Oakland-Berkeley Electrification Workshop

Thursday, June 13, 2019 2:30-5:00 PM
Oakland City Hall (One Frank Ogawa Plaza, Oakland) – Hearing Room 3

Attendees:

At least 25 stakeholders, excluding organizers and presenters, attended the workshop. Stakeholders included a good mix of developers, HVAC designers, architects, engineers, city staff, and contractors.

Agenda:

2:30 – 2:35 Call to order, Brief Welcome, Housekeeping, Review agenda

- Meeting objective: Moving away from onsite NG combustion – aka building electrification – is an important goal for both of our cities. The purpose of today's meeting is to begin exploring how we can craft policy that won't inhibit housing or economic development.

2:35 – 2:43 City perspectives

- In Oakland, we're pursuing electrification as a central component of our building resiliency strategy: IAQ, Seismic safety, grid modernization, and 2 of our top 5 climate action strategies
- In Berkeley, there is a big focus on the climate impacts of natural gas. Berkeley's climate strategy focuses on reducing energy first, then cleaning the electric grid, and finally electrifying transportation and buildings.
- East Bay Community Energy (EBCE) is Alameda County's new mission-driven utility, supporting both cities' goals by rapidly cleaning the grid that serves most of the County (including Oakland and Berkeley), and providing technical assistance for building and vehicle electrification. EBCE was represented in the room by their consultant, TRC.

2:43 – 2:53 Intros around the room

2:53 – 3:30 Short presentations:

<u>Why are we talking about electrification? (Pierre Delforge, NRDC)</u>

- Health and environmental damage from natural gas leakage, both system-wide and in buildings.
- 50% of fires after earthquakes are caused by natural gas pipeline ruptures (either distribution or in buildings)
- PG&E requested a 42% increase in natural gas rates starting next year to deal with pipeline safety, to avert future disasters like Aliso Canyon and San Bruno; $7.5 B/year is needed.
- CCA (EBCE) is providing clean electricity
- Electric water heating and space heating technology is much more mature and efficient now
- One barrier to electrification may be cost. The perception is that the natural gas based system is cheaper. However, heat pumps are more efficient, and with high efficiency heat pump, it breaks even.
    - The infrastructure costs for natural gas is expected to rise significantly because of investments in disaster management and reduction in amount of people using gas. As people start using more electricity over natural gas, the gas rate will increase for maintaining the infrastructure.
    - Over last 6 years, California NG rates have increased 3.5% annually, while electricity rates have increased 1.5 annually%.

- 80% of natural gas costs are fixed (i.e. not dependent on usage).

Question from audience: The electricity rates in California are much higher as compared to other states?
A: The electricity and gas costs are both relatively higher.

Electrification 101 (Nick Young, AEA) - How to electrify all building end uses?

- Natural gas end uses in California: 49% = water heating, 37% = space heating, 7% = cooking, 3% = clothes drying, 4% = pool/spa/miscellaneous. There are cost-effective electric options for all.
- What changes with electrification: no gas connection or meter; less cost on joint trench; larger electric service; generally PV (solar) only (no solar thermal); small amount of PV can significantly offset electricity costs.
- On demand electric water heating isn't a good idea because of demand charges.

Questions/concerns:

1. Is carbon monoxide alarm required for an all-electric building as well?
    a. Nick Young: With all-electric, CO alarm may be eliminated, but this requires changes in fire code
2. Where does the heat pump compressor go? How does it affect the access and availability for PV?
    a. Nick Young: It takes similar space to that of traditional air conditioner compressor.
3. How do the energy costs compare between gas and electric on-demand water heaters?
    a. Nick Young: For electricity, you pay both peak demand charges when applicable and per unit consumption charges, so on-demand isn't cost effective; better to use large tank for storage and spread demand out over time, avoiding peak demand charges.
    b. Nick Young: For gas water heater, you pay for the per unit consumption only, hence instantaneous (on demand) is better to reduce storage loss.
4. There is pushback from designers on air-driven heat pump because it is really big, heavy, requires sufficient airflow around the outdoor unit and may need structural modification to accommodate.
    a. Nick Young: If the system is in a garage, it can be hooked with the garage exhaust. It should be okay to put the system in a naturally ventilated garage.
5. How does it align with Title 24 and compliance software challenges?
    a. City of Oakland: The goal of today's workshop is to focus on the economic and technical feasibility and collect feedback on how to inform code change. Code will not enforce certain types of systems or curtail flexibility but allows a pathway for whole building electrification. CEC is on record as moving from Zero Net Energy to Zero Net Carbon, so likely more compliance pathways. SB1477 will incentivize electric technologies for traditional gas systems, like heat pump water heaters and space heating systems for both new construction & existing buildings at $200M/year; structure TBD.

Bay Area Projects list (Scott Shell, EHDD)

- Many all-electric projects including multifamily buildings are being developed. Many have been built with central heat pump water heating.
- The challenge is not in the actual construction but in explaining to contractors how to price the systems appropriately, since they're often not yet familiar with them.
- Ecotope is doing central heat pump water heating in many high-rise buildings.

- Interface engineering is designing most projects to be all-electric unless specifically asked to include natural gas.
- Majority of the restaurants in Florida are all-electric.
- Many educational institutions are moving towards all-electric buildings on campuses especially University of California.

Questions from audience:

1. What about resistance heating?
    a. Resistance technologies are about 20% as efficient as heat pumps. CA Building Code is technology neutral with the performance approach, so a builder can use electric resistance heat if the building envelope is good enough.
2. What about grid impacts of electrifying all natural gas systems?
    a. Overall impacts likely only amount to a 10% increase overall, since demand will be spread out mostly over non-peak periods; solar plus storage, as well as load management technologies, will help to even out the electricity demand curve throughout the day.
    b. California's electricity grid is legislatively required to be 100% carbon free by 2045 (largely from increased wind and utility-scale solar), so an all-electric building stock will be pulling from that carbon-free grid.

3:30 - 3:50 Understanding questions and concerns:

- Facilitators asked attendees to list their remaining questions or concerns.

<u>List of questions</u>

1. Are CO meters necessary for all electric buildings?
2. How can restaurants go all electric for special cooking?
3. Are the reach codes looking at new construction only? Or does it apply to existing building retrofits as well?
4. What is the rate of increase in clean power in California? Is the grid adept to meet the increase in electricity demand due to electrification and electric vehicle charging reach codes?
5. What is the timeline of implementation? What is city's approach towards implementation strategies such as incentive program?
6. Are there all-electric buildings with a 5-10 year of track record of demonstrating successful implementation of technologies?
7. People have a perception hurdle with induction cooker.
8. How do projects get around the Title24 2016 mandate to use natural gas if it is available on site?
9. How to install technologies with limited space for outdoor equipment or in infill developments?
10. How does the reach code impact the community economic development? Is there any support provided to help cover capital costs?
11. For retrofits, at what point do they need to consider electrification?
12. How does the technology and reach code strategy apply to high rise applications?
13. How to educate designers, architects, developers? Perhaps partner with trade association?
14. Is there enough grid capacity to handle the increased electric demand?
15. For water heating, solar thermal needs to be removed in most presented case to compensate the cost, what is the T24 implication which has compliance credit.
16. EV charging infrastructure impose a challenge on grid capacity and electrical panel sizing.
17. Reach codes should be agnostic to allow new technologies that combines solar thermal and PV.

18. Can you use electric resistance heater? How is Title24 planning to incorporate it?
19. Double fuel source can provide redundancy and resiliency, for example if electricity is out, gas can provide option to provide food.
20. Is nuclear a part of the clean grid efforts of California?
21. There is pushback from property managers for ease of access to maintenance or replacement issues. Outreach and education may be required.
22. Workforce training for maintenance and operation is needed.

4:00 – 5:00 Facilitated deeper dive – Addressing concerns

- Facilitators and experts in the room responded to the above questions, which they categorized as follows: Technology, Code, Grid, and Policy/Education/Outreach:

<u>TECHNOLOGY (Largely facilitated by Jason Bernstein, Director of Development, City Ventures)</u>

1. How can restaurants go all electric for special cooking?
    a. People may still think of electric stove; induction cooking is different.
    b. High end induction stoves are being installed in buildings. High end chefs love induction cooking (e.g. Great British Baking Show).
    c. Daniel Hamilton (City of Oakland) has a presentation resource for list of commercial induction cooking systems and costs.

2. How to install technologies with limited space for outdoor equipment or in infill developments?
    a. Gas piping takes up much space for trenching. Avoiding gas can save space and cost.
    b. Solar thermal tank no longer needed, replace with heat pump tank.
    c. Need to start the conversation early with architect to allocate required space.

3. How does the technology and reach code strategy apply to high rise applications?
    a. Many buildings have started implementing heat pump technologies (see Scott Shell's presentation).

4. For water heating, solar thermal needs to be removed in most presented cases to compensate the cost; what is the Title24 implication?
    a. Compliance modeling consultants have been able to work around the software limitations.
    b. For high rise multifamily, we use electric water heating. Issue is with solar thermal water heating as it is compared against 20% standard solar fraction.
    c. Software is getting updated to fix this by end of the year before code goes into effect
    d. Tax credits can be routed via Green Point Rating system. CEC is aware of the limitations and allows workaround to meet the code.

5. Reach codes should be agnostic to allow new technologies that combines solar thermal and PV
    a. All agree. PV and water heating combination should not be an issue.
6. Double fuel source can provide redundancy and resiliency, for example if electricity is out, gas can provide option to provide food.
    a. PV and battery storage option such as off the shelf powerwall helps with the resiliency or offset high peak demand costs.

b. Perception that gas is more resilient, but most modern gas appliances also need electricity to run except cooking.
c. After a major disaster, it can take up to 2 weeks for the utility to restore electricity, but up to 6 weeks to restore gas (from Pierre Delforge).

7. There is pushback from property managers for ease of access to maintenance or replacement issues. Outreach and education may be required.
    a. Operation and maintenance of heat pumps is similar to air conditioners, and can be done by most HVAC contractors.
    b. City staff agree that contractor training is needed. The Bay Area Regional Energy Network (BayREN) is developing a heat pump and electrification contractor training program, and PG&E already provides classes at their Pacific Energy Center.

<u>CODE (Largely facilitated by Daniel Hamilton, Environmental Services Manager, City of Oakland)</u>

1. How do projects get around the Title24 2016 mandate for retrofits to use natural gas if it is available on site?
    - CEC is working with a team to do lab testing, system mapping etc. to fix the software for heat pump water heating.

2. What is the timeline of implementation? What is city's approach towards implementation strategies?
    - Aligning with CEC's timeline of 2019 Title 24 code
    - Zero Net Carbon is the target
    - 30 cities in Bay Area and 50 cities across the State are looking to adopt electrification reach code. The City of Oakland is coordinated with other cities for consistency.
    - Incentives for all-electric retrofit
        - SB 1477 allocates $200m in incentives for HP retrofits and all electric new construction; actual program structure is being worked upon.
        - East Bay Community Energy is funding research to support Alameda County cities pursuing electrification policies (with consultant TRC). EBCE's Local Development Business Plan will include incentive programs; structure is being formulated.

3. Are the reach codes looking at new construction only? Or does it apply to existing building retrofits as well?
    - Mostly talking about new construction right now. More research is needed to understand cost effectiveness and contractor capacity for existing building retrofits.

4. How does the technology and reach code strategy apply to high rise applications?
    - Can meet code by performance approach if prescriptive approach has software or other limitations.
    - There are actual constructed projects showing it to be technically feasible (see Scott Shell's presentation).
    - City has consultants working on cost-effectiveness analysis, waiting on results of study to go further.

5. Can you use electric resistance heater? How is Title24 planning to incorporate it?

- CEC is moving toward performance pathway, so can trade off heating efficiency (i.e. with the low-efficiency resistance heater) with high-efficiency building envelope.

ELECTRIC GRID (Largely facilitated by Daniel Hamilton, City of Oakland)

1. What is the rate of increase in clean power in California? Is the grid able to meet the increase in electricity demand due to electrification and electric vehicle charging reach codes? Is nuclear a part of the clean grid efforts of California?
    a. We do not anticipate big impacts on grid load. Currently, it is sized for summer peak, so ramping up winter heating loads still leaves enough room for all-electric. No shortage is expected.
    b. If we have to increase the grid capacity, it will be renewable source. Possibly combination of wind and solar, some hydro power is being built and nuclear is being phased out.
    c. Entire grid is going renewable regardless by 2045.
    d. Storage will help.

POLICY/EDUCATION/OUTREACH (Largely facilitated by Shayna Hirshfield-Gold, City of Oakland; and Billi Roman, City of Berkeley)

1. How to educate designers, architects, developers? Perhaps partner with trade association?
    a. Training is a critical need. BayREN is developing a training programs for contractors.
    b. Building decarbonization coalition is continuously coming up with information material.
    c. TRC on behalf of East Bay Community Energy is assisting in developing tools to assist implementation.
    d. We need to work on developing programs and resources to provide design assistance and mentorship for new first-time developers, designers, and contractors.
    e. City of Oakland does outreach anyway for the new code cycle of all Title 24 components. This includes further input opportunities for the building community to comment on the Energy Code (Part 6) amendments. The City requests that stakeholders inform the City on who should be contacted for additional outreach and engagement. Oakland is developing its next 10-year Equitable Climate Action Plan, which is likely to include actions addressing building energy use and electrification, including stakeholder engagement and training.

2. Workforce training for maintenance and operation is needed.
    a. Similar to the above, training is important and needed. Staff from both cities are working with local and regional partners to identify training resources.
    b. Many contractors and operators (homeowners, property managers) are not yet familiar with the specific technologies and brands; however, if you have building HVAC and DHW, the components are similar, so most contractors should be able to service the equipment with no or minimal training. As with any mechanical system that includes a refrigerant, it's important to ensure against leakage. Installing contractors can also play a role in training on-site managers in basic operation and maintenance when the systems are first installed.