CITY OF LOS ANGELES
CALIFORNIA

May 2, 2018

Honorable Members of City Council
c/o Office of the City Clerk
City Hall, Room 395
Los Angeles, California 90012

Dear Honorable Members:

EFFECTIVE RECOMMENDATIONS IN REDUCING DEMAND IN BUILDINGS FOR NATURAL GAS (CF-18-0002-S7)

SUMMARY

On February 8, 2018, City Council members adopted a motion to instruct the Los Angeles Department of Building and Safety (LADBS), in consultation with the Los Angeles Department of Water and Power (LADWP), to report back on recommendations that would be effective in reducing demand in buildings for natural gas. The report considers potential strategies for replacement of gas in thermal heating loads, water heating and cooking in new construction, converting existing gas uses to electricity and explores policies that align with the City's existing Greenhouse Gas (GHG) reduction targets, as described in Mayor Garcetti's Sustainable City pLAn.

RECOMMENDATION

LADBS, in consultation with LADWP, recommends continuation and expansion of incentives, such as rebate programs, to encourage the installation of highly efficient equipment, as a means to reduce buildings' natural gas demand and overall greenhouse gas emissions in alignment with Mayor Garcetti's Sustainable City pLAn.

BACKGROUND

Historically, the electricity used to power electrical systems have come from coal, gas, or oil power plants, which generally convert 30% of their fuel energy into electricity[1]. LADWP's energy portfolio for the 2016 calendar year (displayed below), shows that more than half of its energy sources comes from fossil fuels. Given the intrinsic inefficiencies of power distribution and the City's power resources, the GHG emissions tend to be higher for electric heating when compared to their gas-heating counterpart.

Power Resources (Calendar Year 2016) – (As reported to CEC)[2]	
Natural Gas	34%
Renewable Energy*	29%
Coal	19%
Nuclear	9%
Large Hydroelectric	3%
Other/Unspecified Sources of Power	6%
*Renewable energy sources include biomass & waste (2%), geothermal (5%), small hydroelectric (2%), solar (5%), and wind (15%)	

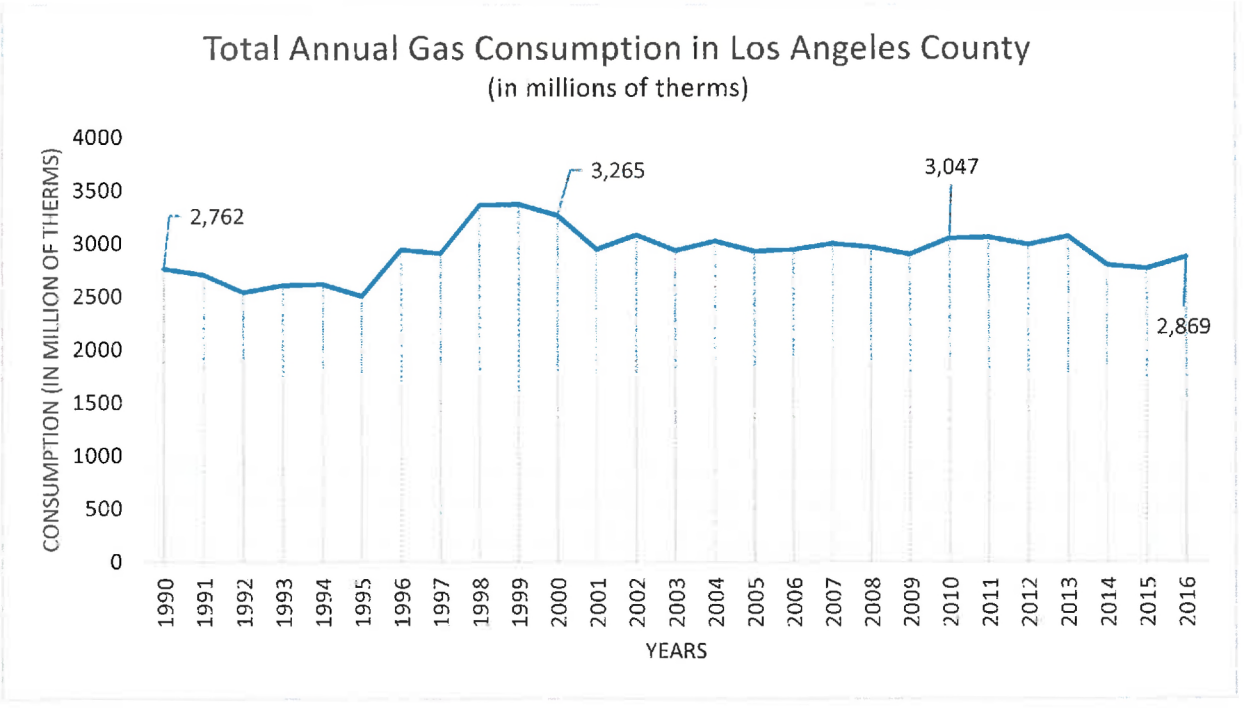
Current building standards do not prohibit the installation of space heating equipment that utilize electric-resistance nor do they prohibit the installation of electrical water heating equipment as long as both heating and water heating systems meet minimum efficiency standards and are able to demonstrate compliance with the California Energy Code (CEC). Additionally, the Los Angeles Building Standards Code does not mandate the type of cooking equipment utilized within a building. Prior to making any modification or establishing more restrictive building standards, LADBS must make express findings and filings, as required by the California Health and Safety Section 17958.7, showing that such modification are reasonably necessary due to local climactic, geological or topographical conditions. Considering the specific conditions listed, LADBS does not recommend building regulations as a potential strategy.

Space heating presents the largest potential for electrification as it accounts for the most GHG emissions reduction. Builders have a wide array of heating systems available that do not utilize natural gas, such as electric furnaces, electric wall heaters, and radiant heating. Existing nonresidential buildings that currently use natural gas for their heating loads are capable of easily converting to electric heat provided there exists sufficient power supply. For example, buildings utilizing a forced air system or similar modem HVAC unit may be able to utilize the existing ductwork in conjunction with a new electric furnace. Older buildings that do not use ducts for distribution have the option to install electric baseboard heaters or electric wall heaters. However, electric resistance heating may be allowed only under certain exceptions (CEC §140.4(g), 141.0(b)2C, 150.1(c)6), usually under limited uses, often as supplementary heating, and typically after demonstrating energy compliance through energy modeling. In order to reduce electric usage and cost, buildings can opt for a system that pairs electric resistance heating with heat pumps with controls that prevent the use of electric resistance supplementary heating when the heating load can be satisfied with the heat pump alone. Although the operating costs for electric heating systems tend to be higher than natural gas systems, the upfront cost is lower, the lifespan is higher and routine maintenance is less expensive.

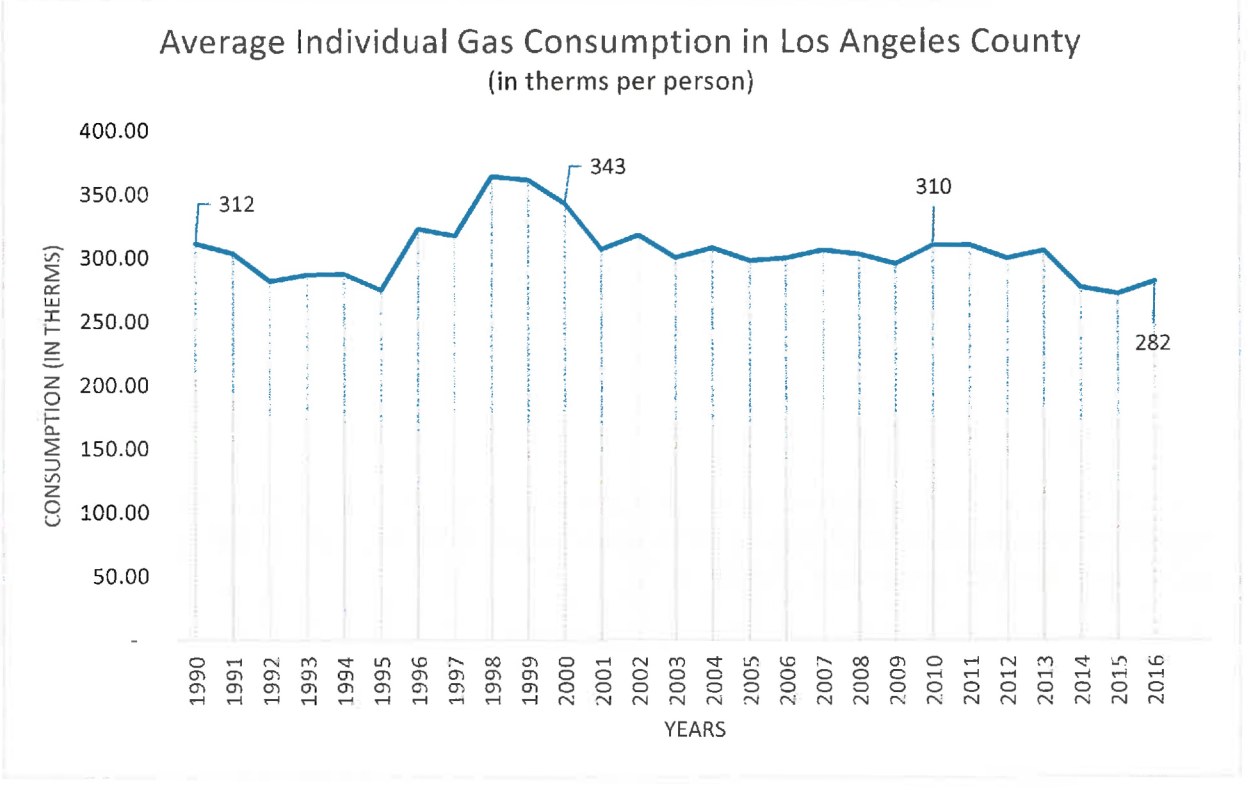
Converting gas water heating appliances to electric is generally achieved without much difficulty. A building's water heating system can typically accommodate a change in the type of water heating system without substantial alterations to the plumbing system. Moreover, some electric water heaters do not require a tank, which allows for more freedom when determining a suitable place for installation. A report from the National Renewable Energy Laboratory (NREL) published in 2017, identifies water heating as the second-largest use of fossil fuels in the residential and non-residential sector, and consequently the second largest potential for electrification and GHG emissions reduction. Residential Heat Pump Water Heaters (HPWH) typically have Uniform Energy Factors of 2.0-2.5, which are substantially higher than their gas equivalent, which typically achieve UEF of 0.64, but despite these higher efficiencies, they make up a very small share of installed residential water heaters. Among the sources examines, current installed costs of a residential HPWH ranged from $1,400/unit to $2,630/unit, depending on the tank volume and efficiency. Similarly, commercial HPWH are not very common in most commercial uses, mainly due to their high cost, but are used in some commercial laundries, hotels, and restaurants since those business uses can take advantage of the HPWHs hot water and cool air output (offsetting their higher capital costs relative to a single-function natural gas unit).[3]

Electrification of buildings is certainly feasible, but certain aspects of electrification may come with an associate cost to building owners in the form of higher electricity costs. A recent study, funded by the California Building Industry Association, examined the costs customers might incur from switching from a mixed-fuel home to an all-electric one. The study found that an existing single-family home (1-story, 2,100sqft home and 2-story 2,700sqft home used as baselines), would see an 11-19% increase in their utility bill depending on home location and a 35-39% reduction in GHG emissions. The study also touched upon potential costs for upgrades for older homes such as the need to upgrade the electrical panel capacity from 100amp to 200amp, branch circuit and utility service connection (approximately $4,600).

Fortunately, an owner can choose to decrease their reliance on gas by opting to upgrade to equipment that is more efficient and by inspecting and sealing the existing distributions systems. Generally, equipment upgrades do not alter the existing distribution system and therefore do not come with a high price tag. Additionally, both LADWP and SoCalGas offer incentive programs for upgrades and high efficiency equipment in the form of rebates. Currently, both residential and commercial utility customers have access to rebate programs ranging from water heater rebates to whole house upgrade programs to solar rooftop system incentives. Owners taking advantage of such rebates can further mitigate the cost of upgrades while enjoying the benefits of lower utility bills. Encouraging owners to commit to these upgrades is in line with the California Energy Commission's mission to reduce the rate of growth of energy consumption. Indeed, data archived by the California Energy Commission, and displayed in the following graph, illustrates that natural gas consumption in Los Angeles County has remained steady within the last decade and when compared to consumption levels dating as far back as 1990 has seen an overall increase of less than 4% despite a 16% increase in population[5].



Taking into account the population growth and displaying the data as therms (unit equivalent of 100,000 Btu) per person in the graph below, it becomes evident that efforts in promoting higher efficiency space heating and water heating equipment systems in buildings is yielding reductions in natural gas consumption.



As investment in research in development brings forth more energy efficient equipment and continues to increase efficiencies of renewal energy sources, reliance in fossil fuels will keep diminishing. As renewal energy contributes more to the City's energy portfolio, building electrification will undoubtedly be a viable option in decreasing greenhouse gas emission. In the interim, LADBS recommends that the City continue to incentivize installation of high efficiency equipment and distribution systems in buildings in an effort to reduce overall greenhouse gas emission in alignment with Mayor Garcetti's Sustainable City pLAn.

CONCLUSION

Presently, the GHG emissions resulting from natural-gas burning equipment are lower than equipment using electricity derived from the City's current energy portfolio. However, as the City makes progress in increasing its energy supply from renewable sources, the GHG emissions resulting from utilizing electric heating, cooking, and water heating will continue their downward trend. In the interim, LADBS recommends incentives, such as rebate programs, for more energy-efficient equipment and distribution systems in building as a means to drive a reduction in buildings' demand for natural gas.

Should you have any questions, please contact Catherine Nuezca Gaba at (213) 482-0435 or via email at Catherine.NuezcaGaba@lacity.org

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Executive Officer

REFERENCES

[1] United States, Congress, "Department of Energy." *Department of Energy*. www.energy.gov/energysaver/home-heating-systems/electric-resistance-heating.

[2] "Briefing Book 2017-2018." *LADWP Facts and Figures*, Aug. 2017, www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB629209&RevisionSelectionMethod=LatestReleased.

[3] Jadun, Paige, Colin McMillan, Daniel Steinberg, Matteo Muratori, Laura Vimmerstedt, and Trieu Mai. 2017. *Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-70485. https://www.nrel.gov/docs/fy18osti/70485.pdf.

[4] "Cost of Residential Electrification." *The California Building Industry Association, Affordable Housing Advocates, and Community Organizations Announce New Findings on the High Cost of Electrifying Homes and Californians Strong Preference for Natural Gas as an Affordable Energy Choice*, California Building Industry Association, Mar. 2018, www.cbia.org/uploads/5/1/2/6/51268865/2018_residential_cost_impact_analysis_summary_navigant_study.pdf.

5 United States, Congress, "US Census". www.census.gov