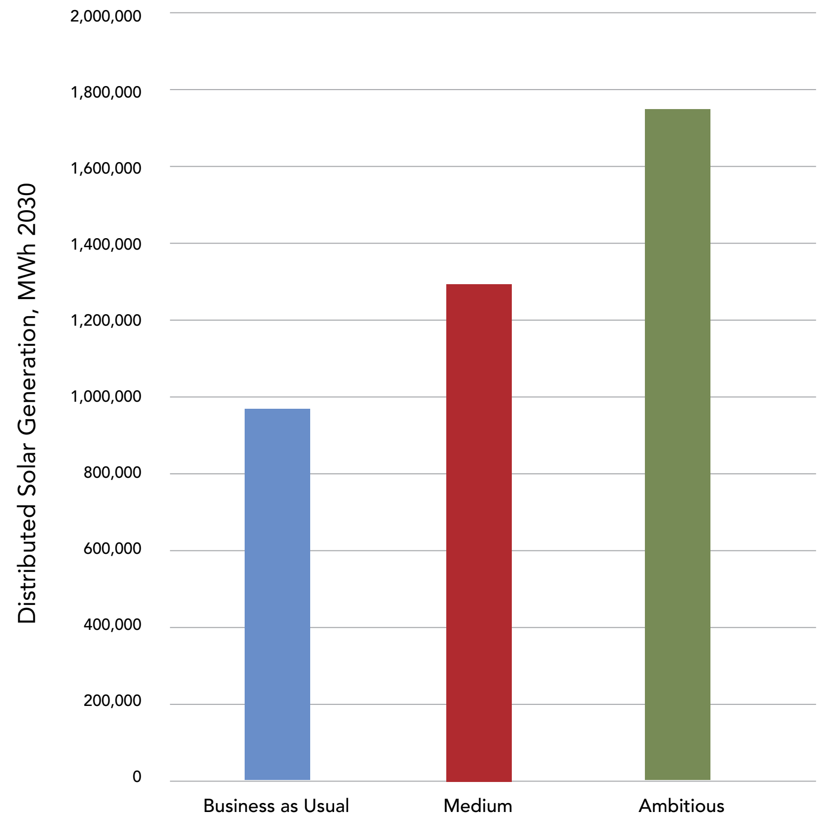
Three distributed solar scenarios were considered:

1. Business As Usual
The base case for distributed generation as forecasted for use in Rocky Mountain Power's 2017 Integrated Resource Plan.

2. Medium
The high case for distributed generation as forecasted for Rocky Mountain Power's 2017 Integrated Resource Plan.

3. Ambitious
A forecast for the growth of distributed solar based on the reference case scenario from the National Renewable Energy Laboratory's 2018 Standard Scenarios Report.

Figure 21. Distributed Solar Potential Generation, 2030



Rooftop solar could result in 963 to 1,741 gigawatt-hours of additional distributed renewable energy generation in Utah in 2030.

Navigant Consulting, Inc. *Private Generation Long-Term Resource Assessment (2017-2036).* July 2016. *https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy*

National Renewable Energy Laboratory. *2018 Standard Scenarios Report: A U.S. Electricity Sector Outlook.* NREL/TP-6A20-71913. November 2018. *https://www.nrel.gov/docs/fy19osti/71913.pdf*

Beneficial Electrification: The beneficial electrification of residential space and water heating can deliver overall greenhouse gas emissions reductions and air quality benefits, but will result in increased electricity usage.

Three beneficial electrification scenarios were considered:

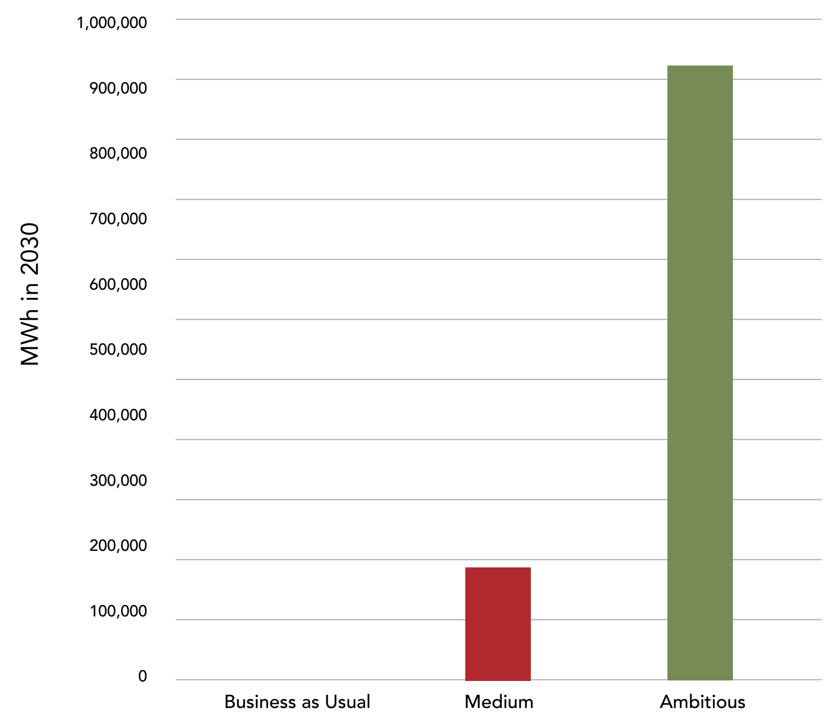
1. Business As Usual
Adoption of beneficial electrification technologies for residential space and water heating is currently negligible, and the business as usual scenario assumes this trend continues.

2. Medium
The economic potential of beneficial electrification of existing single-family homes, including all available technology options that meet cost-effectiveness criteria.

3. Ambitious
The technical potential of beneficial electrification of existing single-family homes using all available technology, regardless of cost.

This analysis only addressed single-family housing stock, and did not consider beneficial electrification in the commercial or industrial sectors. As technology continues to advance, commercial and industrial electrification will offer new opportunities to reduce greenhouse gas emissions.

Figure 22. Residential Single-Family Potential Electricity Usage From Beneficial Electrification, 2030



Beneficial electrification of space and water heating in existing single-family residential homes could result in 190 to 927 gigawatt-hours of of additional electricity usage and 65,583 to 215,138 metric tons of greenhouse gas emissions reductions.

National Renewable Energy Laboratory. *Efficiency Potential in the U.S. Single-Family Housing Stock.* Technical Report NREL/TP-5500-68670. December 2017. *https://www.nrel.gov/docs/fy18osti/68670.pdf*

Electric Vehicles: The growth of light-duty electric vehicles will provide significant air quality benefits and reduce greenhouse gas emissions, but will increase overall electricity usage and could impact peak energy usage.

Three beneficial electrification scenarios were considered:

1. Business As Usual

This scenario assumes electric vehicles reach 7% of all light-duty vehicles on the road in Utah in 2030 (54,600 electric vehicles).[1]

2. Medium

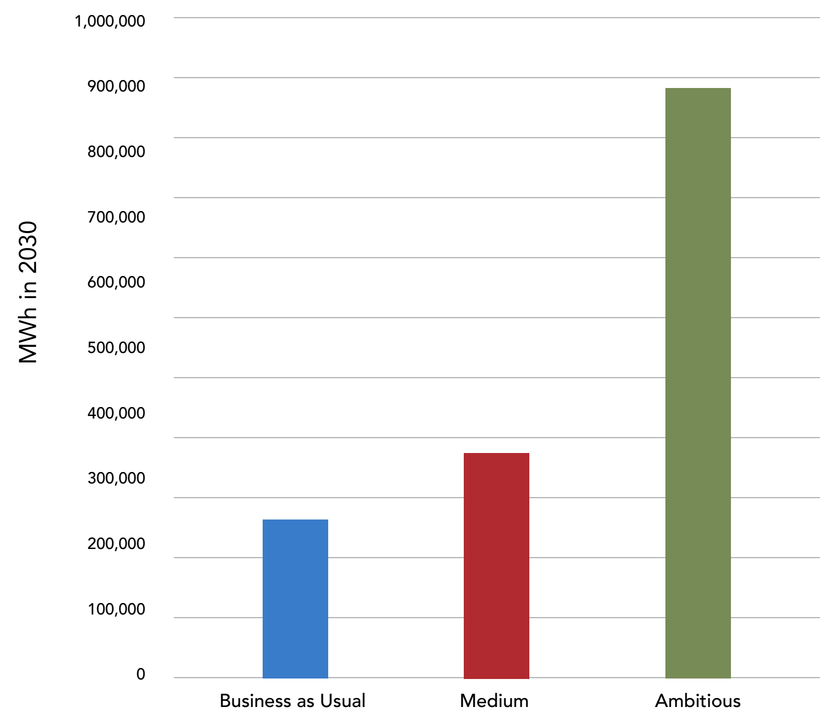
This scenario assumes electric vehicles reach 10% of all light-duty vehicles on the road in Utah in 2030 (78,000 electric vehicles).[2]

3. Ambitious

This scenario assumes electric vehicles reach 20% of all light-duty vehicles on the road in Utah in 2030 (182,000 electric vehicles).[2]

This analysis only addressed light-duty electric vehicles, and does not account for the potential to reduce greenhouse gas emissions through medium- and heavy-duty vehicles like transit buses. As technology advances, new electric vehicle options will become available including heavy-duty vehicles like electric semi trucks.

Figure 23. Electric Vehicle Energy Use, 2030



The growth of light—duty electric vehicles could result in 261 to 871 gigawatt-hours of additional electricity usage for vehicle charging in 2030 and 189 to 629 metric tons of greenhouse gas emissions reductions per year, compared to a conventional gasoline vehicle.

[1] Edison Electric Institute. *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030.* November 2018. *https://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20EV%20Forecast%20 Report_Nov2018.pdf*

[2] National Renewable Energy Laboratory. *National PEV Infrastructure Analysis.* DOE/GO-102017-5040. September 2017. *https://www.nrel.gov/docs/fy17osti/69031.pdf*

Electricity Sector Analysis Results

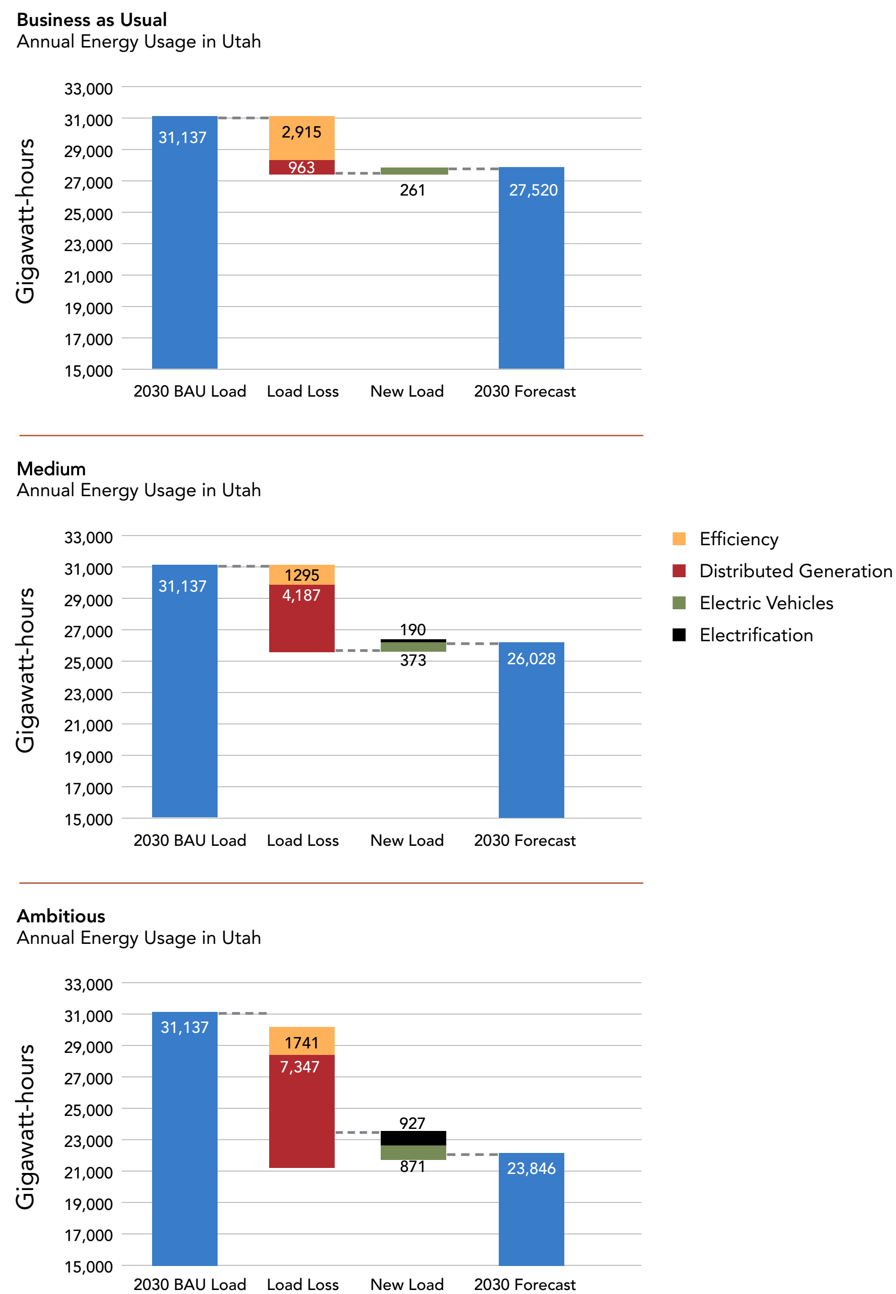
This statewide analysis of distributed energy resources in Utah illustrates the potential for residential energy efficiency, rooftop solar, beneficial electrification of residential space and water heating, and light-duty vehicle electrification to impact future electricity usage.

Energy efficiency and distributed solar have the potential to provide 3,877 to 9,084 gigawatt-hours of clean energy annually in Utah by 2030. At the same time, the growth of electric vehicles and residential beneficial electrification has the potential to add 451 to 1,798 gigawatt-hours of energy usage annually in Utah by 2030.

This analysis does not consider several market segments that have the potential to significantly impact future electricity consumption in Utah, including beneficial electrification in the commercial and industrial sectors and the growth of medium- and heavy-duty electric vehicles. New and emerging technologies will create additional opportunities for energy savings, increased demand flexibility, and greenhouse gas emissions reductions in these sectors.

Note: Business as usual load forecast is based on pre-DSM forecasted annual load growth and includes generation from the base case rooftop solar forecast, as described in slide 38.

Figure 24. Stacked Analysis of Distributed Energy Resource Electricity Impacts



Chapter 5

Strategies to Achieve Net 100% Renewable Electricity by 2030

Action Plan & Strategies: By supporting targeted programs, incentives, and community outreach and education campaigns, the utility and Utah municipalities can work together to achieve a net 100% renewable electricity future

Categories of Distributed Energy Resource Strategies for Achieving Renewable Energy Goals

- ENERGY EFFICIENCY
- DISTRIBUTED GENERATION
- BENEFICIAL ELECTRIFICATION
- ELECTRIC VEHICLES
- CUSTOMER EQUITY & ACCESS
- FINANCIAL TOOLS

The strategies outlined in this chapter represent a suite of tools and actions that Salt Lake City, Park City, and the City of Moab can consider as each city works towards their community renewable electricity goals. These strategies and action items can accelerate deployment of distributed energy resources to go beyond business as usual and reach the ambitious levels of deployment identified in the resource analysis in chapter 4 while improving flexibility and maintaining energy affordability.

The first four categories of strategies address the distributed energy resources evaluated in chapter 4, including energy efficiency, distributed generation, beneficial electrification, and vehicle electrification. The action items identified in these categories describe opportunities for the cities, the utility, and industry stakeholders to not only accelerate growth of distributed energy resources, but to maximize their value by leveraging the full capability of these resources to improve grid flexibility. The fifth category, customer equity and access, identifies cross-cutting strategies that apply to a variety of distributed energy resources that can maintain affordability for low- and moderate- income residents throughout the transition to net 100% renewable electricity. The final category, financial tools, identifies financing mechanisms to amplify and accelerate the impact of the preceding strategies or mitigate the cost of developing new distributed energy resources. Last, a discussion of next steps identifies additional opportunities for clean energy deployment and carbon reductions that are not addressed in the roadmap and topics where further study is needed.

Action Plan & Strategies: Energy Efficiency

Energy Efficient New Construction

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Lead by example: require net zero energy construction for any municipally-owned or city-funded project, including projects funded through city redevelopment agencies. Utilize best practices for building design and operation, including integrated design processes, energy modeling, and building commissioning.	●			●	●			●		●	●		●
2. Develop packages of incentives for net zero energy buildings that account for lifecycle energy savings and non-energy benefits.	●	●				●			●	●	●	●	●
3. Work with the Associated General Contractors and the Homebuilders Association ofUtah to offer training and education about affordable net zero energy construction strategies.	●	●	●				●			●	●		
4. Partner with realtors and green builders to conduct outreach and education about the benefits of net zero energy buildings for consumers.	●		●				●			●	●		
5. Encourage ultra-efficient or net zero energy construction practices and provide incentives and public recognition for achieving ultra energy efficient or net zero energy standards, such as the U.S. Department of Energy Zero Energy Ready Home program or the International Living Future Institute's Zero Energy Building Certification. Include provisions for solar-ready and EV-ready buildings.	●		●	●	●	●		●		●	●		
6. Ensure that a meaningful percentage of building department's plan examiners and inspectors possess ICC certification for IECC or ASHRAE 90.1. Consider designating a dedicated staff person to ensure compliance with energy codes and above-code programs, including commissioning to operate as designed.	●			●						●	●	●	●

Action Plan & Strategies: Energy Efficiency

Energy Efficient New Construction Examples and Resources

- **Zero Energy Ready Home program**
  U.S. Department of Energy
  A voluntary program that recognizes builders for their leadership in increasing energy efficiency and making homes zero energy ready.
  https://www.energy.gov/eere/buildings/zero-energy-ready-homes

- **Zero Energy Building Certification**
  International Living Future Institute
  A voluntary, third-party building certification program based on actual energy performance of buildings.
  https://www.living-future.org/zero-energy/

- **Better Buildings Initiative**
  U.S. Department of Energy
  An initiative to improve the lives of the American people by driving leadership in energy innovation. Through Better Buildings, DOE partners with leaders in the public and private sectors to make the nation's homes, commercial buildings and industrial plants more energy efficient by accelerating investment and sharing of successful best practices.
  https://betterbuildingssolutioncenter.energy.gov/

Action Plan & Strategies: Energy Efficiency

Deep Energy Retrofits

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Use energy benchmarking to identify existing buildings with opportunities for energy savings by measuring a building's energy usage relative to average usage for other similar building types.	●	●		●			●	●		●	●	●	●
2. Lead by example: complete deep energy efficiency retrofits of city-owned and city-funded buildings, including affordable housing or building redevelopment projects funded by city redevelopment agencies.	●			●				●		●			●
3. Allocate funding from city budgets to develop tools, such as loan loss reserve funds, to leverage private financing for single-family residential deep energy efficiency retrofits.	●			●	●	●		●		●			
4. Consider or promote Energy Performance Contracts to large buildings and campuses in the public and private sector.	●		●		●		●				●	●	
5. Actively promote C-PACE financing as a tool to finance comprehensive deep retrofit projects in commercial, multifamily, and industrial buildings.	●		●		●		●	●			●		●
6. Develop incentives for efficiency measures that result in comprehensive, fuel-agnostic energy savings (including building shell improvements and beneficial electrification).		●				●			●	●	●	●	●
7. Work with home energy analysts or home inspectors to implement the U.S. Department of Energy's Home Energy Score Program to provide energy scores and customized retrofit recommendations for homes at the time of sale.	●						●	●		●			
8. Explore options to revive Utah's successful Home Performance with Energy Star Program with extra support for low- and moderate-income families.	●	●	●	●		●	●	●	●	●			

Action Plan & Strategies: Energy Efficiency

Deep Energy Efficiency Retrofits Examples and Resources

- **Utah Home Performance Program**
  This program helped 1,277 homeowners make energy efficient upgrades, and the average homeowner reported 25% energy savings through the program.
  https://pscdocs.utah.gov/electric/18docs/1803528/303992UCEAttA-UtHmePerfEnerStr2010-2012Rep8-16-2018.pdf

- **Portfolio Manager**
  Energy Star
  An online tool used to measure and track energy and water consumption, as well as greenhouse gas emissions for one building or a portfolio of buildings.
  https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

- **Home Energy Score**
  U.S. Department of Energy
  The U.S. Department of Energy's Home Energy Score tool provides home owners, buyers, and renters "directly comparable and credible information about a home's energy use" and can include customized energy retrofit recommendations.
  https://www.energy.gov/eere/buildings/downloads/home-energy-score

  Example: The City of Portland requires a Home Energy Score for all homes for sale, and scored 8,700 homes in 2018
  https://www.pdxhes.com/

- **E2 Business Program**

  Salt Lake City recognition program for businesses that benchmark their energy usage or engage in other sustainable business practices.
  https://www.slc.gov/sustainability/sustainable-business-resources/e2-business-program/

- **Elevate Buildings**
  The Salt Lake City Sustainability Department recognizes large buildings that have achieved ENERGY STAR certification through an annual Elevate Buildings awards: *https://slcgreenblog.com/2019/09/05/elevate-2019/*

Continued on next page

Action Plan & Strategies: Energy Efficiency

Deep Energy Efficiency Retrofits
Examples and Resources

Continued from previous page

- **Kilowatt Crackdown**
  A BOMA Utah program to award commercial buildings that achieve energy and greenhouse gas emissions reductions.
  https://bomautah.org/kilowatt-crackdown/

- **Green to Gold**
  A Moab program to recognize businesses that take steps to reduce their environmental impact. *https://www.sustainablemoab.com/*

- **Energy Benchmarking**
  Salt Lake City's Energy Benchmarking & Transparency Ordinance (18.24) requires all municipal buildings larger than 3,000 square feet and commercial buildings that are 25,000 square feet or larger to benchmark and report their energy consumption on an annual basis using free online ENERGY STAR Portfolio Manager software. *https://www.slc.gov/sustainability/elevate-buildings/*

  A January 2015 Salt Lake City Executive Order requires that managers of city-owned buildings develop an Energy Management Plan to guide their operations, and address benchmarking, energy savings opportunities, efficient operations, building operator training, employee engagement, and renewable energy opportunities. *http://www.slcdocs.com/slcgreen/energyefficiencyexecutiveorder.pdf*

  Commercial buildings can enroll in automated benchmarking of their energy usage through Rocky Mountain Power and Dominion Energy.
    Rocky Mountain Power Energy Benchmarking:
    https://www.rockymountainpower.net/savings-energy-choices/business/benchmarking.html

    Dominion Energy ThermWise Benchmarking (for businesses on the General Service natural gas rate schedule):
    https://www.thermwise.com/business/BusinessBenchmarking.php

Action Plan & Strategies: Beneficial Electrification

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Conduct outreach to distributers, contractors, and plumbers to provide education about new technologies and the availability of utility incentive programs.	●	●				●	●			●	●	●	
2. Support the development of new supply chains for air source heat pumps and heat pump water heaters by creating city-recognized lists of local air source heat pump contractors who have received manufacturer-level training and have experience in the local market.	●						●			●	●		
3. Support or administer bulk-purchase "thermalize" campaigns to leverage group purchasing power, provide community education about air source heat pumps, and reduce the upfront cost of purchaseand installation.	●	●						●		●			
4. Develop programs that target homes with electric resistance heat for beneficial electrification retrofits	●	●						●		●			
5. Work to develop fuel-agnostic incentives and programs to advance beneficial building electrification.	●	●	●	●					●	●	●		
6. Advance beneficial building electrification using technologies that can be enabled for controllability and flexibility to further the cost-effective integration of additional renewable energy resources.	●	●		●		●	●	●	●	●	●	●	
7. Leverage findings from the Building Electrification Initiative report on beneficial electrification in the residential sector for Salt Lake City, available in late 2019.	●			●		●	●			●			

Action Plan & Strategies: Beneficial Electrification

Examples and Resources

- **Building Electrification Initiative**
  A project of the Innovation Network for Communities
  A program to assist cities across North America to develop and implement strategies to electrify building systems and transition buildings away from fossil fuels.
  https://www.beicities.org

- **"Heat Clean" Campaign**
  A project of Vermont Public Interest Research Group (VPIRG)
  A campaign to promote cold-climate air source heat pumps for residential use in Vermont.
  https://www.vpirg.org/category/issues/clean-energy/heat-clean/page/4/

- **HeatSmart Tompkins**
  A project of Tompkins Solar
  A program to help residents in Massachusetts purchase air source heat pumps.
  https://www.solartompkins.org/

Action Plan & Strategies: Distributed Energy Resources

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financng	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Lead by example: explore opportunities to install rooftop solar with and without battery storage to improve resiliency and provide emergency power at municipally-owned or city-funded facilities, or to pilot the use of battery storage for demand response.	●							●			●		●
2. Support or administer bulk-purchasing community programs designed to reduce the upfront cost of rooftop solar for residents and businesses.	●						●	●		●	●		
3. Create opportunities to spur the growth of rooftop solar on commercial roof space. These could include on-bill financing, new rate structures, or utility ownership of distributed solar.		●		●					●		●	●	
4. Pilot incentive or bulk-purchase programs for customer-sited battery storage, including customer-owned and utility-owned options with opportunities for utility ownership or control of storage.	●	●		●	●			●		●	●		●
5. Create programs that provide public recognition to businesses that adopt distributed renewable energy resources and provide opportunities for businesses to share best practices.	●						●	●			●	●	●
6. Design rate structures that reward customers for pairing distributed energy resources with technologies that provide demand flexibility.		●							●	●	●	●	●
7. Utilize codes, ordinances, or voluntary codes to support solar- and storage-ready construction.	●		●	●						●	●		●

Action Plan & Strategies: Distributed Energy Resources

Examples and Resources

- **Solar and Storage Bulk-Purchase**
  A project of Solar United Neighbors (SUN)
  SUN piloted a community bulk-purchase program to advance residential use of solar and storage in Maryland.
  https://www.solarunitedneighbors.org/learn-the-issues/solar-storage/

- **GMP Resilient Homes**
  A project of Green Mountain Power
  A program that allows utility customers in Vermont to purchase a Tesla Powerwall battery for their home through a fixed monthly fee paid through their utility bill.
  https://greenmountainpower.com/product/powerwall/

- **EPIC Loans**
  A project of Fort Collins Utilities
  A financing tool to help residential and commercial property owners invest in energy-efficiency improvements through a streamlined process, including term loans, low-interest rates, and payments through the customers' monthly utility bill.
  https://www.fcgov.com/utilities/residential/conserve/financing

Action Plan & Strategies: Vehicle Electrification

Light-Duty Vehicles and Fleets

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Implement the strategies outlined in *Salt Lake City's Electrified Transportation Roadmap*.	●			●	●	●	●	●		●	●		●
2. Lead by example: convert city fleets to electric vehicles.	●							●					●
3. Advance the growth of well-sited charging infrastructure in convenient and strategic locations.	●	●	●	●		●		●			●		
4. When adding charging infrastructure, match charging infrastructure to location; i.e. for workplace charging, level 1 and 2 are appropriate,* but long-distance transportation corridors require level 3 fast charging.	●	●		●			●	●			●		●
5. Develop programs or incentives to encourage installation of charging infrastructure and use of electrified car shares at multi-family housing.	●	●				●		●		●			
6. Explore strategies like a Zero Emissions Vehicle state policy to ensure availability of electric vehicles for purchase and lease.			●	●						●			
7. Work with car share and ride share companies and other mobility service providers to advance use of electric vehicles and electrified mobility services.	●		●				●						●
8. Utilize codes, ordinances, or voluntary codes to support electric vehicle charging or electric vehicle-ready construction and EV charging for multi-family.	●			●						●	●		

* Level 1 stations use a 120 volt circuit and take 17 - 25 hours to fully charge an EV with a 100 mile battery. Level 2 stations use a 240 volt circuit and take 4-5 hours to fully charge an EV with a 100 mile battery. Level 3 stations recharge a battery at a rate of 40 to 50 miles every 10 minutes.

Action Plan & Strategies: Vehicle Electrification

Transit

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Adopt electric transit buses for use in city and state transit services.	●		●	●				●					●
2. Explore new rate designs to minimize rate impacts of Level 3 "fast charging" and bus charging.		●		●		●			●	●	●		
3. Develop strategies to locate charging infrastructure to minimize utility infrastructure costs.		●					●				●		
4. Work with utility and stakeholders to strategically pilot and implement control technology for charging to provide load flexibility and minimize infrastructure costs.		●		●				●	●	●	●		

Action Plan & Strategies: Vehicle Electrification

Examples and Resources

- **Zero Energy Vehicle Policy**
  California requires major manufacturers of passenger cars and light trucks to sell a certain number of zero emissions vehicles in the state. A policy like this improves the availability of zero emissions vehicles to consumers in the state, and creates an incentive for manufacturers to support dealerships with training and marketing to improve sales of zero emissions vehicles.
  https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program

- Salt Lake City Electric Vehicle Transportation Roadmap
  A Roadmap including 25 strategies to assist cities, towns and counties in Utah as they advance electrified transportation in their communities. These strategies represent near-term opportunities to reduce pollution, lower fuel costs, serve emerging community needs and encourage electrified mobility solutions.
  http://www.slcdocs.com/slcgreen/Electrified%20Transportation%20Roadmap%20for%20Local%20Governments.pdf

- **Utah Clean Cities**
  Utah Clean Cities provides businesses in Utah with assistance completing fleet evaluations to identify benefits from electrifying fleets.
  http://utahcleancities.org/electricity

- **Electric Vehicles as Distributed Energy Resources**
  Rocky Mountain Institute
  A Rocky Mountain Institute report describing strategies and opportunities for utilities to plan for the growth of electric vehicles and capture benefits for the grid and for their customers.
  https://rmi.org/insight/electric-vehicles-distributed-energy-resources/

Action Plan & Strategies: Customer Equity and Access

Customer Equity and Access

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Create a Low and Moderate Income Action Plan that anticipates cost impacts for low and moderate income residents and recommends targeted incentives, programs, or information to help these households reduce energy waste.	●					●	●	●		●			
2. Explore community solar investment models that deliver additional benefits to the communities, for example by siting projects locally within the community or allowing community ownership of the solar project.	●	●		●				●	●				●
3. Encourage and incentivize distributed solar on buildings that serve low-income residents, including food banks, affordable housing, and homeless service providers.	●			●		●					●		●
4. Work with utilities to develop a city-utility partnership that works in low-income communities to accelerate deep energy efficiency retrofits.	●	●				●	●	●		●			

Action Plan & Strategies: Customer Equity and Access

Examples and Resources

- **Affordable Energy for All: A Plan to Expand Energy Efficiency Benefits for Low-Income Salt Lake City Residents**
  A report recommending ways that Salt Lake City can expand energy efficiency improvements in low-income housing, including a review of current low-income energy services and five recommendations for steps the city can take to increase the number of low-income families that benefit from home energy retrofits.
  https://www.utahcleanenergy.org/images/Affordable_Energy_for_All_A_Plan_to_Expand_Energy_Efficiency_for_Low-Income_SLC_Residents_July_2017_FINAL.pdf

- **Empower SLC**
  A community engagement effort to target Salt Lake City residents in historically under-served zip codes with tools to save energy and money while reducing pollution on a community-wide scale.
  https://utahcleanenergy.org/empower-slc

- **CPUC Environmental and Social Justice Action Plan**
  The California Public Service Commission adopted an Environmental and Social Justice Action plan to serve as a roadmap for public inclusion in Commission decision-making and to improve services to targeted communities.
  https://www.cpuc.ca.gov/CPUCNewsDetail.aspx?id=6442461331

- **Insights from the Colorado Energy Office Low-Income Community Solar Demonstration Project**
  A Colorado program that leverages 1,484 megawatts of community solar programs administered by eight utilities to provide nearly 500 low-income customers with 15 – 50% bill savings.
  https://www.colorado.gov/pacific/sites/default/files/Insights%20from%20the%20CEO%20Low-Income%20Community%20Solar%20Demonstration%20Project.pdf

- **NY Affordable Solar Program**
  New York offers increased incentive amounts for households earning less than 80% of the median area income, and also requires minor low-cost energy efficiency upgrades
  https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Home/Paying-for-Solar/Incentives-and-Financing

Action Plan & Strategies: Financial Tools

Strategy	Implementer			Type						Sector			
	Municipality	Utility & Regulators	State	Policy	Financing	Incentive	Information	Program	Regulatory	Residential	Commercial	Industrial	Municipal
1. Partner with the utility to develop on-bill financing programs to accelerate growth of energy efficiency retrofits, beneficial electrification, energy storage, and solar.		●			●			●	●	●	●	●	
2. Enable securitization, a financial tool designed to allow utilities to accelerate depreciation of certain assets at a lower interest rate through ratepayer-backed bonds order to invest in new lower cost assets. Securitization can be used to improve the affordability of a transition to clean energy resources by creating opportunities for the utility to benefit from new investments in clean energy resources while also mitigating the rate impacts on electricity customers.		●	●	●	●				●				
3. Support the creation of a Green Bank, a financial institution that specializes in financing products and market development tools to accelerate deployment of clean energy technologies.	●		●	●	●			●		●	●	●	●
4. Promote the use of Commercial PACE financing, a financing option for commercial building owners that is available in Utah for energy efficiency, renewable energy, water conservation, seismic upgrades, hybrid transport devices, electric vehicle charging stations, and battery storage. Salt Lake City, Park City, and Moab have all passed resolutions to authorize use of C-PACE financing in their jurisdictions.	●		●		●		●	●			●		●

Action Plan & Strategies: Financial Tools

Examples and Resources

- **On Bill Financing**
  U.S. Department of Energy State & Local Solution Finder
  A primer on on-bill financing and payment programs.
  https://www.energy.gov/eere/slsc/bill-financing-and-repayment-programs

  ACEEE State Policy Toolkit
  An introduction to on-bill financing, including types of on-bill programs, barriers, and program design considerations.
  https://aceee.org/sector/state-policy/toolkit/on-bill-financing

  Fort Collins EPIC Loans
  A financing tool to help residential and commercial property owners invest in energy-efficiency improvements through a streamlined process, including term loans, low-interest rates, and payments through the customers' monthly utility bill.
  https://www.fcgov.com/utilities/residential/conserve/financing

- **State Policy Toolkit**
  A toolkit from the American Council for an Energy Efficient Economy (ACEEE) to provide state policy guidance related to on-bill financing.
  https://aceee.org/sector/state-policy/toolkit/on-bill-financing

- **Green Bank Examples**
  Examples and descriptions of Green Banks operating in the U.S.
  https://www.nrel.gov/state-local-tribal/basics-green-banks.html

Chapter 6

Conclusions and Next Steps

Conclusions and Next Steps

Salt Lake City, Park City, and Moab have created a pathway to net 100% renewable electricity by 2030. An innovative partnership with Utah's utility, Rocky Mountain Power, enables the cities to pursue utility-scale renewable energy resources in addition to distributed energy resources in pursuit of their goal. This energy goal is a critical first step towards accomplishing the cities' ambitious greenhouse gas emissions reductions goals. Utility-scale renewable energy resources are cheaper than ever before, creating an opportunity for a swift and affordable transition to clean energy.

As Salt Lake City, Park City, and Moab chart a course towards a clean energy future, a focus on demand flexibility is necessary to maintain affordability and reliability throughout the transition. Many types of distributed energy resources, including energy efficiency, beneficial electrification, solar, storage, and electric vehicles, can be leveraged to shift and shape energy usage. The cities and the utility should actively pursue programs to increase demand flexibility through a variety of customer-sited resources.

New opportunities to increase customer engagement and drive demand flexibility will emerge as the cities' work towards their energy goals. Technology advancements will allow for the electrification of medium- and heavy-duty vehicles and electrification of industrial processes, which are not addressed in this Roadmap. Analysis completed through the Building Electrification Initiative will provide more information about the opportunities for cost-effective electrification of air and space heating in existing and new residential buildings in Salt Lake City, and can be used to inform programs to drive adoption.

An iterative process to evaluate progress towards the net 100% renewable electricity goal and redefine goals and priorities will allow the cities and the utility to capitalize on the full value of emerging clean energy and demand flexibility resources. The partnership between Salt Lake City, Park City, the City of Moab, and Rocky Mountain Power represents a new opportunity for communities to work collaboratively with their utility to choose a clean energy future. Using the information and strategies outlined in this Roadmap, the cities and Rocky Mountain Power can work together to advance the cities' clean energy goals while providing residents and businesses with increased choices about their energy usage, maintaining affordability and reliability, improving air quality, and creating a model for other communities to follow.

Chapter 7

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