

CITY OF PHOENIX
ENERGY ACCESS PLAN
2024 EDITION

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EXECUTIVE SUMMARY

The Energy Access Plan for the City of Phoenix represents a fundamental step towards realizing the ambitious vision set forth in the 2015 General Plan—to become the most sustainable desert city on the planet. As the fifth largest city in the U.S. and part of the fastest growing county in the nation, Phoenix stands at the intersection of growth, development, and sustainability. The city is uniquely positioned to lead the way in building a strong, equitable, and resilient community.

Recognizing the link between energy access and poverty, the plan addresses the disparities that persist, particularly in the United States. Low-income households, both urban and rural, spend three times more of their income on energy bills compared to their non-low-income counterparts. This imbalance, compounded by energy insecurity, poses significant challenges to vulnerable communities. In 2015, an estimated 17 million households faced energy disconnects or delivery stop notices, while 25 million had to sacrifice essential areas such as food and medicine to pay energy bills. The term "energy poverty" may not be formally recognized by the United States Government, but its impacts are tangible. The City of Phoenix acknowledges this issue and commits to bridging the energy gap, reflecting a dedication to building a resilient, sustainable, and inclusive community. This commitment aligns with the Global Covenant of Mayors, the United Nations Sustainable Development Goal 7 on energy access, and the City of Phoenix Climate Action Plan.

The Energy Access Plan indicates a commitment to environmental sustainability and emphasizes the importance of social equity, economic development, and resilience. The City of Phoenix aims to create a future where every resident can access reliable, sustainable, and affordable energy. Affordability emerges as a critical aspect of energy access, particularly considering the high and severe energy burdens experienced by many US households. Approximately 67% of low-income households face a high energy burden, with Black, Hispanic, Native American, and senior adult households disproportionately affected. In the Phoenix metropolitan area, 9.8% of households with a severe energy burden and 20.8% with a high energy burden highlight the need to address energy poverty.

The measures outlined in this plan are dedicated to advancing the accessibility of affordable energy. This decision is informed by the recommendation of the Global Covenant of Mayors Common Reporting Framework (2023a), which advises prioritizing the most critical energy attributes based on the Regional and National Covenant. Furthermore, it aligns with the assessment results on access to reliable, sustainable, and affordable energy, demonstrating that the City of Phoenix already has access to reliable and sustainable energy. To ensure enhanced energy access, the City of Phoenix is undertaking the following actions: Expand the City of Phoenix Weatherization Assistance Program; Create a low-income solar program; Integrate energy, housing, and health programs; Community-driven planning; and Education and Workforce Development.

INTRODUCTION

Energy access and energy poverty

Energy access and poverty are intricately linked, with the availability and affordability of energy playing a pivotal role in determining the well-being of individuals and communities. The International Energy Agency (IEA) defines energy access as households having reliable and affordable access to both clean cooking facilities and electricity sufficient to meet a bundle of energy services initially, with an increasing level over time to reach the regional average. This "bundle of energy services" encompasses minimal energy requirements necessary for lighting, communication, and various other essential needs (IEA, 2020).

Common across definitions is the emphasis on household access to a minimum level of electricity, safer and more sustainable cooking and heating fuels, as well as modern energy, enabling productive economic activity and supporting public services such as health facilities and schools (IEA, 2020). These elements are not merely conveniences but are crucial for economic and social development. The quality of energy supply, including technical availability, reliability, safety, and affordability, is collectively called "quality of supply." The United Nations Sustainable Development Goals (SDGs) highlight the significance of ensuring universal access to affordable, reliable, and modern energy services by 2030. Indicators like the proportion of the population with access to electricity and the reliance on clean fuels and technology underscore the commitment to addressing energy poverty on a global scale (UN, 2015).

Energy poverty is a significant challenge, as defined by the absence of sufficient choice in accessing adequate, affordable, reliable, high-quality, safe, and environmentally friendly energy services (Goldemberg, 2000). Measuring energy poverty involves considering three thresholds: technological, economic, and physical (González-Eguino, 2015). This multi-dimensional construct extends beyond economic aspects to include physical conditions of housing, energy expenditures, and coping strategies, impacting social, economic, and environmental determinants of health (Hernández, 2016).

Evident disparities in energy burdens exist, particularly in the United States, where low-income households spend three times as much of their income on energy bills compared to non-low-income households. This disproportionality is even more pronounced among urban and rural low-income households. Energy insecurity, characterized by imbalances between household income and energy expenditures, extends to physical and behavioral realms of hardship. In 2015, the US Energy Information Administration estimated that 17 million households faced energy disconnects or delivery stop notices, while 25 million had to sacrifice food and medicine to pay energy bills (Bednar & Reames, 2020). The term "energy poverty" is not formally recognized by the United States Government, highlighting a discrepancy in understanding and addressing the issue at a policy level. However, the impacts are evident, with vulnerable communities experiencing significant challenges meeting their energy needs. A significant concern arises from the disproportionate burden on lower-income households, which tend to allocate a larger share of their income to electricity costs. This financial strain puts these households at risk of energy hardship, where meeting basic energy needs becomes challenging.

It is crucial to highlight the nexus between sustainable energy and energy poverty, as energy access is framed as access to clean, reliable, and affordable energy services. In this narrative, the interplay between sustainable energy expansion and the fight against energy poverty emerges as a defining

chapter in the quest for progress and equality, reducing health hazards and social burdens, and securing a more equitable and resilient future for all (IPCC, 2011).

Local governments and energy access

In the pursuit of sustainable development, resilience, and the overall well-being of cities and local governments, the recognition of energy access and energy poverty as critical elements cannot be overstated (UN, 2021). The Energy Access and Energy Poverty Pillar (EAPP) emerges as an indispensable component, seamlessly integrated into the journey of local governments toward a more sustainable future. Within this paradigm, cities employ strategies and measures that address multiple pillars simultaneously, intertwining mitigation efforts with those directed at energy access and poverty.

At the forefront of this transformative process, local governments are pivotal in facilitating energy access and reducing energy poverty. Through initiatives such as comprehensive energy data gathering, analysis, and evaluations, cities strive to comprehend the details of energy supply and service provisioning within households and all assets. This proactive approach allows them to identify gaps, laying the groundwork for informed action. Moreover, local governments champion energy access by actively promoting local renewable energy generation, extending support to low-income households, and fostering new employment opportunities. Their influence extends beyond mere encouragement; they are crucial in formulating, facilitating, and implementing goals, strategies, and tactics to collectively address energy access and poverty (Global Covenant of Mayors, 2022).

In policy commitment, local governments pledge to implement measures aligning with sustainable development goals. They commit to contributing to the achievement of SDG7, ensuring access to affordable, reliable, sustainable, and modern energy for all. Additionally, they strive to increase energy access levels and reduce energy poverty within their jurisdictional boundaries, recognizing the imperative to track progress toward these objectives (Global Covenant of Mayors, 2023).

The City of Phoenix intensifies efforts to promote reliable, sustainable, affordable, and clean energy access for all residents in response to this glaring inequity. Recognizing that a lack of energy limits opportunities and negatively impacts health and overall well-being, the city is committed to addressing these issues through its Climate Action Plan (City of Phoenix, 2021). Aligned with the 2021 Global Covenant of Mayors and the United Nations Sustainable Development Goal 7 on energy access, Phoenix strives to create a future where all its residents have equitable access to essential resources, fostering economic and human development. The commitment to bridging the energy gap reflects the city's dedication to building a resilient, sustainable, and inclusive community, setting an example for other urban centers facing similar challenges on their path to a more sustainable future.

Climate Action Plan and Energy Access Plan

The City of Phoenix is actively addressing climate challenges by incorporating a comprehensive Climate Action Plan and, more recently, an Energy Access Plan into its initiatives (City of Phoenix, 2021). This commitment aligns with the Global Covenant of Mayors. It directly contributes to achieving the United Nations Sustainable Development Goal 7, which aims to ensure universal access to affordable, reliable, sustainable, and modern energy (UN, 2015). Within the Global Covenant of Mayors framework, the Common Reporting Framework emphasizes the Energy Access and Poverty Pillar (EAPP). The EAPP is a crucial tool, empowering municipalities to enhance energy access and alleviate energy poverty. These

efforts play a pivotal role in fostering sustainable development, building resilience, and promoting the overall well-being of cities (Global Covenant of Mayors, 2022).

The Common Reporting Framework Version 7.0 highlights that climate action plans and energy access plans can be submitted collectively in a single document or as distinct entities. Adhering to the guidelines outlined in this Common Reporting Framework, as well as the Global Covenant of Mayors Energy Access and Poverty Pillar (EAPP) Annex, and the Guidance for reporting to the Global Covenant of Mayors (GCoM) through CDP-ICLEI Track, the City of Phoenix has chosen to submit its Energy Access Plan as a standalone document. This strategic decision aligns with the prescribed frameworks and ensures comprehensive reporting by established standards (Global Covenant of Mayors, 2022, 2023a, 2023b).

ENERGY ACCESS AND ENERGY POVERTY ASSESSMENT

According to the Global Covenant of Mayors Common Reporting Framework (2023), local governments should do their assessments and target setting based on the regionally selected energy attributes, being only affordable energy for cities in North America. The City of Phoenix has decided to do this assessment based on the three key energy attributes (secure energy, sustainable energy, and affordable energy), instead of only affordable energy as established in the Common Reporting Framework. Table 1 shows the mandatory and non-mandatory Global Indicators for the City of Phoenix.

Table 1

Mandatory and non-mandatory Global Indicators for the City of Phoenix

Attribute	Mandatory		Non-mandatory
Secure Energy	Average yearly energy consumption per capita: 10,694 kWh/year/person (City of Phoenix, 2022a; U.S. Census Bureau, 2020)	Percentage of municipality population with access to electricity: 100% (IEA, IRENA, UNSD, World Bank, WHO, 2023)	The average number of minutes without power (averaged over all utility retail customers): 84.3 SRP, 84.5 APS (SRP, 2023a; PWCC, 2023)
Sustainable Energy	Energy consumption from renewable energy sources: 2,614,248 MWh (City of Phoenix, 2022a; EPA, 2022)	Percentage of households within the municipality with access to clean cooking fuels and technologies: 100% (WHO, 2023)	The number of local energy efficiency programs: 1 (City of Phoenix, n.d.)
Affordable Energy	Percentage of households that spend more than 6% (high energy burden) of income on energy service: 20.8% (Drehobl et al., 2020)	Percentage of households that spend more than 10% (severe energy burden) of income on energy service: 9.8% (Drehobl et al., 2020)	Price of green electricity: \$0.005/kWh on top of the current price plan (estimate) (SRP, n.d.)

Note: Data collected by authors using Common Reporting Framework (Global Covenant of Mayors, 2023a).

Secure Energy

According to the World Bank and other institutions, 100% of the population in the United States has access to electricity (IEA, IRENA, UNSD, World Bank, WHO, 2023), assuming the total population in Phoenix has access to electricity. Also, the City of Phoenix is part of an urban metropolitan area, and research has shown that rural areas have lower access to electricity than urban areas (Ritchie et al., 2019). Electricity in the city is provided by two vertically integrated utilities, Arizona Public Service (APS) and Salt River Project (SRP). These two utilities serve more than 1.64 million residents (U.S. Census Bureau, 2020), with a yearly energy consumption per capita of 10,694 kWh (City of Phoenix, 2022a).

Securing energy implies a reliable grid to prevent interruptions; the United States Department of Energy has stated that reliability refers to the electric system and its component's ability to withstand uncontrolled events, cascading failures, and unexpected system issues (US DOE, 2024). Standard reliability measurements have focused on these power outages' frequency, duration, and extent (Morgan, 2016). Utilities usually record reliability metrics for the system average interruption duration and frequency to determine system performance. SRP's 2022 grid performance results show the System

Average Interruption Frequency Index (SAIDI) which tracks the number of minutes customers are without power for five minutes or more, reflects an average interruption of 83.3 minutes. The largest contributing factor was an unusually high number of significant event days caused by weather, such as rain, lightning, and high winds. Additionally, underground cable line failures minimally contributed to service interruptions (SRP, 2023). APS, owned by Pinnacle West Capital Corporation (PWCC, 2023), reports a 2022 monthly average of 4.23 minutes of outages among its customers. Its end-of-year average was 84.5 minutes. This is nearly identical to SRP's results, reflecting shared extreme weather conditions that both utilities must work with.

Sustainable Energy

The Arizona – New Mexico region uses 15.2% of its electricity from renewable sources, including hydro, biomass, wind, solar, and geothermal (EPA, 2020), representing 2,614,248 MWh from renewable energy sources. To advance the energy transition to clean and renewable sources of energy, both utilities have goals for emission reduction from power generation:

APS set the goal to use 100% clean and carbon-free electricity for its customers by 2050, including the goal of 65% clean energy by 2030, with 45% of the generation portfolio coming from renewable energy. It has acquired 2,115 MW of primarily carbon-free solar and energy storage facilities since 2020 while planning to increase this number significantly through additional solar energy, wind energy, and energy storage (PWCC, 2023). Further promoting its goal, APS offers a renewable energy plan to its customers and promotes several energy efficiency programs, such as energy audits, a marketplace for energy efficiency equipment, install insulation and smart thermostat, among other (APS, n.d.).

SRP has also adopted a sustainability plan, which includes reducing carbon emissions by 65% by 2035 and 90% by 2050. From May 2022 through April 2023, SRP added 400 MW of new solar plants and has contracts for an additional 1,697 MW; implemented over 1,200 energy-saving rebate projects and provided 3,063 limited-income customers with free energy savings kits while growing demand response program participation. SRP offers smart home thermostat monitoring program, energy audit, preferred solar installers program, and rebates for energy efficiency. Additionally, SRP offers free desert-adapted shade trees (SRP, 2023b).

The City of Phoenix has signed a Memorandum of Understanding with both utilities, APS and SRP, aiming to develop joint actions in support of common sustainability goals that include renewable energy, electric vehicles, water conservation, heat mitigation, and air quality, among others (City of Phoenix, 2020; 2022b). The city recognizes that sustainability is vital to public health and the environment and central to fostering equity and accessibility and modernizing its economy to ensure it remains competitive. Its Climate Action Plan outlines the necessary actions to achieve carbon neutrality (City of Phoenix, 2021). One way of promoting this is through its weatherization assistance program, using cost-effective building improvements to increase energy efficiency by preventing heat and air conditioning loss, thus reducing carbon emissions in communities and reducing energy poverty.

Affordable Energy

Affordability stands out as a critical element in ensuring energy access. Households in the US experience high and severe energy burden, with 25% of all US households experience high energy burden, and 13% experiencing severe energy burden. A more focused examination of low-income households reveals that approximately 67% of such households experience high energy burden, while 60% experience a

severe energy burden. Notably, populations disproportionately affected by energy poverty include Black, Hispanic, Native American, and senior adult households. Additionally, those residing in low-income multi-family housing, older structures, and manufactured housing face heightened vulnerability to energy challenges (Drehobl et al., 2020).

Arizona homes consume almost a quarter of the energy consumed for air conditioning, representing more than double the national average (EIA, n.d.). Using data from the American Housing Survey, studies of the Phoenix population demonstrate that 9.8% of households in the Phoenix metropolitan area (165,189) have a severe energy burden, and 20.8% of households in the same area (351,448) have a high energy burden. 26% of Black households (27,872) and 25% of Hispanic households (94,575) in the Phoenix metropolitan area experience a high energy burden (Drehobl et al., 2020).

Phoenix households affected by energy poverty can use the city's weatherization program to reduce energy consumption and save money. Conducted by the city's Neighborhood Services Department, the program provides professional assessment and repair of a home's heating and cooling system for income-qualified residents. Home weatherization can reduce low-income energy burdens by making houses more energy efficient through health and safety repairs and improvements (City of Phoenix, n.d.). In addition, Phoenix households can use resources provided by other organizations, including APS, SRP, Maricopa County, State, and Federal Government.

ENERGY ACCESS AND POVERTY TARGETS

This section is dedicated to outlining the goal, targets, and actions aimed at enhancing the accessibility of affordable energy. As recommended in the Global Covenant of Mayors Common Reporting Framework (2023a), cities should prioritize the most pertinent energy attribute based on the Regional and National Covenant. In the case of the City of Phoenix, the primary focus is on the affordable energy attribute. This decision is informed by the assessment detailed in the previous section, which demonstrated that the City of Phoenix has access to reliable and sustainable energy.

The reliability attribute underscores that 100% of the Phoenix population has access to electricity, with the grid experiencing minimal interruptions, primarily attributed to extreme weather conditions. Furthermore, Phoenix boasts access to sustainable energy, with 15.2% of the total electricity production sourced from renewable energy. The city actively supports advancing its renewable energy capacity, contributing to a more sustainable grid. Additionally, the City of Phoenix collaborates with both utility providers to advance shared sustainability objectives, particularly in renewable energy.

Table 2 presents the targets the City of Phoenix is adopting to improve access to affordable energy within the city boundary.

Table 2

Energy Access and Poverty Targets for the City of Phoenix (proposed)

Attribute	Target	Baseline
Affordable Energy	Reduce to no more than 10% the percentage of households that face high energy burden by 2030.	20.8%, 2020
Affordable Energy	Reduce to no more than 5% the percentage of households that face severe energy burden by 2030.	9.8%, 2020

The energy burden of a household refers to the proportion of income dedicated to covering home energy expenses. High energy burden is defined as exceeding 6%, while severe energy burden is characterized by surpassing 10% (Drehobl et al., 2020). Implementing energy-efficient upgrades and weatherization initiatives for low-income households provides a lasting remedy for reducing high energy burdens. Essential approaches to tackle energy insecurity involve tailoring energy efficiency and weatherization programs to suit the requirements of heavily burdened communities, augmenting overall funding, and enhancing program design to optimize advantages for low-income populations. The following describes the actions (proposed) to reduce high and severe energy burden, helping to meet the targets mentioned above:

Action 1: Expand the City of Phoenix Weatherization Assistance Program. Allocating additional funds to the City of Phoenix Weatherization Assistance Program, promoting energy efficiency retrofits on low-income communities. This program includes air sealing, efficient light sources, high-efficiency

appliances, carbon monoxide detectors, attic insulation and ventilation, home energy efficiency assessments, and repair or replacement of heating and cooling equipment.

Action 2: Create a low-income solar program. The city will promote low-income solar development, creating strategies and incentives for higher renewable production in economically vulnerable communities. Harnessing solar energy can mitigate energy poverty, a problem that disproportionately affects low-income families and communities, by providing a source of clean and affordable energy.

Action 3: Integrate energy, housing, and health programs. The strong connection between high energy burdens, inadequate housing, and health issues cannot be ignored. Collaborative efforts, the consolidation of resources, and the creation of referral networks spanning various sectors can effectively extend program budgets and enhance accessibility, streamlining services for residents.

Action 4: Community-driven planning. Those designing and executing programs can engage in cooperative and impactful community involvement, developing programs tailored to community needs rather than trying to fit the community into pre-existing programs. Additionally, they can integrate best practices in program design, implementation, and assessment.

Action 5: Education and workforce development. The city will disseminate information regarding supplementary programs, grants, incentives, and other initiatives to alleviate the energy burden. It will also formulate strategies to foster the development of a skilled and inclusive energy workforce that empowers individuals and communities.

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