For More Information

If you would like to learn more about Austin Energy, the LBJ School of Public Affairs, or Solar Austin, please visit the following web sites:

www.austinsmartenergy.com
www.utexas.edu/lbj
www.solaraustin.org

Moving Towards a Sustainable Electric Utility

There are many ways for Austin Energy (AE) to reach carbon neutrality by 2020. If the US decides to regulate carbon dioxide emissions AE would face a business choice: whether it wishes to reach carbon neutrality by potentially paying hundreds of millions of dollars in carbon fees, taxes, or offsets, or whether it wants to invest in new sources of renewable or nuclear energy that cost more to build than its proposed energy resource plan but less to operate under a carbon regulation regime.

AE's proposed resource plan appears to be a reliable, low cost, and low risk investment plan compared to the other seven scenarios evaluated by the project team. However, it also reduces direct CO_2 emissions the least because AE continues to burn coal at a constant rate through 2020. If AE wishes to reduce its carbon footprint significantly by 2020 one option is to reduce its reliance on coal. So-called "clean coal," nuclear, biomass, and geothermal create opportunities for replacing AE's current pulverized coal-fired baseload generation capacity with cleaner forms of baseload power. Biomass and geothermal resources face availability constraints that limit their potential to replace all of AE's current coal baseload power usage. It is not known if AE could build clean coal facilities with carbon capture and storage at the necessary scale to replace FPP on its own by 2020. Additional nuclear or natural gas power generation capacity remain reliable substitutes for coal baseload power generation.

Renewable sources of energy present the most sustainable options for generating electricity, but are expensive and uncertain given the variable nature of solar and wind. Energy storage could help reduce carbon dioxide emissions if coupled with onshore wind investments to reduce the risks associated with the variable nature of wind. The cost of implementing new renewable power generating technologies, particularly solar technologies, into AE's resource portfolio would need to drop considerably between 2009 and 2020 to make a high renewable investment scenario cost competitive with AE's proposed energy resource plan.

Drafts of the summary report and full-length report can be accessed online at the following website:

http://www.utexas.edu/lbj/news/story/732/

Sustainability

Sustainability is a relative term regarding the degree of impact that a particular activity or power generation technology has upon the environment and the availability of resources for future generations. Therefore, one activity or technology that poses less adverse consequences for future generations than another activity or technology is more sustainable for the purpose of electric generation.

Carbon Neutrality

Carbon neutral status is achieved by reducing carbon dioxide emissions to the greatest extent possible and then balancing the remaining carbon dioxide emissions with measurable and reliable carbon dioxide storage methods or by purchasing offsets.

Sustainable Energy Options For Austin Energy

March 2009

A Policy Research Project of the Lyndon B. Johnson School of Public Affairs

Co-sponsored by Austin Energy and Solar Austin

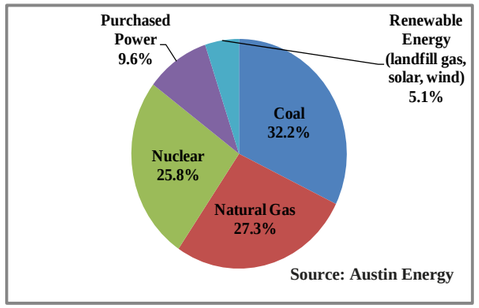
Exploring Future Energy Options

This brochure presents a brief overview of the findings of a research project on "Sustainable Energy Options for Austin Energy." Several reports were prepared during the 2008-09 academic year by a policy research project team composed of graduate students from multiple departments of The University of Texas at Austin through the Lyndon B. Johnson School of Public Affairs. The project was commissioned by the City of Austin (on behalf of Austin Energy) and Solar Austin, a Central Texas non-profit renewable energy organization.

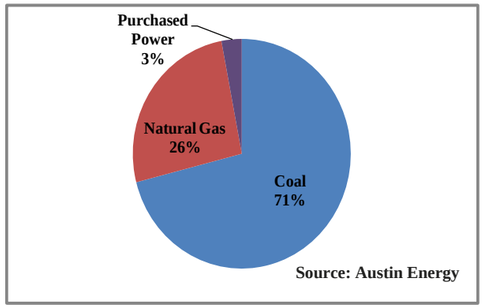
This report seeks to identify feasible and cost-effective investment opportunities for Austin Energy (AE) that can help contribute to the creation of a sustainable electric utility. The report set the target of achieving zero net carbon dioxide (CO_2) emissions by 2020 as an interim goal towards achieving a sustainable electric utility.

The power generation mix that AE implements in the future will represent a major portion of its cost of service and will be a significant contributor to either increasing or reducing AE's carbon footprint. The resources used and technologies implemented will influence how AE and Austin are perceived as a sustainable utility and a sustainable city, respectively. AE's future energy portfolio will affect customer electricity rates and AE's capacity to contribute assets to the City of Austin budget.

AE Power Generation Mix by Source (FY 2007)



AE Direct CO_2 Emissions by Source (2007)



Austin Energy faces the dilemma of meeting the energy needs of the public while accounting for potential carbon regulation, public perception of conventional energy resources, and cost and reliability issues associated with new, clean sources of energy.

Austin Climate Protection Plan (ACCP) 2007

Austin Energy will:

- Establish a CO_2 cap and reduction plan for utility emissions.
- Only make new investments in carbon-neutral power generation.
- Reduce peak demand by 700 MW by 2020 through energy efficiency, conservation, and demand-side management.
- Meet 30% of its energy needs from renewable resources by 2020, including 100 MW from solar.

The ACCP does not require Austin Energy to be carbon neutral by 2020.

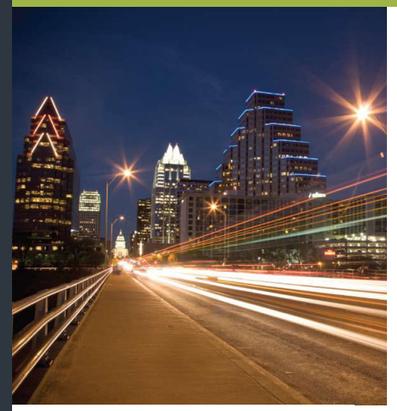


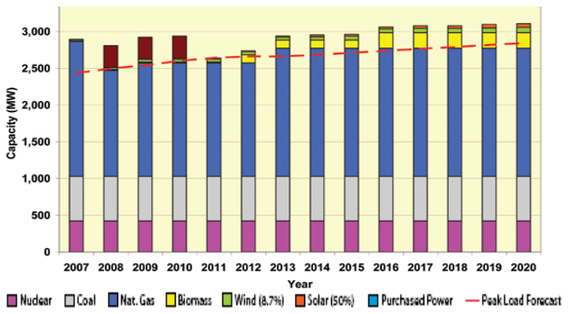
Photo: Dan Herron Source: Austin Energy

Austin Smart Energy

Clean – Reliable – Efficient

In 2008, Austin Energy released its "Smart Energy Resource Guide" and launched a public engagement process to gather input from citizens and stakeholders on the future investment decisions the city can make.

Austin Energy Proposed Resource Plan



Note: The 8.7% wind and 50% solar are the amount of capacity that can be counted on during peak demand hours.

Source: Austin Energy

The City of Austin has an educated populace and engaged City Council concerned with the local and global environments. Austin owns its electric utility, Austin Energy (AE), so its citizens can influence its future operations and energy choices. Over the past several decades AE has exhibited leadership in promoting energy efficiency and conservation programs and investing in sources of renewable energy. AE is arguably one of the most innovative and creative electric utilities in the United States, with a record of environmental stewardship and concern for assuring low-cost and reliable electricity to its customers. Despite previous efforts, AE has difficult choices to make, as "business as usual" may not be the most sustainable approach to providing electricity to customers.

City Council passed the Austin Climate Protection Plan (ACPP) in 2007 to reduce Austin's contributions to global warming by 2020. The primary goal of AE is to ensure that its power generation mix can meet demand reliably at affordable electric rates for customers. AE is now faced with additional goals set forth by the ACPP to increase the amount of renewable energy resources used and reduce the amount of carbon dioxide (CO_2) emitted into the atmosphere that can be directly attributed to its resource mix. While the benchmarks set by the ACPP aim to reduce dependence on traditional fossil fuels and limit CO_2 emissions, this report seeks to take these goals further by evaluating the impacts of moving toward a sustainable AE.

AE has proposed adding 1,000 additional MW of power generation capacity to its current resource mix by 2020. Since releasing this plan, AE has made considerable efforts to engage its customers in a public dialogue regarding the proposal and the future energy options for AE. The following additions to AE's resource mix have been proposed:

- 200 MW of combined-cycle natural gas additions at Sand Hill by 2013;
- 100 MW of additional biomass by 2016;
- 600 MW of net on-shore wind; and
- 100 MW of solar by 2020.

The following seven portfolio mix scenarios were tested to demonstrate the diversity of investment opportunities for AE and the associated impacts:

- nuclear expansion;
- high renewables;
- high renewables to replace coal and nuclear;
- expected available renewables;
- expected available renewables with energy storage capacity;
- natural gas expansion;
- clean coal (integrated gasification combined-cycle.

Austin Energy's proposed resource plan appears to be the most reliable, least costly, and least risky investment plan of the eight scenarios that were evaluated by the project team. However, it also reduces direct CO_2 emissions the least.

Source: Austin Energy

Portfolio Analysis Simulator

In order to assess power generation options, the project team designed a user-friendly spreadsheet relying on Microsoft Excel to automate calculations and displays. This simulator allows a user to compute consequences of resource additions and subtractions made to AE's resource mix between 2009 through 2020. Inputs include potential power generation and associated technology investments and the associated availability factors, capacity factors, capital costs, fuel costs, and levelized cost of electricity associated with these technologies. A user can manipulate the investments in different technologies, the characteristics of these technologies, and cost data to align with their assumptions.

The following power generation types are potential inputs in the model:

- Pulverized Coal;
- Coal-fired integrated gasification and combined cycle with carbon capture and storage;
- Nuclear;
- Natural gas fired combustion turbines and combined cycle;
- Wind (on-shore and off-shore);
- Biomass (wood waste);
- Coal co-fired with biomass;
- Landfill gas;
- Concentrated solar;
- Solar photovoltaic; and
- Geothermal

Energy storage options including compressed air energy storage are considered.

The simulator generates the following charts and graphs to demonstrate how the choice of energy source affects system reliability, carbon emissions, and costs:

- Annual generation capacity by resource through 2020;
- Annual electricity production by resource through 2020;
- Hourly load profile by resource for meeting peak demand in 2020;
- Annual carbon emissions profile through 2020;
- Potential annual carbon costs or profits;
- Potential costs to offset remaining carbon emissions;
- Annual capital costs;
- Annual fuel costs; and
- Expected increases in the cost of electricity.

The graph below demonstrates how costs (green line) can decrease as carbon emissions (blue bars) increase. Average residential cost of electricity is currently about 10 cents/kWh.

Simulator Output: Carbon Dioxide Versus Average Cost of Electricity in 2020

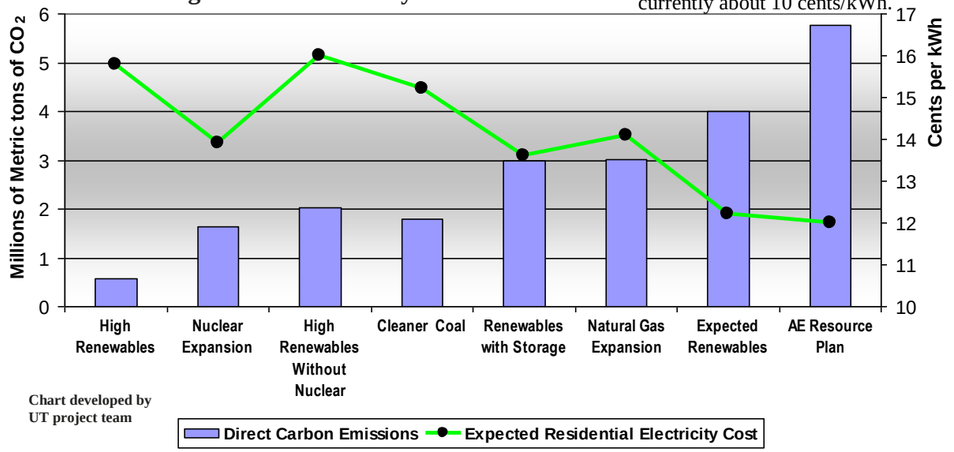


Chart developed by UT project team

Energy Storage "The Holy Grail"

Utility-scale energy storage technologies may allow electric utilities to store low-cost off-peak electricity generated from wind to yield electricity during peak usage periods. Energy storage may perform a highly valuable operation for electric utilities that would increase the value of variable renewable energy sources (particularly wind). The spreadsheet can calculate benefits of energy storage by transferring stored power generated during off-peak periods to peak demand periods.

Demand-Side Management (DSM) "Nega-Watts"

Conservation, load-shifting, peak-smoothing, demand response, direct load control and pricing can encourage reductions in energy use which can defer the need for capital investment in new power plants or avoid the costs of serving load at a demand peak. The scenarios presented here all assume AE will reach its target of 700 MW of new demand reduction by 2020 through a variety of existing and planned programs. However, it is possible that AE could achieve greater energy savings through increased investment in DSM.