Integrating Solar Energy into Local Plans

Communities adopt local plans in order to chart courses for more sustainable and livable futures. Planners and public officials then use these plans to inform decisions that affect the social, economic, and physical growth and change of their communities. Given the potential economic and environmental benefits of local solar energy production, it is no wonder that an increasing number of cities and counties are addressing solar energy in their plans.

Local solar market expansion means lower monthly energy bills for homes and businesses with solar installations and new jobs for solar installers. Furthermore, increasing local solar energy production reduces the demand for fossil fuels and, by extension, the production of greenhouse gas emissions. Regardless of the specific justifications for prioritizing solar energy use on local agendas, the simplest reason for addressing solar energy in local plans is to provide residents and potential solar developers with a clear vision of community priorities as they relate to solar energy production.

Most local plans fall into one of three broad categories: (1) comprehensive plans, (2) subarea plans, or (3) functional plans. In this conceptualization, comprehensive plans cover a wide range of topics of communitywide importance. In contrast, subarea plans cover one or more topics of particular importance to a limited part of a single jurisdiction, and functional plans focus on a single topic or system that is not limited to a single subarea. While some communities have adopted functional plans on the specific topic of solar energy use, many others address solar energy in comprehensive or subarea plans or in functional plans covering climate change, sustainability, or energy.

There are a number of possible references to solar that may appear in any policy-oriented plan. For example, a broad vision statement may relate how solar energy production intersects with general community values. An introductory background section may describe the existing physical and policy conditions for producing solar energy, and subsequent chapters or elements may state specific goals, objectives, policies, and actions relevant to promoting solar energy production. The substance of these references to solar will, naturally, vary depending on community preferences as well as the type of plan.

The purpose of this paper is to provide planners, public officials, and engaged citizens with an overview of established and emerging approaches to integrating references to solar energy into local plans. The initial sections focus on addressing solar energy use in features common to many types of plans, and the paper concludes with issues specific to comprehensive, subarea, and functional plans.

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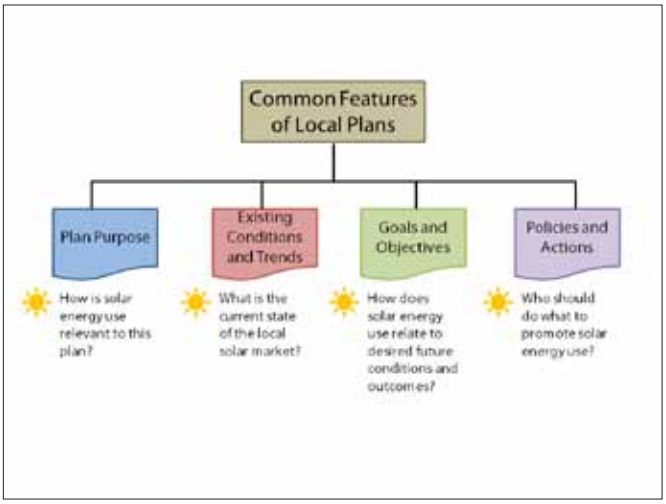
Addressing Solar Energy Use in Common Plan Features

While local plans vary based on geographic scale, timeframe, and breadth of topics, there are four features common to most local plans: (1) an explanation of the purpose of the plan, (2) a discussion of existing conditions and trends, (3) a presentation of desired outcomes in the form of goals and objectives, and (4) an enumeration of policies and actions in support of these goals and objectives. Planners and others involved in plan making (i.e., plan authors) have opportunities to address solar energy use in each of these common plan sections.



Plan Purpose

The purpose section allows plan authors to explain the plan's impetus, scope, and authority, while also providing some insight into the nature of the planning process. In practice, the plan purpose may be articulated in one or more introductory paragraphs, or it may be stated broadly up front and then revisited or reframed in the introduction to each thematic plan element.

Regardless of the form of the statement in a particular plan, a core purpose of local planning is facilitating the development or protection of community resources. Because sunlight can be harvested for heat or electricity, it has a value beyond its intrinsic human health benefits. However, relatively few communities acknowledge solar energy as a resource comparable to other local resources such as vegetation, water, minerals, fossil fuel reserves, or historical buildings and heritage sites.

Unless the scope of the plan is limited to identifying opportunities to promote solar energy use, a plan purpose statement may not explicitly reference solar energy. However, one way to help community members start to see solar energy as a local resource is by simply pointing out the nonlocal and nonrenewable origins of most locally used energy. For example, the Solar Access Protection element of Shakopee, Minnesota's 2030 Comprehensive Plan begins with a warning that the State of Minnesota currently produces only 0.2 percent of the fuel it uses.

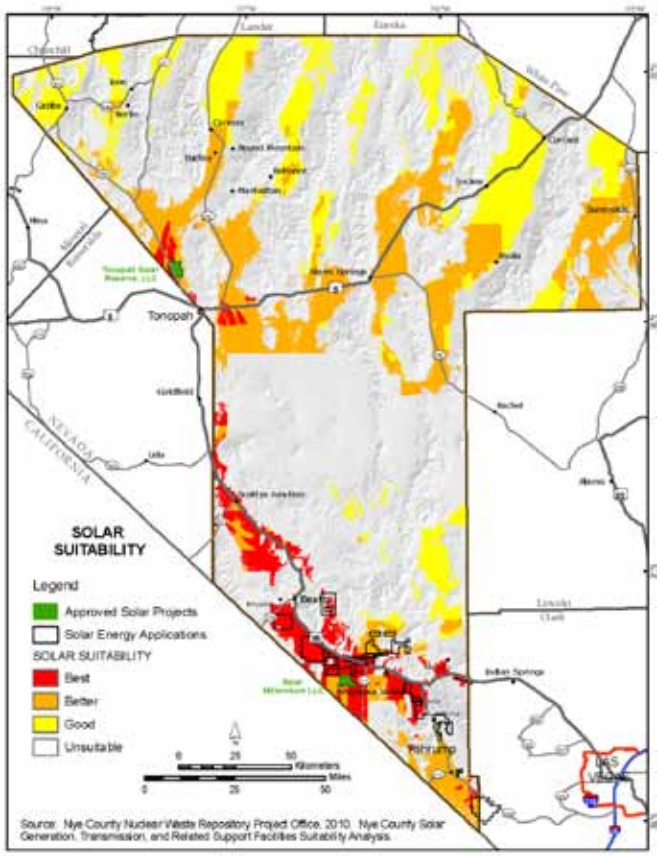
Existing Conditions and Trends

The existing conditions and trends section provides context for the broad goals and objectives of the plan and sets the stage for the policies or policy considerations detailed in subsequent plan sections. Understanding the potential importance of a community's solar resource requires some knowledge of both the availability of the local solar resource and the community's existing energy use. Plan authors can use this section to document the amount of energy consumed, the mix of energy sources currently used in the community, information about existing installed solar capacity, and a summary of how local solar investment has changed over time.

While a national map of the photovoltaic solar resource of the U.S. will show that solar energy production is a viable option across the country, demonstrating how access to sunlight may vary across a community can be especially helpful. The potential for harvesting this resource in a specific location depends primarily on local landscape variables rather than general conditions such as latitude and average cloud cover. Topography and shading from trees and adjacent buildings has a greater impact on the available solar resource for a specific building or site than whether or not the property is located in Arizona, Minnesota, or North Carolina.

Identifying where solar energy potential is greatest in a community can help residents, business owners, and developers understand how to direct their efforts and investments, and from a broader perspective, this information helps elected officials make decisions about where to focus future development and conservation efforts. The second briefing paper in this series, "Solar Mapping," explains how several communities have created solar maps to demonstrate the potential for solar installations across their jurisdictions.

Once a community has documented the geographic characteristics of its solar potential, plan authors can summarize this information for community members. For



Nye County, Nevada's latest comprehensive plan shows the relative suitability of different areas of the county for solar installations. (Image courtesy of Nye County, Nevada)

example, the latest version of Los Angeles County's Conservation and Natural Resources General Plan Element includes a direct link to the county's online Solar Map and Green Planning Tool, and Nye County, Nevada, includes maps indicating solar suitability and documenting existing solar installations as figures in the conservation chapter of its 2011 Comprehensive Master Plan.

The existing conditions and trends section can also describe how technological and economic factors influence the local solar market. For instance, solar energy systems may be active or passive and may be used to generate heat or electricity, and these different solar technologies are associated with different costs and performance characteristics. Furthermore, the feasibility of different types of solar energy systems is influenced by state and local policies and incentives.

While an inventory of state and local policy incentives for solar energy use may be too detailed for an existing-conditions analysis in a comprehensive or subarea plan dealing with multiple topics, a functional plan focused exclusively on energy may include a summary of the state and local laws that encourage or inhibit solar energy use.

Beyond the state and local policy context, financial incentives can also exert a powerful influence on the local solar energy market. Unlike regulations, which tend to be relatively static, incentives are often more ephemeral. Consequently, instead of cataloguing existing state and local incentives for solar installations, it may make more sense for plan authors to describe the different species of incentives that have historically influenced local solar markets. For example, some common types of financial incentives for solar installations are renewable energy credits, tax credits, and equipment rebates. Plan authors can then provide a reference to an up-to-date resource, such as the Database of State Incentives for Renewable Energy (DSIRE), with more information about active programs and offers.

Perhaps the most easily overlooked factor influencing the local solar market is the knowledge and experience of local solar installers. Like incentives, local installer capacity is dynamic and can change rapidly as new installers enter the marketplace or existing installers acquire additional experience or training. While plan authors may not be able to discuss local capacity in detail, they can help community members understand how limited installer knowledge and experience may present a barrier to expanding the local solar market.

One example of a community that has included extensive information about baseline conditions and trends related to solar energy is Tucson, Arizona. The city's Solar Integration Plan and its companion, the Greater Tucson Solar Development Plan: Strategies for Sustainable Solar Power Development in the Tucson Region, provide a thorough analysis of existing solar capacity and the factors likely to influence market growth.

Goals and Objectives

Almost all local plans contain one or more sections presenting goals and objectives related to the plan's focus. Goals are general statements about desirable future conditions. Objectives are statements of measurable outcomes in furtherance of a certain goal. Together, goals and objectives comprise the cornerstones of a local policy framework. In other words, all local policies and implementation actions should ideally be in furtherance of adopted goals and objectives.

Most communities formulate and prioritize goals through participatory planning processes. These processes may include formal visioning and goal-setting exercises as well as various other citizen engagement tools used by planners to facilitate conversations about the future of their communities. The first briefing paper in this series, "Solar Community Engagement Strategies for Planners," describes the importance of engaging the community to develop goals related to solar energy.

Each goal in a plan may be associated with multiple objectives. Again, these objectives are ideally byproducts of robust and authentic participatory planning. Effective objectives are both achievable and subject to measurement. In order to formulate an achievable objective, participants in the planning process must have access to the best available data and analysis on the issue at hand. Moreover, objectives should, ideally, be associated with a timeframe. This may be the time horizon of the overall plan, or it may be specific to the objective.

The process of formulating goals and objectives may be the first and best opportunity for planners and other participants to work through potential conflicts among goals. The fifth briefing paper in this series, "Balancing Solar Energy Use with Potential Competing Interests," highlights some potential conflicts among goals that may affect efforts to promote solar energy.

Among communities that have added goals and objectives related to renewable energy, generally, or solar energy, specifically, to their plans, common themes include improving the energy performance of municipal facilities, removing barriers and creating incentives for small-scale installations, and capturing economic development opportunities associated with renewable energy investment. As an example, Pinal County, Arizona, lists the following goals and objectives in the Environmental Stewardship chapter of its latest comprehensive plan:

- Improve the energy efficiency of Pinal County government (Goal 7.3).
- Set an example by improving energy efficiency and use of renewable sources in County facilities, vehicle fleets, and equipment (Objective 7.3.1).
- Expand renewable energy in Pinal County (Goal 7.6).
- Support small scale renewable energy projects (Objective 7.6.1).
- Support the growth of renewable energy in Pinal County (Objective 7.6.2).

Policies and Actions

Effective local plans typically include both specific policy statements and action steps. Policies are statements of intent with enough clarity to guide decision making, and actions are directives about programs, regulations, operational procedures, or public investments intended to guide the implementation of specific policies.

While goals and objectives generally remain abstract, policies point to a course of action and imply responsibility for implementation. To illustrate, a goal to expand local renewable energy production, with an objective of increasing solar energy capacity to a certain level by a target date, says little about what roles local government, private developers, and individual property owners should play in order to meet this goal. However, a policy stating that rooftop residential solar installations should be permitted in all areas of the jurisdiction implies that the local legislative body will adopt new zoning regulations for accessory solar energy systems.

Action steps make the implied responsibilities of policy statements explicit. For example, a plan with a policy sanctioning residential solar installations may include a directive for the planning staff to prepare a zoning amendment for city council review that defines accessory solar energy systems and permits these systems by right in all districts.

Among communities that have added policies and actions related to solar energy to their plans, common topics include adding solar to municipal facilities, solar access protection, regulatory or financial incentives for small-scale solar installations, and preferential locations for new solar energy systems. Fort Collins, Colorado, and Chico, California, provide two examples of communities that make clear connections among solar-related goals, policies, and actions in their most recent comprehensive plans. Both plans include multiple policies aimed at expanding active and passive solar energy systems on public and private property, and both plans detail specific actions and identify parties responsible for implementing these policies.

Addressing Solar Energy Use in the Comprehensive Plan

While planners help towns, cities, and counties prepare a wide range of communitywide, subarea, and functional plans, the most significant of these is the local comprehensive plan. The

comprehensive plan, sometimes referred to as the general plan or the master plan, is the foundational policy document for local governments. In many ways it functions like a community constitution, establishing a framework for future growth and change within the jurisdiction to be implemented through local laws and public investments over the next 20–25 years.

Comprehensive plans are named as such because they cover a broad range of topics of communitywide concern. All states either allow or require local governments to prepare comprehensive plans, and many states require local development regulations to be in conformance with an adopted comprehensive plan. While enabling laws vary from state to state, common topics for plan elements (i.e., chapters or major sections) include land use, transportation, housing, economic development, and community facilities. In recent years an increasing number of cities and counties have added elements addressing sustainability, natural resources, or energy to their comprehensive plans.

Given the importance of the comprehensive plan in the local planning system, it represents a logical point to introduce solar energy–related goals and objectives in the context of the wider local policy framework. This gives plan authors a chance to highlight synergies and potential conflicts between solar and other community resources and to summarize any previous, ongoing, and planned policies and actions to support the implementation of goals related to promoting solar energy use.

The comprehensive plan is the legal foundation that legitimizes local land-use regulations. As such, it is important for plan authors to establish a policy foundation in the comprehensive plan for development regulations that affect solar energy use. The fourth briefing paper in this series, "Integrating Solar Energy into Local Development Regulations," discusses the importance of clear zoning and subdivision standards in removing barriers to and incentivizing the installation of solar energy systems on private property.

Ideally, the local comprehensive plan is a primary guide not only for updates to development regulations but also for the creation of local capital improvements plans, which detail planned capital expenditures over a multiyear period. By extension, comprehensive plans with goals, objectives, policies, and actions that support solar energy use can pave the way for future public facility construction or rehabilitation and private development projects that incorporate solar energy systems.

In the most recent versions of their comprehensive plans, Orlando, Florida, and Anaheim, California, both tie previous and ongoing activities that support solar energy use to new policies that support local solar market growth. Orlando's plan voices support for ongoing partnerships with the local utility commission and county government to support renewable energy initiatives and includes policies calling for the creation of a solar mapping tool and a solar master plan. Meanwhile, Anaheim's plan references an existing city-owned solar installation and discusses ongoing public education efforts before listing policies that clarify the city's intent to support active and passive solar design in both new and existing development.

Addressing Solar Energy Use in Subarea Plans

Subarea plans are plans that include goals and objectives for a discrete geographic area within a jurisdiction. Some common types of subarea plans include plans for specific sectors, neighborhoods, corridors, or special districts, such as transit station areas, redevelopment areas, or areas designated for historic preservation. These plans may cover a wide range of topics relevant to the plan area, essentially functioning as smaller-scale comprehensive plans, or they may be strategic in nature, focusing on a subset of topics with special urgency.

The limited extent of subarea plans has both advantages and disadvantages. Because comprehensive plans can seem abstract or diffuse to residents, business owners, or institutions that identify more with specific neighborhoods than with the city as a whole, planners often have an easier time identifying and engaging key stakeholders when a plan has clear implications for these stakeholders' homes, businesses, and shared public spaces. The other clear potential advantage of subarea plans is that these plans can be more specific about how goals and objectives apply to individual parcels of land. On the flip side, strong emotions can lead to a loss of objectivity, making it difficult for communities to prioritize scarce resources.

When considering the limited extent and greater specificity of subarea plans in the context of planning for solar energy, plan authors have opportunities to discuss the neighborhood- or parcel-level implications of policies and actions aimed at increasing adoption of solar technologies. Subarea plans can provide greater detail about preferred locations for solar installations and go into more depth about the regulations, incentives, and potential competing interests that may either support or inhibit local solar market growth.

Many communities incorporate design guidelines for future development into subarea plans. For example, both Austin,

Lawrence Township, New Jersey, Green Buildings and Environmental Sustainability Element of the Master Plan Goals, Objectives & Strategies: Energy Conservation and Renewable Energy Production

Goal B: Promote local production of renewable energy.

Objectives		Strategies	
#1.	Revise the Land Use Ordinance to make it easy for property owners in all zone districts to produce renewable energy on their property as accessory uses.	(a)	Accessory solar/photovoltaic shall not be subject to particular design standards intended to screen them from public view.
		(b)	Within historic districts, solar/photovoltaic shall be permitted; however, their placement and design should be compatible with the historic character of the building/district or screened to the extent practical. Specifically, renewable energy structures, such as solar panels, should be placed such that they are not visible on the front of an historic building or a building located in a historic district.
		(c)	Encourage property owners to cover roof tops and surface parking lots with solar/photovoltaic structures.
		(d)	Creation of solar power facilities on undeveloped land is strongly discouraged because of potential loss of carbon sequestration, natural eco-systems and habitats, and potential stormwater impact from ground mounted systems. However, an exception is the installation of renewable energy facilities on agricultural lands and managed open spaces, such as meadows, in such a way that the agriculture or managed open space use may be conducted and is viable under the renewable energy facility.
		(e)	The Township should encourage property owners who have existing solar facilities or are proposing to install them to enter into solar easements with neighboring property owners in order to ensure continuing access to sunlight for a solar facility.
#2.	As upgrades and renovations become necessary, municipal facilities and infrastructure should incorporate renewable energy production.	(a)	The Township should consider incorporating new renewable energy production, such as solar power, into existing and any future facilities.
		(b)	The Township should consider infrastructure upgrades and changes to facility operations that utilize renewable energy. Infrastructure upgrade examples include but are not limited to solar powered streetlights. Changes to facility operations include but are not limited to installation of energy efficient lighting.

Texas, and Amherst, Massachusetts, have adopted neighborhood plans that address solar design. Austin's Brentwood/Highland Combined Neighborhood Plan recommends subdivision layouts and lot configurations that maximize solar access, and it encourages concentrating windows on the south face of buildings to promote passive solar heating. Similarly, Amherst's Atkins Corner plan includes a workbook of sustainable development design options, which highlights the importance of solar design as part of an overall strategy to maximize climate-friendly development.

Addressing Solar Energy Use in Functional Plans

Functional plans are stand-alone plans for systems or special topics that have spatial planning implications but are not, fundamentally, rooted in a single subarea of a community. Examples include capital improvement plans, affordable housing plans, transportation system plans, and open space network plans. And as an increasing number of communities acknowledge the importance of energy and climate planning, other functional plans—such as sustainability plans, climate action plans, and energy plans—have become increasingly common.

Some communities use functional planning processes as a way to incrementally create or update comprehensive plans. Alternately, other communities create functional plans either to address new topics rising on the public agenda or in response to special federal or state funding requirements. One topic that may be worthy of additional planning consideration is the role that solar energy use plays in vacant land management. The sixth briefing paper in this series, "Recycling Land for Solar Energy Development," highlights some key issues related to planning for solar on vacant properties.

While there are numerous local sustainability, climate action, and energy plans that incorporate goals, policies, and actions related to promoting solar energy, these plans seldom hold the same statutory authority as the comprehensive plan. Therefore, communities should incorporate relevant solar policies and action items from these functional plans into the comprehensive plan. This may involve incorporating functional plans into the comprehensive plan by reference, or it may mean updating specific sections of the comprehensive plan to reflect new community priorities.

As an example, in 2010 Lawrence Township, New Jersey, adopted a Green Buildings and Environmental Sustainability plan as an update to the township's 1995 Master Plan. The new plan element contains an explicit reference to New Jersey's planning enabling law, discusses existing conditions relating to solar energy production, and lays out several specific goals, objectives, and policies for promoting solar design and installations in both private development projects and municipal facilities.

Conclusions

Planners have a variety of opportunities for incorporating goals, objectives, policies, and actions that support solar energy use into local plans. And there are a number of justifications for doing so. While the simplest justification may be to provide residents and potential solar developers with a clear vision of community priorities as they relate to solar energy production, it is also important to lay a legally defensible groundwork for any regulatory changes that communities undertake to encourage solar installations. Furthermore, local plans provide a basis for public officials to address potentially competing goals, such as conflicts between protecting solar resources and preserving historic structures or existing trees.

A simplistic view of local planning inevitably emphasizes the idea of linear planning processes, where communities prepare and adopt a comprehensive plan and then subsequently prepare and adopt subarea plans, capital improvement plans, and development regulations, which then function as implementation measures for the comprehensive plan. However, in practice, planning is iterative, and new community goals and priorities may be as likely to emerge through a functional planning process as through a traditional comprehensive planning process. The truth is that communities create plans at different times and for different reasons (e.g., vocal stakeholders or special funding opportunities). Because not all plans carry the same weight in the eyes of courts, it is important to ensure consistency with the comprehensive plan throughout the entire local planning system.

This briefing paper was written by David Morley, AICP, APA's Planning Advisory Service Coordinator, with assistance from Brian Ross, AICP, of CR Planning and Darcie White, AICP, of Clarion Associates.

Resources and References

Anaheim (California), City of. 2011. General Plan. Available at www.anaheim.net/generalplan/.

Anderson, Larz T. 2000. *Guidelines for Preparing Urban Plans*. Chicago: American Planning Association.

American Planning Association. 2006. "Part 1: Plans and Plan Making." In *Planning and Urban Design Standards*. New York: John Wiley & Sons.

Amherst (Massachusetts), Town of. 2002. *Atkins Corner Workbook*. Available at http://amherstma.gov/index.aspx?NID=741.

Austin (Texas), City of. 2004. *Brentwood/Highland Combined Neighborhood Plan*. Available at http://austintexas.gov/page/neighborhood-planning-areas.

California Governor's Office of Planning and Research, State of. 2003. *State of California General Plan Guidelines*. Available at http://opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf.

Chico (California), City of. 2011. *2030 General Plan*. Available at www.chico.ca.us/document_library/general_plan/GeneralPlan.asp.

Database of State Incentives for Renewable Energy. Available at www.dsireusa.org/.

Fort Collins (Colorado), City of. 2011. *City Plan*. Available at www.fcgov.com/planfortcollins/.

Lawrence (New Jersey), Township of. 2010. *The Green Buildings and Environmental Sustainability Element of the Master Plan*. Available at www.lawrencetwp.com/documents/planning/Lawrence%20Sustainability%20Element.pdf.

Los Angeles (California), County of. 2012. Draft *General Plan 2035*. Available at http://planning.lacounty.gov/generalplan/draft2012.

Nye (Nevada), County of. 2011. *2011 Comprehensive Master Plan*. Available at www.nyecounty.net/index.aspx?NID=677.

Orlando (Florida), City of. 2012. *Growth Management Plan*. Available at www.cityoforlando.net/planning/cityplanning/GMP.htm.

Pinal (Arizona), County of. 2009. *Comprehensive Plan*. Available at http://pinalcountyaz.gov/Departments/PlanningDevelopment/ComprehensivePlanUpdate/Documents/Complete%20CompPlan.pdf.

Tucson (Arizona), City of. 2009. *Solar Integration Plan*. Available at http://cms3.tucsonaz.gov/files/energy/Solar%20Plan%20Final.pdf.

Pima Association of Governments. 2009. *Greater Tucson Solar Development Plan: Strategies for Sustainable Solar Power Development in the Tucson Region*. Available at www.pagnet.org/documents/solar/SolarDevPlan2009-01.pdf.

Shakopee (Minnesota), City of. 2009. *2030 Comprehensive Plan*. Available at http://www.ci.shakopee.mn.us/compplanupdate.cfm.

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Planning for Solar Energy Briefing Papers

This is one in a series of briefing papers providing planners with guidance on promoting solar energy use in their communities to help meet local energy and sustainability goals. APA produced this paper through its participation in the SunShot Solar Outreach Partnership (SolarOPs), a U.S. Department of Energy-funded initiative designed to help accelerate solar energy adoption on the local level by providing timely and actionable information to local governments.

Please visit our website at www.planning.org/research/solar/ to learn more about this series and APA's participation in SolarOps.

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