South Coast AQMD

Residential and Commercial Energy White Paper - Draft

2016 Air Quality Management Plan

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RESIDENTIAL AND COMMERCIAL ENERGY WHITE PAPER

I. Introduction

Purpose and Objective

To attain the federal ozone and $PM_{2.5}$ standards, significant NOx reductions are needed within the Basin. California has a long history in implementing energy efficiency, conservation, and distributed generation programs, and these programs are an integral part in achieving AB 32 targets. Reducing, managing, and changing the way energy is used in the commercial and residential sectors provides needed emission reductions, and reduced energy costs. Governor Jerry Brown recently highlighted these benefits in his 2015 inaugural speech by establishing new targets to double energy efficiency within existing buildings, reduce petroleum use by 50%, and increase renewable power generation to 50% by 2030. Additionally, the EPA recognizes the emission reduction potential of efficiency and renewable energy programs and in 2012, released a roadmap to including them within state implementation plans for criteria pollutants[1]. The Residential and Commercial Energy workgroup has been assembled to assist SCAQMD staff in the development of this white paper that evaluates the existing and emerging energy programs in the residential and commercial sectors to determine how NOx reduction co-benefits can be better quantified and captured in the 2016 AQMP. Additionally, this review identifies actions the SCAQMD may pursue as part of the 2016 AQMP to encourage and incentivize renewable energy use and emission reduction efforts in these sectors.

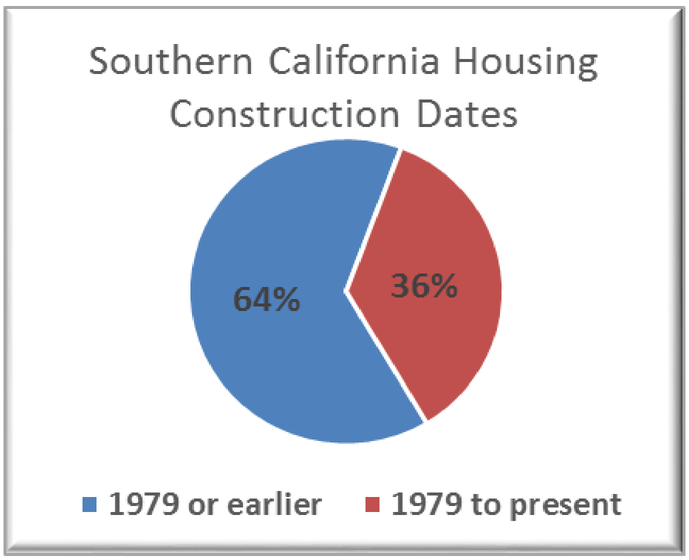
II. Background

Overview of Residential and Commercial Sector in the Basin

The South Coast Basin (Basin) is home to approximately 17 million residents, 44% of the population in California, that reside in close to 6 million housing units and utilize commercial space for shopping, entertainment, and places of employment. Structures making up the residential and commercial spaces within the South Coast Air Basin differ widely in their periods of construction, size, purpose, and locations within different climate zones. These factors, along with income variations, regulations, ordinances, economic sectors, and tenant or owner occupancy result in differences in the amount of energy, water and other resources needed to support these structures. The consumption of energy within the residential and commercial sectors is a direct and indirect source of criteria pollutants and greenhouse gas emissions. These emissions can be reduced through energy savings measures that include efficiency, conservation, and distributed generation. California has policies in place that support agency and utility efforts that provide resources, technologies, and financial support to help minimize energy consumption in residential and commercial structures. Additional policies are being developed to reduce water consumption in the residential and commercial sectors. The energy water nexus within

Southern California has always been high as result of conveyance, treatment, distribution, and wastewater treatment[4]. Reduced water consumption is an immediate need within California which is in the midst of the worst unbroken drought interval in the past millennium[5].

Despite California's stringent building energy standards, the potential for improving energy efficiency within existing buildings is high. For instance, over 64% of the residential structures in Southern California were constructed before the 1979 California Title 24 building energy standards were enacted (Figure 1). Despite the many benefits from undertaking energy savings measures and the availability of multiple financial assistance programs, there remain many barriers to overcome. One of these barriers is increasing efficiencies within rental and leased properties where tenants are often responsible for utility costs (Figure 2). Some of these barriers have been reduced through regulations that require energy savings measures be employed within new construction, building retrofits, appliance energy standards, and incentive programs that help lower the capital cost barriers.



Undertaking energy efficiency and distributed generation projects provide numerous other economic benefits beyond reduced energy costs, such as providing local employment opportunities. Within California, the organization Next 10 estimates that 196,000 people were employed within California's Core Clean Economy in 2012[2]. These measures also provide economic benefits to residential and commercial property owners by increasing property values and improved community appearance through updated structural attributes such as windows.

Figure 1: Housing units constructed in the Orange, Los Angeles, Riverside, and San Bernardino counties before and after California Title 24 building standards were implemented (AmericanFactfinder).

Smart energy measures have beneficial cascading effects when viewed holistically from the supply side to the end users. Efficiency measures in place in California have already reduced the need to build 12,000 MW of generating capacity and have been beneficial during peak electrical load periods[3].

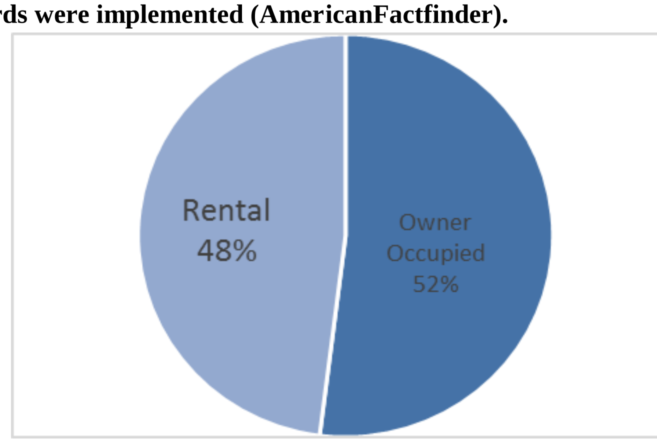


Figure 2: Among the four counties within the Basin almost 50% of the residential units are rental properties (AmericanFactFinder).

III. Residential and Commercial Energy Usage

Residential and commercial energy needs rely primarily on utility-provided natural gas and electricity for energy needs. Within Southern California energy consumption from the residential and commercial sectors resulted in 29% of the energy used within the Basin in 2008 (Figure 3). The milder climate, heavy reliance on transportation in Southern California, and existing California energy policies results in the residential and commercial sectors accounting for less of the overall energy consumed in the Basin as compared to the rest of California and the nation.

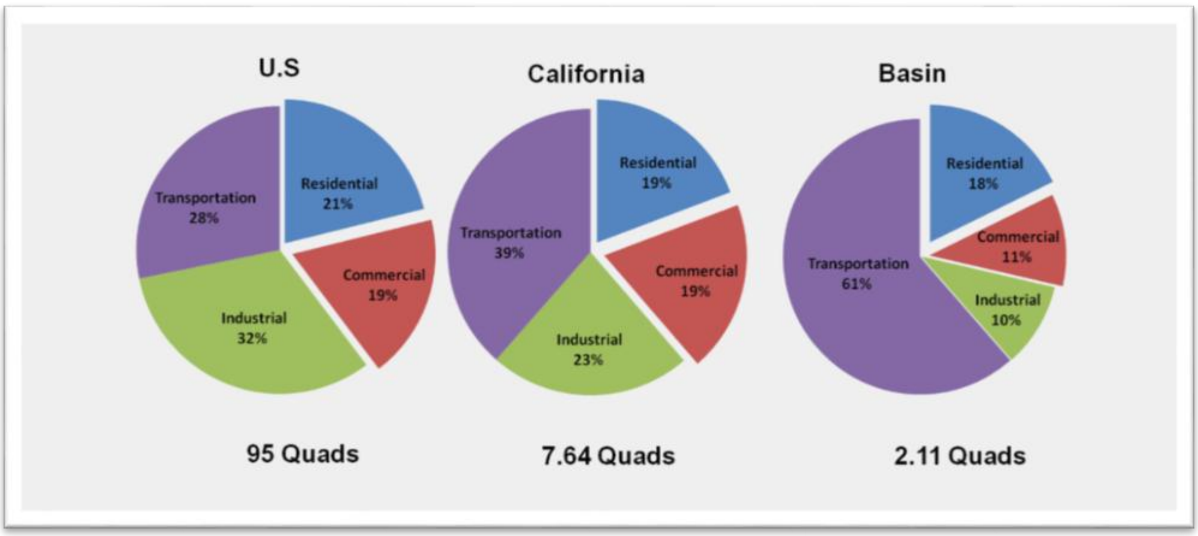


Figure 3: U.S and California data for year 2012; Basin data for year 2008.

Within the Basin the residential and commercial sectors account for over 71% of the electricity consumption and over 64% of the natural gas consumption (Figure 4).

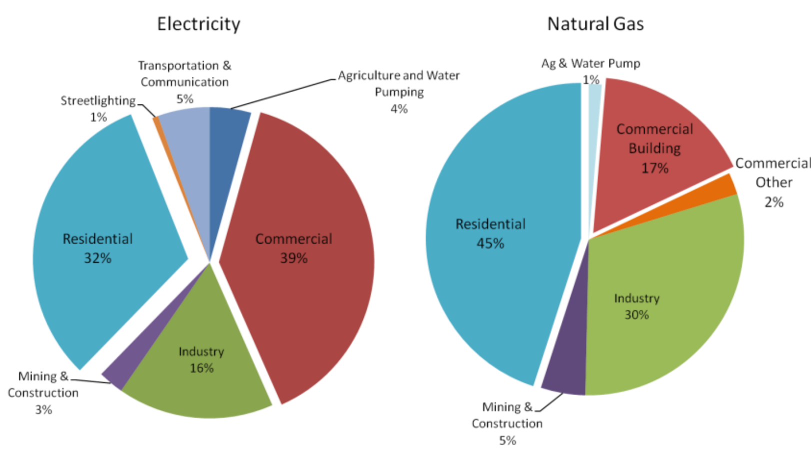


Figure 4: Southern California electricity and natural gas consumption by economic sector in 2013 (Electricity data for Basin utilities; natural gas covers SoCalGas territory; CEC Energy Almanac)

Commercial Sector:

The commercial sector is the largest electricity consumer within the Basin. Office spaces are the largest consumers of electricity in the comercial sector with electric vehicles currently consuming the least amount (Figure 5). In contrast, office spaces are among the lowest natural gas consumers, with resturaunts having the highest usage.

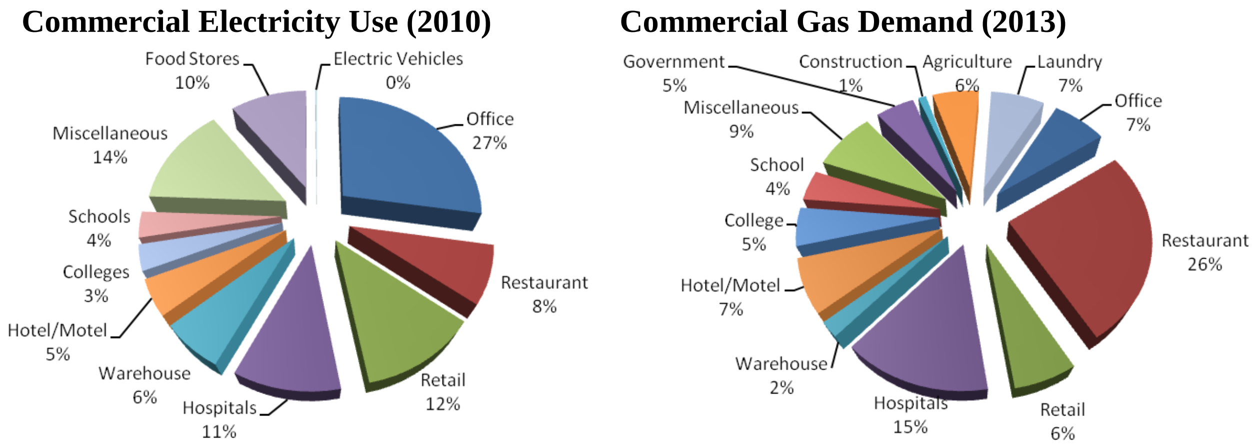


Figure 5: Distribution of electricity and natural gas demand by commercial business type for Southern California utilities in 2010 and 2013 (CEC California Energy Demand Forecast; NG Forecast Report).

As shown in Figure 6, for electricity and natural gas consumption in the commercial sector is predicted to increase by 16% for electricity consumption in 2023 with natural gas consumption increasing by a minor 1.7% by 2025. The relatively small increase in natural gas consumption is a result of efficiency efforts in building and appliance standards in place within California. The largest predicted percent change within the commercial electricity sectors by 2023 is increased usage attributed to higher market penetration of electric vehicles (56 to 206 GWh by 2023)[24]. The large projected increase in electric vehicle energy usage within the commercial sector links the transportation sector with electricity demand, a new development since historically; transportation sector energy needs have not been reliant on the electrical sector. However, the trend will provide needed emission reductions from the transportation sectors.

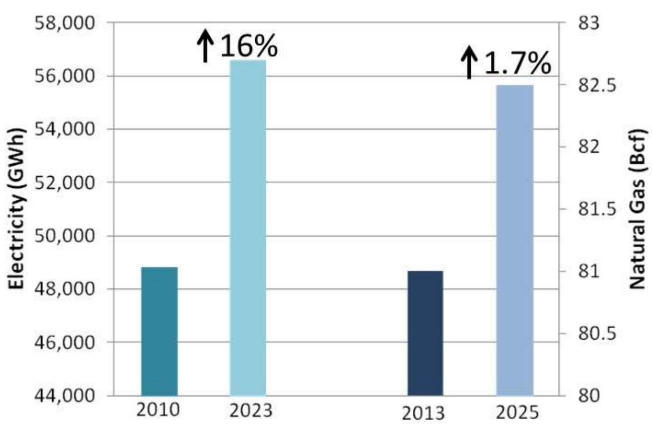


Figure 6: Estimated electricity and natural gas increase within the Southern California commercial sector (California Energy Demand 2014-2023, NG Forecast Report).

Residential Sector:

The residential sector is the largest consumer of natural gas and second largest consumer of electricity within the Basin. In California, the average household electricity consumption is 6,300 kWh, and the average natural gas consumption is 350 therms. The largest uses of natural gas in the residential sector within California are for water heating and space heating. Appliances and lighting account for the most electricity consumption in residential settings.

Residential Electricity Use (2010) **Residential Gas Use (2009)***

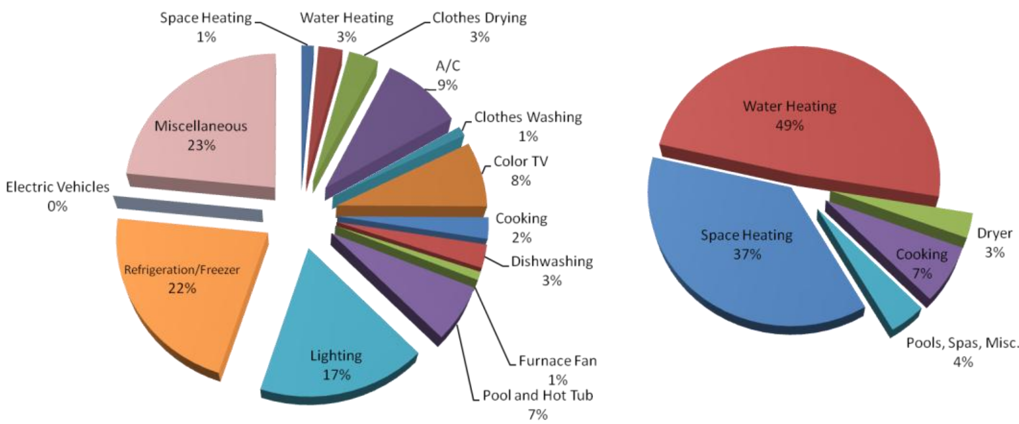


Figure 7: Electricity and natural gas consumption in the residential sector by end use; residential natural gas use is average for California. Residential electricity includes Basin electrical utilities. (CEC California Energy Demand 2014-2024; KEMA Appliance Saturation Survey).

It is estimated the residential demand for natural gas will decline 4.2% between 2013 and 2025 as a result of building and appliance efficiency programs currently in place (Figure 8). The electricity sector is predicted to increase usage by 25% between 2010 and 2023. The largest electricity sector will continue to be within the miscellaneous category. However, similar to the commercial sector the largest categorical percentage increase is predicted to be for residential electric vehicle charging (1.4 to 2,100 GWh by 2023)[24]. Overall, net decreases in electricity consumption by 2023 are estimated to occur within lighting, water heating, refrigeration, and televisions while all other categories are predicted to have electricity consumption increases.

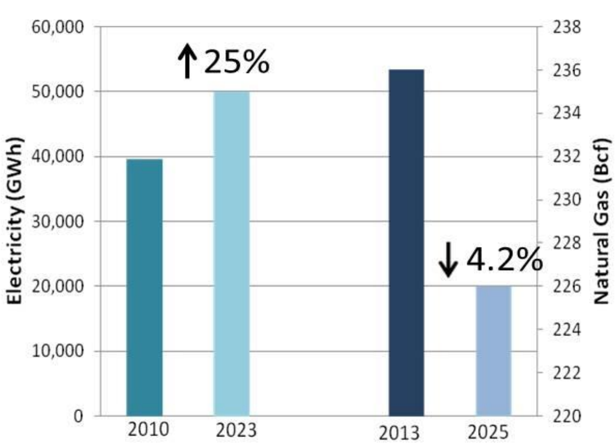


Figure 8: Estimated electricity increase and natural gas decrease within the southern California residential sector (California Energy Demand 2014-2023, NG Forecast Report).

IV. Emissions

Based on 2012 AQMP emissions inventory projections, the residential and commercial sectors directly emitted 29.3 tons per day of NOx and 8.5 tons per day of $PM_{2.5}$ in the Basin in 2014. The 2012 AQMP baseline inventory projections for emissions from the residential and commercial sector in 2023 and 2030 will become 8% of the overall NOx inventory as reductions are achieved in other sectors. The majority of NOx sources within the residential and commercial sectors are from water heating and space heating; the residential sector has higher PM2.5 direct emissions resulting from residential wood burning.

Table 1: 2012 AQMP emissions inventory for residential and commercial sectors.

YEAR	2014	2023	2030	2014	2023	2030
	Residential (tons/day, % of total Inventory)			*Commercial (tons/day, % of Inventory)*		
NOx	19.79 (3.9%)	15.58 (4.7%)	13.45 (4.6%)	9.53 (1.9%)	9.17 (2.8%)	9.60 (3.3%)
VOC	8.61 (1.9%)	8.59 (2.1%)	8.57 (2.1%)	4.47 (1.0%)	4.42 (1.1%)	4.60 (1.1%)
PM2.5	7.15 (10.2%)	7.12 (10.1%)	7.09 (9.7%)	1.37 (2.0%)	1.39 (2%)	1.45 (2%)

Source: *2012 Air Quality Management Plan – Appendix III*

These emission estimates do not include non-combustion emissions resulting from residential or commercial cooking, upstream emissions occurring at power plants, or those resulting from support services such as water transport and treatment, waste hauling, construction, landscaping services, and material deliveries. Additionally, the 2012 AQMP inventory did not include projections for recent efficiency targets established by Governor Brown or the recent net zero energy targets under Title 24. In Section II, the residential and commercial sectors are shown to account for 71% of the electricity consumption. A rough estimate of the NOx emission resulting from upstream power plants providing electricity to the residential and commercial sectors is an additional 1.4 tons of NOx per day. The total NOx emissions from in-Basin power plants is currently nearly 2 tons per day and is not expected to increase dramatically due to other emissions regulations and implementation of new renewable generation technologies.

V. Current Practices and Barriers to Implementation

Current Practices:

When energy savings measures are implemented there are common practices or situations that can lead to these actions. Generally, within the residential and commercial sectors, undertaking energy measures occurs through categorized efforts involving efficiency, conservation, onsite generation, and demand management.

Decisions made to implement one or more of the energy measures within those categories are often not arrived at through strategic assessments that implement the least costly measures to achieve the greatest energy savings. For instance, many homeowners have neighbors that installed solar, and there are door to door outreach efforts by solar companies promoting the benefits of adding generation. Many homeowners decide to add solar generation before considering less costly but more beneficial efficiency efforts such as adding insulation. Undertaking strategic efficiency efforts prior to adding generation capacity can provide a more cost effective approach to energy savings. In reality, energy saving measure decisions are not often made through a thoughtful cost benefit analysis and may be influenced by the following:

- Immediate Needs: Energy savings decisions are often made on the immediate need for equipment or appliances.
- Perceptions: Common perceptions benefit certain individual activities, technologies, or measures that often result in them being popular choices.
- Outreach Efforts: Businesses selling products through retail chains, mailings, and door to door efforts influence behavior on implementing measures. Available incentive programs are often a highlight of business sales pitches.
- Competitive Efforts: Businesses may undertake energy savings measures to reduce energy costs, reduce exposure to energy volatility, highlight sustainability efforts, and increase property value.

Barriers to Implementing Energy Savings Measures and Renewable Generation:
The benefits that energy and water savings measures provide in addition to available incentives should result in rapid and widespread implementation. However, there are a multitude of barriers as to why owners of residential and commercial buildings do not implement water and energy savings measures. These barriers, in part, include[6,7,8]:

- Lack of Awareness: Residents and Businesses are often occupied with other issues than reviewing energy consumption or the benefits energy saving measures may provide.
- Lack of Information: Those that would like to reduce energy consumption often lack information on how to best initiate the effort. Is it better to undertake efficiency projects relative to adding generation? What measures are available and appropriate to implement first? What incentives and programs are available and are they aligned with my efficiency needs? How are benefits quantified? Who do I trust to provide correct information and reasonable costs?
- Difficulty in Measuring Success: Once energy savings measures are implemented it is often difficult to evaluate, measure, and verify the savings.
- Utility Rate Designs: Complex and changing rate designs make quantification of reduced energy usage benefits difficult.
- Lack of Responsibility: Building owners that lease or rent residential and commercial spaces often do not feel obligated to reduce energy usage for tenants since they typically do not pay the utility bills.
- Lack of Capital: The initial capital cost of undertaking energy saving measures is either not available or is competing for limited funds with other priorities.

VI. Existing Programs, Regulations, and Financing Mechanisms

The Warren-Alquist Act of 1974 established the California Energy Commission (CEC) and has moved energy consumption within the residential and commercial energy sectors from a business as usual path to an innovative approach, establishing a positive reinforcement cycle of increasingly lower energy standards that leads to new technologies, manufacturing processes, building materials and techniques[9]. California has led the nation and the world in aggressively developing and implementing regulations, incentives, and market innovations. What is termed the "California Effect" or "Rosenfeld Curve", is the level of per capita energy consumption in California since the early 1980's, whereas, the rest of the nation has seen increases in per capita consumption in energy as the use of electronic devices has increased significantly at residences and workplaces (Figure 9).

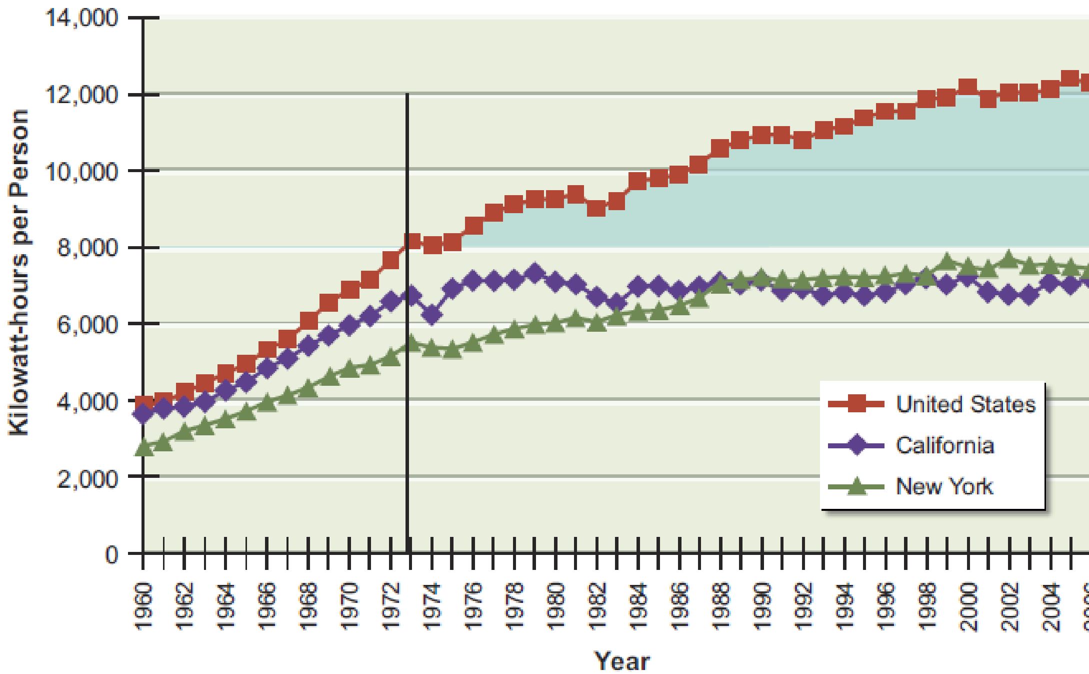
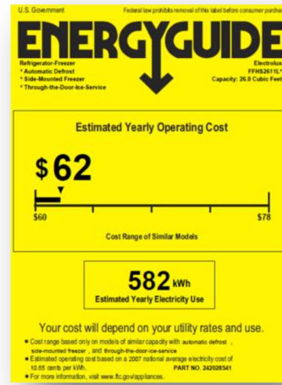


Figure 9: Per capita electricity consumption levels have remained relatively flat in California and New York, partially as a result of California energy policies in place[21].

Regulations and Policies:

In 1982 the California Public Utilities Commission removed a potential economic incentive for utilities to oppose efficiency efforts by decoupling electricity sales from revenues. This decoupling led the pathway for efficiency, distributed generation, combined heat and power applications, and demand side management to be considered the preferred resources in managing energy needs within California. Implementing preferred resources is an important component of the CEC's long term energy procurement planning and has resulted in the establishment of many different types of incentives to promote these resources.

The earliest and most recognizable residential and commercial energy programs within California are the Title 20 appliance efficiency standards adopted in 1976 followed by the building efficiency standards in Title 24 adopted in 1978. The implementation of the Title 20 efficiency standards has saved consumers over $75 billion in electricity and natural gas costs. These two programs are still in effect within California and currently work in conjunction with federally established appliance and building efficiency programs, such as the EPA Energy STAR building and DOE appliance standards (EnergyGuide label). Generally the most stringent energy building codes and appliance standards are first adopted in California. As the CEC further couples renewable power, efficiency, energy management, and new technologies into future Title 24 codes, the path has been set to achieve net zero energy use in new residential construction by 2020 and net zero energy use in commercial construction by 2030.



Incentive/Rebate Programs:
In 2014, over $1.4 billion in ratepayer funded programs were administered by the CPUC through utilities towards efforts that help develop preferred resources. These programs provide incentives and rebates for measures that include insulation, energy audits, shade trees, solar panels, low flow showerheads, turf replacement, adding demand response capabilities, and load shifting technologies. Additional incentives to promote energy savings measures include offering tax incentives. The Database of State Incentives for Renewables & Efficiency (DSIRE) developed and maintained by the North Carolina Clean Energy Technology Center provides a comprehensive list of available incentives by zip code (www.dsireusa.org).

Financing and Funding Mechanisms:
As identified earlier, the lack of funds for initial capital costs is often a reason many owners of residences and commercial buildings do not undertake energy saving measures, even though a project can later have partial cost recovery through available tax incentives and/or rebate programs. Currently there are multiple financing mechanisms and purchase agreements available for different types of projects. Some of these current mechanisms include:

- On Bill Financing: Energy measures are financed through utilities and loans are added to utility bills[10].
- California Clean Energy Jobs Act (Prop. 39): Provides roughly $550 million yearly to improve energy efficiency and expand clean energy generation in California Schools.
- Property Assessment Clean Energy (PACE) financing: Provides loans that get repaid through property tax assessments to fund approved energy savings measures or new generation.
- Power Purchase Agreement (PPA): Under PPAs, the solar installation company provides and installs the equipment that generates electricity for which the user purchases. Due to the declining costs of solar panel equipment and the incentives available to third parties that own the equipment, the electricity costs through the PPA are generally less than the higher tiered rates charged to residential users.
- Power Efficiency Agreements (PEA): This is a relatively new financing technique that allows a third party to install an energy saving project that is financed through expected future energy cost savings.

VII. Achieving Greater Implementation

Existing buildings in the residential and commercial sector generally do not meet the current Title 24 building codes and thus have significant opportunities for energy savings. This in part is being addressed under AB 758 which requires the CEC to develop a plan to achieve cost-effective energy savings within existing residential and nonresidential buildings[11]. Reducing energy consumption within existing buildings is particularly difficult with rental and leased properties[12]. It is usually not apparent that it is the property owner's best interest to undertake energy savings measures when the tenants pay utility energy costs. Under AB1103, tenants leasing commercial buildings will have a better understanding of the previous energy costs since they must be disclosed; nonresidential buildings must disclose their past energy use to a prospective buyer, a prospective lessee, or a lender financing the building. There currently is not a program in place requiring past energy disclosures from residential structures.

Energy usage within the residential sector shows a correlation with household income. Many of the rebates and financing programs require property ownership and upfront capital[13]. Income qualified programs are available such as the federally funded Weatherization Assistance Program (WAP) and ratepayer funded Energy Savings Assistance Program (ESAP). Both programs provide energy assistance measures at no or very low cost to lower income households. One of the drawbacks of these two programs has been the requirement to own the residence or have property owners consent for the programs to be implemented[14].

Incorporating non-energy benefits into energy savings programs may provide more of a motivating factor to utilize existing programs. A recent UCLA study showed a study group of Los Angeles residents were least motivated to undertake energy saving measures when they were linked to reduced energy costs. However they identified a more significant motivator was to link energy saving efforts with reduced emissions. Coupling energy savings with the amounts of air emissions reduced may provide additional motivation to implement energy savings measures. Air emission benefits could also be included on appliance energy efficiency labels.

Turning energy savings into a game or contest that uses existing incentives and resources provides a novel way of achieving reduced energy usage[15]. Within the California Cool Communities Challenge, city governments and residents compete against each other in reducing energy usage. At the end of the competition the city with the highest points not only receives bragging rights for winning the competition, but also a portion of $100,000 in prize money. Currently the Cool Communities Challenge tracks energy savings and estimates the GHG reductions from the energy savings activities; benefits may further be extended to include criteria pollutant emission reductions along with water conservation[16]. Energy savings contests could be further extended to California schools with support from Prop 39 funding.

Net Zero Energy Home of the Near Future

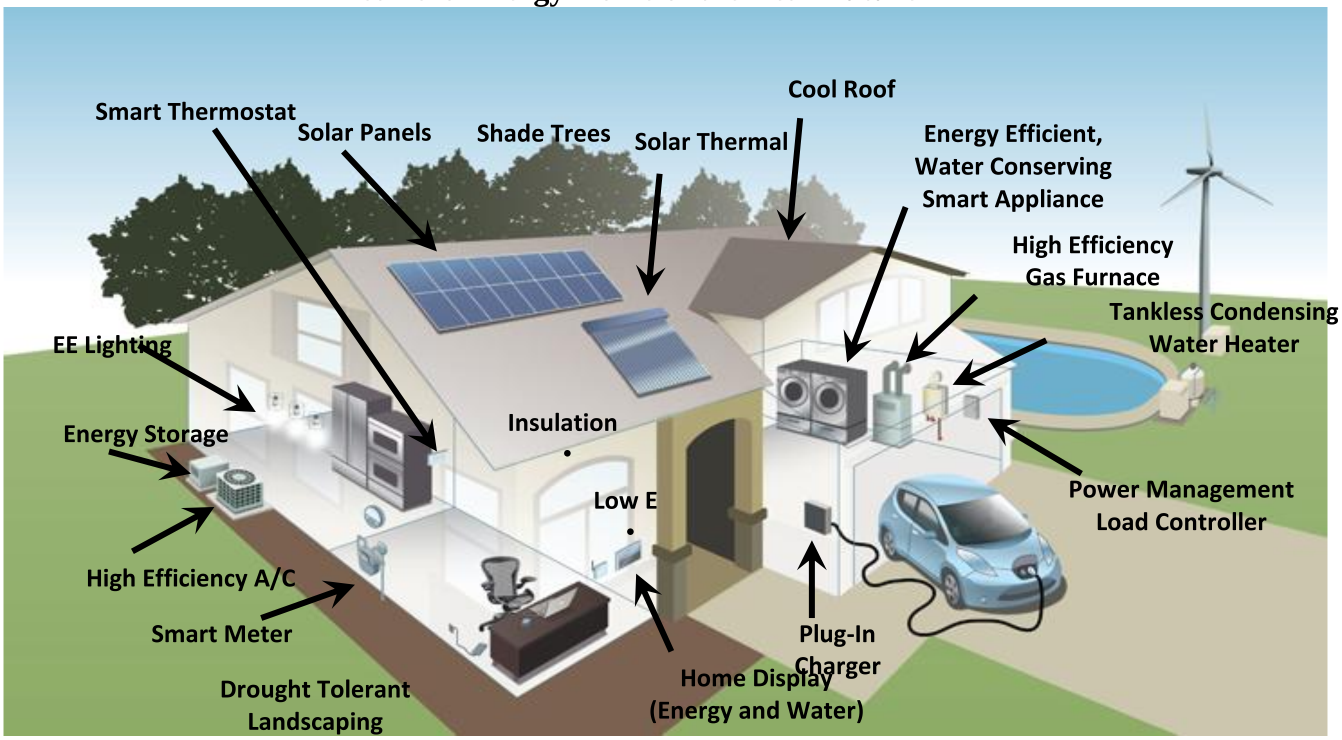


Figure 11: Building materials, generation, power management, and low water use will help move residential construction to net zero energy use towards the 2020 goal (adapted from SDG&E).

VIII. Technology Assessment

New technologies are helping California move forward in establishing net zero energy usage in new construction, implementing higher renewable portfolio standards, providing climate resilience, and reducing air emissions.

Distributed Generation

California is currently leading the nation in installed renewable generation capacity with over 4,000 MW of installed solar (CPUC), over 6,000 MW of installed wind capacity, and 1,200 MW of biomass generating capacity accounting for 15% of the total generation capacity within the state as of 2013[17]. Policies and incentives helped initiate renewable generation systems, however, more recently rapidly declining costs, increased electrical utility rates, and financing mechanisms have greatly increased installations.

Rooftop photovoltaic (PV) systems are currently the most popular generation technology being installed at residential and commercial buildings. Generating efficiencies for solar panels over the years have been increasing from around 10% solar energy conversion to over 40% with new panel technologies[18]. New solar panel designs are also being coupled with solar thermal systems to reduce rooftop space needed for both systems. Fuel cell energy systems are being implemented within residential and commercial settings that can provide power as well as waste heat for use in building hot water and/or space heating needs[19].

Energy Flexibility

Rooftop photovoltaic systems may no longer be considered an emerging technology due to the large amount of installations occurring. The current primary motivation behind the decision to install these systems is to help avoid the highest tiers on the electricity rate structures. The installation of PV systems within commercial buildings does not generally provide large utility savings for larger commercial buildings due to power demand charges that are in effect into the evening hours. Power demand charges on commercial users are typically based on the highest 15 minutes of power usage (kW) over a billing period. Utilities usually apply the highest demand charge rates during the summer months when electricity consumption is the highest. PV system generation is also intermittent and thus can be destabilizing to the electrical grid. Currently, these systems need to be coupled with other flexible generation capacity such as fossil peaking units which has created some excess generation capacity.

To address generation intermittency, demand charges, and help provide capabilities to participate in demand response events; new technologies and rate structures are being implemented. Among these technologies is energy storage at residential and commercial buildings which provides a flexible resource that can be coupled with generation, load management needs, and utility rates. Uses for battery storage systems can reduce the intermittency associated with onsite renewable generation, reduce demand charges through peak shaving, provide energy arbitrage capabilities, and provide utility grid services support.

There are different types of storage technologies including batteries (chemical), thermal, and pumped water (hydro) (Figure 11). Some of the stationary battery systems utilize electric vehicle batteries as a second life application. Battery systems coupled with solar PV help reduce utility power demand charges by filling in generation intermittency and help reduce utility demand charges (peak shaving). In large commercial applications, thermal storage is widely used to chill water or create ice during off peak electricity rates that is later used to cool buildings during peak demand charge periods. Smaller applications are being developed for the residential sector that has ice storage capabilities next to air conditioning compressors. New storage technologies are being developed that utilize compressed air and flywheels.

In the residential and commercial sectors, new load management technologies will enable residents to optimize their energy consumption and cost relative to utility rate structures that include real time pricing, time of use rates, and demand management needs. These technologies include using Home and Area Network (HAN) devices that utilize the Internet of Things, connecting smart appliances, thermostats, irrigation controllers with user habits, the weather, and utility prices[8].

Building Materials and Lighting

New building materials and methods provide the greatest potential reduction in energy consumption within residential and commercial buildings, along with providing some of the fastest paybacks through cost savings. As shown in Figure 7, space heating and cooling are the largest sources of energy consumption. Adding insulation and ensuring ducting is properly sealed does not require emerging technologies and is often the least expensive measure to reduce energy consumption within a building. Coupling insulation with energy efficient windows, envelope sealing and using building materials with high thermal mass helps reduce the need for larger heating and cooling systems. Additionally, as Southern California's warmer climate causes air conditioning to be a large energy load, incorporating cool roofs, fenestration systems, and trees that shade buildings helps reduce the cooling demand of the buildings occupied spaces.

Cool roofs reduce the heat loads going into buildings through increasing the reflectance of the rooftop and/or incorporate roofing materials that have high thermal emittance. This not only helps reduce air conditioning needs of interior spaces, but also can reduce outside temperatures and lower the urban heat island effect. Lowering outside temperatures and using less energy to cool interior spaces reduce criteria and greenhouse gas pollutants[20].

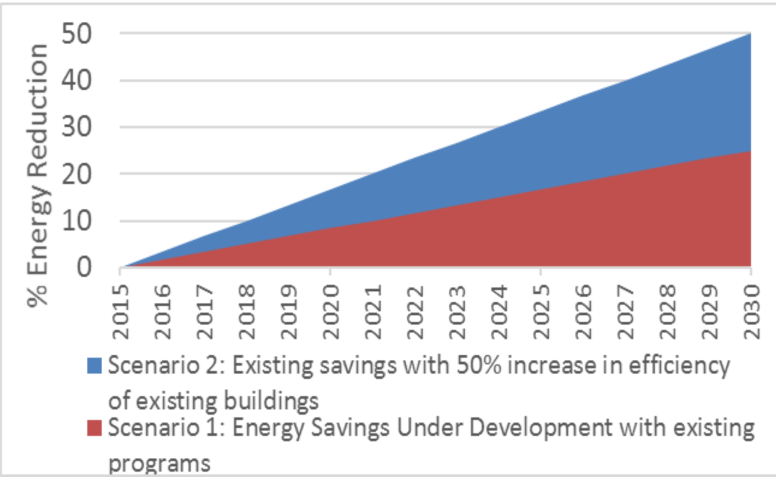
One of the largest advances in efficiency technology has been lighting. Lighting traditionally has been with incandescent filament bulbs with a total system efficiency of less than 2% considering the chemical energy being converted to electricity at a power plant then being delivered to light an incandescent bulb[22]. Advances in high efficiency lighting technologies include fluorescent and light emitting diodes along with advances in luminaires that provide lighting in the right places and lighting controls[21,22]. A lower tech development in daytime interior lighting has been solar light tubes, skylights, and daylight redirecting films on windows that provide natural daytime lighting within interior spaces through insulated spaces[23].

Cross sector coupling

With new technologies and efficiency being rapidly adopted in the residential and commercial sectors, the traditional utility business models of adding capacity to meet demand is rapidly changing. With buildings being capable of adding generation and providing energy flexibility, it reduces the need for new generation capacity and allows for more efficiently utilizing existing energy infrastructures. This coupling and improved management of energy supply and demand will need to include new transportation technologies that use electric, natural gas, and fuel cell vehicle technologies. The interconnection of energy use between residential, commercial and transportation sectors is increasing rapidly as a result of the alternatively powered transportation technologies that are being rapidly developed and deployed.

IX. Scenario Analysis

Two scenarios are presented here that account for updates to energy savings targets since the 2012 AQMP inventory was developed. The emissions from the 2012 AQMP presented in Table 1, on page 6, do not currently account for increased efficiency targets set in place under Title 24, within the Integrated Energy Planning Report (IEPR), and recent efficiency improvements in appliances. Using estimated energy demand reductions estimated by the State from these efforts, an expected 25% decline in energy consumption within the residential and commercial sectors will occur as a result of current targets in place (Scenario 1); a 50% decline is expected, with current targets and the Governors new proposal (Scenario 2) (http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf). A linear implementation of these scenarios is assumed along with a linear and proportional reduction in criteria pollutants as a result of reduced energy usage.



Using the existing efficiency and energy programs set in place, the NOx levels within the residential and commercial sectors might be expected to decline by 3 to 5 tpd of NOx in 2023 and 2030 respectively, Table 2. With the new targets set by the Governor a decline of 7 to 11 tpd of NOx might result by 2023 and 2030.

YEAR	2014	2023	2030	2014	2023	2030
	Residential (tons/day)			*Commercial (tons/day)*		
2012 AQMP	19.79	15.58	13.45	9.53	9.17	9.60
Scenario 1 (25% by 2030)	-	13.6	10.1	-	8.0	7.2
Scenario 2 (50% by 2030)	-	11.4	6.7	-	6.7	4.8

Table 2. NOx reductions that may result from state energy targets

X. Findings and Recommendations for the 2016 AQMP

Southern California is facing challenges in providing capacity and infrastructure for water, energy, and transportation. Traditional development patterns and policies may not be appropriate for the future. Fortunately, many policies, programs, and technologies have been and continue to be implemented in California and within the Basin to alleviate resource challenges and accommodate an increasing population. Additionally to increase resilience against persistent drought conditions, a changing climate, and to address looming air quality attainment deadlines, more needs to be done sooner.

As part of the 2016 AQMP development, staff is recommending the inclusion of the following actions:

- *General*
  - Develop a control measure in the 2016 AQMP to recognize emission reduction potentials from energy saving programs that are implemented locally, statewide, and nationally;
  - In consultation with state energy agencies and utilities, develop a tracking mechanism for timely quantification of SIP creditable emission reductions from energy efficiency and distributed generation programs within the residential and commercial sectors;
  - Work with appropriate agencies to augment the current appliance labeling programs to include air quality benefits of using higher efficiency models (e.g., Over one year energy savings from this appliance can power xx EVs or xx zero emission miles, or an equivalent emission reduction rating system);
  - Monitor implementation of AB1103 and effectiveness of energy disclosures for prospective tenants leasing commercial buildings. Review the need and support for legislation requiring energy use disclosures for residential rental properties;
  - Identify ways to help incentivize and implement energy saving measures with building owners that lease or rent commercial and/or residential spaces;
  - Provide technical assistance along with other agencies to compile methodologies and best practice guidelines to retrofit existing buildings towards net zero energy consumption;
  - Sponsor energy saving competitions or campaigns at schools and promote student youth participation in energy saving practices (e.g., financial awards to winning schools);
  - Include energy efficiency in the Districts outreach and education materials to enhance the awareness of energy saving opportunities; and
  - Help expand PACE programs into existing commercial buildings and multi-unit dwellings. Further review additional ways to incentivize additional energy saving measures, including but not limited to, tax credits or low-interest loan programs;

- *Electricity*:
  - Work with electrical utilities and state agencies to make rate structures transparent and easier to understand so consumers can make informed energy choices, including alternatively fueled vehicle choices; and
  - Work with stakeholders to develop incentive programs for solar installations and other renewable distributed generation systems that are zero or near-zero emitting for existing buildings.

- *Natural Gas*: While SCAQMD has adopted the most stringent NOx emission regulations for new residential and commercial natural gas-fired water heaters and space heaters in the nation, residential natural gas combustion related NOx emissions remain a significant source of emissions, ranked second highest among stationary NOx emission sources. Energy efficiency is an effective means to augment SCAQMD existing regulations to bring about further NOx reductions.
  - Where SCAQMD funding is available, provide financial incentives to promote energy efficient equipment/appliances beyond regulatory requirements or to accelerate equipment/appliance replacements that are targeted towards maximizing criteria and greenhouse gas emission reductions. These incentive programs can be in conjunction with or an augmentation to the existing utility programs; and
  - Consider and promote equipment energy efficiency in future SCAQMD regulatory or incentive programs.

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