Clean, Renewable Energy

Climate change is one of the most significant and critical challenges confronting the world today and implementing energy efficiency and renewable energy strategies is key to addressing this challenge.

A first step in meeting this challenge is to establish a renewable energy portfolio for the Albuquerque metropolitan area. Our plan calls for 30% of the energy generated or used within its city limits to come from renewable energy sources by 2020. By 2050, that figure should rise to a minimum of 80%. (See *Carbon-Free and Nuclear-Free Energy Systems in the U.S.* by Dr. Arjun Makhijani.)

We define renewable energy as solar, wind, geothermal and biomass, based on Albuquerque's geography and local resources. We believe these resources will play a major role in the plan to reduce greenhouse gas emissions and the carbon footprint for the Albuquerque metropolitan area. The lion's share of greenhouse gas reductions will come from solar- and wind-generated electricity, implemented energy efficiency measures and behavior changes for energy conservation. Geothermal also has some real potential for efficiently heating and cooling homes and businesses, as does biomass.

In this report, we outline a variety of strategies for each of the four renewable energy resources available to Albuquerque. We also highlight energy efficiency strategies, stressing the vital importance of energy conservation. Energy efficiency is the easiest and least expensive way to achieve greenhouse gas mitigation.

Our recommendations are to:

- Identify clean, renewable energy options and strategies to significantly increase renewable energy use within the greater Albuquerque area over the next 40 years.
- Increase energy efficiency in the same time frame in homes and in governmental, commercial and industrial operations throughout the greater Albuquerque area.
- Collaborate with educational institutions, national laboratories and industry to foster research and development of energy efficiency and renewable energy solutions in the greater Albuquerque area.

Strategy One
Increase solar energy development and use from current levels of less than 1% to future levels of 70% of the metro region's renewable energy portfolio to help achieve the 2020 and 2050 GHG reduction goals.

Strategy Two
Increase wind energy development and use from current levels of approximately 5% to future levels of 20% of the metro region's renewable energy portfolio to achieve 2020 and 2050 GHG reduction goals.

Strategy Three
Increase biomass development and use from current levels of less than 1% to future levels of 5% of the metro region's renewable energy portfolio to help achieve the 2020 and 2050 GHG reduction goals.

Strategy Four
Increase development and use of geothermal energy from current non-existent levels to 5% of the metro region's renewable energy portfolio to help achieve the 2020 and 2050 GHG reduction goals.

Strategy Five
Achieve a minimum of 30% reductions in greenhouse gases through energy efficiency to help meet the 2020 and 2050 GHG reduction goals.

1. Increase solar energy development and use from current levels of less than 1% to future levels of 70% of the Albuquerque metropolitan area's renewable energy portfolio to help achieve the 2020 and 2050 GHG goals.

- The City leads by example by installing solar energy systems at highly visible City-operated facilities such as the airport, zoo, BioPark, museums and other facilities.
- Centralize sustainability and energy efficiency efforts and resources into one department that reports directly to the Mayor. Demonstrate commitment to greenhouse gas reduction by hiring people who understand the needs of the City and the technology. Pay staff a competitive salary to better ensure continuity, retention and development of dedicated professionals who will promote and monitor the implementation of renewable energy resources over the long-term.
- Recommend that the NM State legislature increase its greenhouse gas and energy efficiency goals to match the City of Albuquerque's goals.
- Prepare a comprehensive roof study to identify viable candidates for solar photovoltaic and solar thermal installations and identify carport parking that could include solar photovoltaic systems.
- Utilize Clean Renewable Energy Bonds to leverage for solar installation.
- Negotiate purchase power agreements (PPAs) to buy electricity from concentrated and photovoltaic solar facilities in the state.
- Offer low-interest loans to residents and businesses to install solar photovoltaic and solar thermal equipment on their rooftops and establish a revolving fund to finance the loan program.
- Tap into the new $3.1 billion Federal-State Energy fund to enable homes and businesses to pay up-front costs.
- Provide tax rebates and credits for building, manufacturing and buying solar technology. Tier the tax credits based on household income and provide 100% of the system to the lowest income residents.
- Base all installations on performance (energy generated by the system).
- Require that all installations utilize quality solar equipment. At a minimum, quality indicators require Universal Laboratory (UL) listed equipment.
- Consider feed-in tariffs to encourage residential and commercial distributed solar electric generation. Tariffs must be cost-competitive and must provide an incentive to conserve power. This may best be accomplished as an expansion of the Renewable Energy Certificate credit.
- Increase the City's Capital Improvement set-aside fund for energy efficiency and renewable energy from three to five %.
- Exempt solar thermal equipment manufactured within the City from sales tax.
- Retrofit all exterior city lights (streets, parks and parking lots as appropriate) to run on solar photovoltaic power in a manner consistent with lighting regulations.
- Work with Mesa del Sol and other developments to establish a pilot project that features solar-powered model buildings.
- Site large concentrated and photovoltaic solar installations close to Albuquerque for easy transmission.
- Modify existing planning, zoning and building codes to ensure that all new buildings have solar thermal hot water systems.
- Continue to work with Mesa del Sol and other developments to maximize cost-effective solar energy.
- Work with CNM, UNM and other educational institutions to encourage training programs for energy efficiency and renewable energy. If possible, provide grants hire program graduates.

2. Increase wind energy development and use from current levels of approximately 5% to future levels of 20% of the Albuquerque metropolitan area's renewable energy portfolio to achieve 2020 and 2050 GHG reduction goals.

- Negotiate wind power purchases from sites in Eastern New Mexico and other sites as they develop. Renegotiate with the local electric utility because it has an exclusive contract to provide electricity to the City of Albuquerque.
- Partner with the local electric utility to ensure transmission infrastructure is available for transmitting renewable energy to Albuquerque residents and businesses. Lobby the Public Regulation Commission and the Renewable Energy Transmission Authority to achieve these ends.
- Perform a siting survey to identify local microclimates in and around Albuquerque that would be suitable for small-scale wind energy installations.
- Initiate a wind energy pilot project to install wind energy on City buildings.

3. Increase biomass development and use from current levels of less than 1% to future levels of 5% of the Albuquerque metropolitan area's renewable energy portfolio to help achieve the 2020 and 2050 GHG reduction goals.

- Encourage cellulosic fuel crop development. Research and fund a pilot project that converts crops (cellulosic) into fuel.
- Expedite the permit process for companies that generate organic wastes so that the wastes could be transported to fuel processing centers.
- Consider ways to encourage algae producers to use marginal lands to develop algae as an oil-producing feedstock for biodiesel production.
- Provide tax credits to companies that implement biomass fuel programs.
- Research and fund a pilot project that converts salt cedar, Russian olive and other non-indigenous species into fuel.
- Consider combining biomass with solar energy generation at Mesa del Sol and other developments. Utilize City curbside green waste collection that includes the use of green waste with some generation systems.
- Provide funding or resources to support research and development efforts at local universities to develop improved biomass growth programs such as those that use the carbon dioxide from stack emissions to bubble through algae, which consumes the carbon dioxide and is then harvested and used for biodiesel fuel that replaces conventional fossil fuels.
- Expedite the permit process for companies that want to replace conventional fuels with biomass fuels.
- Expand the recovery of methane off-gases from landfill operations.
- Encourage the segregation of municipal solid waste, so that certain waste streams can be utilized for recycled material or as a fuel source that would replace conventional fuels. Otherwise, these materials would be landfilled and would eventually generate methane gas.

For additional information about algal biofuel research, development and demonstration in New Mexico, refer to the New Mexico State University's Agricultural Science Center program by entering "NMSU algae" in your web browser's search engine.

While electricity produced from biomass has great potential, environmental impacts of air emissions created from biomass must be carefully addressed. Clean-burning biomass technologies must be incorporated into any biomass facility planned for the Albuquerque region.

4. Increase development and use of geothermal energy from current non-existent levels to 5% of the Albuquerque metropolitan area's renewable energy portfolio to help achieve the 2020 and 2050 GHG reduction goals.

- Develop ground source heat pumps in Albuquerque.
- Offer rebates and tax credits to offset the initial cost of purchasing and installing geothermal systems.
- Work with the local electric utility to fund initial costs in a manner similar to that being done with non-refrigerated air cooling systems in Colorado.
- Install a demonstration project at the BioPark and give geothermal engineers and developers publicity and credit in exchange for design and installation work.
- Encourage geothermal technology training programs at higher learning institutions such as Central New Mexico Community College and the University of New Mexico.

5. Achieve a minimum of 30% reductions in greenhouse gases through energy efficiency to help meet the 2020 and 2050 GHG reduction goals.

A 24% savings in electricity consumption in New Mexico by 2020 is possible from energy conservation alone.

(Source: Southwest Energy Efficiency Project, NM Energy Efficiency Strategy, Nov. 2008.)

- Encourage energy audits for homes and commercial buildings.
- Work with the local electric utility to extend lighting rebate programs for homes and businesses.
- Install light-emmitting diode (LED) street lighting on City streets.
- Promote best-technology LED lighting at City facilities and in residential and commercial buildings.
- Builders and developers should work with the local electric utility to incorporate energy efficiency into buildings from design through completion. Reconsider refrigerated air and inoperable windows and encourage evaporative cooling, which works well in New Mexico and is three-to-five times more efficient than refrigerated air.
  (Source: *Evaporative Cooling Design Guidelines,* NM Department of Energy, Minerals and Natural Resources Department, December, 2002.)
- Incorporate Home Energy Rating System (HERS) standards for all new buildings now.
- Increase energy efficiency incentives for ENERGY STAR appliances such as refrigerators and washers. Expand existing incentive programs for energy efficient lighting and water conservation.
- Enforce stricter building codes by applying Leadership in Energy and Environmental Design-New Construction (LEED-NC) Gold Certification criteria to commercial and residential buildings.
- Exemplify City and State leadership by forming energy teams at every City and State building. Energy teams will include building maintenance and staff and incorporate energy management and conservation incentives for conserving energy.
- Follow the good sustainability example set by the Leadership in Energy and Environmental Design standards and require that new construction

increase the portion of renewable energy generated onsite.

- Incorporate better shading techniques for buildings' southern exposures. Shading is a simple and cost effective technique for conserving energy. City and State energy teams can identify shading opportunities at each building.
- Eliminate the urban "heat island effect" by incorporating green roofing and additional shading to City buildings. If green roofing is not possible, incorporate reflective roofing materials whenever possible.
- Incorporate alternative transportation fuels, hybrid and electric vehicles in the City's fleet and consider implementing "feebates" that charge fees for inefficient vehicles and provide rebates for efficient vehicles.
- Wherever possible, use natural daylighting in buildings instead of using conventional electrical lighting.
- Work with chain stores to reduce their carbon footprints.
- Research other municipal and institutional energy efficiency programs and consider employing successful approaches used by comparably sized cities in similar climate zones. Also consider successful programs of larger cities such as Portland, Houston and Los Angeles.
- Increase conservation education program in schools and fund additional programs aimed at fostering sustainable behaviors.
- Adopt new business models and economic frameworks that are increasingly based on renewable energy rather than fossil fuels.
- Make energy efficiency and renewable energy economically attractive to homeowners and building developers.
- Train employees to ensure that the workforce incorporates energy efficiency in all thinking and planning. Hold facility energy teams accountable for energy conservation and provide incentives to encourage results.
- Use peak demand reduction programs offered by demand response specialist firms such as EnerNOC and Converge.

Additional Resources and Information

Leadership in Energy and Environmental Design (LEED): LEED is a third-party certification program for the design, construction and operation of high performance green buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. (Source: *What is LEED©?*, US Green Building Council website. For more information about LEED rating systems and certifications, refer to www.USGBC.org.)

The urban "heat island" effect: Caused by heat-absorbing, non-reflective surfaces such as concrete, asphalt and dark roofs that trap heat near the ground's surface. The result is higher ground temperatures in an urban area that contrast with cooler ground temperatures in surrounding rural areas. This causes a "heat island" that traps heat in the city. The excess heat poses a health threat during heat waves, requires the use of additional energy to cool buildings and affects regional weather pattens. Remedies include the use of vegetation and trees, shading strategies and reflective or light colored materials on ground and roof surfaces to reflect rather than absorb heat.

"Feebates": A feebate is an incentive policy that encourages the continuous improvement to automobile fuel economy and greenhouse gas emissions by providing incentives for manufacturers to build more efficient vehicles and rewarding consumers who purchase more efficient vehicles. The feebate is simple in concept: inefficient vehicles receive a surcharge (FEE-), and efficient vehicles are granted a rebate (–BATE). The fees on the inefficient vehicles pay for the rebates on the efficient vehicles. Thus, the feebate has the potential to accelerate the production and adoption of more efficient vehicles, ultimately reducing the United States' transportation fossil fuel consumption. (Source*: Feebates: A Legislative Option to Encourage Continuous Improvement to Automobile Efficiency, Rocky Mountain Institute,* Natalie Mims and Heidi Hauenstein, Feb 2008.)

Daylighting: Daylighting is a design technique that uses natural daylight to illuminate interior building spaces. Building siting, window locations, sky lights, other openings and reflective surfaces are some techniques used to maximize natural interior light in a building.