Energy

KEY PERFORMANCE MEASURES

- *Percentage of Electrical Energy from Renewable Sources*
- *Community-Wide Greenhouse Gas Emissions*
- *Energy Use from the Built Environment*
- *Mass Transit Use*

The Aspen community effectively manages its energy needs while minimizing adverse environmental impacts. *Energy generation and consumption, while integral to a prosperous economy, can result in the emission of greenhouse gases and pollutants that contaminate land, air and water. By replacing fossil fuel-based energy with renewable resources – and maximizing energy efficiency across all sectors – Aspen meets its energy demands in an efficient, clean and affordable manner. In doing so, Aspen maintains a thriving economy while reducing the adverse environmental impacts of its energy needs.*

The Aspen community consumes energy across a variety of sectors: to power homes and businesses, fuel industry, and transport goods and people (residents and visitors). Every day, the City depends on the availability and reliability of electricity, natural gas, propane, and gasoline. Meanwhile, these power sources and fuels incur environmental costs. The use of finite resources, greenhouse gas emissions, and air pollution are but a few. Improving efficiency through upgrades or the adoption of new technologies, along with the use of cleaner energy, can significantly reduce the environmental impacts of conventional energy sources.

Aspen has demonstrated leadership in moving away from fossil fuel energy sources through its multi-decadal efforts to source 100% of the municipal utility's electricity comes from renewable sources. A significant goal realized in 2015.[10]

In 2012, a group of local experts and stakeholders convened to come to a mutual understanding of what energy-related environmental sustainability means in Aspen and how to track it. The four following metrics are the result of their deliberations:

- *Percentage of Electrical Energy from Renewable Sources*
- *Community-Wide Greenhouse Gas Emissions*
- *Energy Use from the Built Environment*
- *Mass Transit Use*

Together, these measures address many facets of the energy landscape, encompassing both supply and demand, as well as behavioral and infrastructural change. Each measure is specifically introduced in the following pages and complemented by a corresponding 1-page dashboard.

[10] *"Renewable Energy." City of Aspen, Colorado. Web. <http://www.aspenpitkin.com/living-in-the-Valley/Green-Initiatives/renewable-Energy/>.*

Percentage of Electrical Energy from Renewable Sources

The Aspen community has long recognized the significance of smart and environmentally sound energy use. In 1989, the community adopted an Ecological Bill of Rights, which claims as one of its tenets: "the right to the efficient and renewable use of energy."[11]

Renewable energy comes from sources that are not depleted or diminished by human use, such as solar, wind, water, geothermal, or biogas. Also included in this category are resources that can be replenished or regrown within a human lifespan, such as biomass. In contrast, fossil fuels are found on earth in limited supply and contribute to the emissions of greenhouse gases and air pollution.[12] Accordingly, the environmental and economic benefits of renewable energy conversion include:

1. Minimal to no greenhouse gas emissions or air pollution.
2. Diversified energy portfolio, increased energy independence, decreased dependence on fossil fuels and imported fuels.
3. Economic development.

Wind turbines[13]

Two electricity providers serve the City of Aspen: Aspen Electric (municipally owned) and Holy Cross Energy (cooperatively owned). Aspen Electric (AE) has a service area of 4 square miles, which includes approximately 2,900 residential, commercial, hotel, and condominium accounts, all inside Aspen City Limits.[14] This includes much of the downtown core of Aspen, as well as the Aspen Recreation Center on Maroon Creek Road and the Burlingame Housing Complex off of Highway 82 (See Figure 1).[15]

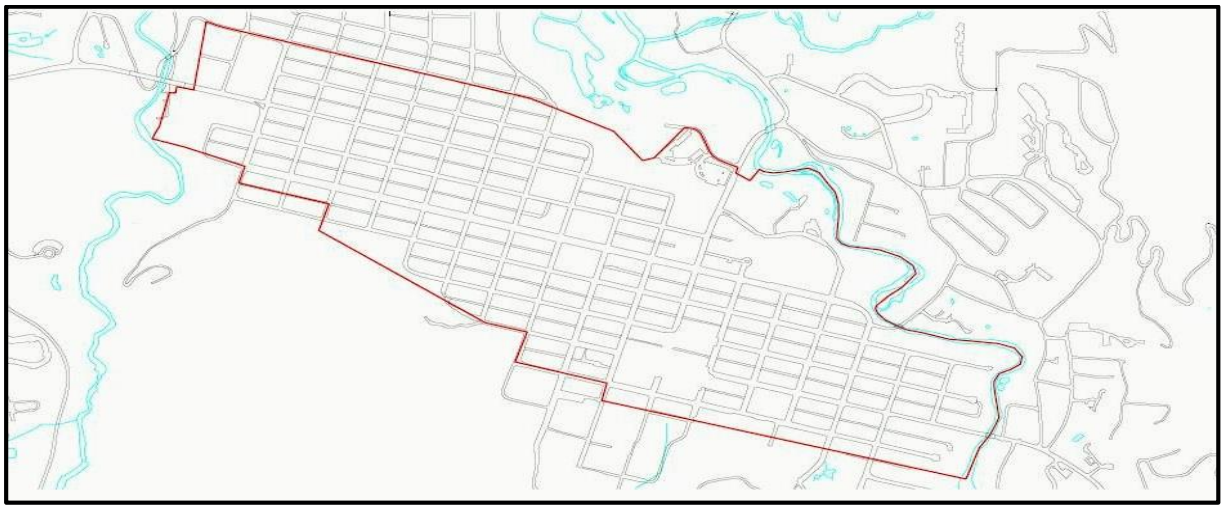


Figure 1. The service area for Aspen Electric. Service area also includes Aspen Recreation Center and Burlingame Housing Complexes (not shown on map).

[11] *Aspen Area Community Plan. 2012. City of Aspen and Pitkin County. Web. http://www.apcha.org/FINAL_AACP_2272012_reduced.pdf,*
[12] *Depending on scope and method, some renewables also incur environmental harm. Hydroelectric projects can threaten river and riparian health. Burning biomass can lead to air pollution and GHG emissions.*
[13] *Photo: City of Aspen.*
[14] *"Electric." City of Aspen, Colorado. Web. <http://www.aspenpitkin.com/Departments/Utilities/Electric/>.*
[15] *Image: City of Aspen.*

All other areas in Aspen receive electricity from Holy Cross Energy (HCE), which serves over 55,000 consumers in Western Colorado.[16]

Both providers measure the percent of renewable energy in their portfolios. In 2015, Aspen Electric reached its goal of sourcing 100% of its electricity from renewable sources. The contractual agreements to support the 100% renewable program have an initial 3-year lifespan. Maintaining the 100% renewable status over the long-term will require ongoing efforts and is critical for progress toward Aspen's GHG reduction goals (30% reduction by 2020, 80% reduction by 2050, based on 2004 levels). Continued support from the community, as well as a decoupling of increased energy demand from economic growth, will aid in this effort. Further details of this achievement are shown in the corresponding one-page dashboard:

- *Percentage of Electrical Energy from Renewable Sources*

As of 2015, HCE sourced 30.3% of its electricity portfolio from renewables, which puts it on track to exceed its internal targets of 20% renewable by 2015, 30% by 2020, and 35% by 2025. These targets exceed the Colorado standard that 10% of electric sales from Co-ops must come from renewable sources by 2020.[17] Still, an increased commitment to sourcing from renewables can be sought. As consumers in the City of Aspen are only one small portion of HCE's customer base, this report does not set targets for the energy provider. Accordingly, the data in the following dashboard pertains to Aspen Electric only. This being said, collaborative efforts to help HCE increase the percentage of renewables in its portfolio would be a positive step forward in reducing the greenhouse gas emissions tied to Aspen's overall energy use.

Figure 2. A solar panel array at the City of Aspen Water Campus.[18]

Community-Wide Greenhouse Gas Emissions

Greenhouse gases (GHG) absorb and maintain heat in the earth's atmosphere. Common GHGs include carbon dioxide (CO_2), methane (NH_4), nitrous oxide (N_2O), and fluorinated gases. These gases are released into the atmosphere in a variety of ways, including the production and combustion of petroleum products, coal, solid waste, as well as agricultural and industrial activities.[19] There are many

[16] *"About Us." Holy Cross Energy. Web. <https://www.holycross.com/about-us>.*
[17] *"2015 CO2 Emissions Report." Holy Cross Energy. Web. <https://www.holycross.com/co2-emissions>.*
[18] *Menges, Chris.*
[19] *"Overview of Greenhouse Gases." EPA. Web. <https://www3.epa.gov/climatechange/ghgemissions/gases.html>.*

factors that influence global climate change, tackling the rise of GHGs in the earth's atmosphere is one of many ways that humanity can take action.

As a city that is likely to be significantly impacted by climate change, Aspen began tracking community-wide greenhouse gas (GHG) emissions in 2004. In that same year, the community established goals to reduce GHG emissions **30% by 2020, and 80% by 2050** (below 2004 levels). GHG tracking and goals apply to Aspen's Emissions Inventory Boundary (EIB)[20], which is the geographic area that represents Aspen's core functionality. Figure 3 is a map of the EIB. [21]

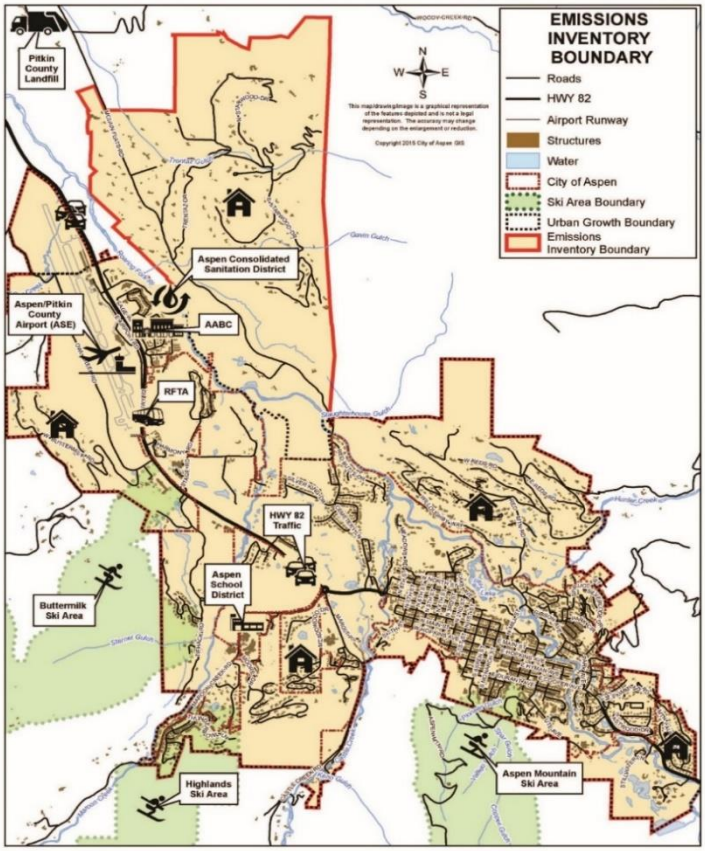


Figure 3: Aspen's Emissions Inventory Boundary.

The most recent Community-Wide GHG Emissions Report indicates that "in 2014, the Aspen community generated 394,341 metric tons of CO_2e (carbon dioxide equivalent): about the same amount as the energy used in 36,000 average American homes for one year or the emissions associated with driving an average passenger vehicle 934 million miles."[22]

Further discussion of this measure is found in the following one-page dashboard:

- *Community-Wide Greenhouse Gas Emissions*

Energy Use from the Built Environment

Even in a town where residents and visitors spend a significant amount of time outdoors, the energy use that residents and guests incur through the built environment in Aspen is significant. In total, commercial and residential buildings account for 70% of all the energy use in Aspen's EIB and are responsible for 56% of GHG emissions.[23]

In Aspen's resort economy, indoor comfort is requisite. This fact, coupled with the town's cold winters, poses a challenge to reducing building energy consumption. To tackle this key issue, a variety of

[20]*Aspen's EIB is nearly identical to the City of Aspen's Urban Growth Boundary, but also includes 1) the Starwood and the White Horse Springs section of the McLain Flats residential areas; 2) the residential areas within and contiguous to the Aspen city limits such as Red Mountain, Mountain Valley (on the southeastern edge of town), Highlands, Buttermilk West, the Aspen-Pitkin County Airport, the Aspen Airport Business Center, and North Forty; and 3) the electricity and natural gas used to run lifts and facilities on Aspen Mountain, Aspen Highlands, and Buttermilk ski areas (because the base facilities and many lifts are within the EIB). The EIB has been used since 2004 under the rationale that this geographic area represents Aspen's core functionality. Menges, Chris. 2014 Aspen Community-Wide Greenhouse Gas Inventory. Rep. Aspen: City of Aspen Canary Initiative, 2014.*

[21]*Image: City of Aspen.*

[22]*Menges, Chris. 2014 Aspen Community-Wide Greenhouse Gas Inventory. Rep. Aspen: City of Aspen Canary Initiative, 2014.*

[23]*Ibid.*

community partners are collaborating to increase energy efficiency and reduce unnecessary use and waste, while still supporting an exceptional guest and resident experience.

The following one-page dashboard provides a concise summary of Aspen's energy use in the built environment:

- *Energy Use from the Built Environment*

Mass Transit Use

Transportation, congestion, and parking are critical issues that impact the health of Aspen's environment, economy and lifestyle. These topics are so important to the community that Aspen's City Council dedicated two of its top ten goals for 2015-2017 to transit-related initiatives. These two goals are to: "Identify and determine the feasibility of viable alternatives to personal vehicles including 'next generation' mobility technology in order to improve the downtown experience," and "Develop and implement a plan to reduce traffic within the next two years."[24]

Achieving these goals and transforming Aspen's transportation sector will require a diverse and multi-faceted approach. Current contributions to this initiative include:

Paid Parking	Encourages walking, biking, and using public transit. Discourages personal vehicle use.
Special Parking Permits	Encourage carpooling and low-emissions vehicles.
Rapid Bus Transit	The Roaring Fork Transit Authority (RFTA) pioneered the first rural bus rapid transit (BRT) service in the nation,[25] which offers comparable if not faster travel times for residents and visitors traveling up and down the valley.
City of Aspen buses	Free and frequent buses enable residents to reduce travel times and dis-incentivizes the use of single occupancy vehicles with their associated gas, maintenance, and parking costs.
WeCycle Bike Share	Convenient bike docks located throughout town provide alternative means for navigating Aspen.
Downtowner Shuttle	In the summer of 2016, a free, electric, on-demand shuttle will provide rides throughout downtown.

Aspen's efforts to decrease traffic and move away from the use of personal vehicles are significant. Truly transforming the transportation sector will require further increased use of mass transit, along with future mobility technologies.

[24] *Aspen City Council. Top Ten Goals: August 2015-August 2017.*
[25] *"VelociRFTA - BRT." Roaring Fork Transportation Authority. Web. <http://www.rfta.com/routes/velocirfta-brt/>.*

Figure 4. Paid parking and a free local bus service are among Aspen's efforts to reduce congestion and promote alternative methods of transportation.

The subsequent one-page dashboard provides a specific examination of the current ridership on City of Aspen bus routes:

- *Mass Transit*

Though these routes are only one piece of Aspen's efforts to promote mass transit, they represent an area of significant impact and insight into possible future expansion.

Current & Proposed Actions

- To meet upcoming GHG reduction goals, the Aspen community needs to work toward de-carbonizing its energy sources, while simultaneously reducing demand through energy efficiency and demand-side management.
- Holy Cross Energy, Black Hills Energy, and Aspen Electric partner with Energy Smart at the Community Office for Resource Efficiency (CORE) to provide subsidized home energy assessments, energy efficiency rebates and grants to residents and businesses.
- The Renewable Energy Mitigation Program (REMP), established in 2000, requires homes and businesses with outdoor pools, spas, snowmelt, or surplus square footage to offset their energy use by installing renewables on site or paying a mitigation fee. Fees from REMP go back into the community to fund energy efficiency grants and rebates.
- The Aspen Energy Challenge is Aspen's locally-branded effort to win the Georgetown University Energy Prize, a national energy efficiency competition. Community involvement and total energy savings in residential, public, and school buildings will determine who wins $5 million dollars to reinvest in their town. As part of this effort, major energy efficiency improvements are being made in Aspen's public schools and affordable housing stock. Residents and businesses are also offered monthly energy saving promotions.
- At the time of publishing, the community of Aspen is in the midst of a climate action planning process to determine sector-specific greenhouse gas reduction measures in transportation, commercial and residential buildings, transportation, waste, and at the airport.
- Working with Holy Cross Energy to source a larger portion of electricity serving the Aspen portion of their service area from renewable energy will be vital if the 30% and 80% reduction targets are to be met.

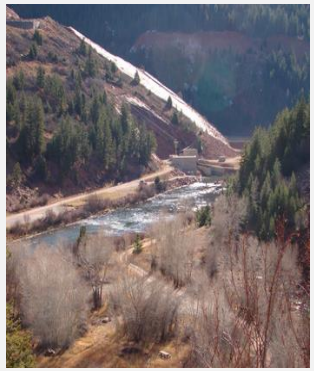
Percentage of Electrical Energy from Renewable Sources

What is it? Why is it important?

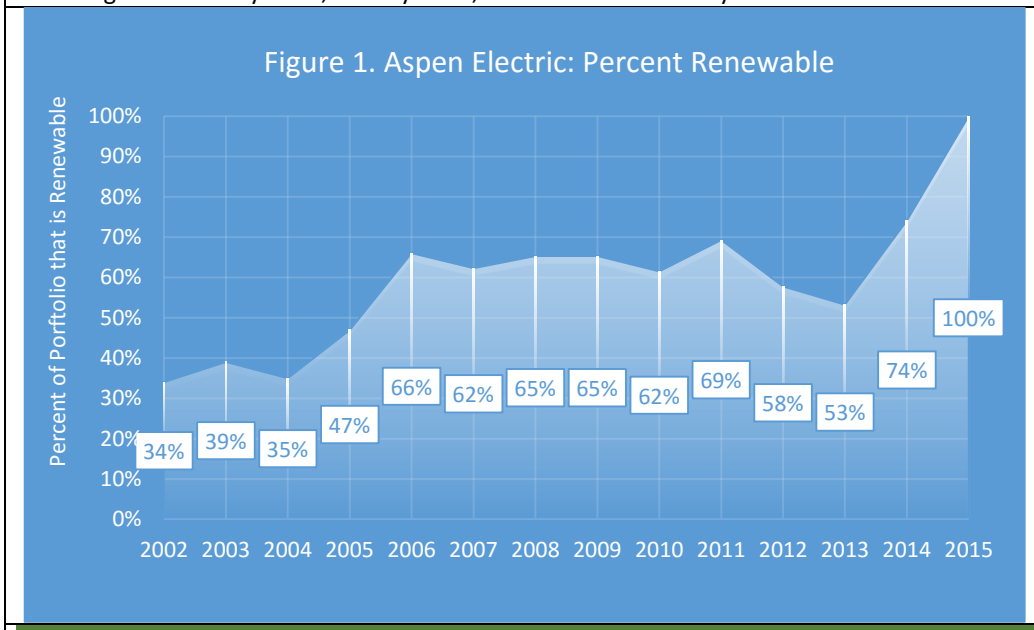
This measure describes how much of the electrical energy use supplied by Aspen Electric is sourced from renewable energy. In 2015, Aspen Electric (AE) Utility reached the goal of procuring 100% of its electricity from renewable sources. By committing to and maintaining renewable energy production, Aspen can limit the use of finite resources and reduce the pollution and greenhouse gas generation associated with traditional energy production.

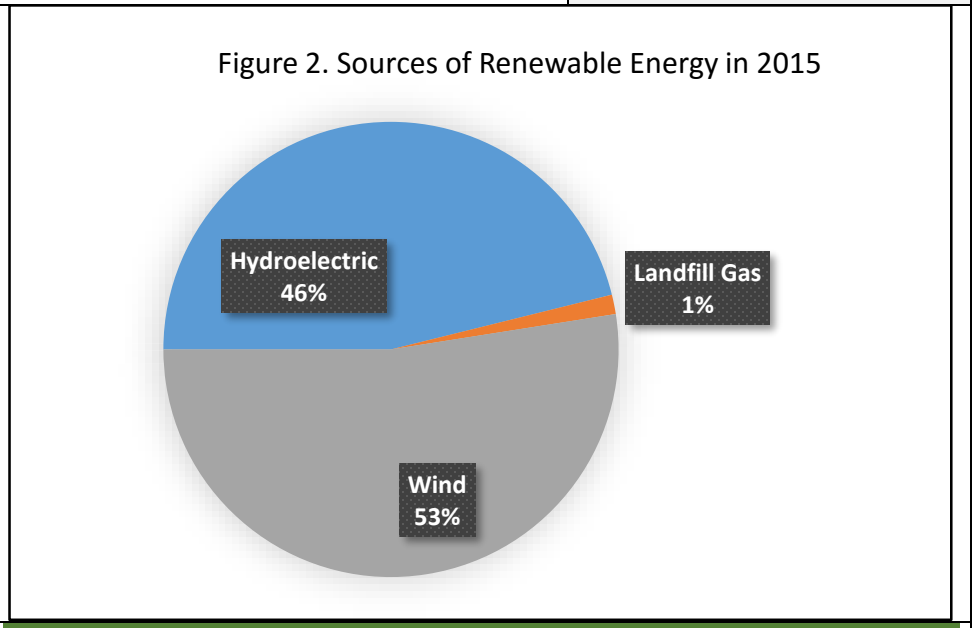
What does the data/trend say?

Figure 1 shows AE's progress in providing 100% renewable energy. In 2015, Aspen achieved 100% renewable energy by procuring a wind-powered contract. Figure 2 describes the different types of renewables that comprise the 2015 AE portfolio, namely 53% wind, 46% hydroelectric, and 1% landfill gas.[1] AE serves approximately 2,900 connections inside of Aspen city limits. All other residents and businesses receive electricity from the Holy Cross Energy Co-op, which in 2015 sourced 30.3% of its portfolio from renewable sources.[2] While there is room for improvement, it also represents significant exceedance above the 10% that is mandated for cooperative utilities in the State of Colorado.[3] Holy Cross Energy has set its own targets of 20% by 2015, 30% by 2020, and 35% renewable by 2025.



The Ruedi Reservoir: a source of hydroelectricity for the City of Aspen





Target

Aspen Electric will maintain its current portfolio percentage of 100% of electrical energy provided by renewable sources. **Aspen is currently meeting its 100% target**. In 2015, AE signed a 3-year contract to procure a 100% renewable portfolio. This represents the increase between 2014 and 2015. In future years, this percentage needs to be continually secured. This is in addition to any increase in electrical energy demand.

Data Sourcing & Considerations

The data in figures 1 and 2 pertains to the Aspen Electric utility, not to Holy Cross Energy. It is important to remember that a large segment of Aspen's population, as well as a wider regional population, is served by HCE.

Sources: [1][Figure data] Menges, Chris. City of Aspen Canary Initiative. [2] "2015 CO2 Emissions Report." Holy Cross Energy. Web. <https://www.holycross.com/co2-emissions>. [Photo] City of Aspen Utilities Department

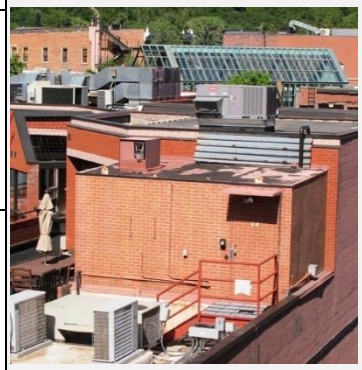
Community-Wide Greenhouse Gas Emissions

What is it? Why is it important?

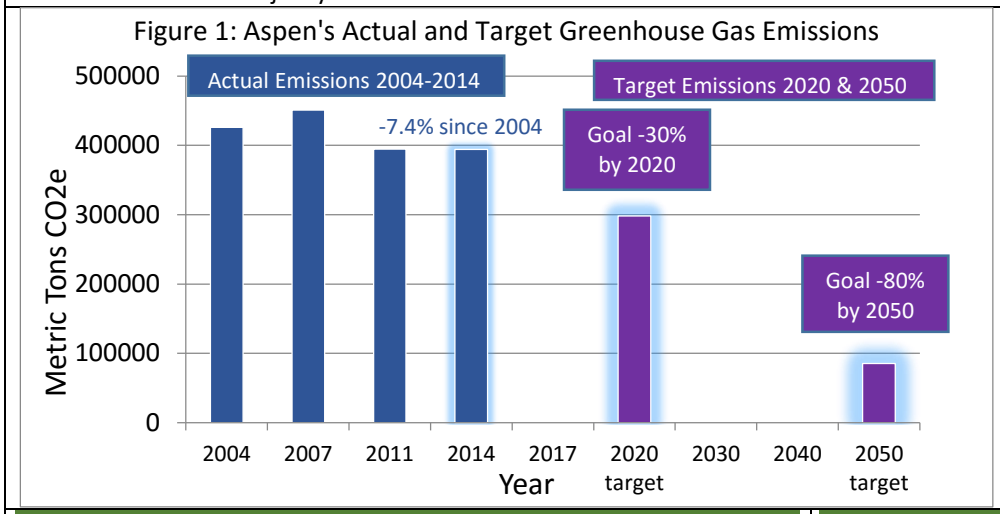
As a mountain town very likely to be impacted by climate change, Aspen has a vested interest in reducing greenhouse gas (GHG) emissions and the harmful impacts that they create worldwide. In 2004, the City of Aspen established goals for reducing GHG emissions 30% by 2020 and 80% by 2050 (all below 2004 levels). Since then, the City has produced regular community-wide GHG emissions inventories, which measure the total metric tons of carbon dioxide equivalent (CO_2e) emitted in the City of Aspen Emissions Inventory Boundary (EIB). CO_2e represents the net climate impact of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions.[1]

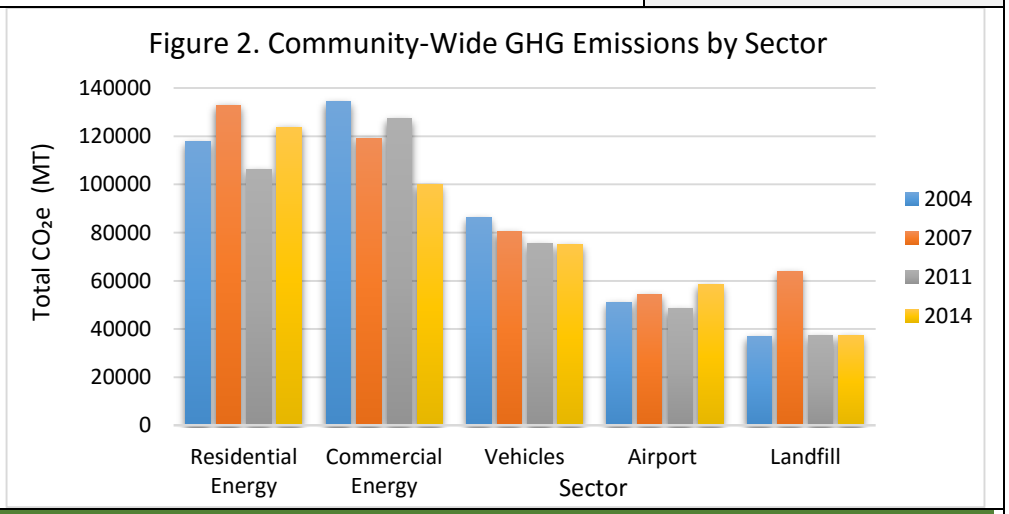
What does the data/trend say?

Figure 1 shows total community-wide GHG emissions over time and compared to Aspen's GHG reduction targets. Between 2011 and 2014, emissions declined by just 0.44%, though a 7.4% reduction in GHG emissions was achieved between 2004 and 2014. While 7.4% reduction in emissions may seem a modest portion of Aspen's reduction goals, it is important to put it in the context of Aspen's concurrent growth in inflation-adjusted taxable sales (22% since 2004) and population growth (5.5% growth since 2004 in City Limits).[2] The fact that Aspen's emissions have not increased as such is encouraging. Still, significant action is needed to reach a further 22.6% by 2020. Figure 2 analyses emissions by sector. Understanding where emissions come from is an essential step in targeting specific reduction areas and efficiency opportunities. By far, Aspen's building stock is accountable for the majority of GHG emissions.



Aspen's buildings account for the majority of GHG emissions.





Targets

Aspen will reduce its GHG emissions from commercial and residential buildings in its EIB below 2004 baseline levels by 30% by the year 2020 and 80% by the year 2050. To meet the 2020 goal, Aspen will need to further reduce its emissions by 22.6%.

Data Sourcing & Considerations

Shifts in GHG emissions are best measured over a multi-year timespan. Thus, Aspen's Community-Wide Inventory is performed approximately every 3 years. Visit this report for more information about its methods and a sector-specific analysis of findings: http://www.aspenpitkin.com/Living-in-the-Valley/Green-Initiatives/Canary-Initiative/Climate-Action-Progress/. In Figure 2, the Wastewater sector was not included due to its very limited emissions.

Sources: [1][2][Figures] Menges, Chris. 2014 Aspen Community-Wide Greenhouse Gas Inventory. Rep. Aspen: City of Aspen Canary Initiative, 2014.

Total Energy Consumption from the Built Environment

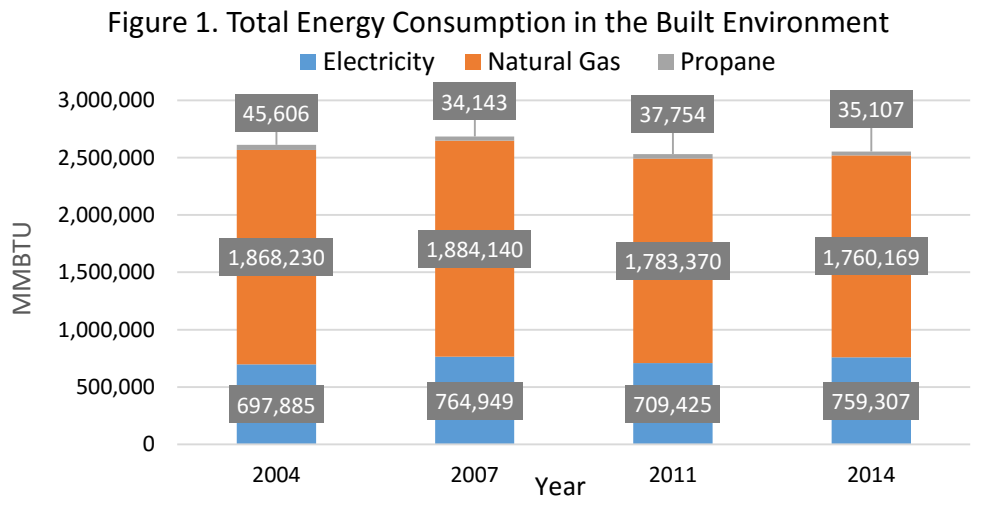
What is it? Why is it important?

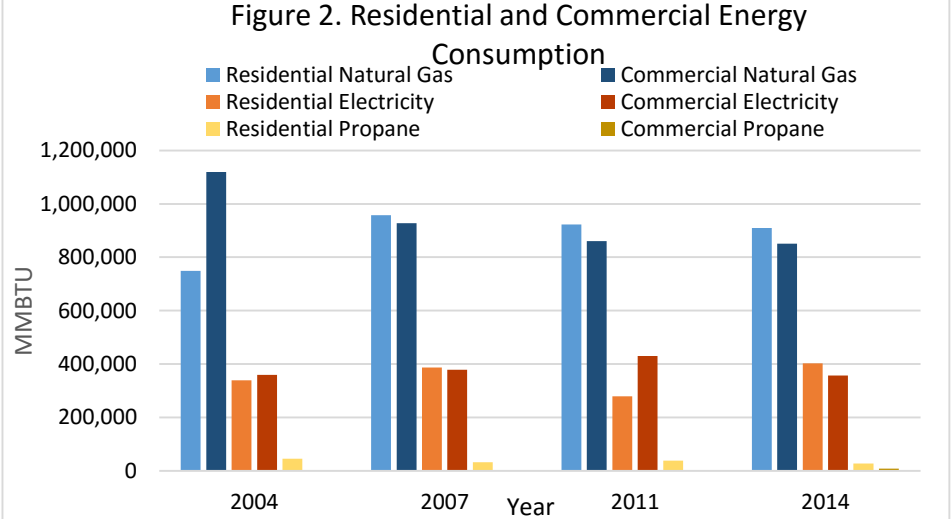
This measure describes the energy consumption of the residential and commercial buildings in Aspen's Emissions Inventory Boundary (EIB). In 2014, energy use from the built environment comprised 70.1% of total energy use and 56% of the greenhouse gas emissions in the EIB.[1] Measuring and understanding building energy use is an essential step in promoting energy efficiency and energy use reductions. Aspen's buildings use energy from two major sources: natural gas and electricity, in addition to small amounts of propane. Natural gas is measured in therms, electricity is in kWh, and propane in gallons. To compare energy uses, all are converted into a common unit, millions of British Thermal Units (MMBTUs).

Energy meters display real-time use.

What does the data/trend say?

As is seen in Figure 1, 2,554,583 MMBTU were consumed in Aspen's built environment in 2014, which constitutes a **1.8% reduction from 2004 levels**. Though this reduction may seem modest, it is important to put it in the context of Aspen's concurrent economic growth (22% since 2004) and population growth (5.5% in City Limits).[2] The fact that Aspen has decoupled its energy use from this growth is an encouraging finding. Natural gas is by far the largest energy source used, followed by electricity. In total, residential building used 2% more energy than commercial buildings in 2014. Figure 2 displays commercial and residential energy use, broken out by source type. Commercial natural gas use has decreased since 2004. Meanwhile residential natural gas use peaked in 2007, since which it has decreased marginally, though not below 2004 levels. 2014 residential electricity increased slightly from 2004 levels, whereas commercial electricity decreased.





Target

Upon writing of this report, the Aspen community is engaged in a climate action planning process, which will be formulating plans for sector-specific energy and greenhouse gas reductions. Upon completion of this planning effort, a target will be established accordingly.

Data Sourcing & Considerations

Data collection follows ICLEI's US Community Protocol for Greenhouse Gas Emissions and is highly reliable. Utility providers use distinct methods for categorizing commercial and residential buildings. Accordingly, there may be discrepancies in how different providers classify the same buildings.

Sources: [1][2][Figure data] Menges, Chris. 2014 Aspen Community-Wide Greenhouse Gas Inventory. Rep. Aspen: City of Aspen Canary Initiative, 2014. [Photo] Menges, Chris.

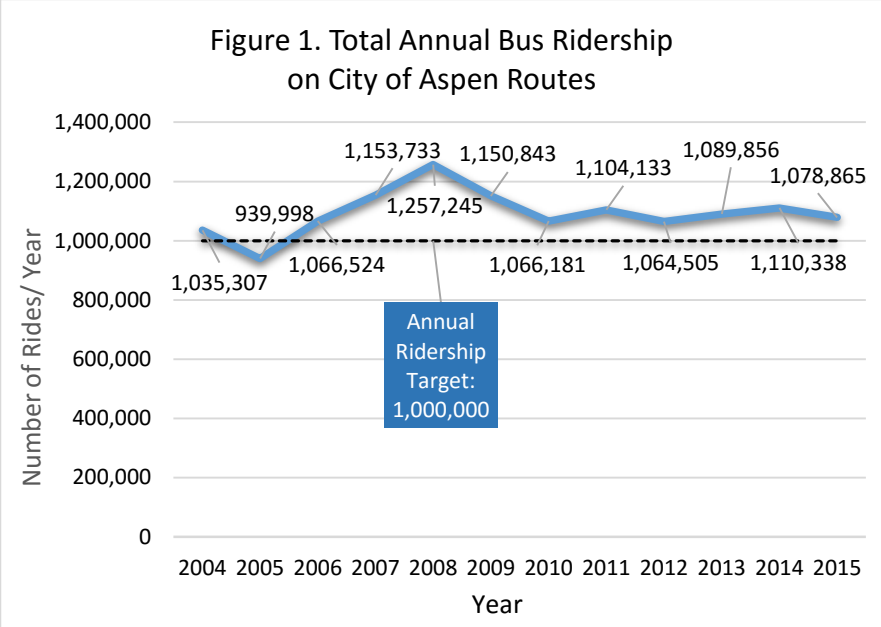
Mass Transit Use

What is it? Why is it important?

Vehicle transportation is responsible for adverse environmental impacts including air pollution and the creation of greenhouse gases. In 2014, on-road vehicles were responsible for 29% of energy and 19% of community-wide greenhouse gas emissions in Aspen's Emissions Inventory Boundary.[1] By using mass transportation, visitors and residents can reduce the number of vehicles on Aspen's roads, their environmental effects, and energy use.

What does the data/trend say?

As seen in Figure 1, total annual ridership of City of Aspen bus routes has remained above 1 million since 2006. In 2015, that number reached 1,078,865. In 2016, these numbers may increase with an added hourly Burlingame service in the winter and summer high seasons, as well as the fall off season. The City of Aspen provides eight free shuttle routes to different destinations in and around the City (Figure 2). It is important to note that in addition to intra-city buses, there are a variety of alternative transit options in Aspen including the WeCycle bike share, Car to Go, carpooling, and the Downtowner electric shuttle program. The City of Aspen also partners with the Roaring Fork Transit Authority (RFTA) to support a robust public transit system within the entire valley.



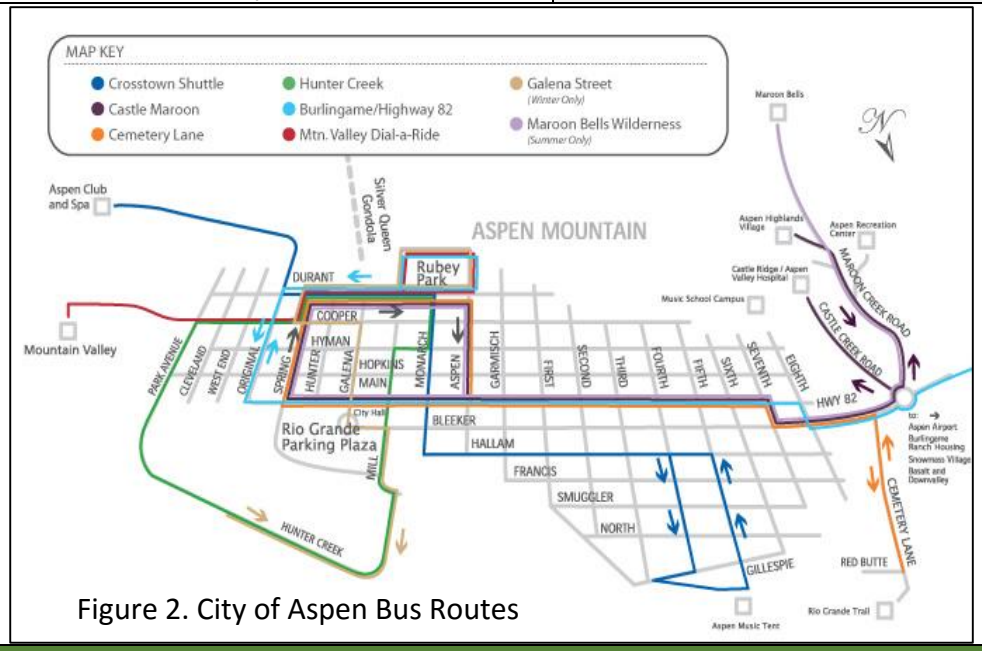


Figure 2. City of Aspen Bus Routes

Targets

Aspen's target is to maintain at least 1 million rides per year on the City of Aspen Routes. Infrastructure and route expansions could lead to increasing this target in the future.

Data Sourcing and Considerations

While data for this measure only applies to internal City of Aspen bus routes, supporting a diverse array of options is critical to the success of alternative transit. In future years, this dashboard may also compare mass transit use with daily population in town, density of population areas served, or vehicle miles traveled.

Sources: [1] Menges, Chris. 2014 Aspen Community-Wide Greenhouse Gas Inventory. Rep. Aspen: City of Aspen Canary Initiative, 2014. Print, p. 32 [Photos and Figure data] City of Aspen Transportation Department