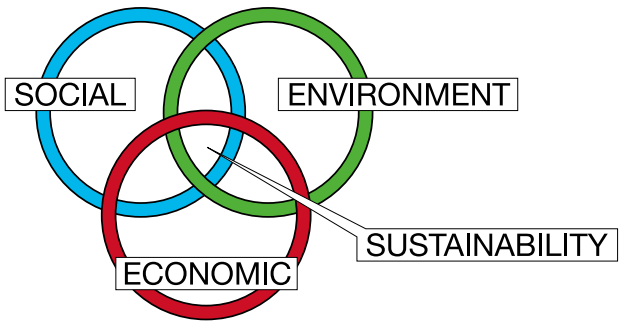
# 7 Energy Efficiency

## Communities Planning for Energy Efficiency

**Governor's Proclamation**
**Governor Leavitt stated: "It is in our economic and personal financial interest to cultivate an ethic of conservation and energy efficiency."**

In times of concern, citizens look to strong and well-informed leadership for solutions and ideas. Officials in government and in energy related fields have worked hard to create political, economic and social solutions to the recent energy problems experienced in the West. The primary goal of this chapter is to provide local government, community planners, and concerned citizens with concepts designed to integrate energy efficiency strategies into communities. These strategies, if implemented, help reduce energy consumption and energy related infrastructure costs, as well as increase reliable energy supplies and economic and resource sustainability.




## Benefits of Sustainable Energy Communities

The United Nations in 1987 defined sustainable development as "...(meeting) the needs of the present without compromising the ability of future generations to meet their own needs." Economic, environmental, and social factors are three interconnected elements of sustainability. To gain maximum sustainable benefits from these three elements, a sustainable community works to bring them into balance.

**Sustainable communities work to bring these three factors into balance.**
**(UEO)**

Consider the three fundamental factors of sustainability as individual rings that overlap. A skewed ring means the other two no longer overlap equally and the entire system is off balance. For instance, a skewed economic "ring" causes the social and environmental "rings" to become imbalanced. This imbalance promotes isolation, which does not sustain the three "rings" to work efficiently and respectfully toward a sustainable community.

Incorporating energy efficiency into community planning is a major step towards community sustainability. Although energy is an integral part of our everyday life, attaining energy sustainability is a way of life. Energy sustainability is a dynamic process that supports change and encourages new ways of thinking.

## Economic Benefits

Sustainable energy strategies benefit a community because they save money. For example, sustainable community designs typically plan for narrower and shorter streets, shorter utility corridors, and fewer streetlights and traffic signals than traditionally developed areas. This type of urban design can result in less money spent and energy consumed for construction materials and follow-up maintenance. These communities then have the option to spend energy savings on parks and civic centers that contribute to a healthy and social lifestyle.

Additional economic benefits of an energy efficient and sustainable community, in comparison to more traditional urban designs, may include the following:

- Increased savings on air emissions control systems and maintenance because of reduced energy production.
- More money retained within the community because of decreased purchases for power on the open market, especially during peak energy demands.
- Increased workforce because of energy-savings revenue reinvested in community and economic development.
- Greater opportunities for start-up and relocating high tech firms because of utilized alternative energy resources.
- More disposable dollars for education because less money is spent to heat and power schools.
- Increased eligibility for affordable housing because of decreased spending for energy utilities and transportation services.
- Increased discretionary income because of decreased spending for energy utilities.

These financial gains can increase the quality of life for the community and boost local economies. All of these possible economic benefits are dependent on many factors and not solely on energy sustainability. A sustainable energy community has a greater potential to experience these benefits compared to traditional communities because they can fund improvements from their own energy savings.

## Environmental Benefits

Energy efficient communities inherently generate less air polluting particulates and gases than energy inefficient communities. Cleaner air is a result because energy sustainable communities provide more opportunities to walk and use alternative transportation methods. Furthermore, these communities use less energy per capita for cooling and heating compared to energy inefficient communities.

Informational programs, such as the Utah Department of Environmental Quality (DEQ) alert program may further reduce concentrations of air pollutants. DEQ monitors air quality around the state and provides Utah citizens with daily air particulates and gaseous concentrations as well as advisory warnings. On occasion, locations in Utah, particularly along the Wasatch Front, exceed federally mandated air quality standards. The major sources of air pollution during the summer are from vehicle and industrial emissions, and other area sources associated with urban living. The major sources in the winter are from vehicle and industrial emissions, and smoke and gases from woodburning stoves and fireplaces. Wintertime temperature inversions exacerbate the concentration of these air pollutants. DEQ prohibits the burning of wood or coal on winter days in counties that register high in air particulates. DEQ also recommends driving less on any day in counties that register high.

The benefits of reduced vehicle emissions and fossil fuel air-borne pollutants by a single community in Utah not only affect the quality of life at the local level, but also at regional and global levels. Economic burdens related to health care of a local community decrease by reducing air quality related illnesses. The quality of life at the regional level improves by helping to protect view sheds near national landmarks, such as Zion National Park. The wellness of our

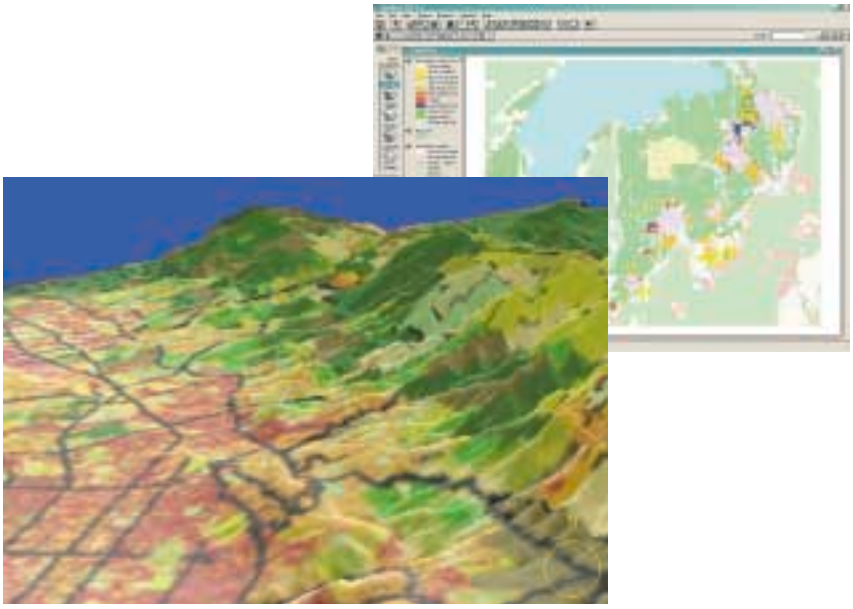
**Salt Lake Valley on a clear day and on a summertime smoggy day.**
**(UEO/Nan Weber)**

**Computer modeling programs that use Geographic Information Systems can quantify the "ecological value" of various parcels of land. These programs use data to quantify and compare the energy and environmental impacts arising from different types of development. Assigning comparative ecological values to the actual costs of the different development plans could help steer development into the least sensitive parcels.**

global economy and environment also improves by reducing Utah's contribution to the global greenhouse gases.

## Social Benefits

Moving towards a sustainable energy community may boost social benefits. Traditional urban and suburban land-use patterns often create communities where citizens may feel detached with less sense of community. Communities that reflect the principles of energy sustainability benefit by: more citizen involvement in community affairs, increased interaction between citizens and neighborhoods, and a greater sense of community and social cohesion. These benefits occur because the recommended process for adopting and incorporating sustainable energy components in a community energy plan is citizen based. Community members willingly contribute ideas and support for community energy planning, which strengthens community continuity and spirit.



**Three-D imagery and environmental modeling.**
**(EU/AGRC)**

# Steps to Draft an Energy Plan

Fundamental steps on assembling an energy advisory committee to present concepts of energy efficiency to the community and on creating a task force to draft an energy plan are below. These steps can be followed for creating community vision and planning energy efficiency into policies that can be carried out for individual projects such as new community developments, commercial buildings, housing projects, and transportation. The Department of Energy's Center of Excellence for Sustainable Development and the Rocky Mountain Institute offer more detailed information and instructional workbooks about planning energy town meetings and drafting energy plans.

## Assemble an Energy Advisory Committee and Hold a Town Meeting

Step One: Assemble an energy advisory committee.
The committee develops an overview of issues and recommendations with respect to community energy-use patterns and transportation. The committee also plans an energy town meeting.

A mayor, county commission, or a well-known energy champion may assemble the energy advisory committee. The person or group that organizes the advisory committee invites a diverse group of people familiar with energy sustainability and sustainable development. The committee may include representatives from economic and community development departments, state and local governments, municipal planning officials, architect and engineering firms, educational institutions, environmental and civic organizations, the media, and energy officials.

Step Two: Invite the community to energy town meetings. The energy advisory committee presents the overview and creates vision at the energy town meeting. The committee also directs discussions to other energy-related matters such as the following:

- General plans of any proposed developments.
- Approximate physical boundaries of developments.
- Likely financial, political, and social barriers to increasing energy efficiency.
- Current municipal ordinances and actions for energy efficiency.
- Present energy supplies and consumption by the community.
- Potential incentives to include energy sustainability strategies into projects.
- Possible energy efficiency strategies for the community.
- Potential alternative energy resources available to the community.

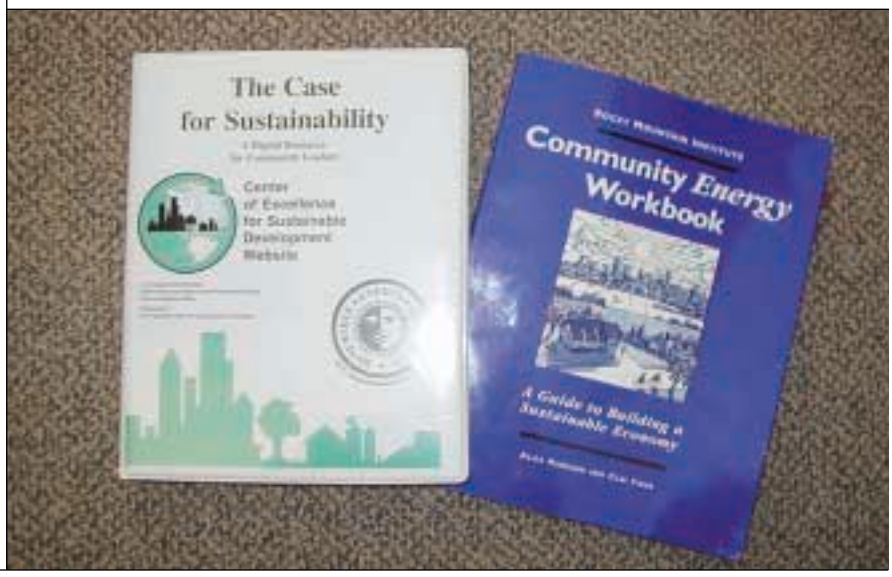
Community members discuss the effects of these energy-related matters on the sustainability of their local economy, environment, and energy-use patterns.

The committee introduces a plan to develop an energy task force to help guide the community towards energy sustainability.

The group provides suggestions of individuals or groups to serve on the energy task force as well as possible energy champions with administrative skills to lead the task force.

**Department of Energy's Center of Excellence for Sustainable Development: A Digital Resource for Community Leaders**

**Rocky Mountain Institute Community Energy Workbook: A Guide to Building a Sustainable Economy**
**(UEO)**



## Assemble an Energy Task Force and Draft an Energy Plan

Step Three: Assemble an energy task force (ETF). The ETF should consist of involved members from the advisory committee along with representatives from construction firms, financial corporations, utility companies, transportation groups, building facility-management teams, and energy trade businesses. The ETF should also have members that lead the plan expeditiously through the political, planning, and implementing phases.

Step Four: Define the Scope of Work of the Energy Task Force. Energy-related concepts and strategies to include in the energy plan are provided in the section titled "The Energy Plan."

The ETF constructs a comprehensive and strategic energy plan. The plan should contain technical information that is current and dependable. Projects in the plan should include energy efficiency strategies and time-lines that are flexible and attainable. The energy plan can have breadth and cutting edge ideas and strategies by researching current case studies that demonstrate sustainable energy communities. Useful case study data includes the project goals, procedures, successes, and setbacks. Another way to identify possible sustainable energy strategies for the plan is to visit proposed project sites.

The ETF coordinates with different partners and stakeholders to draft the energy plan, details the respective goals of the participant groups, and identifies specific energy efficiency strategies that contribute to those goals. The ETF makes sure the plan offers alternative strategies, especially for major components of potential projects. These alternatives provide decision-makers with the opportunity to select the best strategies for implementing a community vision into any future development.

The ETF should present objectives of proposed projects as they relate to the energy plan to different levels of government. This presentation helps prevent uninformed decisions about the projects that would compromise implementation of energy effici-ency strategies. An executive summary of the energy plan as well as other pertinent information and special requests is an efficient way to inform officials.

Implementing the energy plan requires the support and collaboration of those involved in the project including planners, developers, financiers, and realtors. It is essential that planners, developers, builders, and project managers possess the skills and techniques required for planning, developing, or building for energy efficiency. These building-related groups must also appreciate the benefits of energy efficiency strategies, remain current on new technologies and actual costs of energy efficient products, learn about possible financial incentives for energy and location efficiency strategies, and

support change for outdated energy-related policy. For financiers and realtors, it is essential that they publicize and market energy efficiency mortgages, understand energy and location efficiency home mortgages, and sell commercial and residential buildings based on energy efficient features.

## The Energy Plan: Components and Strategies

Each section below provides information and examples to stimulate innovative thinking about community energy planning. The sections also provide general information on policy, financial support, and education programs as well as the status on Utah building codes and energy efficiency technology. There are also a number of energy efficiency strategies included that may be evaluated for individual project applicability.

The energy plan should contain an energy status overview that describes energy-related matters in the community and tallies the estimated total energy consumed by a community. The following checklist identifies essential data to collect:

Energy Status Overview Checklist

1. Demographics
2. Transportation routes
3. Energy resources: traditional and alternative
4. Utility companies
   a. Present power company fuel sources, e.g., coal, hydro, nuclear, wind, solar, geothermal.
   b. Present power generation facilities, natural gas extraction sites, and transportation fuel and distribution centers.
5. Estimated total energy consumed = Sectors (in Btu) + Transportation (in Btu)

The following information details essential data to collect:

a. Sector energy consumed in Btu: Gather the data requested below to estimate total community energy consumed by the residential, commercial, and industrial sectors. To facilitate this step, it may be easier and more organized to prepare a spreadsheet for the data. Energy suppliers can provide the data requested below.

i. Input total amounts of all the different types of energy sold in conventional energy units (kilowatts and kilowatt-hours, therms, and other units of energy). Convert the conventional units to millions of Btu for ease of comparison among the different types of energy consumed.

ii. Input total amounts of all the different types of energy sold in dollars.

b. Transportation energy consumed in Btu: Gather the data requested and use the spreadsheet below to estimate total community energy consumed

### ▶ ENERGY PLAN OUTLINE

**Separate the outline of the energy plan into major components. Each component should provide energy-related strategies, programs, and information. Major components may include the following:**

**Executive Summary**
**Town Meeting Results:**
**Community Energy Goals and Vision for Projects**
**Overview of the Energy Status**
**Energy Policy Recommendations**
**Financial Support Possibilities**
**Education Plans**
**Energy Efficient Strategies**
**Communities and Neighborhoods**
**Commercial Buildings**
**Residential Buildings**
**Transportation**
**Alternative Energy Opportunities**
**Follow-up and Analysis Measures**
**References and Resources [R/R]**

**EXECUTIVE SUMMARY OUTLINE**

**List of task force members**

**Overall objectives for community development**

**Energy efficiency strategies for development**

**Economic, environmental, and social benefits of the energy efficiency strategies**

**Correct and pertinent information about current energy matters**

**Details of the proposed support needed from individual resources**

**Possible resources may come from government, private, and nonprofit groups. The services these groups offer may include financial assistance to implement energy efficiency strategies and information on energy technology, policy, regulations, and permits.**

by transportation.

i. Number of vehicles registered
ii. Average annual price of gasoline
iii. Location of vehicle fuel stations in relation to distribution center
iv. Average annual gallons of gasoline consumed per vehicle

c. Estimated total energy consumed = Sectors (in Btu) + Transportation (in Btu)

Total the amount of residential, commercial, industrial and transportation energy consumed in millions of Btu and dollars for the community. The total provides the estimated quantity and cost of energy consumed. The data is useful to help identify the effects of energy consumption on community economics and the environment. The task force can also use the data to prioritize energy efficiency strategies for achieving the greatest economic and environmental gains as well as to forecast future energy matters.

| | | | | |
|---|---|---|---|---|
| _____ Estimated number of local vehicles | x | 1148 Average annual gallons per vehicle (estimate 2000 value for Utah) | = | _____ Total gallons consumed |
| _____ Total gallons consumed | x | _____ Average local price per gallon | = | _____ Annual transportation fuel bill |
| _____ Total gallons consumed | ÷ | 42 (number of gallons in one barrel) | = | _____ Barrels of oil |
| _____ Total gallons consumed | x | 125,071 Btu per gallon of gasoline (138,691 Btu per gallon of diesel) | = | _____ Transportation Btu |

**Spreadsheet to calculate the average annual transportation energy consumed. This spreadsheet was adapted from Hubbard A and Fong C 1995, The Community Energy Workbook, Rocky Mountain Institute, Pg 59.**

## Energy Policy Recommendations

### Government Policy and Energy Efficiency

Utah communities can join the nation's leaders in sustainability by implementing progressive zoning and building energy codes.

Communities can incorporate into the energy plan, local codes that are more progressive than the State's energy codes.

Communities can suggest that local government and bordering school districts or individual schools also follow similar progressive codes.

The U.S. National Renewable Energy Laboratory (NREL) recommends that buildings can be built at least 50% more energy efficient than existing code allows, with little or no increase in the cost, by using better design and construction. Salt Lake City is one Utah community that is committed to making change towards sustainability. Salt Lake City's High Performance Building (HPB) taskforce is drafting policy intended to increase building energy efficiency and resource sustainability (See R/R). The HPB taskforce is referring to the concepts recommended by the Leadership in Energy and Environmental Design (LEED) program of the U.S. Green Building Council to draft the new policy.

Energy sustainability in Utah communities can increase by recommending, in the energy plan, flexible building permits and regulations designed to allow speedy inclusion for newly developed energy efficient technology. Many times policies are outdated and hinder implementation of innovative energy efficiency strategies. For example, one of the construction requirements of LEED is to recycle construction waste. Salt Lake City's adoption of the proposed HPB plan, therefore, creates a challenge because Salt Lake City does not have the appropriate recycling center. Supportive city officials of the HPB plan, therefore, are recommending a permit for a new recycling plant in Salt Lake City. Changing regulations and streamlining the permit process lifts the recycling barrier that could hinder the implementation of the innovative HPB plan.

One of the leading challenges to increasing energy sustainability in Utah is the actual enforcement of energy codes by the local enforcement agencies. One way to ensure energy codes are enforced, is to heighten awareness and understanding of the codes. The state of Utah currently provides education programs on local codes to code officials and the building community (see R/R).

An energy plan may include recommendations for local government to fund an energy code enforcement staff. Many cities in Utah established energy specialist positions following the 1970's energy crisis. These positions, since then, have slowly vanished.

**▶ Utah state government improved the energy building codes by replacing the ASHRAE 90.1 Version 1989 commercial building energy codes with the Version 1999. The State has also committed to increasing energy efficiency by achieving an additional 25% above the ASHRAE standards in all state buildings. The Division of Facilities and Construction expects to save at least $0.25 per square foot per year out of the operating budget of each new state building. For residential buildings, the state of Utah has replaced the 1995 Model Energy Code with the 2002 International Energy Conservation Construction Code. The State's new building standards went into effect in January 2002. This helps ensure that new construction and major renovation projects include updated technologies for energy efficiency (see R/R).**

**Policy can limit subsidized sprawl by charging fees and taxes only to those who use the service(s). A community in Florida, for example, showed that sewer hookup to outlying subdivisions cost about $7,000 more than hookup fees for the adjacent city-center. Residents in the outlying area and adjacent city, however, were all charged $6,000 for connections (Longman 1998). In terms of economics, this fee meant that the people in the city were subsidizing growth to the outlying areas. In terms of the environment, this development pattern meant that land-use was not linked to energy sustainability.**

For Utah cities to reinstate these positions, funding would need to be identified. Portland, Oregon, overcame a similar financial limitation by implementing a fee program administered to certain city government departments. These departments are charged 1% of their annual energy costs. The fee, however, can not exceed $15,000. The city invests this money for an energy manager to run a program to increase energy efficiency in Portland. Another benefit that arose from the Portland program is, departments that consume less energy contribute less to the pool that funds the energy program. For energy sustainability, Portland's solution was a win-win situation.

Other innovative policies to include in an energy plan relate to user fees, alternative energy production, and regional cooperation. A community can implement user fee programs for infrastructure to encourage consumers to balance their needs with the real costs of services. These fees can decrease demand by consumers, which leads to energy and cost savings for construction materials and daily operations. Another way to increase energy sustainability is to recommend local and state agencies purchase alternative energy in amounts equal to no less than a certain percent of total energy consumed. For example, a midwest city will purchase at least 20% of their total energy needs for streetlights, subways, and public buildings, in alternative energy sources. Energy sustainability can also be addressed regionally.

Neighboring communities can endorse similar, up-to-date energy efficiency standards. These standards may prevent project managers from selecting development sites in communities with the lowest energy building standards. Another interlocal agreement to endorse is to share growth-driven revenues between one city that encourages development and another that protects open space.

## Utility Policy and Energy Efficiency

In the state of Utah, the Utah Public Service Commission (PSC) regulates privately owned utilities. The primary responsibility of PSC is to ensure safe, reliable, adequate, and reasonably priced utility service. The PSC has supported energy sustainability by allowing utilities to sell alternative energy supplies and energy efficiency strategies. The PSC does not regulate municipal utility companies. An energy plan, therefore, may include suggestions for elected officials of the local municipality to draft regulations for publicly owned utility companies similar to those implemented by the PSC. There are groups that provide answers to questions on policy for energy efficiency.

One local example of how regulation supports a utility company to sell alternative energy is Utah Power's Blue Sky℠ program. This program is a partnership between Utah Power and its consumers. Blue Sky℠ gives customers a choice in how their energy is produced. The program also gives consumers an opportunity to help increase the demand for renewable energy resources. Some consumers ask why Utah Power requests customer help to provide wind power? As a regulated utility, Utah Power is required to provide customers the least cost power available. On average, power from coal and natural gas is currently less expensive than renewable power. Through programs, such as Blue Sky℠, customers pay for the incremental difference between market cost energy and wind power, and associated costs for customer education.

Participation in Blue Sky℠ has been so great that last year, Utah Power purchased an additional three megawatts of wind energy from the Wyoming Wind Energy Project, located near Rawlins, Wyoming. This addition will produce enough clean energy for more than 1,550 average homes in the West. Since Blue Sky's launch in 2000, through December 2001, 2,849 Utah Power customers have signed up for Blue Sky energy. The purchase of 452,100 kilowatt-hours of new wind energy each month offsets approximately 3,796 tons of greenhouse gases per year. This offset has the same environmental benefit of not driving 8,136,000 miles or planting approximately 1,537 acres of trees. Customers' involvement directly helps increase the percentage of wind power on the grid system, provides environmentally friendly power generating sources and builds sustainable economies.

## Financial Support Possibilities

Financial budgets of a community are one of the primary limitations to writing and implementing a community energy plan. The actual strategizing and writing of an energy plan may require commitment in time and resources. Implementing the energy efficiency strategies into projects may not necessitate financial expenditures or may require substantial financial support. Below are recommendations for possible financial support to include in the energy plan.

Financial support is available through many different organizations including agencies from state government. The Utah Energy Office, for example, helps public and private organizations by providing technical information and financial assistance, which is primarily met with partnerships brokered by the Utah Energy Office. The Utah Energy Office helped the University of Utah secure technical expertise, as well as helped secure $44 million in private sector funding, for an energy-related project. The University's project-derived energy savings helps pay

**Wind farm in Wyoming.**

for the private sector financing. As funding allows, the Utah Energy Office also provides no interest loans for state and local governments and school districts. Other low interest loans are available for public and private fleet purchase of alternative fuel vehicles. The Office also administers a renewable tax credit available for homeowners and businesses. When federal energy grants are available, the Utah Energy Office issues announcements through the local media and assists eligible applicants with their proposals.

Another state agency that provides energy funding assistance is the Utah Division of Community Development. This agency administers the low-income Weatherization Assistance and HEAT programs (see residential section below). The agency also provides funding for municipal energy projects through the Community Impact Fund and Community Development Block Grant program.

The Quality Growth Commission is one more example of a state entity that offers financial incentives. The Commission has two programs to help local communities' fund energy efficient growth. First is the planning grant program that is available annually to communities for quality growth planning. Projects funded vary by community, but they include regional open space and infrastructure plans, downtown revitalization plans, and walkable communities and transit oriented development plans. The commission also administers the Leray McAllister Critical Lands Conservation Fund. This fund is available to help local communities preserve or restore lands that are critical to their quality of life. Many of these projects include trails and other amenities including the Kays Creek Corridor project in Layton, the Dry Creek Restoration Project in Sandy, and the Jordan River Restoration Project in West Jordan. Preserving and restoring stream corridors helps reduce ambient air temperatures of surrounding areas, which then reduces energy consumption for summertime cooling. These corridors also provide transportation alternatives and walkable recreation options.

Many other state governments have adopted substantial incentive opportunities to help reduce energy consumption. The California Energy Commission, for example, approved a two million dollar Cool Communities Contract that is disbursed to contractors that retrofit roofs with reflective coating materials. The California Cool Communities campaign seeks to save a total of 200 megawatts during peak hours by providing incentives that average 10 cents per square foot of qualifying roofs. This incentive not only stimulates the economy, but also saves enough energy to light 1,000 average sized California homes.

There are conventional mortgage programs available that target energy and location efficiency. The energy plan could recommend these programs for business

and community members. Communities working with financial partners can make a number of financing options available to homebuyers interested in purchasing a home that is energy efficient, a home that would benefit from energy efficiency improvements, or a home located near public transportation. Additional financing options are available to homeowners who are refinancing their energy efficient home, refinancing to make their home energy efficient, or financing home improvement projects that increase energy efficiency, durability, and value (See R/R for more information).

Mortgage financiers, such as Ogden City, have energy efficiency mortgage packages that offer potential buyers greater purchasing power compared to conventional mortgage products. The power is "earned" from the savings predicted for energy efficient homes or from other financial incentives, such as down payment or closing cost assistance and an interest buy down.

The Wasatch Front is now among five nationwide communities participating in a location efficiency mortgage experiment. The Fannie Mae Utah State Partnership Office and Utah Transit Authority have begun work on an innovative "Smart Commute" program. This program will recognize home buyer savings resulting from the purchase of a home located in a densely populated community served by efficient public transportation, such as commuter rail, light rail, and bus services. The "Smart Commute" program is among a few homeownership initiatives to link housing with public transportation.

- **Additional financial support for planning and implementing an energy plan may come from the following:**
  - **Federal government: U.S. Department of Energy's Rebuild America program partners with the Utah Energy Office and interested communities to provide small grants and technical support to communities that plan to 'rebuild' sections of towns or renovate individual buildings.**
  - **State government: The Utah Division of Air Quality provides information on opportunities to finance energy efficiency and other sustainable energy programs through emissions trading. With emissions trading, business and industry offset air pollutants resulting from consumption of fossil fuels by funding energy efficiency and other strategies that reduce pollutants elsewhere in the community. See R/R for more information.**
  - **Utilities: Utilities often offer zero or low interest loans, rebates, and technical assistance.**
    - **Utah Power's FinAnswer™ program offers expert advice and cash incentives to help upgrade commercial or industrial heating, cooling, refrigeration, compressed air, lighting, pumping or industrial processes to the most energy efficient system available.**
    - **Questar Energy Services offers energy efficient products and services including financing and energy audits as well as emerging energy technology such as fuel cell, micro turbines and combined heat and power systems.**
  - **Nonprofit organizations: Many nonprofit organizations help community efforts in understanding the relationship between energy and development.**

- **Other successful partnerships include joint ventures between different government, private, and nonprofit groups and our children. These programs provide information about energy efficiency to our youth. The energy plan could include suggestions for partnerships between schools and any of the groups below:**
  - **Government**

    **Kool Kids Program - Utah Energy Office**

    **K-12 Schools Program – Utah Energy Office**

    **Rebuild America's Energy Smart Schools – Department Of Energy (DOE)**
  - **Public Utilities**

    **Kid Power Program – Murray City Power**

    **Energy Education Program – Utah Municipal Power Agency**
  - **Private Utilities**

    **Rain Forest Van – Utah Power**

    **Do the Bright Thing – Utah Power and National Energy Foundation (NEF)**
  - **Nonprofit**

    **Utah LivingWise™ Program – NEF**

    **Academy of Energy Education – NEF**

    **Jordan School District Energy Action In Schools™ Program – NEF**

    **Salt Lake Clean Cities Coalition Education Outreach Program – NEF**

    **Utah's On-line Environmental Education Database – Utah Society for Environmental Education.**

**The energy plan could also include proposed support for schoolteachers who include energy efficiency in their curricula.**

## Education Plans

Education is essential to incorporate energy efficiency strategies into people's way of life. People provided with facts on energy sustainability have a better understanding of energy-related issues and are more likely to become part of the solution. The energy plan could include recommendations for education-related programs for the community. Workshops and conferences are probably the most direct path to inform significant numbers of people about energy concerns. Within the state of Utah, there is a wide range of instructional programs and workshops on energy-related matters. The goals of these programs and workshops range from providing technical assistance to professionals in the energy field to increasing public awareness on energy efficiency strategies. Government agencies, private corporations, nonprofit organizations, and educational institutions offer energy-related programs and workshops. News releases, newsletters, and websites offer listings of upcoming programs and workshops.

Often, greater numbers of people receive information if groups with


similar energy-related goals establish partnerships. The energy plan could include recommendations for education-based partnerships among groups within in the community. The Power Forward pro-

gram, for example, is a partnership between state government and private energy officials as well as media spokespersons. Their effort informs consumers, daily throughout the cooling season, to practice moderate (green day), cautionary (yellow day), or critical (red day) conservation strategies. Energy officials report that because of this program, 100 megawatts were saved during the four yellow days in the summer of 2001. This amount of energy saved is enough to power 51,300 average sized homes.

Additional ideas to include in the energy plan on educating communities about energy sustainability include the following:

- Recommend training seminars on energy sustainability directed primarily toward decision-makers and government officials.
- Provide continuing education courses on energy matters. Check with Continuing Education at the University of Utah and Salt Lake Community College for any special courses on energy efficiency and renewable energy.
- Plan and build demonstration projects ranging in size from single buildings to entire neighborhoods that easily illustrate energy efficiency strategies. A great arena to showcase energy efficient housing is the local Home Builder Associations' annual Parade of Homes. The probability of informing thousands of people in a short amount of time is high. Schedules of these events are available from the Utah Home Builder's Association or the Utah Energy Conservation Coalition.
- Recommend energy audits of residential and commercial buildings. Energy auditors provide data on energy inefficient locations as well as information of how to increase efficiency in those locations. Consumers should view the process of energy audits as personalized educational tours.
- Promote the use of clean fuel vehicle fleets and the opening of refueling stations.

▶ **The energy plan could include education programs that would be free to the public, such as the recommendations below:**

- **Suggest businesses in the energy trade offer mini-seminars introducing new technology to maximize energy savings.**
- **Offer mini-seminars at local home improvement centers and community centers to educate the public on energy efficiency strategies.**
- **Recruit the expertise of the media to help make energy issues and events newsworthy.**
- **Provide brochures and newsletters on energy matters, for example, Utah Power's Voices newsletter reaches 650,000 homes in Utah every month.**
- **Supply information that identifies the sources of supplied energy to consumers and explains environmental problems caused by energy production and consumption.**
- **Provide public service announcements that alert the community on possible energy supply shortages:**
  - **Explain reasons for the shortages**
  - **Forecast the degree of magnitude of the shortages**
  - **Provide energy efficiency strategies that may help reduce the magnitude of the shortages**
  - **Provide information that explains the consequences of maintaining the status quo**
- **Recommend local financial institutions offer information on the availability and benefits of energy and location efficiency mortgages.**

## Information and Energy Efficient Strategies for an Energy Plan

Suggestions of energy efficiency strategies and energy-related considerations for general development, building design and transportation are below.

### Communities and Neighborhoods

Many aspects of urban design usually show little energy-related consideration. An energy plan ensures that energy efficiency is included in all aspects of design and construction in new development as well as revitalization projects. Certain construction elements to consider for the plan include embodied energy, urban planning and land-use pattern, infrastructure and landscape design.

#### Embodied Energy

Embodied energy is the energy consumed by all the processes associated with production of a building, from the acquisition of natural resources to product delivery. The Architecture League of New York reports that the most common building material requiring the least embodied energy is wood. Wood consumes about 640 kilowatt-hours per ton, mostly from the industrial drying process, and some from the manufacture of and impregnation of preservatives. In comparison, all other building products require up to many times (X) more embodied energy than wood: for example, brick 4X, concrete 5X, plastic 6X, glass 14X, steel 24X and aluminum 126X. Although some of these products may be extremely energy efficient, the embodied energy consumed for those materials must be considered when analyzing the total energy budget of a project.

Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) suggests that in determining which materials to use for a project, consider additional energy consuming factors other than just absolute embodied energy values. Such factors include project design and configuration as well as material quantity, quality, and durability. For example, wood and concrete require relatively low embodied energy, but the total quantity used is typically high. The total embodied energy, therefore, for these two materials may be very high.

Analyzing only the energy used to operate a building is also not acceptable, especially if the building is highly energy efficient. Research by CSIRO showed that materials used in the construction of an average household contain about 1,000 gigajoules of embodied energy. This amount of energy is equivalent to about 15 years of operational energy.

Embodied energy for a project may be minimized by the following:

- Use local resources: Energy consumption is higher for transported materials than for local materials.

- Conserve and restore old buildings.
- Reuse old building materials: The reuse of building materials commonly saves about 95% of embodied energy. (CSIRO)
- Use recycled products: The use of recycled products may lower embodied energy if reprocessing and transportation energy consumption is low.

**Urban Design and Land-Use Pattern**

As America's urban communities spread over ever-wider areas, they contribute to loss of open space, expanding highways, and greater traffic congestion, all of which affect energy consumption, especially for transportation. There are two considerations to help mitigate the impacts of sprawl and decrease transportation energy consumption. One consideration is the drafting of zoning ordinances that do not isolate housing developments from employment sites and shopping centers. The second is to avoid low-density growth such as homes on large lots and widely scattered subdivisions. Both of these considerations can reduce the amount of vehicle miles traveled. Although 70% of the Wasatch Front's population desires and supports low density growth, strategies to introduce energy sustainability in these areas need to be explored.

For more information on urban design to minimize transportation-related energy consumption, see "Transportation" section of the Energy Chapter. For more information about land-use patterns and urban planning for resource efficiency, see "Open Space, Agriculture, and Quality of Life" of the Protecting Sensitive Lands Chapter in Envision Utah "Urban Planning Tools for Quality Growth."

**Infrastructure**

Counties, municipalities, and cities may want to adopt strategies and programs targeted toward infrastructures that reduce energy consumption. Counties could establish a program assisting cities in annexing that guarantees sufficient and sustainable energy infrastructure that supports proposed development. To accomplish this program, governments can require that future developments analyze and compare the costs of infrastructure as it relates to distance and accessibility between existing and future developments.

**Urban sprawl creates energy inefficient communities.**
(CRS Architects)

Geographic Information Systems (GIS) program applications such as ArcView's Spatial Analyst® can model direct route time and distance. GIS mapping can also help track existing infrastructure and capacity as well as determine whether future development in different areas could be absorbed without the need to build additional infrastructure. A partnership with the Utah Governor's Office of Planning and Budget and the Division of Water Resources has developed an infrastructure-costing model that evaluates the economic impact of expanded infrastructure associated with growth.

Adopting a water conservation program is another way to save energy. Energy is used to pump and heat water as well as to transport and treat wastewater. Reducing the demand for water reduces energy costs and associated emissions for both water and wastewater infrastructure. Lower water demand may postpone the need to expand facilities, resulting in additional energy and cost savings. The energy plan may include water conservation programs as well as partnership recommendations between the water and energy groups to share financial cost associated with implementing the conservation strategies.

Other strategies related to infrastructure that may reduce energy consumption include recycling and partnering. Recycling saves energy by reducing the transportation fuel used to haul materials to a landfill and by reducing embodied energy in recycled finished products. Reusing and reducing save energy by reducing the amount of energy used for production and consumption. Partnering with other organizations or government entities to share facilities may also reduce energy consumption for construction materials and daily operations.

**Public and Residential Landscapes**

Moderate to high density and mixed-use developments clustered with interconnecting greenspace is one strategy to help reduce the consumption of energy and other resources. A greenspace corridor reduces energy usage, in part by promoting walking within and among communities and lowering summertime urban temperatures. Local municipalities may want to include in an energy plan a strategy to combine land-use for utility corridors with greenspace.

Other strategies for the community energy plan are to increase tree and other plant coverage. These strategies may be facilitated by using City Green modeling software. This program is designed to add a "green layer" in land development decision making and encourage additional plant cover to increase air quality and to reduce energy consumption along with stormwater runoff.

Salt Lake City took action and adopted a landscape ordinance that requires all vehicle lots to landscape at least 5% of the lot's interior.

This green space does not include the required landscape around the perimeter. The Salt Lake City ordinance results in many new lots featuring islands with trees and shrubbery. For help with developing and evaluating tree ordinances, refer to the website phytosphere.com.

Plants are a relatively inexpensive way to reduce energy consumption and save money. DOE estimates that shade resulting from as few as three trees can save the average household between $100 and $250 annually in energy costs. Iles (1998) reports that plant canopies can reduce municipal energy costs up to 50% and 22% during the summer and winter, respectively. Energy savings similar to those reported are achievable in Utah through proper site and species selection. Below are, a few planting strategies to include in the energy plan that increase energy efficiency for homes and communities:

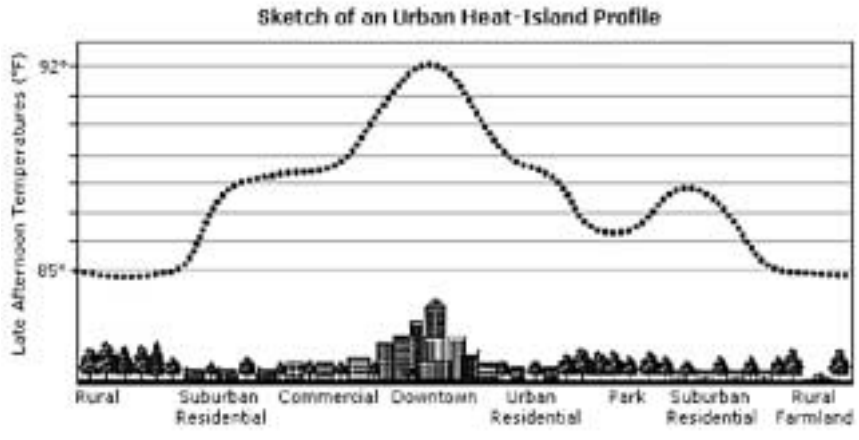
- Plant trees, shrubs, and woody vines to provide shade. Trellised vines are a great solution for areas with limited space.
- Shade the west- and east-facing sides of structures. Shading the west side of structures is the most important because afternoon heat is radiated to surfaces in two ways: direct radiation from the sun and radiation from surfaces that store significant amounts of heat throughout the day.
- Select deciduous woody species for the west and east sides of the landscape because they provide shade in the summer, yet allow solar radiation to filter through the leafless canopy in the winter.
- Plant at a distance such that the vegetation significantly casts shade on the buildings. In general, the taller the plant the further it can be planted from the building and still provide shade. Another general rule is to plant about 20 feet from windows and select species that grow at least 10 feet taller than the windows. Because no plant is able to significantly shade very tall buildings, the planting of trees insignificantly affects the overall energy budget for a high story building.
- Plant tall trees away from the south side of buildings. A tree in this location casts little shade because the solar angle is high in the summer. In winter, however, the same tree casts undesirable shadows on structures to the north for most of the day. If shade trees are already present on the south side, remove lower branches to permit more winter sunlight to reach the structure.
- Select evergreen trees for the north side of buildings to protect from prevailing winds during the winter. Trees planted as windbreaks can reduce wind speed for distances several times their height. Neighborhoods with canopy cover of more than 50% can decrease wind speed by half, therefore, decreasing wintertime energy consumption (DOE 1997).
- Plant trees or shrubs to shade central air conditioning units. A cool air conditioner consumes less energy for cooling the same volume of air compared to a hot conditioner. Note that air conditioner units are naturally cooler if

they are located on the north sides of buildings.

- Plant tall growing species away from power lines to reduce power outages and the need for costly tree trimming and removal. Utah Power has a program called "Plant the Right Tree in the Right Place" that teaches citizens the best species to select for areas near power lines.
- Contact local nurseries and university extension offices for more information concerning appropriate species selection.

Although it is advisable to plant woody species to reduce energy consumption, a word of clarification must be mentioned about the water they require. Utah is the second driest state in the United States, and we are justifiably reminded to conserve water. Most officials in the plant and water industries agree that improper irrigation procedure is the largest water waster in Utah. Although plants consume water, the amount of water used by plants is insignificant compared to the amount that ends up in gutters and sewers. By far, the most efficient way to save water is to properly irrigate, not to remove or reduce vegetation. Even if plants are removed, the amount of water saved would be insignificant compared to the amount of energy consumed by not maintaining plants.

**Temperature comparisons among different types of communities.**
**(UEO)**




### Urban Heat Islands

Urban heat islands are urban areas that are hotter than surrounding rural areas. Factors that contribute to heat islands include the removal of local vegetation and natural surfaces as well as the addition of heat absorbing surfaces like dark roofs and pavements. Many US cities are urban heat islands with temperatures between 2 and 15° Fahrenheit hotter than their surroundings (*Akbari 1996*). Utah urban areas that are landscaped present a special case because much of the surrounding areas are actually dry, hot deserts. However, within Utah urban areas there are localized high-temperature patches caused by the same factors that cause urban heat islands.

Urban heat islands are expanding with spreading populations and new building construction. Since 1940, summertime temperatures of many cities have climbed steadily by 0.25 to 1 degree Fahrenheit per decade (*Akbari, 1994*). As temperatures increase, the need for air conditioning increases, this places more demand for power generation. Los Angeles, for example, experienced one of the largest ever observed heat island cause and effects. This city experienced a peak cooling demand increase of 1.5% for every rise of 1 degree Fahrenheit (*Akbari 1993*). Power plants must generate the additional

electricity to meet these peak-cooling demands, and in the process, they also produce air pollution. One of the main compounds released into the atmosphere, as a byproduct of power generation is the greenhouse gas, carbon dioxide.

The increase in temperatures also increases the rate of release of volatile organic compounds (VOCs) into the urban environment. VOCs enter the atmosphere as a byproduct of transportation and industry fuel consumption as well as from biogenic sources. Certain VOCs, when combined with nitrogen oxides (NOx) and in the presence of sunlight, react to form ground-layer ozone. This pollutant is a powerful oxidizing compound and is the major contributor to summertime smog. In the energy plan, suggest coordinating with air quality groups to develop control strategies for the State Implementation Plan that results in greater reductions in VOCs and NOx emissions.

**Thermal image of Salt Lake City: Hot (red) downtown compared to cooler (blue/green) areas near UofU.**
**(NASA)**

To decrease urban temperatures and prevent the consequences, an energy plan could include the following recommendations:

- Promote the use of light colored roofing.

  Modify building and residential codes to recommend roofing materials with a high albedo (or reflective in infrared wavelengths, such as Classic Products). Standards that are consistent with US Environmental Protection Agency's (EPA) criteria for Energy Star™ labeled roofing systems are a good guideline. Recommend that existing buildings are reroofed or topcoated following the new standards by a specific date. Recommend existing houses to use high albedo roofing materials when they have new roofs installed.

- Promote use of light colored pavement.

- Recommend a light colored aggregate chip seal on roads, new or resurface projects.

**The Environmental Protection Agency and other partners funded the Marshall Space Flight Center's Global Hydrology and Climate Center's fly-over project, to locate hot spots in target cities. Salt Lake City was fortunate to be selected as one of the four target cities in the United States. In July of 1998, National Aeronautics and Space Administration (NASA) sent a Lear jet equipped with thermal (infrared) imaging equipment to take aerial photography of the Salt Lake City valley. The results of the data showed, in part, that it is cool near bodies of water, along roads that are tree-lined, and in areas that are significantly vegetated, such as Liberty Park and the Salt Lake City County Building. These cool temperatures ranged from about 60-70 degrees Fahrenheit. The results also showed that it is hot in vast asphalt paved parking lots (about 120 degrees Fahrenheit) and hottest on dark colored rooftops (exceeding 140 degrees Fahrenheit), such as the Salt Palace and Matheson Courthouse. These results generated by NASA and other heat island researchers, assist groups such as the Utah Energy Office to promote and implement Cool Communities strategies. Contact the Utah Energy Office to help forecast possible benefits of implementing Cool Communities strategies.**

**Energy efficient visitor center at Zion National Park.**
**(UEO)**

- Recommend that parking lots are either cement or asphalt with a light colored aggregate chip seal on top.
- Amend current codes governing off-street parking facilities, including vehicle sales and lease lots, to recommend use of reflective asphalt emulsion sealcoats, pavers, turfblock, or whitetopping for reconstructed asphalt.
- Increase vegetation cover.

▶ **The Zion National Park Visitor Center and Comfort Station is a local example of a building designed for maximum energy efficiency. This complex was designed and built through a partnership among the National Park Service, NREL, and American Institute of Architects. NREL estimates that the Zion's Visitor Center will save $14,000 per year because of the energy-saving strategies. Some of these strategies include the following:**

- **Strategic site location of building and plaza for maximum summertime cooling and daylighting.**
- **Trombe wall for passive solar heating.**
- **Downdraft cooltowers for summertime cooling and natural ventilation.**
- **Thermal mass flooring for maximum wintertime heat gain.**
- **Photovoltaic system for supplemental power.**
- **Clerestory windows for natural daylighting.**
- **Energy efficient lighting system to supplement natural daylight.**

**Other notable energy efficient buildings around the state include the Utah House in Kaysville (completion 2002), Skating Oval in Kearns, Department of Natural Resources State Office Building in Salt Lake City, and American Red Cross – Salt Lake City Chapter (planning in progress). These buildings are designed, in part, for visitors to gain information about energy efficiency strategies and resource efficient products.**

## Commercial Buildings

Buildings in the US use one third of all energy consumed in the US and two thirds of all electricity consumed in the US *(DOE 1997)*. A 30% increase in building energy efficiency could reduce consumer costs by $100 billion each year. To help reduce energy consumption and environmental impact, the building industry is beginning to practice "green" building design and construction. This type of building approach focuses on the whole building system as well as on the building process. Matters such as site placement, building materials, indoor air quality, and construction clean up are all considered in order to reduce energy and resource consumption during and after construction.

**Energy efficient office building, Department of Natural Resources.**
**(UEO)**

Many architects and building engineers are turning to the LEED rating system to design and construct commercial buildings. LEED provides a definitive standard for what constitutes a "green commercial building." It also provides detailed requirements, basic technologies/strategies, and information for each of the categories. It is designed to rate new and existing commercial, institutional and high-rise residential buildings. Buildings that meet the terms of LEED are rated as certified, silver, gold or platinum. In Utah, the Kearns Skating Oval is rated as "certified" and the American Red Cross has challenged its designers to achieve a LEED rating for its new Salt Lake City facility.

Details and recommendations for a green building design and construction are well covered in LEED and other documents, such as the Salt Lake City "High Performance Building Plan."

## Residential Building Considerations and Strategies

Residential energy programs usually include a mix between voluntary standards and mandatory codes. Under voluntary standards, new and existing homes are rated for energy efficiency. In Utah, voluntary standards are set by the Utah Energy Conservation Coalition. That group provides "Home Energy Ratings" for residence based on the nationally recognized and accredited Home Energy Rating standards adopted by the Residential Energy Services Network, Mortgage Bankers Association, and the National Association of State Energy Offices. The incentive to build homes, voluntarily above the energy code, is customer driven with some incentives from lenders who take energy cost savings into account when underwriting mortgages.

Although mandatory codes set the standard and are enforceable, they can hinder implementing innovative energy efficiency strategies. An energy plan could recommend that mandatory codes provide flexibility for energy efficiency, yet assure compliance. Under the U.S. Department of Energy Building Standards and Guidelines Program there are four energy code compliance packages that can be used to demonstrate code compliance for residential structures, they are the following:

- Prescriptive compliance package – using a predetermined "package" of energy efficiency measures.
- Points compliance package – using simple tradeoffs of various energy efficiency measures, which are assigned point values.
- Performance compliance package – by modeling on a computer a proposed building's heating and cooling energy needs.
- Enforcement strategies that include financial penalties (*DOE/GO-10095-073*).

**Energy Star rated home in Cottonwood Heights: 5 star rating.**
**(UEO)**


**Department of Energy and Environmental Protection Agency's Energy Star program.**

**Utah Energy Conservation Coalition conducting a home energy audit.**
**(UECC)**

**Community members should always require and inspect the inclusion of at least the following items for new developments or remodels:**

- **Longest axis of the home is oriented east-west to maximize solar gain.**
- **Insulation for ceiling, walls, and floors is greater than energy code standards.**
- **Appliances installed are EPA Energy Star™ rated.**
- **Appliance size is appropriate for the need.**
- **Fluorescent lamp fixtures are the T8 models.**
- **Windows are double panes, low E glass.**
- **Water fixtures are efficient to conserve water and use less energy.**
- **Outdoor lighting is equipped with motion detectors to save energy.**

**"Built Green Utah Checklist" provides information on energy efficient construction. In addition, DOE provides simple software that performs and analyzes energy efficiency for residences. See R/R for more information.**

The energy plan should recommend building residential developments to the EPA Energy Star HOMES Program standard. This program ensures home energy efficiency is raised a minimum of 30% above the current energy code minimum standard. Homes are "labeled," which identifies them as more efficient by at least 30% than "standard" homes in the housing marketplace and industry. All homes are independently rated and analyzed according to either a Home Energy Rating System score or similar nationally recognized energy compliance package. See the EPA Energy Star website for additional benefits of energy rated buildings.

The energy plan should also contain recommendations to increase energy efficiency in low-income housing. Low-income households typically spend 14% of their total annual income on energy, compared with 3.5% for other households. The Utah Department of Community and Economic Development addresses this discrepancy by administering the DOE's Weatherization program. The major goal of this program is to enable low-income individuals and families (particularly the elderly and handicapped) to participate in energy conservation programs, which lessen the impact of utility costs. Participating households are averaging nearly 25% savings or about $300 per year. Some of the features of the Weatherization program include insulation installation, duct sealing, heating system repairs as well as client education on energy efficiency measures (see R/R for more information).

## Transportation

Population growth and transportation should parallel in a sustainable energy planned community. Often, however, the building of transportation facilities does not keep pace with population growth and, the result is significant traffic congestion. For example, travel demand modeling and socioeconomic data projects a population increase of 71% along the Wasatch Front between 1996 and 2030 (Wasatch Front Regional Council 2001). The modeling also projects vehicle miles traveled (VMT) to increase 77%. Such an imbalance between population growth and VMT illustrates the necessity of long-range comprehensive transportation planning for communities. This planning helps improve air quality, reduce congestion, provide local energy security, and improve economic development as well as increase the quality of life.

The transportation sector includes surface transportation, federal highway system, aviation, motor carriers, railroads, maritime, and Coast Guard. These sectors devour 79% of all oil consumed in Utah. Because this consumption is so significant, it may be necessary to form a sub-committee of the Energy Task Force (ETF) to address energy efficiency specific to transportation. This sub-committee can recommend strategies

for sustainability and automobile reductions for their community. The Transportation ETF can also suggest a variety of transportation choices that reduce dependence on unpredictable petroleum sources. The Metropolitan Planning Organization (MPO) could include these recommendations into the Long-Range Transportation Plan (LRTP) to insure that the energy-efficient transportation goals and air quality standards are achieved.

### Transportation Planning: Goals and Objectives

When the public helps plan for transportation matters, they provide input to the local Association of Government, in rural areas, or to the MPO in urbanized areas with populations over 200,000. These official groups may then integrate the public's ideas into the LRTP. Mountainlands Association of Governments (MAG) and the WFRC are responsible for coordinating and preparing the LRTP (2000 – 2030) for the Wasatch Front Counties. The current LRTP from the WFRC includes the following goals:

- Provide a balanced, interconnected transportation system with a range of convenient, efficient and economical choices.
- Increase transportation mobility and accessibility for persons and freight that promotes economic vitality in the region.
- Increase transportation safety and security for all modes of travel.
- Provide a transportation system that protects and enhances the environment, promotes conservation of energy, and improves the quality of life.
- Protect existing and future transportation systems through ongoing maintenance, preservation, or reconstruction.

The WFRC has a number of objectives to achieve the transportation goals in the LRTP, which include the following (see R/R for more information):

- Provide a system that integrates multiple modes of transportation

**▶ The Transportation Energy Task Force's mission is to:**

- **Identify local issues, priorities, and solutions for local transportation.**
- **Conduct research on transportation solutions.**
- **Establish partnerships with the public and private sectors.**
- **Exchange transportation and planning ideas with the community and local Governments.**
- **Present energy-efficient transportation strategies that illustrate quality of life.**

**(Public Technology, Inc., Urban Consortium Task Force)**

**Salt Lake City Past: Wide Sidewalks, angled parking and trolley car.**

**Salt Lake City Present: Narrower sidewalks, minimal parking, and energy efficient trolley.**
**(CRS Architects)**

**Intelligent Transportation System (ITS) uses advanced computing, information systems, and communications technology and applies it to the control and management of traffic and infrastructure to achieve:**

- **Safer transportation system**
- **Better informed travelers**
- **Improved traffic control systems**
- **Increased efficiency of transit systems and traffic infrastructure.**

**The benefits of ITS include reduced congestion, fewer transportation-related deaths and injuries, and reduced energy consumption and pollution.**

by connecting them for efficient transfer between modes.

- Use transportation system technologies that are innovative.
- Minimize travel time for both passenger travel and freight.
- Increase accessibility to employment districts, commercial and industrial sites as well as education, medical, and recreation centers for all persons in the region.
- Provide access to nearby developing areas.
- Improve safety for pedestrians and bicyclists.
- Provide a transportation system that serves and complements desired community development standards.
- Reduce the degree of air, water, noise, and visual pollution.
- Minimize the disturbances to the natural aesthetics and wildlife habitat of the region.
- Identify and protect corridors for future highway, transit, freight, or other transportation system requirements.

A community needs an energy efficient transportation plan to help direct future transportation demands as the community grows in a sustainable manner. Improved transit service, intelligent transportation systems, increased bicycle and pedestrian options, creative land-use planning, and public education programs are general concepts to all contribute to reducing VMT. Additional strategies that reduce VMT and urban impact, include:

- Build high-density developments with access to existing public transit.
- Establish a job-to-resident ratio that reduces VMT.
- Add to past investments through infill and brownfield redevelopments.
- Develop residential areas close to existing amenities.
- Institute incentive programs that increase public transit ridership and reduce VMT.
- Install Intelligent Transportation Systems to keep traffic moving.

### Road and Parking Lot Design

Sustainable communities use road and parking lot design strategies that reduce VMT and environmental impact. The transportation subcommittee of the ETF may want to consider some of the following energy efficiency strategies for roads:

- Minimize the length of streets and highways.
- Design road width and configuration for specific needs, such as maintenance and snow removal, emergency vehicle access, and evacuation routes.
- Incorporate bikeways, walkways, carpooling links, and transit into roadway planning.
- Anticipate interconnectedness of future development to minimize road building.
- Include pedestrian right-of-way whenever possible to encourage walking.
- Design facilities for business and trucking operations for maxi-

mum transportation efficiency.

- Plan road construction activities and detours to limit congestion and reduce fuel consumption.
- Use energy saving materials and techniques during road construction, such as concrete and asphalt recycling.

Community energy planning should also contain recommendations for parking lots. Large parking lots are often built to entice customers with the notion of convenient parking. Studies show that suburban parking lots provide up to 36% more parking than the average peak demand. Land is too valuable to provide massive parking lots that encourage single-occupant driving when there are alternative modes of transportation available. Shared parking is one strategy for energy efficiency land-use planning. This type of parking allows two or more enterprises to share one parking area. The enterprises should have different hours of patronage to be most effective. For example, a bank whose peak hours of business are during the day might arrange to share parking with an adjacent apartment complex that primarily requires parking from dusk until dawn.

Communities that implement energy-efficient transportation strategies can also save energy used for lighting. Shorter roads and smaller parking lots naturally require fewer lighting fixtures than longer road and larger lots. Fewer fixtures mean less energy consumed for lighting. Building managers and road departments can also increase energy savings by eliminating unneeded lighting fixtures and reducing 20-30 light candle fixtures to 2-10 light candle fixtures. Increases can also come from using motion sensors to illuminate parking lots after hours as patrons approach and selecting energy-efficient light fixtures that direct light source only where needed.

**E-BIKE: Electric bike with rechargeable battery, great for city commuting.** (UEO)

**Wide 6 lane road at 1300 East 2700 South in Salt Lake City creates a localized heat island.** (UEO)

**Trax commuter rail in residential area of South Salt Lake.**
**(Clean Cities Coalition Stock Photo)**

### Public and Traditional Transportation, and Alternative Fuels

Public transportation provides energy efficient travel for large numbers of people. The viability of public transit, however, is highly dependent on population density. Areas of higher density usually have more reliable and adequate public transportation service compared to areas of lower density. The community members of high-density areas that use public transportation save money and time. The community energy plan could recommend development patterns that are higher density to decrease transportation energy use.

For families that are unable to take advantage of public transportation, employers may be able to offer energy efficiency strategies for the daily commuter. These strategies can include offering premium parking spaces to employees that carpool, arranging for employees to work outside the office, and compressing workweeks. Another strategy is to offer the Utah Transit Authority Rideshare program.

Alternative fuel vehicles are another option for the daily commuter. The Clean Air Act Amendments of 1990 and the Energy Policy Act of 1992 encourage the use of alternative fuels for environmental, economic, and energy security reasons. Natural gas, propane, electricity, ethanol, and biodiesel are the most common alternative fuels and are obtained or produced in North America. Use of these fuels can bring energy security to a community as well as cleaner air.

Until a few years ago, alternative fuel vehicles were gasoline vehicles converted to run on a different fuel. Today, all auto manufacturers offer a wide range of AFV choices along with a full-vehicle warranty. AFVs do not experience loss of power, and start easily and run smoothly in all types of weather and terrain. AFVs emit less air pollution because the fuels have lower carbon concentration compared to gasoline.

▶ **A study in Southeastern Wisconsin shows the economic impact of transportation options for a family of four living in a single family dwelling (Alternatives to Sprawl in Southeastern Wisconsin by Citizens for a Better Environment).**

| TRANSIT AVAILABLE | MODE OF TRAVEL (20 MILES) | GOODS AND SERVICES ACCESSIBLE BY FOOT AND BIKE | COST PER YEAR | HOURS IN TRAFFIC |
|---|---|---|---|---|
| None | 2 cars | Poor | $10,010 | 1,430 |
| Some | 1 car<br>1 bus | Some | $ 5,525 | 715 |
| Most | 2 cars<br>1 bus<br>1 rail | Good | $ 4,050 | 415 |
| All | 1 bus<br>1 rail | Very good | $ 2,020 | 0 |

Natural gas and propane-powered vehicles use fuels that may not be readily available outside the I-15 corridor. The significant cost of the specialized fuel systems in natural gas and propane-powered vehicles is offset by the low cost of the fuels. Flex-fuel vehicles can be fueled by either ethanol or unleaded gasoline. Biodiesel, a cleaner burning alternative to diesel, can run in most diesel engines without any modifications or increased cost to the vehicle. (see R/R for more information.)

Utah has become a leader for encouraging the purchase and use of AFVs. The State of Utah offers a number of incentives that encourage AFVs. Another incentive includes a lower price for natural gas at the pump, and available funds through the local Clean Cities program. There is even an incentive that permits the right to use the commute or carpool lane of the freeway with only one occupant in the vehicle. Companies can also use AFV in their fleets. Successful AFV fleets in Utah are Newspaper Agency Corporation, Questar Energy Services, Jordan School District, Flower Patch, Park N' Jet, Salt Lake International Airport, and Danville Services Corporation (see R/R to review a list of incentives).

**Transportation Funding**

New transportation design features may be costly to implement. There are numerous grant solicitations for community revitalization projects that often include transportation improvements. Federal funds for transportation projects are available with government support:

TEA-21: Transportation Equity Act for the 21st Century funds many transportation projects. The state Departments of Transportation and the MPO direct the funds. Public input can ensure that MPOs fund projects that create more workable and livable communities. Government must sponsor projects that receive this funding.

FTA Section 5303 & 5313 Planning Programs: MPO prepares transportation plans for submission to UDOT for approval, which ties directly to apportioned FTA 5303 funds earmarked for each state. UDOT staff addresses statewide transportation planning needs outside of MPO boundaries


**Compressed Natural Gas (CNG) vehicle being fueled by local fueling station.**
**(Clean Cities Coalition Stock Photo)**

under FTA 5313. Federal Transit Administration awards the States.

CMAQ: Congestion Mitigation and Air Quality Program: A federal program formed by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) is designed to help states implement their air quality plans in conformity with the Clean Air Act Amendments of 1990 (CAAA). The energy task force may want to recommend these funding opportunities. (see R/R for more information.)

**▶ The US represents only about 4-5% of the world population but consumes 25% of the world's energy resources. In a typical community, 40-50% of that energy use is due to the transportation sector (The Energy YardStick 1996). Because of this significant proportion, community members must know about energy strategies that help reduce vehicle fuel consumption, such as the following:**

- **Ensure local governments know about intelligent transportation systems, sustainable mobility, and other transportation information technologies.**
- **Encourage the community to reduce VMT.**
- **Keep vehicles properly tuned for the most fuel-efficient operation.**
- **Maintain the recommended pressure in vehicle tires.**
- **Drive a commuter car that gets good mileage or uses alternative fuel.**
- **Disseminate the "10 tips for saving gas when driving" brochure.**
- **Expand driver education programs to cover energy efficient transportation.**
- **Encourage walking and biking in communities.**

## Alternative Energy Opportunities

### Strategies and Incentives

Communities can implement strategies to increase the reliance on renewable energy sources by adopting solar easements. These easements guarantee that as new developments arise, the preexisting structures that depend on the sun for heating or power are not shaded and do not lose access to the sun's rays. Another strategy applies to those communities with municipal utilities. These communities can adopt special green pricing programs where citizens voluntarily subscribe and purchase a portion of their monthly electrical consumption from renewable sources in turn acquired by the municipal power company. A third strategy is for communities to adopt performance standards for new buildings that require a percentage of a buildings annual energy use to be from renewable sources. Finally, some communities with municipal utilities have also set a renewable portfolio standard where a percentage of the total power grid is derived from renewable sources.

Utah offers an incentive in the form of a state income tax credit for renewable energy systems, such as solar, wind, biomass, and hydropower. The credit for residential systems is 25% of the equipment and installation cost, up to a maximum of $2,000. Commercial systems receive a

10% tax credit up to a maximum of $50,000. The Utah Energy Office administers the tax credit.

Another incentive that can be adopted and is being considered in Utah, is a net metering law. This law would require electric utilities to allow customers to connect generation systems to the grid for their own use and to supply excess electricity to the electric grid. The utility would "net" the customer's electricity use and production over a defined period of time, in essence, paying the customer retail price for the electricity they produce. Currently there are 34 states with net metering laws. Utah has a proposed net metering bill that will be considered in the 2002 legislative session. This bill, as currently proposed, states that if net metering results in excess customer-generated electricity during the billing period, the electrical corporation shall credit the customer for the electricity at a value that is at least avoided cost.

## Definitions of Alternative Resources

Alternative energy resources can provide substantial and reliable energy supplies. Below are definitions of resources that may be encouraged in the community energy plan. Careful surveying and analysis helps determine whether alternative energy resources are available and economical for individual communities.

### Wind

Wind turbines convert the kinetic energy of the wind into mechanical power that runs a generator to produce clean, nonpolluting electricity. There are three major factors to consider when determining whether a turbine is reasonable and cost effective. First, the building structure must be as energy efficient as possible before alternative energy resources are considered. Second, there must be ample windspeed to meet the power demand. Third, the results of an energy budget identify the size of the turbine required. A general rule of thumb for estimating the cost of a residential turbine is $1,000 to $3,000 per kilowatt.

Wind energy can provide a practical and economical source of electricity if

- Property has a good source of wind.
- Building is located on at least one acre of land in a rural area.
- Local zoning codes or covenants allow wind turbines.
- Average electricity bills are $150 per month or more.
- Building is in a remote location without easy access to utility lines.
- Finances can absorb long-term investments.

## Geothermal

Geo (Earth) thermal (heat) energy is an enormous, underused heat and power source that is clean and reliable. This resource is converted into heat and electricity with little or no greenhouse gas emission, and is released or generated domestically, making us less dependent on foreign oil.

One technology that uses geothermal energy is geothermal heat pumps. In winter, heat from the relatively warmer ground is pumped through the heat exchanger into the house. In summer, hot air from the house is pumped through the heat exchanger into the relatively cooler ground. Heat removed during the summer can be used as no-cost energy to heat water.

A homeowner investing in a heat pump may pay $15 more per month for the cost of the system but may save more than $30 a month on their electricity bill.

Electricity use is reduced by 30% to 60% compared to traditional electric resistance heating systems, allowing system payback in 2 to 10 years. These low-maintenance systems can remain operable for 30 years or more. Where natural gas fired heating is used, the total energy bill may not be reduced by changing to a geothermal heat pump.

## Photovoltaic

Photovoltaic (PV) panels convert sunlight to electricity, directly. PV panels vary in size ranging from a few square inches to about the size of a door. The largest panels generate 300 watts in full sunlight, which is equivalent to power one refrigerator or 12 - 25 watt compact fluorescent light bulbs. A PV system can provide enough electricity to power parking lot lights to large systems that power cities.

These systems have several advantages including no moving parts, low maintenance, and providing an alternative to utility line extensions. Photovoltaics may be preferred even in areas with utility service because electricity is produced without polluting the environment. The visitor center at Zion National Park, for example, has a PV system that contributes power to the building without affecting air quality.

**Photovoltaic panels at Dangling Rope marina, Lake Powell.**
**(UEO)**

**Solar thermal**

The sun heats solar collectors, which transfers gained energy to water or air in the collector. Because Utah has a high amount of solar radiation due to high elevation and many cloudless days, a solar thermal heating system can meet a majority of a home's water and interior heating needs.

Another solar thermal system consists of perforated panels attached to the south wall of a building with a few inches between the panels and the building wall. The dark colored panels absorb heat from the sun. The buildings heating system draws incoming air through the perforations and behind the panels where the air is heated before entering the building.

**Passive solar**

A passive solar design is one that permits direct sunlight to enter through windows to warm interior spaces. This design is intended to not overheat the building and to minimize heat lost through windows at night. Solar radiation passes through windows and is absorbed by interior materials such as stone and brick. These materials temporarily store the infrared radiation (heat) until the interior temperatures drop, then they reradiate heat back into the interior space. In Utah, 50 to 75% of total heating is achievable with these systems if designed properly.

**Small-scale hydro**

Hydropower plants convert the energy of flowing water to electricity and do not necessarily require large dams such as Glen Canyon. Diversion hydropower channels a portion of the water to a canal and through a turbine, from which power is generated. The water is later returned to the river, minimizing the environmental impact.

The economics of small-scale hydropower are site specific and can be very competitive with traditional electricity sources. The electric output is site specific and can vary from a few hundred watts to a megawatt or more. Utility connected hydropower can be a practical and cost-effective addition to the energy mix.

**BioEnergy**

Biomass to Energy (BioEnergy) is energy produced from any renewable organic matter including forest residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residue, aquatic plants, and municipal wastes. Examples of BioEnergy include using municipal wastes to produce methane, fermenting feedstock to ethanol, and converting animal fat waste to diesel fuel (BioDiesel). BioEnergy is successful primarily because it converts waste into useable forms of energy. New demonstration projects are coming on line as the need for energy rises.

## Follow-up and Analysis Measures

Actual inclusion of energy efficiency strategies into a project may not occur even though officials and those involved in the project support the plan. The ETF, therefore, may want to revisit project managers during the implementation phase of the energy plan to monitor progress of development and individual projects. The ETF can provide suggestions or technical assistance to speed the process along.

Computer software modeling programs are an effective method to quantify existing and future impacts of development design. These programs rapidly produce images of design plans, which allow stakeholders to easily conceptualize recommendations and changes. Certain programs are designed to predict future energy demands, energy-related gas emission concentrations, and energy cost analysis of proposed projects (see R/R for suggested modeling packages).

As an ongoing activity, the ETF should quantify the energy benefits and savings in the community to evaluate the effectiveness of the adopted energy plan. After a particular community development or project is completed, an analysis between the forecasted and actual energy used quantifies success. For a renovation project, a comparative analysis between the amount of energy used before and after implementing energy efficiency strategies quantifies actual energy saved.

These evaluations give the ETF an opportunity to revisit existing strategies and modifying where necessary. The ETF can also incorporate new strategies as data warrants. Publicity of the overall savings in energy units and dollars helps maintain momentum for future sustainable energy projects.

# Concluding Remarks

The dawning of the last century here in the United States saw the introduction of new products and technology, most of which are energy consuming. As these products and technologies became an integral part of our Utah communities, the entire economic health of each community and the quality of life of the citizens became dependent on the reliability, cost, and availability of energy sources. Events of 2000-2001 show that no community is immune from a regional or national energy crisis – these crises precipitate local problems. Rapid growth only exacerbates and compounds potential energy problems for our communities.

This Envision Utah Energy Chapter has discussed how each community can address present and future energy issues through "sustainability" – using resources wisely and efficiently in the context of community to create certain economic, environmental, and social benefits. Steps that Utah

**Sustainable community design for downtown Ogden.**
**(CRS Architects)**

communities can take to becoming "sustainable" have been presented along with the organizational elements needed for development of customized community energy plans. As each community develops a plan, this chapter can serve as a valuable resource for delineating strategies needed to meet the goals of the community energy plan.

The key to any community achieving sustainability is the synergy that develops as local officials, citizens, business, developers, and industry work together toward common energy goals. No great society was built upon the status quo. As individuals representing each of these sectors embark on this quest for sustainability, they will exemplify the best in leadership with vision for change and a commitment to success. We can make a difference for the better in Utah's communities and energy future.