





# ENERGY

## Energy's Role in Our Community

Energy has a direct impact on the community's economic development, public health and safety, air quality, and environment. It is essential that we plan for the energy resources upon which we depend, how they get to us, how to cost-effectively manage their use, and how to respond when the supply changes. Investing in energy efficient land use and transportation, renewable energy, and efficient building standards will reduce impacts on health and the environment, increase reliability of our energy supply, decrease housing costs, reduce water use, and keep dollars in the local economy.

How the region's land uses are designed plays a major role in energy conservation and efficiency. For example, compact development leads to driving less and walking more, smart site design takes advantage of solar gain, and green building techniques use less energy to heat and cool buildings. *Flagstaff Regional Plan* policies, together with the City's Zoning Code, play a role in the urban form of our community and both encourage efficient land use through "smart growth" principles.

## Efficient Use of Energy

Long-term energy planning will help the City and County to prepare for future energy-intensive initiatives and to be resilient to fluctuating energy costs. The City and County have and will set a positive example for the region by developing strong internal energy efficiency policies and programming that reduce operational expenditures. Both City and County buildings have gone through rigorous energy evaluations and efficiency retrofits. For the City of Flagstaff, this has resulted in a 42 percent annual savings in natural gas, electric, and water, which is more than \$335,000 annually.

In addition, both the City and County have been proactive in developing programs and codes to promote energy efficiency in new buildings and the retrofit of existing structures. Directing energy-efficient changes to the region's approximately 26,000 housing units<sup>1</sup> **[Need to update with 2010 Census data]** and 3,200 businesses<sup>2</sup>

Photo at left by: XXXXXXXXX

### GUIDING PRINCIPLES

#### ***Sustainability matters.***

Environmental, economic, cultural, and social sustainability ensure that present actions are the basis for future health and prosperity.

#### ***The environment matters.***

Natural environmental health is inherent to individual and community health, and healthy ecosystems should be nurtured.

#### ***A smart and connected community matters.***

Smart land use and design based on cohesive communities are respectful of our environment and create efficiencies that benefit community health, social interaction, commerce, and infrastructure.

#### ***Prosperity matters.***

Capitalizing on the innovative spirit that exists in the community will support the human, financial, and capital infrastructure needed for a sustainable and diverse economy.

#### ***Cooperation matters.***

Regional partnerships create a strong community, protect the environment, and achieve our common goals.

## GUIDING PRINCIPLES

Energy supply is an important component of a successful community. Decreasing energy consumption, increasing energy efficiency, and encouraging the use of renewable energy further this plan's vision for "intellectual, environmental, and economic vitality."

could affect and upgrade approximately 20 to 30 percent of our built environment [Doesn't make sense. Sounds like 100%. How do we get to 20-30%?]. Focusing on housing only, about 4,000 homes were built after 1994<sup>3</sup>, when building codes began to regulate minimum insulation standards. The homes built before this may or may not have insulation. "Basic efficiency upgrades" include sealing ducts, adding weather stripping, increasing or adding insulation, insulating the water heater and hot water pipes, adding a programmable thermostat and changing heating, ventilation and air conditioning filters. This is estimated to save a homeowner 15 to 25 percent in energy costs<sup>4</sup>.

The region's programs and codes promote energy conservation and efficiency through education and outreach. The Sustainable Building Program Checklist<sup>5</sup>, which certifies "sustainable" construction projects, requires standards above the International Energy Code baselines. This program also supplies research on the latest technologies and provides fact sheets on weatherization, insulation, efficient appliances, and annotated lists of local, state, and federal incentives for energy efficiency. Energy efficiency education is incorporated into many sustainable building programs taught at Coconino Community College<sup>6</sup> and Northern Arizona University<sup>7</sup>. The Flagstaff Unified School System recognizes energy efficiency in school buildings as a cost savings and as a component of K-12 energy education.

Continual effort to ensure energy-efficient buildings, whether new or retrofit, is one of the most effective cost savings a home or building owner can realize. With funding through the Federal Recovery Act of 2009, through the Department of Energy, the City of Flagstaff's Sustainability Program has partnered with the County's Sustainable Building Program and Coconino County Community Services to promote residential energy efficiency retrofits throughout the region (also refer to the Flagstaff Zoning Code, Section 10-30.70 "Residential Sustainable Building Standards" for examples). Arizona Public Service (APS) also offers weatherization programs for its customers.<sup>8</sup> Northern Arizona University has incorporated energy efficiency through its "green construction" and sustainability initiatives.<sup>9</sup>

### Meeting Our Objectives for Sustainability and Resiliency:

**Sustainable** energy solutions include renewable energy sources, conservation, and intentional design.

**Resiliency** will be met by multiple sources of energy and multiple modes of travel.

<sup>1</sup>Census 2000 with projected growth

<sup>2</sup><http://www.city-data.com/business/econ-Flagstaff-Arizona.html>

<sup>3</sup>City of Flagstaff Building Permit records

<sup>4</sup>Building Official / local architectural estimates

<sup>5</sup><http://www.coconino.az.gov/comdev.aspx?id=148>

<sup>6</sup>Note CCC programs here

<sup>7</sup>Note NAU programs here

<sup>8</sup>[www.acs.com/\\_\\_\\_\\_\\_](http://www.acs.com/)

<sup>9</sup><http://www.green.nau.edu/buildings.html>

Flagstaff Total housing units 26,058		
Year Structure Built		
Built 2005 or later	1,641	6%
Built 2000 to 2004	3,827	15%
Built 1990 to 1999	5,357	21%
Built 1980 to 1989	6,361	24%
Built 1970 to 1979	4,462	17%
Built 1960 to 1969	1,848	7%
Built 1950 to 1959	1,545	6%
Built 1940 to 1949	211	1%
Built 1939 or earlier	806	3%

\* Source: U.S. Census Bureau, 2009-2011 American Community Survey

One of the greatest uses of energy in the Flagstaff region is for transportation. Single-occupant vehicles are a significant user of energy for transportation, and represent an opportunity to improve overall energy efficiency. Transportation energy efficiency can be achieved by strengthening use of travel alternatives such as public transit, bicycling, and walking, and decreasing the population's auto dependency through smarter development patterns. These are individual choices, yet **urban form [What does this mean?]** can greatly influence the choices people make.

## GOALS AND POLICIES - EFFICIENT USE OF ENERGY

### Efficient Use of Energy

Goal E.1: Reduce total and per capita non-renewable energy use through efficiency and conservation.

**POLICY E.1.1.** Identify and pursue cost-effective energy efficiency options in the context efficiency options in the context of long-term planning.

#### Education

**POLICY E.1.2.** Develop land use regulations that promote land use patterns that increase energy efficiency in the building and transportation sectors.





**POLICY E.1.3.** Develop and implement education and outreach opportunities focused on efficient building materials and practices in collaboration with the public sector and educational institutions (Flagstaff Unified School District, Northern Arizona University, Coconino Community College, and community partners).

**POLICY E.1.4.** Support workforce training for the installation and maintenance of energy efficient technologies.

**POLICY E.1.5.** Develop and implement educational programming to ensure individual, family and business preparedness for short and long-term energy outages.

#### Building

**POLICY E.1.6.** Adopt requirements for energy efficient technologies and design in all new and retrofit buildings for residential, commercial and industrial projects.

**POLICY E.1.7.** Support policies and programming that reduce electricity, natural gas, and water consumption to conserve natural resources and reduce financial costs.

**POLICY E.1.8.** Incorporate energy conservation and renewable energy systems in zoning and building codes.

**POLICY E.1.9.** Develop standards and guidelines to guide builders, architects and developers toward optimal building water use and energy performance and standards.

**POLICY E.1.10.** Incentivize energy efficiency and renewable energy technologies in construction projects.

**POLICY E.1.11.** Identify financing mechanisms to support water and energy efficiency improvements in public, residential, commercial and industrial sectors.

#### Transportation

**POLICY E.1.12.** Promote and encourage the expansion and use of energy efficient and multi-modal transportation to reduce vehicle miles traveled.

**POLICY E.1.13.** Develop policies and programs that incentivize the use of fuel efficient vehicles and vehicles that use renewable fuels and/or electricity.

## Renewable Energy

At the small and large scale, the Flagstaff region could maximize its access to renewable energy by increasing its use of passive solar, photovoltaic panels, solar hot water, solar thermal generators, wind turbines, biomass, and geothermal energy. Northern Arizona has the greatest solar gain capacity in the state because of elevation.<sup>10</sup> The region's wind resources are deemed adequate for residential wind projects.<sup>11</sup> Another renewable fuel already used extensively is wood for home heating. This resource is also being explored for biomass energy production, especially with the availability of a large volume of trees from forest thinning projects. The Forest Service obtained clearance on the necessary environmental analysis to allow for long-term, large-scale thinning contracts that could allow for expansion of this type of energy source. The Greater Flagstaff Forests Partnership has ascertained that there is adequate forest fuel available on a long-term basis for supplying a new 5 megawatt (MW) biomass power plant.<sup>12</sup>

The region may have an abundance of these raw resources, and APS is extending transmission systems to areas with photovoltaic and wind potential, yet the inadequacy of the existing energy grid is a significant challenge to large-scale renewable energy generation. Current renewable energy production for APS is 2 percent with a goal of 16 percent by 2025. This is in line with the community's goal to tap into and use more renewable energy.<sup>13</sup> In addition, biomass has been explored in the region as a possible renewable energy source.

Northern Arizona University has mapped optimal commercial wind turbine locations, and is in the process of mapping residential locations. Large-scale wind production (100 MW) has been installed in Coconino County, yet is unlikely to be built within the region; most small-scale wind turbines are located in the Doney Park area, which has been identified through studies as having a significant wind resource.

<sup>10</sup>NAU Solar studies website:

<sup>11</sup>NAU Wind energy studies website

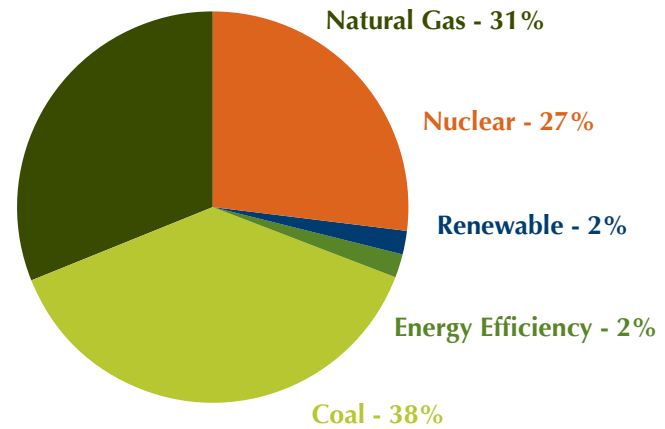
<sup>12</sup>Preliminary Feasibility Assessment For A Biomass Power Plant in Northern Arizona: Greater Flagstaff Forests Partnership Prepared by: TSS Consultants November 11, 2002 Final Report

<sup>13</sup>[http://www.aps.com/\\_files/various/ResourceAlt/Resource\\_Plan\\_-\\_Presentation\\_sFinal.pdf](http://www.aps.com/_files/various/ResourceAlt/Resource_Plan_-_Presentation_sFinal.pdf)

<sup>14</sup>City of Flagstaff and Coconino County Building Permits records

Small-scale wind and solar facilities are already permitted uses within the region. Since 2005, approximately 260 photovoltaic systems (each producing approximately 2-5 Kw), 74 solar water heaters, 28 turbines, 16 passive solar sunrooms and one geothermal system have been installed in the Region.<sup>14</sup>

**APS Energy Mix - 2009**



**APS Energy Mix - Projected 2025**

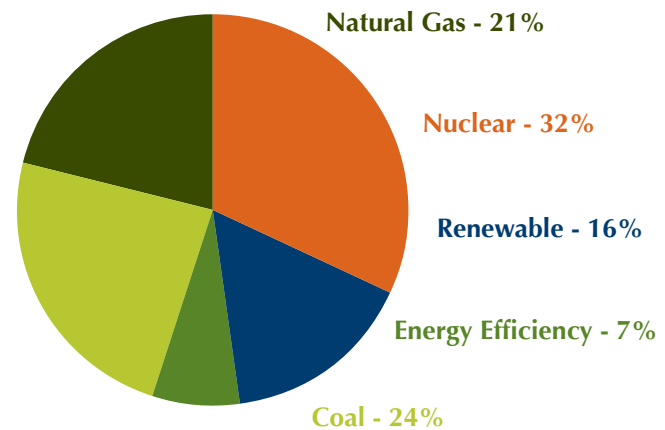




Photo by: Bill Ferris

Community members are pursuing renewable energy projects for several reasons:

1. To reduce reliance on corporate providers
2. To have an impact on greenhouse gas reduction
3. To take advantage of local, state, and federal tax incentives
4. To provide energy to those who live “off the grid” and rely on renewable energy, many in the region’s rural areas.

The Flagstaff region is also home to a local manufacturer of small wind energy systems, which is both a community resource and asset. Large-scale wind and solar projects are likely to be developed in the county, where there are large tracts of land with adequate wind resources. The locations for these facilities are outside of the *Flagstaff Regional Plan* boundaries in the more remote areas. As possible suppliers to properties within the plan boundary, transmission lines into this area may be necessary.



Goal E.2. Expand production and use of renewable energy.

**POLICY E.2.1.** Promote renewable energy sources that reduce demand upon fossil fuels and other forms of generation that produce waste.

**POLICY E.2.2.** Preserve opportunities for development of renewable energy resources in the planning process.

**POLICY E.2.3.** Integrate feasible renewable energy requirements into development and building standards.

**POLICY E.2.4.** Develop City and County renewable energy pilot programs as a showcase to educate the public and development community about the feasibility and benefits of renewable energy.

**POLICY E.2.5.** Pursue, promote and reward small-scale renewable energy production and use on the local level at individual residential, commercial and industrial parcels.