It's About How and Where We Build: Connecting Energy and Smart Growth[1]

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ABSTRACT

In recent years, energy issues have become a growing concern for Americans. Largely missing from present energy discussions, however, is the role that land-use practices have on energy consumption and the use of alternative energy resources. By efficiently locating development, we can reduce the amount of energy needed for transportation and for other infrastructure as compared with spread-out, suburban development. Moreover, by including greater use of energy efficient design, these "smart growth" land-use practices could become even smarter – and better achieve their goals of environmental protection, economic prosperity, and community livability. The smart growth land-use and energy efficiency movements are intrinsically linked, yet these two fields have mostly operated in separate worlds. Greater coordination between these two professions is warranted, yet substantial barriers exist. A recent survey reveals that planners' technical knowledge of energy issues is limited, as is their inclusion of energy factors in comprehensive planning, zoning, and development review. Heightened concern about foreign oil dependence, climate change, and the other ill effects of fossil fuel usage makes the energy-land-use collaboration especially important. Recently, there have been some hopeful signs of collaboration between energy professionals and community developers.

Introduction

Not since the early 1970s have energy issues consumed as much national attention. From California's rolling blackouts and deregulation problems, to the massive East Coast blackout in 2003, to historically high prices at the pump, energy problems have found their way into nearly every U.S. household. As Americans search for ways to become more energy efficient, however, they frequently overlook the way in which land-use planning and community design affect the use of energy. Energy debates have largely focused on the need to expand our energy supply, and, to a lesser extent, the development of energy saving technologies. Yet, the way in which we design, plan, and build our communities has significant influence over the amount of energy we use, how energy is distributed, and the type of energy sources we will consume in the future.

Post-World War II suburban development grew up in a time of inexpensive and readily accessible sources of energy. Energy resource discoveries and mass production of the automobile, coupled with the development of the interstate highway system and post-war lending practices, enabled us to move further from urban centers into spread out neighborhoods with larger homes. Both housing size and vehicle miles traveled (VMT) expanded significantly in

[1] The author wishes to thank the Funders' Network for Smart Growth and Livable Communities for permission to update and reprint this paper. Visit www.fundersnetwork.org. Also see: www.eesi.org.

these decades.[2] Since the 1970's, however, the U.S. has became steadily dependent on foreign oil supplies[3] to maintain this suburban lifestyle and increasingly cognizant of the negative effects of fossil fuel usage.

Energy professionals, over the past few decades, have made marked progress in developing and implementing more energy-efficient technologies and products, and in beginning to expand alternative energy generating capacity. Yet, comparable progress has not been made in addressing the energy challenges of urban form. While important thinkers and organizations (e.g., Jaccard, Failing & Berry 1997; Owens 1986; Cal. Energy Commission 1993) have advocated a more comprehensive approach to energy management, for several reasons, including, perhaps, the intractable connection between spread-out development and the American definition of success, the lack of experience most energy experts have with land-use planning, and the fact that land-use policies are best influenced locally rather than through changes on the federal level, these solutions have not been embraced as serious, implementable approaches.

At about this same time but for different reasons, a growing chorus of architects, land-use planners, developers and local and state government officials began to advocate an alternative way to develop land. Known as "New Urbanism"[4] and later "smart growth" this development paradigm called for more compact development near existing infrastructure, neighborhoods with a mix of uses, varied transportation options, and the preservation of green space. By the end of 2003, there were 648 New Urbanist projects built, under construction or in pre-construction (Steuteville 2004). While these strategies have been shown to have many social, aesthetic, and economic advantages, such practices also tended to use less energy than spread-out development. While energy conservation was not a key goal of such communities, it was one very positive outcome.

The high price of gasoline, rises in natural gas and electricity prices, and the growing recognition of increasing worldwide demand for energy, presents the opportunity to build on the success of each of these movements and embark on a comprehensive approach to energy management. New collaborations between energy experts and land use planners and developers are evident. Vermont requires comprehensive land-use plans to include an energy element. California is encouraging inclusion of energy in local and regional transportation and land-use plans. Twenty-eight states have greenhouse gas reduction plans or policies, and at least eleven of these have goals related to land-use planning and/or a reduction in VMT. And, the Green Building Council and the Congress for the New Urbanism have teamed up to create a new rating for green communities, called LEED ND, that addresses both efficient location and environmentally sustainable design and technologies.

These are hopeful developments; however, the marriage between land-use planning and energy efficiency is still in its infancy. There are several barriers to greater integration of energy including the lack of experience most land-use professionals have with energy issues. This paper reviews some of key opportunities for including energy in how and where we build our

[2] The size of the average new American house has increased from 1,170 square foot in 1955 to 2,349 in 2004. (U.S. Census 2000; U.S. Statistical Abstract).

[3] U.S. oil production peaked in the early 1970's. Our net imports in 1970 were 22%, and by 2005, we were importing nearly 60% of total oil consumed (DOE 2006, Table 1.7; DOE EIA 2006).

[4] "New Urbanism" promotes the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environments, and the preservation of our built legacy (Charter of the New Urbanism).

communities, highlights some of the most promising collaborations, and provides some recommendations for further research and activity.

How and Where We Build

There are many opportunities to include improved energy management in the planning and building of our communities. One useful way to think about energy and development is in terms of "where" and "how" and we build— "where" involving location issues and "how" concerning the elements of design. Box 1 provides a snapshot of opportunities to include energy considerations—in macro (location) and micro (subdivision and building) land-use decisions.

Box 1: Opportunities to Integrate Energy into Community Development and Design

"Where to Build" – Location Efficiency

- **Develop areas in or near city centers and public transportation** (e.g transit oriented development) to reduce vehicle miles traveled and petroleum usage.
- **Locate residential development near commercial development and other services** to increase opportunities for walking and decrease dependence on automobiles.
- **Redevelop abandoned and vacant lots (e.g. infill development)** in areas close to existing infrastructure and other services.
- **Direct development away from remote locations** to increase the efficiency of water and electricity distribution and reduce infrastructure subsidization.
- **Site schools** in an efficient location to increase walking and biking.
- **Integrate land-use and energy planning** to allow for siting small scale distributed energy facilities (e.g., co-generation, solar, and fuel cells) closer to customer loads.
- **Promote "greenspace" and the preservation of rural and urban forests** to allow for urban cooling and sequestration of carbon dioxide.[5] Preserve "green" infrastructure to withstand the impacts of extreme weather events, thought to be on the rise with global warming.

"How to Build" – Improved Neighborhood/Building Design

- **Employ energy efficient site planning, including solar street and building orientation** to reduce the use of fossil fuels and increase daylighting.
- **Promote narrower streets and reduced parking requirements** to reduce the "urban heat island effect" and building cooling costs.
- **Utilize energy efficient building design** including energy efficient equipment and appliances, upgrades, insulation, and light colored roofs and overhangs which can reduce energy usage by at least 30 percent and **increase housing affordability.**
- **Consider issues of house size.** Smaller homes have less square footage to heat, cool and light, and tend to have fewer appliances and smaller equipment. Planners can address size through Floor Area Ratio requirements and building volume ratio regulations. (Kendig 2004)
- Preserve and plant **broad-canopied, deciduous shade trees** to lessen demand for cooling at peak hours and to sequester carbon dioxide from the atmosphere. This includes green roofs.
- **Pay attention to where buildings are situated** to maximize opportunities for co-generation (producing energy from the waste heat of other buildings).

[5] In 2004, U.S. forests and related land uses offset approximately 13 percent of U.S. carbon dioxide emissions and 11 percent of U.S. greenhouse gases. From 1990 to 2004, total U.S. sinks decreased by 14 percent primarily due to declines in forest carbon sinks (US EPA Emissions Inventory 2006).

- **Install solar thermal hot water systems** on the rooftops of buildings (such as on existing big box stores) to reduce natural gas and electricity demand for water heating.
- **Increase density** without compromising aesthetics or community character
- **Create projects with a mix of residential, commercial, institutional, and light industrial uses**

Where to Build—Location Matters

Deciding where to develop within a metropolitan region has been a longtime focus of the smart growth movement, with numerous states passing laws to regulate where growth should occur. These range from Oregon's urban growth boundaries that pose different development rules for land inside and outside a defined border, to Maryland's smart growth law that uses the state budget to direct development to areas with existing infrastructure. These strategies aim to increase "location efficiency" by encouraging development in areas that are close to public services and by discouraging growth in areas not well serviced and/or that have vital natural resources. While energy has not been a deliberate focus of such programs, it is an indirect benefit. Location-efficient communities are typically near commerce centers and transit and have been shown to use less energy for transportation and other infrastructure. [6]

A comprehensive U.S. energy policy must grapple with the energy demand of transportation[7] – and influencing driving behavior is a key component of this effort as the growth in transportation activity has exceeded the rate of improvement in vehicle energy efficiency (Greene & Schafer 2003). From 1980 to 1997, VMT grew by 63 percent—an increase of about 3 percent per year and nearly three times that of population growth (DOE EIA 2006).[8] While shifting demographics have contributed to additional cars on the road, over 60 percent of the growth in driving and associated forms of energy consumption has been due to land use factors, according to the U.S. Department of Transportation (EPA 2001).[9]

Numerous studies indicate the energy used for the transportation of people is closely linked to growth patterns. According to Susan Owens in, *Energy Planning and Urban Form*, the single most important factor affecting the relationship between urban form and transport energy requirements is the physical separation of activities, determined by both density and the interspersion of land uses. After studying dozens of cities, Peter Newman and J Kenworthy determined that as density increases per capita energy goes down, well beyond income factors (Newman nd). (See Figure 1.) A comprehensive study of three metropolitan areas suggests that neighborhood design has a universal relationship to car ownership and driving (Holtzlaw et al. 2000),[10] and other research shows that individuals living in higher-density neighborhoods that

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[6] They may also demand less energy for residential use due to more compact housing (e.g., Lantsberg 2005).

[7] Transportation accounts for 28% of U.S. energy consumption, 2/3 of petroleum consumption, and generates about ¼ or our CO_2 emissions (DOE 2006; DOE EIA 2006).

[8] The EIA projects that transportation energy use will continue to grow, but due to higher fuel prices and a leveling off of women entering the workforce, they predict the average yearly increase will be lower than the past, just under 2% per year. Their projection does not consider the effect of land-use changes. (DOE EIA 2006)

[9] Using data from the Texas Transportation Institute, the Surface Transportation Policy Project determined the increase in driving is largely due to: longer average trips; a reduction in carpooling; and the decision to drive instead of walk, bike, or use public transit. (STTP 1999).

[10] *Measuring Sprawl and it Impact (*Reid Ewing, et al 2004) concurs that in the ten most sprawling metropolitan areas, there are, on average, 180 cars to every 100 households, compared with 162 cars in the least sprawling areas. Reducing household car ownership has been shown to reduce VMTs (Gilbert 2002).

include pedestrian and bicycle-friendly features, mixed-use design, and convenient access to transit reduce their driving by 15 to nearly 50 percent with regional VMT reduction 10 percent.[11]

While transportation is the most significant energy gain from location efficiency, there are also energy savings inherent in shorter distances for the delivery of water, electricity and sewage. Electricity transmission and distribution networks, for example, are expensive to build, and energy losses are significant. With electricity, there is a cost associated with extending and maintaining the service delivery system, as with water and wastewater, but there is also loss in the commodity delivered. The further from the generator, the more power is lost in distribution (Risse 2000). According to the DOE EIA, about nine percent of energy is lost in transmission. One utility company estimates that it spends $1.50 to deliver power for every $1.00 that it spends producing it.[12] Yet, there has been far less research documenting other infrastructure energy savings as compared with transportation (Lantsberg 2005).

Another advantage of location-efficient communities is the reduction in per household operating expenses. As affordability is a key community development goal and an Achilles heel of smart growth, reducing household operating costs is a significant societal benefit. A study conducted in the Toronto area found that travel costs and housing costs tend to increase as one moves away from the central cities. While a rise in transportation expenditures was expected, the researchers were surprised to find that despite the fall in housing prices as one moves further out, the amount of money spent on housing –including utilities and other housing costs– actually increased for both owners and renters. This was due to increases in housing size in the suburbs, which made these homes more expensive to own and operate. In the outer most areas, however, the cost of transportation became so significant, it eventually exceeded housing costs (Miller 2004).

In the same vein, the new *Housing and Transportation Affordability Index* prices the savings that derive from living in communities that are near shopping, schools, work, and transit.[13] Preliminary research using this tool in the Twin Cities of Minneapolis/St. Paul found the combined costs of housing and transportation are most affordable in areas well served by public transit. Only the central city neighborhoods were found to be affordable to low income families at less than 50 percent the area median income. Better transit service, access to more jobs, and some lower priced housing improved the overall cost of living for these urban households (CNT & CTOD 2006).[14] Some writers, such as James Kuntsler, have taken this relationship further, claiming that steep oil prices will render outlying suburbs obsolete (Kuntsler 2005).

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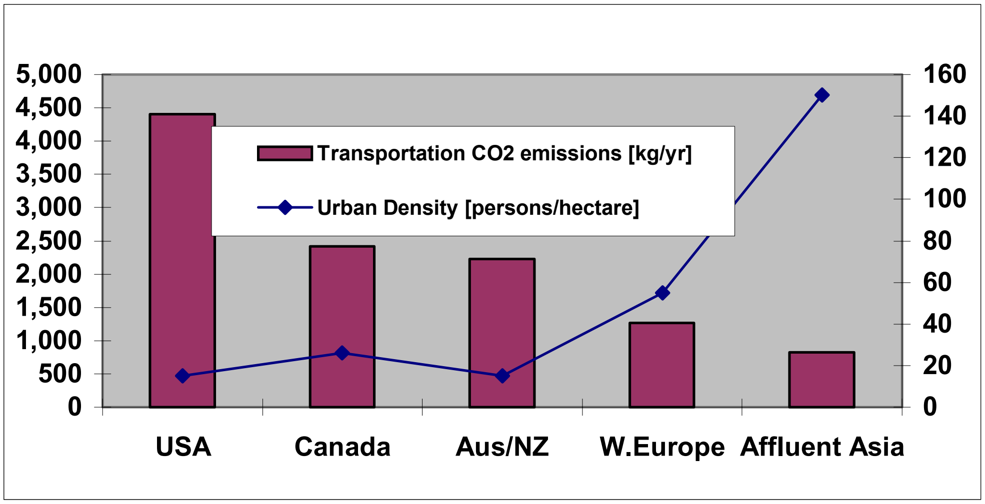
[11] For additional discussion on community design, VMT, transportation energy usage, etc., see: Newman and Kenworthy 1999; U.S. EPA, 2001; U.S. EPA 1999; CCAP nd).

[12] Concerns about energy distribution inefficiencies drove the former CEO of New England Power to embrace smart growth. The company needed a certain density to make energy distribution efficient and sometimes leaned on their commercial customers to subsidize the cost of delivering energy to residences (Jim Dodge, Personal Communication, 2002).

[13] The Affordability Index is the total of Housing Costs (H) + Modeled Transportation Costs (T) divided by Income, where Transportation Costs include the cost of auto ownership, auto use, and transit use (CNT & CTOD 2006).

[14] Researchers found that at $3 per gallon, double the price of two years ago, the average U.S. household will increase transportation expenditures by 14 percent or $1,200 per year (CNT & CTOD 2006).

Figure 1. Per Capita CO2 Emissions Around the World Compared with Urban Density



Data Source: Kenworthy, Transport Energy Use and GhG, 1995 Data.

How to Build—Building and Neighborhood Design and Energy

"How" we build concerns the actual design of neighborhoods including streets, subdivisions, buildings, and transportation facilities. The New Urbanism and smart growth movements have emphasized the need to build well-functioning and livable places, but have not promoted energy goals in their work. Smart growth could become even smarter through *deliberate* inclusion of energy efficient designs and technologies. Between 30 and 40 percent of total U.S. energy consumption is used for building operations—such as heating, cooling and lighting. The U.S. DOE has calculated that with more efficient design and technologies (excluding active renewable power), 30 percent—or $100 billion per year in energy costs—could be saved in the 25 million new housing units and 17 billion square feet of commercial development the nation is projected to build over the next 15 years.[15]

Site selection, orientation, and design greatly affect building energy needs as well as the potential for using alternative sources. Buildings that take advantage of solar access, for example, can have a significant affect on energy usage and bills. The California-based Local Government Commission examined the subdivision plans of about 30 California counties and found that with improved solar orientation (for passive solar heating, cooling, and daylighting), narrower street widths, and additional tree plantings, developments could achieve significant energy reduction savings (over 20 percent reduction beyond already rigorous state codes) as well as save developers money despite investment in home efficiency upgrades (Stoner 2003).[16]

[15] Energy Star qualified homes are independently verified to be at least 30 percent more efficient than homes built to the 1993 national Model Energy Code. These savings are based on heating, cooling, and hot water energy use and are achieved through: building envelope upgrades, high performance windows, upgraded heating and air conditioning systems, and upgraded water-heating equipment. In 2006, EPA revised the guidelines to include lighting & appliances and savings are over the IECC 2004 codes. www.energystar.gov

[16] Cost savings were incurred through deferred pavement costs, reduced cooling costs through additional street shading, and the ability to site additional lots using north/south orientation

New Urbanism and smart growth professionals would benefit from borrowing ideas from their energy and "green building" counterparts. The green building movement has experienced spectacular growth in recent years. Membership in the U.S. Green Building Council has increased ten-fold since 2000, and 462 projects have received their Leadership in Energy Efficiency and Design (LEED) certification, with over 3,000 buildings registered for LEED review (USGBC 2006).[17] Additionally, surveys have indicated that energy efficiency improvements may increase real estate values (NAR 2004). Solar orientation and maximum day lighting have been shown to increase comfort as well as worker and student performance (EESI 2001). Steve Bodzin, formerly with the Congress for the New Urbanism, suggests promoting the benefits of energy efficiency in terms of increased comfort and quality of life. By adopting a more thoughtful approach to orientation and the relationship between buildings, Scott Sklar, a renewable energy expert, suggests that building aesthetics and the livability of public spaces could be enhanced.

Rebuilding after natural disasters presents another opportunity to include energy efficient construction. Using the DOE-2 software model, ICF Consulting demonstrated that the incremental cost of $900 million to rebuild 310,353 homes in Louisiana, Mississippi, and Alabama to 2006 Energy Star standards, post Katrina and Rita, would have a payback of just 7.5 years – much less than the terms of a mortgage. (ICF 2005).

Another important aspect of building energy use, challenging to both energy and land-use planners, is the issue of size. House size affects the amount of electricity need for heating, cooling and lighting, and may also affect the number and type of miscellaneous electronics and appliances. While the size of the average new house has grown 42 percent since the early 1970's, to 2,349 square feet, the size of the average household has *decreased* 13 percent.[18] A comprehensive evaluation of Kane County, IL, electricity use revealed that housing that sprawled west from the Urban Corridor had higher household energy use due to being newer and larger. Researchers concluded that while new homes might be more energy-efficient, they often contained more electrical appliances and more air conditioning (Community Energy Coop. nd). According to national energy data, increases in per capita electricity use are due to the increase in housing size and the demographic shift of northeasterners from their multi family households to larger homes in the south and west that are reliant on air conditioning. Furthermore, the miscellaneous category, that includes small appliances and electronics, is the fastest growing component of household electricity use -- currently demanding over 1/5 of total energy use (DOE EIA 2006).

Putting It Together

Described below are some of the most efforts to integrate energy into community development.

- **A Development Rating System that Includes Energy -** The Natural Resources Defense Council, Congress for the New Urbanism, and USGBC have come together to develop a

[17] The LEED program certifies buildings based on the number of green points earned for good site selection, water efficiency, energy and atmosphere, materials, indoor environmental quality, and innovation and design.

[18] The average new house in 1973, at 1,660 square feet, would use 93.5 million BTU's according to 2001 electricity use standards. Today's new homes with an average of 2,349 square feet use 106.8 million BTU's per household. The average new house in 1955, at 1,170 sq. ft, would use 75.4 million BTU's (DOE EIA 2001).

national set of standards for neighborhood design that emphasizes smart growth aspects of development in addition to green building practices. LEED for Neighborhood Developments (LEED-ND) emphasizes location efficiency, transportation linkages, good neighborhood design, and resource efficiency. One limitation with the draft standards for LEED-ND, however, is that while transportation energy efficiency is strongly represented and a required criteria that can be accomplished through infill development or by locating a development near adequate transit service, there is less emphasis on encouraging energy efficiency in the way developments are built. Energy is only a voluntary requirement in this case, and the use of energy efficient construction or active or passive renewable energy is not required. As this standard is not final, energy may become a more important part of the rating (www.usgbc.org).

- **Greenhouse Gas Reduction Planning** - Twenty eight states and over 200 local governments have established greenhouse gas reduction policies and/or plans. Such plans provide an opportunity to convene a broad cross-section of agencies to address multiple energy issues across community activities. Land-use improvements are becoming an increasingly important component of such plans. In an assessment of 17 state GhG plans, the Environmental and Energy Study Institute (EESI) found that 11 had land-use or VMT reduction components, of which 9 (e.g., CT, MA, ME, MN, NH, NC, NY, OR) included significant sections. In most cases, the land-use planning sections called for offering additional transportation options, with the more recent plans having the most significant land-use sections. The Center for Clean Air Policy (CCAP) and the International Council for Local Environmental Initiatives (ICLEI) provide excellent tools to plan GhG reduction activities.
- **Affordable Housing/Community Development and Energy** – Communities, particularly those in "hot" real estate markets are grappling with the challenges of affordable housing and dislocation.[19] According to the Environmental Resources Trust, energy bills are one key reason that lower-income families cannot afford to stay in their homes (Env. Resources Trust 2003). *The Enterprise Community Partners*, a leading national community development intermediary, has embarked on a new partnership with NRDC to green affordable housing. To offset "green" planning and construction costs, estimated at 2 to 3 percent of the total project, Enterprise is giving away a half-billion dollars to help create 8,500 affordable homes that are energy efficient, healthy, and environmentally beneficial (www.greencommunitiesonline.org). Additionally, 15 states have established Clean Energy Funds (coming out of electricity deregulation) slated to collect nearly $3.5 billion from 1998 to 2012. These funds can finance energy projects to enhance urban development, such as green buildings in inner cities and smart school design (Wiser et al. 2002; USDOE 2002).
- **Land-Use Planning and Energy**– Comprehensive land-use plans direct development in most communities; however most land-use plans do not include a dedicated energy section. In light of energy shortfalls and utility pricing problems, the California Energy Commission is distinguishing itself by working to encourage localities to include energy considerations in the update of their local comprehensive and regional transportation plans. Through its PIER Program, the agency is distributing grants to support sustainable urban energy planning research. Of note is the American Planning Association's (APA)

[19] Smart growth/New Urbanism neighborhoods can raise housing prices because of their desirability.

renewed interest in energy. The APA completed an Energy Policy Guide;[20] conducted a survey of planners on energy (see below); and is committed to increasing the energy outreach it delivers.[21]

More work needs to be done to calculate the energy savings from a comprehensive energy approach. Some of this research has begun. For example, Jaccard, et al, has determined that a community could reduce energy use by an estimated 15 to 30 percent through adoption of a range of energy improvements. If land-use improvements (excluding site design and vehicle changes) are extrapolated to a larger region, GhG reductions of 17 percent were projected. Seattle estimates that by reducing auto dependence and increasing the energy efficiency in residential and commercial buildings (including renewable energy), the City could reduce 486,000 metric tons of CO2 over its baseline, equivalent to 71 percent of its goal to reduce emissions levels by 7 percent below 1990 levels (Seattle 2006).[22] The City of Portland and Multnomah County, OR, calculate a 13 percent GhG reduction since 1993.

More Work Needs to Be Done: Barriers and Opportunities

Research -- Increasing Transparency and Information Disclosure

Far more research needs to be conducted to better understand the relationship between energy and land-development. More evaluation of the embedded energy savings and trade-offs associated with different development scenarios would be useful – for example, the energy savings associated with LEED-ND rated projects.[23] Because turnover of the built environment is slow (2,052,000 new homes were permitted in 2004 as compared with 122, 761,734 households in existence) (U.S. Census), research will need to consider how to improve energy management in *existing* neighborhoods in addition to gains in new development.

It also will be important to expand the delivery of energy information to planners, developers, and consumers. Box 2 highlights a recent survey of planners that indicates a large information gap. Homebuyers do not obtain comprehensive energy information for homes, as they do for many household products. Even when homebuyers request copies of past utility bills, such information may be incomplete and outdated.[24] The EPA Energy Star Program has a voluntary certification for new homes that has penetrated 10 percent of the residential market; adding location costs to such measures (e.g. The Affordability Index) could be useful. It is also important to evaluate consumers' willingness to pay for energy improvements, determine how to distribute these costs to keep housing affordable, and tie energy advantages to other issues of importance to communities.

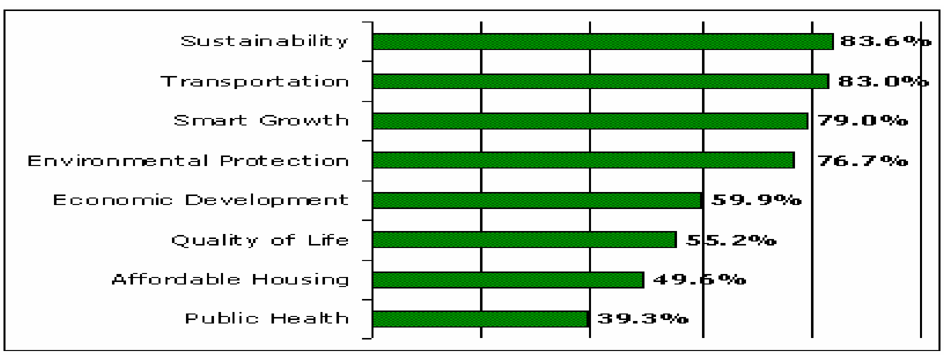
[20] http://www.planning.org/policyguides/energy.htm
[21] There are other groups and states working in this area, such as the Gas Technology Institute (GTI) working to upgrade the energy characteristics of three large "greenfield" developments and planning to open an energy training center with San Diego State.
[22] Including improved average fuel economy and biofuels, Seattle could exceed its 7% reduction goal (Seattle 2006).
[23] This could be difficult to do as many of the energy requirements are voluntary.
[24] Berkeley, CA, requires disclosure of household energy use to prospective homebuyers (Majersik 2006). A voluntary effort to educate and certify realtors to promote the energy advantages and "green" qualities of high performing buildings is being undertaken by ECOBROKER.

Box 2: Planners and Energy: Results of a Survey

A recent survey of nearly 5,000 land-use planners, conducted by APA, in conjunction with EESI, reveals that planners are very aware of the importance of addressing energy, but have limited knowledge of specific energy issues and a low level of implementation. The survey found the following:

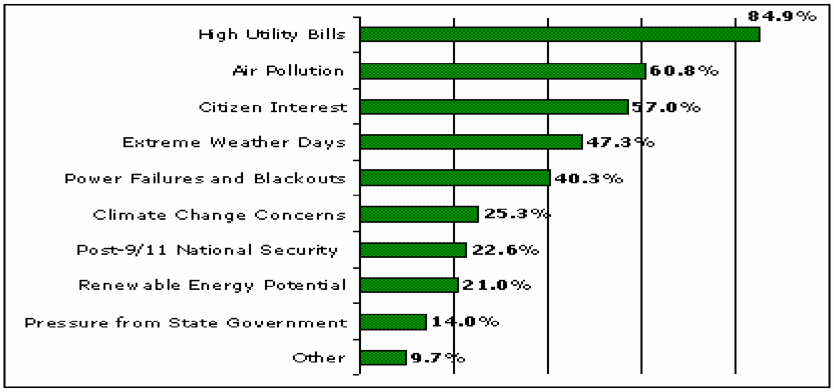
- Planners are not very familiar with renewable energy generating technologies. Planners indicated they were most familiar with passive solar and hydro, with less than one-quarter indicating familiarity with wind, solar thermal or fuel cells.
- More familiarity with green building issues. Just over ½ of planners expressed some familiarity with LEED Green Building ratings, with 1/3 indicating their community required public buildings to be energy efficient. Forty-five percent said they provided developers and builders information on improving energy use in new construction.
- Energy considerations are not being integrated into land-use planning and community design. Planners generally are not including energy issues in land-use plans or regulations, in zoning regulations, overlays, or bonus densities.
- When energy is being included in community planning, it is typically being addressed in transportation planning, and in some cases, green public building requirements. Only 28 percent said their community has an energy policy statement, with most focusing on transportation improvements and walkable communities.
- On a positive note, planners are prime to become stronger energy allies. Ninety-five percent of planners believe that energy is very or somewhat connected to their jobs as planners. See Figure 3 for information on the areas of their jobs they thought were most related to energy.
- Energy is a growing concern in many communities because of high utility bills, air pollution, and general citizen interest. One-quarter said climate change is a concern in their community. See Figure 4. APA/EESI plan to address this gap.

Figure 3: Planners' Rating of Areas of their Job Related to Energy



Source: Lewis, Friedman & Ross (APA/EESI) 2006.

Figure 4. Reasons Communities Are Becoming More Interested in Energy According to U.S. Planners



Communication and Collaboration

Energy smart growth will require new institutional alliances and coordination between the state agencies and utilities involved with energy planning -- and the state and local entities engaged in land-use planning. Land-use planners also should be included in GhG reduction planning. Similarly, energy professionals should play an active role in interagency task forces and committees that address land-use issues, community development, and housing. [25]

Integrated Planning and Measurement Tools

Decision-making support tools that integrate land-use with transportation and energy planning help to put the energy smart growth connection into practice. GIS-based planning tools, such as PLACE3S (the Planning for Community, Energy, Economic and Environmental Stability) and INDEX, address certain aspects of energy use, though none are fully inclusive (http://www.smartgrowthtools.org/).[26] PLACE3S, developed by the CA Energy Commission, is likely the most energy comprehensive – and is currently being updated to include more energy criteria. Data on local renewable energy potential could be added as an overlay to tools.

Policy

On the federal and state levels, other policy needs include (not a comprehensive list):

- Provisions for mixed-use developments, location efficiency, and improved community design in public housing, welfare and travel to work policies.
- Include energy-efficient building and community design in post-disaster rebuilds.

[25] In some states, smart growth planning encouraged the breakdown of these "silos" by bringing together environmental agencies with other offices- however, energy professionals were typically left out.

[26] Test analysis have been performed with GIS tools showing that New Urbanist type developments outperformed conventional developments on energy efficiency due to higher residential densities, more common walls, ceilings that reduce energy losses and greater walking, biking, and transit use. Additional energy efficiency features were able to achieve additional reductions. (e.g., Allen, 2002)

- Implement multi-year tax incentives (rather than two years) for energy improvements and renewable energy installations. Innovative costing policies to reflect the true cost of sprawl. [27]
- Encourage utilities to work more closely with states and municipalities to encourage long term planning and more community-based energy options.

On the state and local level:

- Include energy conservation and clean energy goals in the definition of smart growth. The Smart Growth Network principles list many actions that can, indirectly, save energy, however, energy is not referred to directly. The Charter of the Congress for the New Urbanism mentions energy, though not the preamble, nor is there a discussion of solar orientation and energy efficient building design.
- Require the inclusion of an energy element in local comprehensive plans, including energy demand and supply assessments and renewable energy generating potentials.
- Improve and enforce building codes for energy efficiency. [28]The International Energy Conservation Code (IECC) could serve as a minimum standard and/or other models (Energy Star, Cal. code – including requirement for solar orientation).
- Build location and energy efficiency into plan reviews. Buildings meeting criteria could accelerate through the design review process, and/or receive other benefits (better financing).
- Eliminate regulatory barriers to the use of solar, wind energy or other appropriate distributed generation. Implement zoning and building regulations that encourage New Urbanism.

Changing Behavior

Altering urban form to reduce energy demand assumes that changes in design can alter behavior. Achieving a change in behavior can be harder than improving technology, yet cited studies show it is possible. Without some ability to curb driving activity and the consumption of larger homes, each individual unit might become more efficient, but overall energy consumption rates may continue to climb, especially with increases in population. Americans have demonstrated high acceptance for New Urbanist type neighborhoods, with sales holding strong. Amenities (such as walkability, access to transit, a close mix of services) have been shown to have an economic value. This positive trend needs to be further investigated to determine if it is a passing fad or whether it is sustainable. Additionally, the use of financial incentives to encourage more environmentally desirable behavior is also being investigated, but outside the scope of this paper (e.g. congestion pricing; rising gasoline).

[27] With electricity deregulation, some states now charge customers/developers fees for extending distribution to new locations rather than rolling such costs into utility rates (Burns 2003).[27] The New Jersey State Plan had proposed a better way for the state to link infrastructure costs with smart growth.

[28] About 20 states have not adopted mandatory energy codes for new residential and commercial buildings or have out of date codes.

Conclusion

The energy efficiency and smart growth movements have a unique opportunity to come together at this time to capitalize on the momentum that each is currently experiencing. Combined, the two fields have the opportunity to promote greater change and awareness than they may be able to accomplish individually. Incorporating considerations about energy efficiency into smart growth decisions about where and how we build could result in economic benefits as well as further enhance the idea of livable communities. The time is right for a new collaboration. With 200 mayors singing on to the U.S. Mayors Climate Change Reduction Policy, and several states embarking on greenhouse gas reduction planning, there is a new audience eager for solutions. As Jim Schwab of the American Planning Association recently stated, "In an era when 'smart growth' is the common mantra, it may be worth considering that smart growth must, of necessity, be energy-efficient growth. Taking stock of how that equation can best be realized, however, will be no small challenge" (Schwab 2002).

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