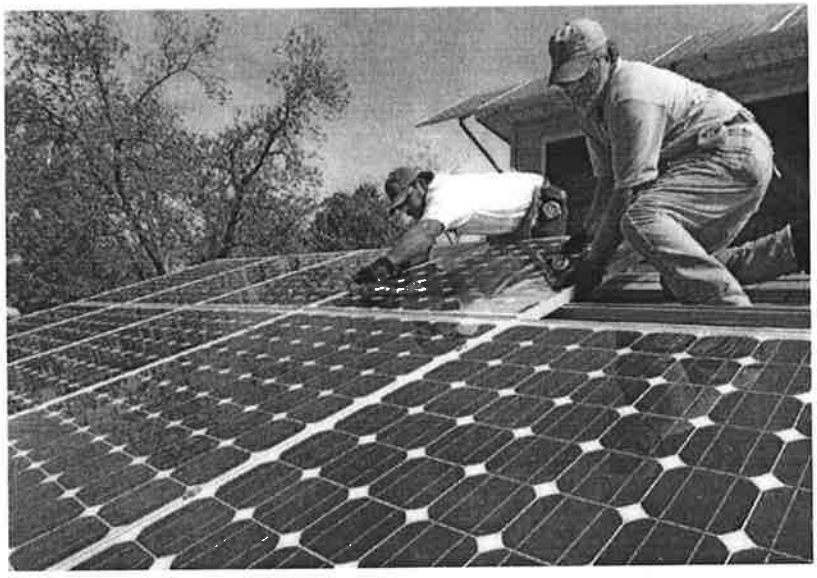
net-zero

Austin COMMUNITY CLIMATE PLAN 2015



"Austin Energy is committed to the City of Austin's climate protection goals by ending our use of coal power by the end of 2022 and retiring inefficient natural gas units. We will replace these resources with a highly efficient gas plant and continued investments in local storage, demand response and renewable energy."

—Larry Weis, Austin Energy General Manager


Photo by C. Jody Horton

Electricity & Natural Gas Sources of Emissions

(source of 55% of total community-wide emissions)

Because the City of Austin owns its electric utility and can guide generation planning decisions, City Council can set the direction to achieve significant emissions reductions. The following policies have been adopted by City Council:

Austin City Council Resolution 20140828-157

Adopted in August 2014, this resolution set the vision for reducing CO_2 emissions from all city-controlled generation resources to zero by 2030, increasing the amount of renewable generation resources from existing goals, advancing the local solar market, and encouraging further deployment of storage technologies (all goals subject to the previously-adopted and reaffirmed affordability goals).

Austin Energy Resource, Generation, and Climate Protection Plan: An Update of the 2020 Plan

Adopted on December 11, 2014, the 2025 Generation Plan supports an increase in the amount of renewable energy to 55% of customer demand, as well as investments in local storage and demand response. The following items are included in the new Generation Plan:

- Potential replacement of the Decker steam units with a nominal 500 megawatt highly efficient combined cycle plant, contingent on an independent review and Council approval.
- Supporting creation of a cash reserve fund for Fayette Power Project retirement beginning in 2022.
- Issuing a Request for Proposal for up to 600 megawatts of utility scale solar.
- Achieving a total of at least 900 megawatts of demand side management (DSM) by 2025.
- Developing an implementation plan for distribution connected local storage of at least 10 megawatts, complemented by as much as 20 megawatts of thermal storage.

Contingent upon further study, technological development, progress toward goals, and rate adjustments or restructuring, the Generation Plan also recommends the following:

- An additional 100 megawatts of demand response or energy efficiency to increase the demand side management achieved to 1000 megawatts by 2025.
- An additional 100 megawatts of local solar for a local solar portfolio of 200 megawatts contingent upon a rate structure that maintains equity among customers.
- Issuing a Request For Information for 170 megawatts of large scale storage, such as Compressed Air Energy Storage.

Transportation and Land-Use Sources of Emissions

(source of 35% of total community-wide emissions)

The City directs general land use policy and works with multiple partners on strategic transportation investments that will help reduce community-wide emissions:

Imagine Austin Comprehensive Plan

Provides a set of defined goals, principles, policies, and actions for the city's future growth. While there are numerous priority programs and goals laid out in Imagine Austin, some of the concepts related to transportation and land use are:

- A more compact and connected city that provides housing and businesses with activity centers.
- An integrated, expanded, and affordable transportation system that supports a variety of transportation choices, while reducing sprawl, congestion, and travel times.
- Safe bicycle and pedestrian facilities with well-designed routes that provide connectivity throughout Austin.

Austin Bicycle Master Plan

Aims to significantly increase bicycle use and improve safety throughout Austin by creating an all ages and abilities network, which is expected to significantly reduce automobile congestion in key travel corridors.

Urban Trails Master Plan

At full implementation, this plan will provide a cohesive recreational and transportation network of non-motorized, multi-use pathways to safely travel long distances across all of Austin.

"Over the past decade, our region has made strides in leveraging partnerships and implementing measures toward the reduction of traffic congestion and the improvement of air quality. As our city continues to grow, the Austin Community Climate Plan provides a unique opportunity to continue to build on the successes of existing partnerships to provide additional benefits to the community as a whole, while reaching toward the goal of net-zero greenhouse gas emissions by 2050."

—Rob Spillar, P.E., Director of Austin Transportation Department

"Austin's Zero Waste initiatives are proactive steps to protect Austin's quality of life now and for future generations. This new perspective treats the collected material as a resource that is recovered for a second life, rather than a waste stream destined for a landfill. Our collective efforts will reduce greenhouse gases from landfills and provide green job opportunities while adding economic value to our discards."

—Bob Gedert, Director, Austin Resource Recovery

Materials and Waste Management Sources of Emissions

(source of 3% of total community-wide emissions)

The City only controls approximately 25% of the amount of annual waste generated, so there is a heavy reliance on working with private sector partners to achieve these goals.

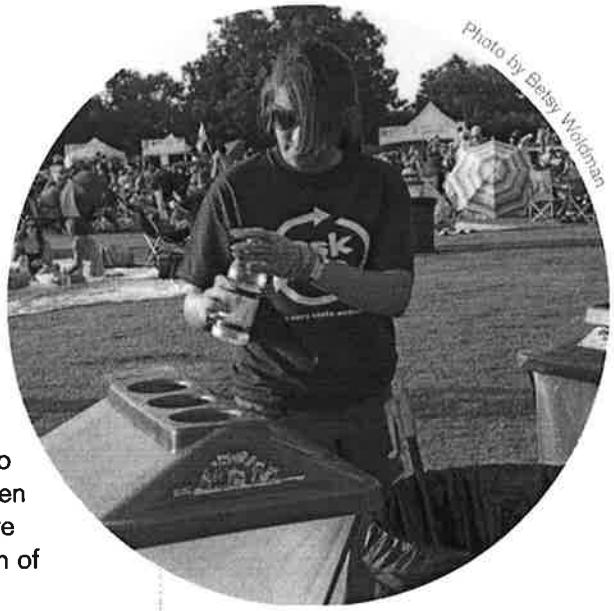
Austin Resource Recovery Master Plan
Sets the goal of reaching 90% diversion (i.e. solid waste and materials that are not disposed of in a landfill or incinerator) by 2040, along with strategies for how to accomplish that goal.

Natural Systems

Green Infrastructure: Imagine Austin refers to "green infrastructure" as "parks, the urban forest, urban trails, greenways, rivers, creeks, lakes, gardens, green buildings, green streets, urban agriculture, open spaces, and wildlife habitat." As such, green infrastructure is a strategic element in addressing Austin's increasingly hot city, and its carbon footprint. Imagine Austin has a stated goal to integrate green infrastructure elements into the city's urban design.

Trees and the Urban Forest: A highly visible, and integral, aspect of green infrastructure is the role of trees in our environment, which can provide some direct carbon sequestration benefits. One federal research paper estimates that trees can sequester between 1-9 metric tons of CO_2 per acre per year, depending on the application.[1] In March 2014, City Council adopted the Urban Forest Plan, which provides the framework to manage Austin's public urban forest resources. A March 2015 study demonstrated the multitude of benefits that the city's urban forest provides; Austin's urban forest, "helps improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from the power plants." Specifically related to carbon dioxide benefits, Austin urban trees are already removing an estimated 38,400 metric tons of carbon per year, the equivalent of removing the annual greenhouse gas emissions associated with over 8,000 vehicles.[2]

[1] http://fas.org/sgp/crs/misc/R40562.pdf
[2] i-Tree Ecosystem Analysis, "Urban Forest Effects and Values," March 2015.



Urban Heat Island: The Urban Heat Island effect occurs as pavement and buildings radiate absorbed solar energy, creating increased heat, increased demand for air conditioning, and decreased air quality. Research has shown that urban heat islands add 3% to 8% to the energy consumption of US cities.[3] The City of Austin has taken a multi-pronged approach to addressing urban heat islands through rooftop solar programs, the Austin Energy Green Building Program, efforts to encourage green roofs, tree plantings and other green infrastructure within rights-of-way, and adopting more efficient building codes to ensure maximum adoption of reflective roofs.

Austin Water

As the City of Austin's water utility, Austin Water has the responsibility to ensure that the citizens of Austin have an adequate and safe water supply–which includes making every effort to conserve that water supply. Lakes Travis and Buchanan are the region's main drinking water reservoirs and they are managed by the Lower Colorado River Authority. The Austin area, and particularly the region upstream of Austin that flows into the Highland Lakes, has been in the grip of an epic drought generally considered to have begun in March 2008. As of January 2015, lake storage was thought to be approximately 34% of full capacity, approaching historical low levels.

There is a distinct possibility that this drought is a consequence of climate change and that the region is shifting permanently to a drier climate or at least one with less water availability. While it is too early to know that for certain, and Texas has experienced many severe droughts over the centuries, Austin Water takes the possibility of a shift to a drier climate due to climate change very seriously. With the likelihood of less precipitation and higher temperatures (which would likely translate into drier ground, less runoff, and more evaporation in the lakes), water conservation efforts become even more critical moving forward. Efforts toward developing an Integrated Water Management Plan are already underway.

[3]Kamal-Chaoui, Lamia and Alexis Robert (eds.) (2009), "Competitive Cities and Climate Change", OECD, Regional Development Working Papers N° 2, 2009, OECD publishing, ©OECD

Another aspect to the water discussion is the relationship between water and energy. There is significant water used in the production of energy, depending on the type of generation, and water utilities consume large amounts of energy to pump raw and treated water, as well as to collect and treat wastewater. While Austin Water Utility is already purchasing 100% carbon-free energy, any increases in efficiency of treating and delivering water will still provide benefits to the utility and its customers. By focusing efforts to ensure our generation resources are cleaner and require less water, both locally and in the extraction of fuels needed for certain types of generation, Austin can continue to be a leading city for protection of natural resources.[4]

[4]Austin Water Utility, "Understanding the Drought," February 2015

Photo by Victor Orvalle

Climate Resilience Planning

Climate impacts everything in the natural and built environments. As the climate in Texas continues to change it has contributed to various environmental impacts, which have required tens of millions of dollars to address recovery efforts statewide.

- During the summer of 2011, Austin had 90 days with temperatures of at least 100° F.
- Multiple wildfires destroyed over 1,500 homes and 32,000 acres of forest surrounding Bastrop in 2011.
- The Halloween flood of 2013 resulted in loss of life, caused extensive damage to homes and businesses around Onion Creek, and displaced many people from their homes. In addition, the loss of vegetation from intense precipitation combined with prolonged drought conditions may increase flooding severity in the future.
- The entire region is in the midst of a hydrologically unprecedented drought that has severely depleted our sources of water, stressed vegetation and ecosystems, and negatively impacted water quality.

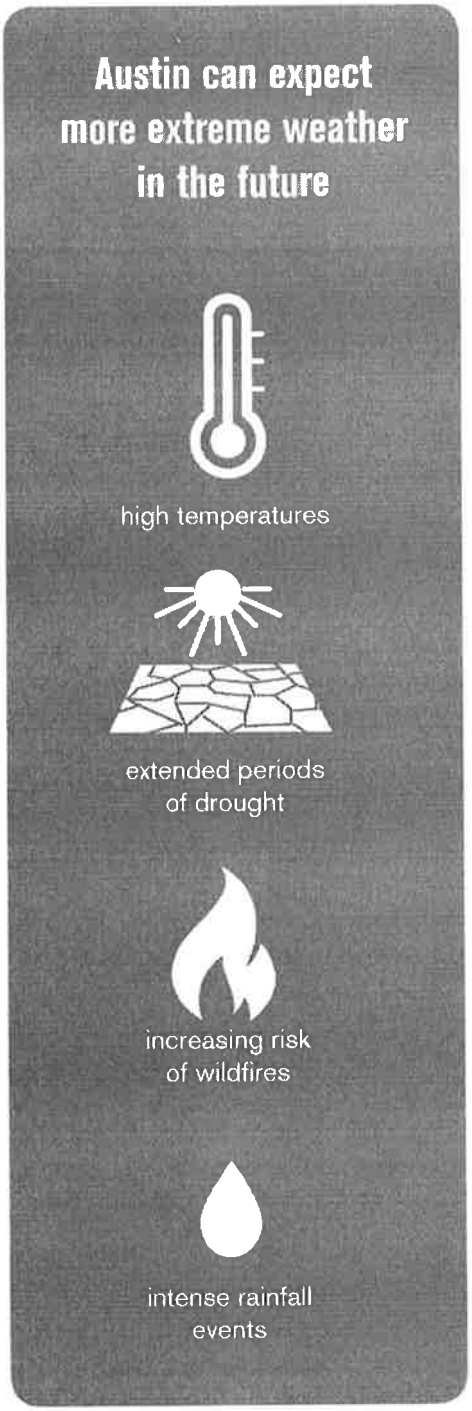
These and other changes are consistent with trends across the United States and around the world that have been attributed to human-induced climate change–the result of carbon dioxide and other heat-trapping gases released during fossil fuel combustion, deforestation, agriculture, and other activities. These emissions that have accumulated in the atmosphere will continue to change the climate for years to come. Bearing this in mind, it is not enough to create plans for mitigating future emissions; the City must also become resilient to climate change.

On November 21, 2013, City Council passed a resolution that resulted in the Office of Sustainability working with nine departments to determine how planning efforts integrate future impacts of climate change, and to identify a process for performing departmental vulnerability assessments. The resolution requested that the following be included in the scope of the assessment: transportation, electric utility, water utility, and drainage infrastructure; community health and wellness efforts; and disaster preparedness and emergency response management.

Photo by City of Austin

"The Watershed Protection Department stands at the nexus of extreme weather events, nature, and people. Whether it is saving lives from floods; managing our stream ecosystems to maintain or improve water quality; or protecting and preserving our endangered species, all cost-effective efforts must be made to creatively reduce our emissions and make our community more climate resilient."

–Victoria Li, Director, Watershed Protection Department



To proactively take steps to become more resilient to climate change, the City must manage the risk of impacts to both new and existing capital investments. This may involve infrastructure design and material decisions that ensure adequate service despite climate change projections. It will also mean ensuring high levels of service to residents and the ability to effectively protect human life during extreme weather events.

The City of Austin has begun preparing for the future by purchasing over 500 of the most flood prone homes in the Onion Creek area, with plans and funding to purchase another 355 homes. The total expenditure is expected to be approximately $160 million dollars and will address the greatest contiguous flood hazard region in Austin. In addition, frequent evaluations of changes in flood intensity and duration will be conducted using the most up-to-date information available.

It is also important to understand that some issues are out of the City's direct control such as grid-wide energy capacity, basin-wide water availability, regional food supply, and regional evacuees. In addition, some regional entities may not acknowledge climate change or recognize its risks. Climate variability also makes strategic planning a complex and ongoing process; there is a high degree of uncertainty in predicting the occurrence of when, where, and how strong extreme weather events will be. Although planning for uncertain weather may seem daunting, the City can act to ensure that departments and community members are resilient to the impacts of climate change.

Appendices

Appendix A: Methodology for Calculations

Protocol

The Office of Sustainability follows the *U.S. Community Greenhouse Gas Protocol* developed by the International Council for Environmental Initiatives (ICLEI). According to this protocol, five basic emissions generating activities must be included:

1. Use of Electricity by the Community
2. Use of Fuel in Residential and Commercial Stationary Combustion Equipment
3. On-Road Passenger and Freight Motor Vehicle Travel
4. Use of Energy in Potable Water and Wastewater Treatment and Distribution
5. Generation of Solid Waste by the Community

The intent of this protocol is to include all significant emissions sources that contribute to the community's total greenhouse gas emissions inventory, while establishing practical limits on the extent of insignificant sources that are to be reported. By following this standard, the community inventory process is relevant, accurate, complete, measurable, consistent, comparable, and transparent. The community-wide greenhouse gas inventory included in this report was based on 2010 data. An inventory based on 2013 data will be available later in 2015 and will be updated every three years going forward.

Boundary

The community greenhouse gas emissions inventory used in this document is based on emissions that originate from sources located within Travis County, or that directly serve the needs of the area.

Greenhouse Gases Included

General source categories that have been included in the community greenhouse gas inventory are consistent with the *U.S. Community Greenhouse Gas Protocol's* accounting guidelines. The greenhouse gas constituents included are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N20), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The Office of Sustainability currently adheres to the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report for reporting global warming potentials and converts amounts of individual greenhouse gas emissions to CO_2 equivalents (CO_2e).

Data Sources

This plan used primary data and information from sources including:

- Austin Energy
- Austin Transportation Department
- Austin Water Utility
- Austin Resource Recovery
- Texas A&M Transportation Institute
- Texas Gas Service
- EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)
- Pedernales Electric Cooperative
- Bluebonnet Electric Cooperative

Appendix B: Electricity and Natural Gas Sector Findings

Introduction

The Electricity and Natural Gas sector comprised 55% of total community greenhouse gas emissions in 2010, the majority of which are indirect emissions associated with electricity use. Electricity in Austin is provided via an interconnected network of wires (the grid) that covers most of the state and is overseen by the Electric Reliability Council of Texas (ERCOT) . All electricity users are connected to this grid which includes meters, distribution lines, utility poles, substations, and transmission wires. All power plants connected to the grid supply energy to maintain the right frequency on the grid, which ensures electricity is available to the end user when needed. ERCOT balances the frequency by continuously forecasting and monitoring electricity demand and then dispatching power plants as needed. Although the locations of power plants relative to load centers are important, it is not possible to say that one end use is being served directly by a certain power plant; all electricity at any given time is made possible by all of the power plants generating into the grid at that time. Emissions associated with electricity use in a community can be estimated using the average emissions intensity from all power plants on the grid.

Approximately 8% of Electricity and Natural Gas sector emissions are direct emissions associated with natural gas distribution and consumption for heating, cooking, and other uses. Figure 1 shows the relative breakdown of greenhouse gas emissions by use for the sector in 2010.

A key consideration for the Electricity and Natural Gas Technical Advisory Group (TAG) was how to properly account for emissions associated with electricity use across the entire Austin community. The TAG used electricity sales multiplied by a grid-average emissions factor, adjusted by any owned resources or resources with which local utilities have a long-term power purchase agreement and for which the location of the resource is known. By using this approach, the community's greenhouse gas footprint accounts

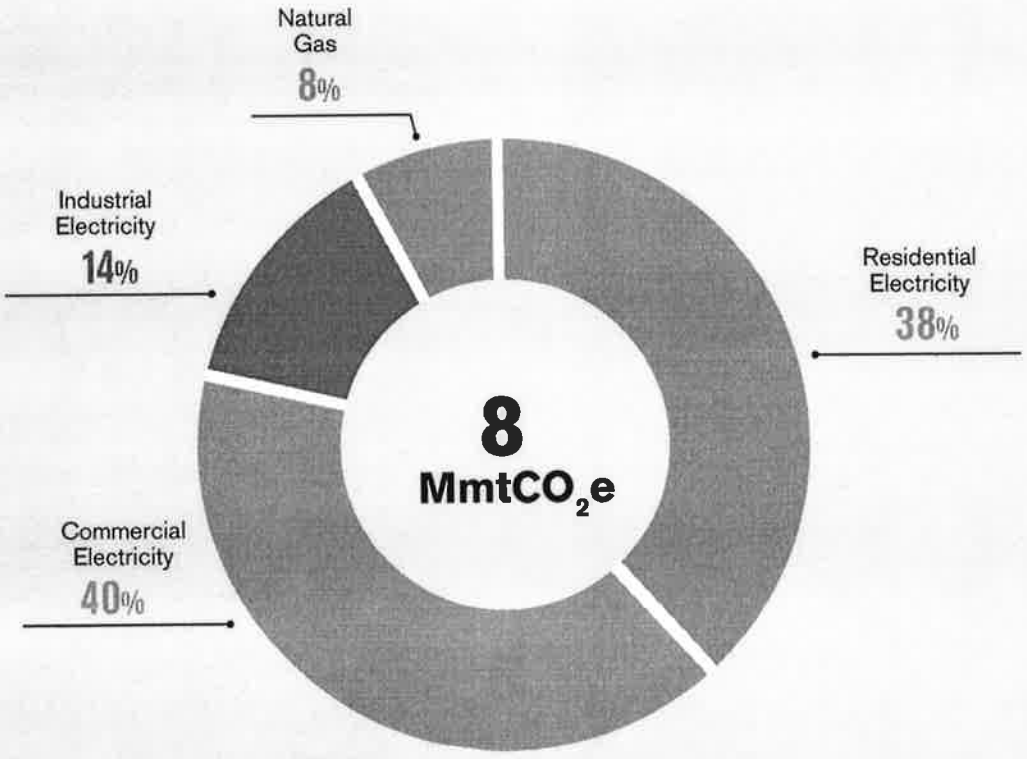


Figure 1: Breakdown of Greenhouse Gas Emissions for Electricity and Natural Gas.

for electricity generated or contracted by the local utility and also that which is supplied by the ERCOT grid. The City of Austin currently uses this method to account for Austin Energy's generation emissions inventories, and to the extent other local utilities either own their generation resources or have long-term agreements with specific resources, they can calculate their emissions in this way. Otherwise, emissions would be calculated based on a grid-average emissions factor and local decisions about generation resources would have a negligible impact on total community greenhouse gas emissions.

This plan uses Travis County as the geographic boundary for emissions. Electricity use in areas served by Bluebonnet Electric Cooperative, Pedernales Electric Cooperative, and the University of Texas at Austin is included when calculating and projecting greenhouse gas emissions. This definition provides an opportunity for the City to collaborate with other electricity providers in the County to share ideas and strategies for emissions reductions beyond Austin city limits, or Austin Energy service areas. Representatives from Texas Gas Service participated as part of the TAG since they provide natural gas to residents in the community and they will be an important stakeholder in helping the community achieve the long-term goal of net-zero community-wide emissions.

The Electricity and Natural Gas TAG worked with the Office of Sustainability to develop estimated emissions reductions for the proposed strategies and actions in this plan. Figure 2 shows 2010 emissions for this sector, estimated emissions in 2050 using a Business As Usual (BAU) trend line, and the approximate reductions impact of various strategy areas.

Most of the emissions in this sector are associated with electricity provided by Austin Energy. Austin Energy's recently approved Generation Plan proposes aggressive energy efficiency and renewable goals for the community by 2025 and no greenhouse gas producing resources by 2050. The third bar (#1)

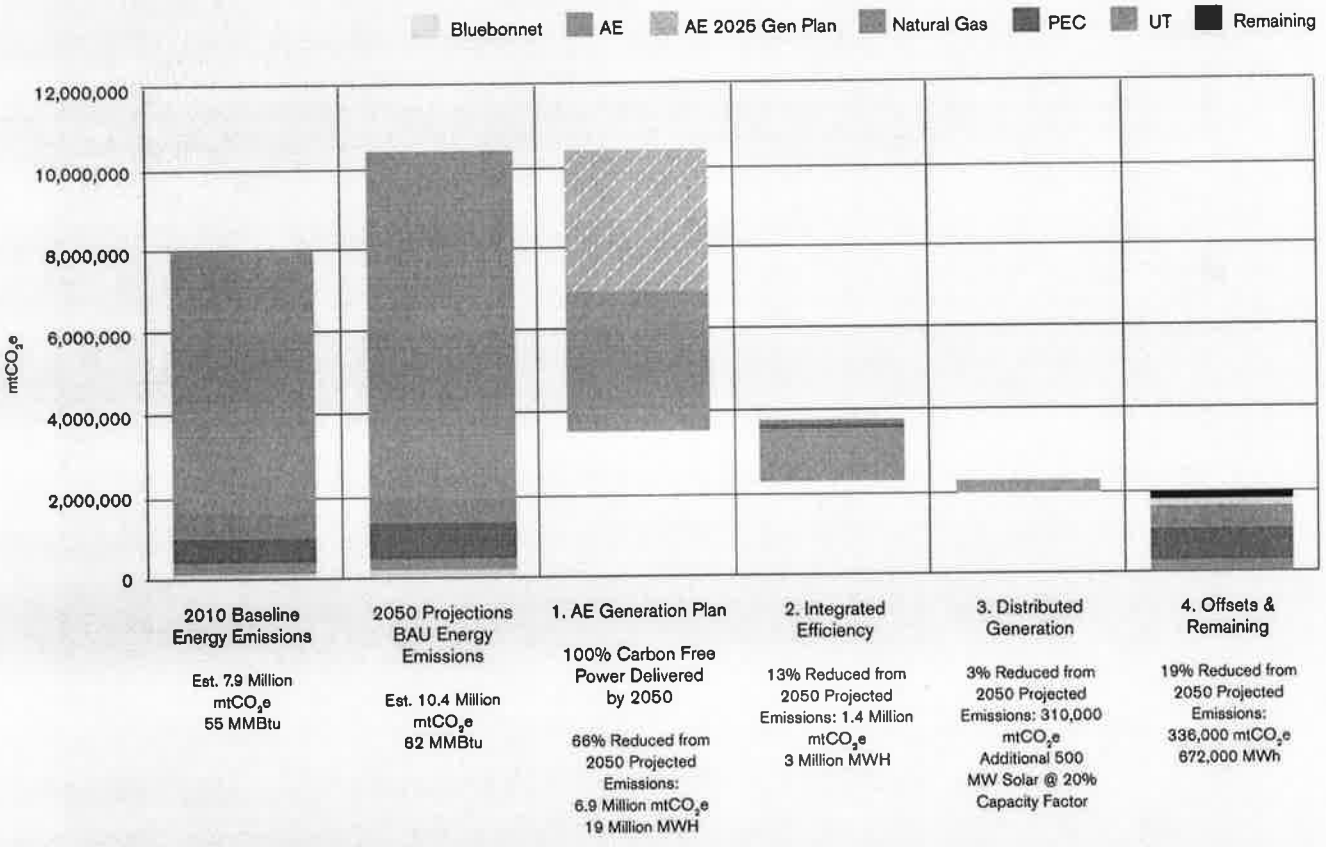


Figure 2: Electricity and Natural Gas Sector - Projected Reductions Needed to Reach Net-Zero-emissions by 2050

in Figure 2 represents the reductions expected by 2025 (white stripes), as well as future implementation of greenhouse gas emissions-free sources by 2050 (solid orange). Implementing the Generation Plan will reduce community-wide greenhouse gas emissions by close to 67% from BAU. Another 16% reduction is projected to result from additional energy efficiency and distributed generation beyond what is planned today, assuming advancements in technologies make this cost-effective. The final 17% emissions are from sources that either currently do not fall under a long-term plan, or for which there are not non-fossil-fueled alternatives readily available.

Challenges and Opportunities

- The electricity sector is transforming–technology developments, new regulations, and consumer preferences are leading to opportunities to transition away from carbon-based generation resources.
- Austin Energy provides the majority of electricity to the community and has met record demand growth almost entirely with demand side management and renewable energy resources, but the pace and extent of further progress must be balanced with the City's commitment to maintain affordable electric rates.
- Energy efficiency remains an affordable way to meet growth while offsetting the need for fossil-fueled energy resources. However, as programs mature and some cost-effective actions are exhausted it will be challenging for local utilities to create new programs that optimize value to customers. Education and partnership with the building community will be important to avoid resistance to more aggressive building codes and mandates.
- Renewables are increasingly cost-competitive with traditional fossil resources, but renewables are carbon-reliant when backed up by dispatchable resources from the grid. Non-fossil-fueled dispatchable resources, including storage, will be key to meeting net-zero goals.
- Distributed renewable energy can potentially avoid the need for centralized resources, but long-term efforts in grid modernization will be required to fully realize that potential. These efforts may be costly but could provide opportunities for job creation.
- The City must take a systems-oriented approach in coordinating climate activities and strategies among different sectors. This will ensure there is no shifting of emissions from one sector to another and limit unintended consequences.
- Some electric utilities in the U.S. and other countries have begun to explore changes to their business models to enable advancements in energy efficiency, distributed generation, and micro grids. Local electric utilities should continue to evaluate whether greenhouse gas reduction strategies recommended here can be implemented within the framework of existing business models and whether the regulatory framework in Texas will allow change.
- The City must ensure that impacts on all members of the community, especially low-income residents, are appropriately taken into consideration. Likewise, the City should ensure that all members of the community have equal opportunity to participate and help achieve long-term carbon goals.
- The City should begin considering the use of offsets and/or carbon sinks as ways to reach net-zero community-wide emissions from this sector if total independence from fossil fuels by 2050 is not achievable.

Existing Plans and Initiatives

The City of Austin's 2007 Climate Protection Resolution included goals for the local electric utility to:

- Achieve 800 MW of peak demand savings by 2020
- Achieve 30% of generated electricity from renewable resources by 2020, including 100 MW of solar
- Reduce CO_2 emissions by 20% from 2005 levels by 2020

Because the City of Austin owns its electric utility and can guide generation planning decisions, City Council can set the direction to achieve significant emissions reductions. The following policies have been adopted by City Council:

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- Issuing a Request For Information for 170 megawatts of large scale storage, such as Compressed Air Energy Storage.

Electricity and Natural Gas Strategies

Strategy 1: Decrease Energy Use in New and Existing Buildings

The City of Austin will continue to be a national leader in energy efficiency and demand management as a result of existing policies. New minimum standards for existing building energy use and enforced through building codes could greatly help drive emissions reductions as opposed to offsetting new demand. However, such standards would represent a significant change for the local building sector and may require phase-in over the long term.

Austin Energy plans to have less carbon-intensive generation by 2025, meaning the effectiveness of building strategies in reducing greenhouse gases will be diminished, but other benefits such as cost savings and greater affordability for individual customers may still be achieved. Local utilities should continue to balance financial benefits to the customer and the utility, respond to customer preferences, and weigh the greenhouse gas benefits from future generation resource plans.

Phase 1 Actions

- BIE-1: Explore financing mechanisms to enable energy efficiency, demand response, distributed generation and energy storage. Possible financing mechanisms which could enable large amounts of private sector retrofits include Property Assessed Clean Energy (PACE) and Warehouse for Energy Efficiency Loans (WHEEL), and privately financed on-bill repayment.
- BIE-2: Increase funding for energy efficiency rebates within the constraints of rate affordability goals. Emphasize and market offerings or higher amounts that may attract new customers.
- BIE-3: Identify high energy users in all sectors and target incentives and initiatives to those users to maximize impact.
- BIE-4: Promote specific high-impact strategies including envelope improvements (biggest impact), lighting retrofits (LEDs), HVAC improvements, water heating efficiency, and plug load reduction.
- BIE-5: Implement programs to reduce energy use and carbon intensity associated with water consumption (caveat: this will have a decreased impact if the water utility uses renewable energy to pump and treat water).

- BIE-6: Coordinate effort with AWU to reduce energy use and carbon intensity associated with consumption, treatment, and delivery of water and wastewater.
- BIE-7: Expand the availability and use of automated demand response to more and new technologies.
- BIE-8: Increase meter reading frequency and use the information to identify opportunities for utility action, customer conservation, and demand response.
- BIE-9: Create a new minimum standard for existing building energy use; enforce the new standard.
- BIE-10: Consider the potential for net-zero new construction of residential and commercial buildings.
- BIE-11: Educate designers, builders, code inspectors, and plan reviewers to gain higher compliance with new energy codes as they are implemented every 3 years.
- BIE-12: Phase-in requirements to submeter new commercial office space as new permits are issued.

Strategy 2: Lower Greenhouse Gas Intensity of Generation Resources Serving the Community

Generation resource planning is a complex economic modeling and risk management exercise since resource decisions are typically long-term commitments that "lock-in" both environmental benefits and costs to customers. Austin Energy developed a Generation Resource Plan in 2014 with input from stakeholders, an independent advisory committee, third-party reviewers, and extensive internal modeling and analysis . This TAG did not attempt to duplicate this detailed resource planning exercise and assumes that the 2007 Climate Protection Resolution goals and the updated 2014 resource plan will direct future City actions to address electricity-related greenhouse gas emissions.

The City of Austin already makes generation resource decisions to minimize greenhouse gas emissions while remaining within the affordability limits set by City Council. Those plans are reviewed bi-annually with participation from stakeholders and the public. This TAG believes that a full transition to renewables by an integrated utility that will serve its entire load is not feasible today; renewables are not dispatchable resources and utilities rely on dispatchable resources to manage cost risk to customers and maintain grid reliability. In the near term, a local utility without any dispatchable resources would indirectly depend on dispatchable, greenhouse gas emitting resources for reliable power because of the interconnected grid. Technologies such as large-scale battery storage that enable utility-scale renewables to dispatch on demand are still in development, untested at scale, and not cost effective. Thus, the transition to a zero or near zero-emissions grid will be incremental, with transitional technologies being used to meet the needs of utilities and their customers.

This TAG assumes that the City will continue to follow resource plans that minimize greenhouse gas emissions in the most affordable and least risky way for its customers, and that other local electricity providers should consider the same.

Technologies that allow users to control, monitor, and generate electricity in their buildings and homes are developing rapidly, driven by end-user demand. Technologies that allow building-to-grid integration must also develop to fully realize opportunities to reduce the need for electricity from large centralized plants. This TAG recommends that local utilities consider supporting or piloting the development and evolution of Smart Grid/Intelligent Energy Management Systems to further enable more user control over electricity use, integrate distributed renewable resources, and enable the use of storage and other means for ensuring grid reliability using intermittent resources.

Phase 1 Actions

- RT-1: Begin a coordinated effort to prioritize strategic development and evolution of Smart Grid/ Intelligent Energy Management Systems, within constraints of rate affordability goals, to further enable intermittent resources and use of electric vehicles for storage/demand shift.
- RT-2: Prioritize investment in zero carbon-emitting resources at utility and/or customer scale: community and distributed solar, including concentrating solar; and wind (inland and coastal).

- RT-3: Routinely evaluate resource technologies for opportunities to incrementally reduce carbon intensity, including storage, distributed chilled water, biomass, geothermal, and nuclear, within constraints of rate affordability goals.
- RT-4: Evaluate technology and cost options for increasing natural gas system leak detection and reduction programs.

Strategy 3: Promote Behavior Change to Reduce Greenhouse Gases

Consumer preferences and willingness to pay upfront for actions that result in lower energy use over time, and concurrently support zero and low-greenhouse gas resources, are key to the effectiveness of net-zero strategies and actions. Electricity and natural gas consumers own their respective carbon footprints, and the City and local utilities should encourage and enable those consumers to proactively reduce that footprint.

Phase 1 Actions

- BC-1: Increase efforts to engage customers to drive energy efficiency and demand response: increase transparency of energy costs in multifamily and commercial buildings; evaluate feasibility of neighborhood-wide energy efficiency challenges.
- BC-2: Implement time of use / dynamic rates, including user educational efforts, supported by advanced metering and other technologies.
- BC-3: Expand educational efforts through social media, applications, competitions (individual and neighborhood scale) and exposure.
- BC-4: Utilize meter reads and bill format/presentation to influence behavior. Present energy use in actionable and timelier ways to customers.

Next Steps

The City and community partners will focus on Phase 1 actions and continue to fully evaluate and prioritize the remaining proposed actions as part of developing a comprehensive implementation plan. The City should engage with non-City utilities that contribute to greenhouse gas emissions from this sector to communicate the goals and strategies associated with this climate plan.

Electricity and Natural Gas Sector Strategies and Actions

Phase	Strategy Category	Action #	Actions
1	Behavior Change and Education	BC-1	Increase efforts to engage customers to drive energy efficiency and demand response: increase transparency of energy costs in multifamily and commercial buildings; evaluate feasibility of neighborhood wide energy efficiency challenges.
1	Behavior Change and Education	BC-2	Implement time of use / dynamic rates, including user educational efforts, supported by advanced metering, and other technologies.
1	Behavior Change and Education	BC-3	Expand educational efforts through social media, applications, competitions (try individual and neighborhood scale competitions) and exposure/Media campaigns using local celebrities to drive behavior change.
1	Behavior Change and Education	BC-4	Utilize meter reads and bill format/presentation to influence behavior. Present energy use in actionable and more timely formats/ways to customers.
2	Behavior Change and Education	BC-5	Promote programs for individuals to manage their own carbon footprint (carbon diet).
2	Behavior Change and Education	BC-6	Educate the local building construction and professional design community about the importance and benefits of climate-appropriate passive solar building design strategies.
1	Buildings and Integrated Efficiency	BIE-1	Explore financing mechanisms to enable energy efficiency, demand response, distributed generation and energy storage. Possible financing mechanisms which could enable large amounts of private sector retrofits include Property Assessed Clean Energy (PACE) and Warehouse for Energy Efficiency Loans (WHEEL), and privately financed on-bill repayment.
1	Buildings and Integrated Efficiency	BIE-2	Increase funding for energy efficiency rebates within constraints of rate affordability goals, and emphasize and market offerings or higher amounts that may attract new customers.
1	Buildings and Integrated Efficiency	BIE-3	Identify high energy users in all sectors; target incentives and initiatives to those users to maximize impact.
1	Buildings and Integrated Efficiency	BIE-4	Promote specific high-impact strategies including envelope improvements (biggest impact), lighting retrofits (LEDs), HVAC improvements, water heating efficiency, and plug load reduction.
1	Buildings and Integrated Efficiency	BIE-5	Implement programs to reduce energy use and carbon intensity associated with water consumption (caveat: decreased impact if the water utility uses renewable energy to pump and treat water).
1	Buildings and Integrated Efficiency	BIE-6	Coordinate effort with AWU to reduce energy use and carbon intensity associated with consumption, treatment, and delivery of water and waste water.
1	Buildings and Integrated Efficiency	BIE-7	Expand the availability and use of automated demand response to more and new technologies.
1	Buildings and Integrated Efficiency	BIE-8	Increase meter reading frequency and use the information to identify opportunities for utility action and to promote customer conservation and demand response.

Electricity and Natural Gas Sector Strategies and Actions

Phase	Strategy Category	Action #	Actions
1	Buildings and Integrated Efficiency	BIE-9	Create a new minimum standard for existing building energy use; enforce the new standard.
1	Buildings and Integrated Efficiency	BIE-10	Consider the potential for net-zero new construction of residential and commercial buildings.
1	Buildings and Integrated Efficiency	BIE-11	Educate designers, builders, code inspectors, and plan reviewers to gain higher compliance with new energy codes as they are implemented every 3 years.
1	Buildings and Integrated Efficiency	BIE-12	Phase-in requirement to submeter new commercial office space as new permits are issued.
2	Buildings and Integrated Efficiency	BIE-13	Transition the AE Energy Efficiency program and codes to a performance model with measurement and verification; program customers would be incentivized to meet targets. (Includes giving credit for passive design strategies).
2	Buildings and Integrated Efficiency	BIE-14	Enhanced sub-metering for demand response.
2	Buildings and Integrated Efficiency	BIE-15	Incorporate recommendations for passive solar subdivision and street/lot orientation into the land development code.
2	Buildings and Integrated Efficiency	BIE-16	Implement neighborhood-wide projects to weatherize homes and increase energy efficiency and demand response.
1	Resource Technologies	RT-1	Begin a coordinated effort to prioritize strategic development and evolution of Smart Grid/ Intelligent Energy Management Systems, within constraints of affordability goals, to further enable intermittent resources and use of EVs for storage/demand shift.
1	Resource Technologies	RT-2	Prioritize investment in zero carbon-emitting resources at utility and/or customer scale: Utility-scale, community and distributed solar, including concentrating solar; Utility-scale wind (inland and coastal).
1	Resource Technologies	RT-3	Routinely evaluate resource technologies for opportunities to incrementally reduce carbon intensity including storage, distributed chilled water, biomass, geothermal, and nuclear, within constraints of rate affordability goals.
1	Resource Technologies	RT-4	Evaluate technology and cost options for increasing natural gas system leak detection and reduction programs
2	Resource Technologies	RT-5	Explore and pilot storage options with grid functionality. Evaluate technology and cost options for increasing natural gas system leak detection and reduction programs
2	Resource Technologies	RT-6	Explore incentives for electrification of carbon-fueled consumer products: hot water heater extended reservoirs, larger pads for battery-powered lawn mowers, weed whackers, chainsaws, etc.
2	Resource Technologies	RT-7	Explore micro-grids as a carbon reduction, resiliency, and security strategy. Consider tradeoffs.