ZONING PRACTICE DECEMBER 2012

AMERICAN PLANNING ASSOCIATION

ISSUE NUMBER 12

PRACTICE ENERGY EFFICIENCY

12

Powering Down Zoning Regulations

By Jeffrey S. Beiswenger, AICP

Over the past several years there has been a paradigm shift in zoning practice with regard to sustainable planning and development.

Policy makers, civic leaders, planners, architects, builders, and energy companies have started to recognize the link between energy consumption and development regulations. Many outdated zoning codes, in particular, are rife with provisions that lead to more energy consumption than necessary or prevent energy saving development techniques. Conversely, many newer codes already include provisions that promote energy conservation.

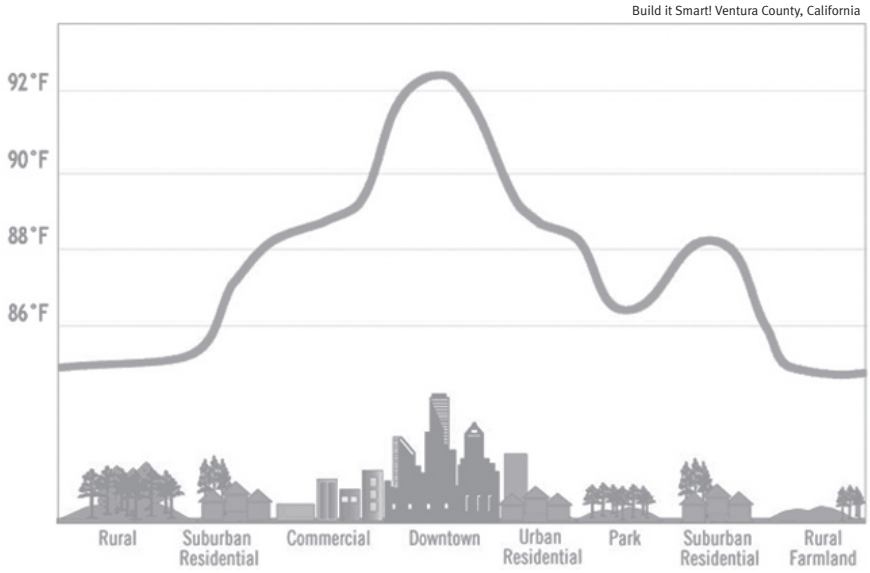
This article explores ways in which energy consumption can be reduced directly or indirectly through zoning and other development regulations. The way that buildings are constructed, neighborhoods are laid out, transportation systems are connected, irrigation systems are designed, parking lots are lit, and even how local produce is grown can help reduce the consumption of electricity and other energy sources. While building codes may be the most direct way to address the energy efficiency of the building envelope, zoning regulations play a particularly important role in accomplishing energy efficiency in the space between buildings. In addition to helping conserve energy, zoning regulations can also play a role in promoting the use of alternative energy sources. Through favorable zoning provisions, communities can facilitate the installation of solar panels, wind turbines, and other renewable energy systems.

UNDERSTANDING THE HEAT ISLAND EFFECT

In order to understand the full impact that zoning regulations can have on energy efficiency it is important to understand the urban heat island effect. Ambient air temperatures in cities are often higher than in surrounding rural areas due to the presence of large expanses of unshaded building and pavement surfaces exposed to direct sunlight. Pavement surfaces exposed to direct sunlight can be 50 to 90 degrees hotter than the air, driving up the ambient air temperature, while shaded or moist surfaces remain close to air temperature.

In some hot cities, shading a building can save $5 to $25 per 100m² of roof area annually. If a city were able to eliminate the heat island effect entirely through extensive tree planting, the corresponding air conditioning savings would provide an additional savings of $5 to $10 per 100m² of roof area (Akbari 2005).

Build it Smart! Ventura County, California



This graphic charts the differential between average late-afternoon temperatures over a range of lands—from undeveloped land to downtown—and shows how parks and open lands moderate high temperatures.

Peak demand for electricity generally occurs on hot summer weekday afternoons, when offices and homes are running cooling systems, lights, and appliances. The urban heat island effect increases both overall electricity demand and peak demand. During extreme heat events the resulting demand for cooling can overload systems and require a utility to institute controlled, rolling brownouts or blackouts to avoid power outages.

THE TOP NINE WAYS TO POWER DOWN YOUR ZONING

There are numerous zoning provisions that affect energy efficiency. These provisions may lead to direct energy savings by reducing lighting levels and the use of furnaces, air conditioners, hot water heaters, and water pumps. And they may

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About the Author
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affect savings indirectly by improving multimodal transportation systems, facilitating mixed use development, and promoting local food production. Regulations that save energy are too numerous to discuss in full here, so the following are the "Top Nine Ways to Power Down Your Zoning Code."

1. Get Smart with Lighting

The low-hanging fruit of energy efficiency is lighting. The amount of electricity used for exterior lighting can be greatly reduced by simply directing the light where needed and by matching the lighting intensity to the need.

The most common zoning provisions related to lighting aim to minimize light spill onto adjacent properties by requiring that light is focused downward or "cut off." Codes may also specify a height limit for light poles and set light intensity levels at property lines. Many communities also set minimum light levels for safety and maximum light levels to reduce excessive light. For an example of common energy-saving outdoor lighting provisions, see §9-5A-6 of Lemoore, California's zoning code.

To maximize energy efficiency gains, communities may consider additional measures such as provisions that encourage or require energy-efficient light fixtures or smart lighting technology (e.g., sensors and timers ensuring that lights only turn on when needed).

Some jurisdictions have adopted strict limits on outdoor lighting levels in order to protect astrological observations. For example, Tucson, Arizona, includes strict shielding and curfew requirements in its Outdoor Lighting Code and sets a maximum light budget (in lumens) for every acre of land, based on proximity to the Kitt Peak Observatory and other factors. However, the code does allow for higher light levels for special circumstances (e.g., a limited exemption for athletic fields).

estimated to account for 19 percent of the total electricity consumed (much of it for agricultural purposes). Nationwide, four percent of electricity goes to this purpose (NRDC 2009).

Codes can play an important role in water conservation. For example, some

Outdoor lighting provisions that limit fixture height and require shielding help to minimize wasteful light spill.

2. Avoid Moving Water Around

Providing households with safe drinking water and wastewater disposal is an energy-intensive process, and this can translate into unnecessary expense at wastewater and water treatment facilities. Reducing water consumption saves energy because less water needs to be treated and pumped to end users. In California the water sector is the largest energy user in the state,

municipal codes may still require that building storm gutters be connected directly into underground storm-sewer pipes. Modern zoning codes now include requirements or incentives for Low Impact Development (LID) techniques to reduce the amount of stormwater runoff. These techniques include drainage swales planted with native species and rain gutters that flow into landscaped areas (instead of

storm sewers). Pervious pavement can also be allowed, or even required, for parking areas to promote on-site infiltration. To illustrate, in 2011 Los Angeles adopted an LID ordinance requiring that the first 0.75 inch of rainfall be captured on-site (Ordinance No. 181899). The city also provides information on best practices such as rain barrels, permeable pavement, planters, rain gardens, and dry wells through its Stormwater Program (Los Angeles 2012).

Another approach to encourage the reuse of water is requiring that developers install dual pipe systems to allow for the use of nonpotable water for irrigation purposes. A secondary pipe (sometimes called a purple pipe) is used to transport this water in a parallel system separate from the potable water. For example, Windsor, California, requires the installation of purple pipe for landscape irrigation purposes (§12-7-105).

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Requiring bioswales in parking areas helps to decrease the volume of stormwater flowing to water treatment plants.

3. Be Cool

Cooling down buildings, parking areas, and other surfaces that tend to absorb heat from the sun can help reduce energy usage—particularly in climates dependent on air conditioning. Trees, landscaped open space, and landscaped (green) roof areas can help reduce the heat island effect and maximize pervious surfaces in urbanized areas, and zoning codes can play a particularly important role in promoting pervious surfaces.

Trees can play a major role in lowering both site-specific and aggregate ambient air temperatures, and many communities have incorporated tree planting and preservation requirements into their zoning codes. Another effective technique is to require that a certain minimum percentage of a paved parking area is shaded. Rancho Cordova, California, uses this approach (§23.716).

Black asphalt absorbs light (and heat), resulting in 57 percent more electricity use than lighter colored concrete (Adrian and Jabanpura 2005). Requiring highly reflective surfaces (i.e., those with a light color high-albedo index of at least 29) for roofs, parking areas, streets, and other paved areas increases the efficacy of artificial lighting and can reduce heat island effects. California's green building code, CalGreen, includes provisions requiring that buildings and paved areas have a certain solar reflectance to minimize heat gain if they are not shaded (§A5.106.11.2). Austin, Texas, has similar reflectance requirements for flat roofs and also actively encourages the provision of green roofs through code incentives (Austin 2012).

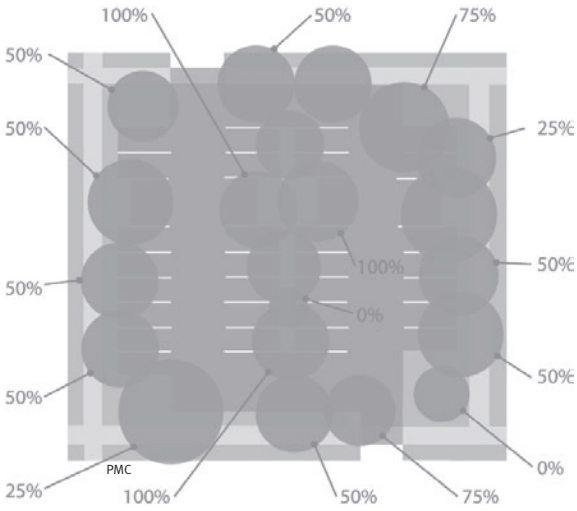
4. Let the Sun Shine

While the previous point focused on how to eliminate solar heat gain to lower air conditioning bills, in certain instances, maximizing solar access increases the opportunity to generate electricity or heat water with a solar energy system. Heating water accounts for 15 to 30 percent of electricity use in homes equipped with electric water heaters, and using a solar water heater can result in a 50 to 80 percent cost savings. Furthermore, many homes have space for a 4kW rooftop solar energy system, which in some circumstances can offset total annual electricity use.

Consequently, some states protect the rights of property owners to receive sunlight. These solar access protections often enable property owners to use solar easements to prevent neighbors from building structures that may block solar panels, garden areas, passive solar heating, or other features that require solar access. A few states even protect solar access without a solar easement. The Database of State Incentives for Renewable Energy includes a state-by-state breakdown of solar rights and access protection laws (www.dsireusa.org).

At the local level, many jurisdictions have a solar access or solar easement provisions in their development regulations. These provisions either enable the recordation of easements or establish a solar envelop by right to ensure that solar systems are not blocked or made less efficient by development on neighboring properties.

Subdivision or zoning provisions can also encourage buildings and neighborhoods to be designed along an east-west access to maximize solar exposure. The percentage of homes that are positioned for optimum solar access could be specified in the code (e.g., 50 percent). This will at least provide the opportunity



Minimum parking lot shade requirements can lessen urban heat island effects.

Notes:
1. This diagram is intended to reflect the manner in which shade is credited under various conditions.
2. Trees may receive 25%, 50%, 75%, or 100% as shown.
3. Shade overlap is not counted twice.

for a certain number of homes within each subdivision the option of installing solar systems in the future.

Beyond just providing for the possibility of future solar systems through solar access and orientation requirements, some jurisdictions are taking the next step of requiring that buildings are prewired (or preplumbed) for solar service. Resources produced by the American Planning Association through its participation in the SunShot Solar Outreach Partnership include examples of all of the strategies discussed above (www.planning.org/research/solar).

5. Reuse Existing Buildings

A common adage in energy conservation circles is that the most energy-efficient (or sustainable) building is the one that you don't build. If the primary goal is to save energy, then a persuasive argument can be made in favor of reusing buildings in more urban settings before constructing new low-density suburban settlements. Allowing a mix of uses within a district or a single building can encourage building reuse by allowing older buildings to be repurposed for new uses.

Many modern zoning codes provide for mixed use districts that allow (or require) combinations of residential, commercial, office, and even light industrial uses. From a utility standpoint, mixed use development maximizes infrastructure efficiency and may even help smooth out peak-period demand. Mixed use districts are often well suited to take advantage of shared parking facilities or available transit service, thereby reducing the need for private off-street parking. Reducing off-street parking can also lessen the impact on the electrical grid since large fields of parking contribute to the heat island effect, spread out the distance between buildings, and increase the distance that electricity has to travel.

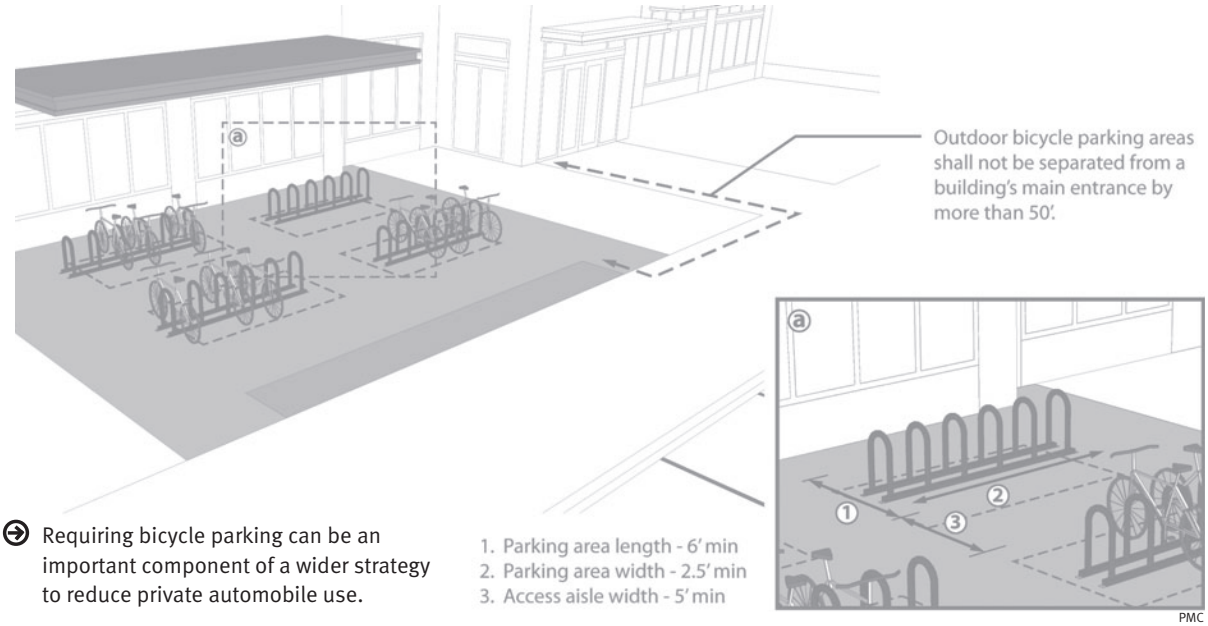
Applying building and zoning codes uniformly throughout the community can lead to the unintended destruction of historic resources. Many older buildings would need to be demolished and replaced in order to comply with strict energy efficiency or minimum off-street parking requirements. For this reason, jurisdictions often exempt downtown and other special areas from off-street parking requirements. Ocala, Florida's parking exempt zone illustrates this approach (§122-981). Similarly, communities may also carve out limited exemptions for historic buildings from energy-efficient building code provisions. For example, Palo Alto, California's green development regulations exempt historic structures from certain requirements (§18.44.10).

6. Reduce Private Automobile Use

While the topic is too large to cover in depth here, the most effective zoning strategy for reducing private automobile use may be mixed use and form-based code provisions aimed at creating more compact, walkable, and transit-friendly areas. Many contemporary zoning codes incentivize or require pedestrian- and transit-oriented development either communitywide or in multiple strategic locations.

In addition to provisions requiring compact, mixed use development in transit-friendly locations, communities can also use zoning to encourage carpooling, car sharing, or the use of more energy efficient vehicles (e.g., motorcycles and electric vehicles). Many communities require bicycle parking in their zoning codes, and these standards are typically based on a ratio related to vehicular parking requirements. CalGreen requires all jurisdictions to provide bicycle parking equivalent to five percent of all vehicle parking spaces (§5.106.4). While carpool spaces have long been required as part of some zoning codes, CalGreen requires parking for "clean air vehicles," which include vanpools, carpools, electric vehicles, and gas-electric hybrids (§5.106.5.2).

Beyond the baseline parking and clean air parking requirements discussed above, communities can also offer off-street parking reductions for sites that provide bicycle lockers, indoor bike rooms, and indoor changing and shower facilities to encourage employees to commute by bicycle. Additionally, communities may consider including separate parking allowances for small vehicles such as motorcycles, mopeds, golf carts, and other energy- (and space-) efficient vehicles.



Requiring bicycle parking can be an important component of a wider strategy to reduce private automobile use.

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A growing number of communities have added zoning provisions in recent years to promote infrastructure for electric vehicles.

7. Prepare for Electric Vehicles

Electric vehicles (EVs) are increasing in popularity, although it is too early to tell if they will be produced in significant enough numbers to compete with their gas-powered cousins. EVs present an interesting set of issues for utilities, but with incentives to encourage off-peak charging (e.g., at night) EVs can avoid undue impact on the grid and allow utilities to sell more electricity at off- hours.

Zoning codes typically do not address EV infrastructure. In general EVs are treated the same in zoning codes that any other vehicle. In a typical scenario these spaces would be part of the parking supply and applied toward the required number of parking spaces. If provided, the Americans with Disabilities Act requires one or more EV spaces to be provided as disabled parking.

However, a growing number of communities have added zoning provisions in recent years to promote infrastructure for electric vehicles. For example, Sequim, Washington, devotes an entire chapter of its zoning code to EV infrastructure requirements (Chapter 18.50). Sequin does not require the installation of electric vehicle spaces but does include detailed provisions that apply if they are to be installed. Also, CalGreen includes model provisions that could be adopted by jurisdictions to require prewiring for future spaces (§A5.106.5.3).

8. Set the Bar High

A variety of project rating systems can be used by local governments to encourage energy efficiency. These systems may either be incorporated into the zoning code as requirements or used to incentivize more sustainable development.

Jurisdictions may encourage developers to build projects that comply with sustainable development rating systems by offering density bonuses or expedited permitting. For example, Rancho Cucamonga, California, recently adopted a rating system based on CalGreen that qualifies energy-efficient residential and nonresidential projects for an expedited permitting process. While developers are always interested in expedited processing times, the desire to implement energy efficiency often comes down to direct financial benefits: Can the homes be sold for more if a solar system is installed? Jennifer Nakamura, senior planner with Rancho Cucamonga, explains that apartment projects can be especially tricky, since reductions in electricity use benefit future tenants and not the developer.

Requiring provisions for more sustainable development—as opposed to simply providing incentives—is also an option. For example, Duarte, California, has adopted an approach that incorporates a wide range of CalGreen provisions directly into a chapter of its zoning code (Chapter 19.52). Different sustainable development provisions apply based on the size of project.

9. Partner With Your Utilities

Why would utility companies want less consumption of energy? After all, utilities are in the business of selling the stuff. In some markets utilities may be required to refund profits above a certain amount, so they don't necessarily make more if more energy is sold. In other cases, if a utility brings in less revenue than expected due to reduced electricity use, the state compensates them for the difference. This incentivizes the utility to produce less electricity because they get to pocket the savings and are guaranteed a certain profit. Capacity constraints also play a role and may encourage conservation. Since it is extremely costly to permit, construct, and operate a new power plant, it can be more cost-effective to promote conservation as a way to reduce demand.

Jeffrey Beiswenger

Some property owners are already starting to include electric vehicle spaces with charging stations in their parking lots.

As a consequence, cities and counties throughout the United States have launched energy-efficiency programs in cooperation with local utilities. Christina Prestella, a program manager with Pacific Gas and Electric, explains that local government programs are popular politically since they are viewed as ways to save money and use resources more efficiently. In addition to energy-efficiency programs which provide direct energy savings to existing buildings, utilities are also funding efforts to help local governments craft regulations that apply to new construction activities that will lead to

greater energy efficiency throughout a larger geographic area.

Utility-driven programs typically address the energy efficiency of governmental operations (e.g., water treatment, streetlights, and facilities), assistance to local businesses (e.g., lighting retrofits) and community residents (e.g., weatherproofing). The programs are often funded by the local utility and may use ratepayer fees identified for this purpose.

Forming multijurisdictional partnerships, particularly where large utilities are involved, can be a particularly effective way to achieve energy-efficiency gains. In 2009, the California Public Utilities Commission authorized $32 million for local governments to engage in strategic energy efficiency activities. As part of this effort, Southern California Edison is partnering

Forming multijurisdictional partnerships, particularly where large utilities are involved, can be a particularly effective way to achieve energy-efficiency gains.

with 27 member agencies of the San Gabriel Valley Council of Governments (SGVCOG) to prepare energy efficiency plans. In early 2012, SGVCOG elicited assistance from the planning consulting firm PMC to develop a toolkit to help jurisdictions adopt regulations that promote energy efficiency. This Model Energy Efficient Code Toolkit will provide a framework to help local governments address energy-efficiency targets, goals, and policies through development regulations. Although certain provisions are calibrated for Southern California, most of the ideas included in the model are applicable in other states and geographies as well. The full toolkit will be available in late January 2013 at www.sgvenergywise.org.

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CONCLUSIONS

Development regulations clearly offer numerous opportunities to promote energy savings, and given the increasing awareness of energy-related issues in many communities, this may be an ideal time to present needed updates to outdated zoning codes. The strategies discussed above are not intended to be an exhaustive list but only a starting point to stimulate conversation. What is particularly interesting about this subject matter is that it allows consideration of a number of past zoning strategies (e.g., smart growth, form-based codes, performance standards, lighting limits, compact development, etc.) through the lens of energy efficiency.

Finally, planners should consider contacting their local utilities for partnership opportunities. Many utilities are operating at or near capacity and may be looking for creative ways to increase energy efficiency and better serve utility ratepayers.

Cover image: iStockphoto.com/janda75; design concept by Lisa Barton

VOL. 29, NO. 12

Zoning Practice is a monthly publication of the American Planning Association. Subscriptions are available for $95 (U.S.) and $120 (foreign). W. Paul Farmer, FAICP, Chief Executive Officer; William R. Klein, AICP, Director of Research

Zoning Practice (ISSN 1548–0135) is produced at APA. Jim Schwab, AICP, and David Morley, AICP, Editors; Julie Von Bergen, Assistant Editor; Lisa Barton, Design and Production.

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12