

HILLSBOROUGH'S "REACH CODE" PROPOSAL

THE PROPOSED "REACH CODE" ELIMINATES GAS-FIRED SPACE HEATING (FURNACES) AND/OR GAS-FIRED WATER HEATERS FOR NEW CONSTRUCTION WITHIN OUR TOWN.

THE REACH CODE'S OBJECTIVES ARE STATED AS: IMPROVED ENERGY EFFICIENCY, REDUCED GREENHOUSE GAS (GHG) EMISSIONS, AND LOWERED ENERGY COSTS.

THESE OBJECTIVES **WILL NOT AND CAN NOT BE MET**. IMPLEMENTATING THIS CODE WILL ACTUALLY RESULT IN:

- DECREASED OVERALL ENERGY EFFICIENCY ON A STATEWIDE OR NATIONWIDE BASIS
- ALMOST DOUBLE THE GREEN HOUSE GAS EMISSIONS WITHIN CALIFORNIA OR ADJACENT STATES
- MORE THAN TRIPLE THE ENERGY COSTS FOR HEATING HILLSBOROUGH HOMES

THE REASON THE REACH CODE FAILS IS:

THIS REACH CODE DOES NOT CONSIDER THAT THE ADDED ELECTRIC POWER USED BY THESE NEW ELECTRIC APPLIANCES WILL PRIMARILY BE GENERATED FROM NATURAL GAS POWER PLANTS IN CALIFORNIA AND ADJACENT STATES, AND THAT THIS ADDED POWER IS GENERATED AT LOW (50%) EFFICIENCY AND WITH HIGH (2X) GREENHOUSE GAS EMISSIONS. FURTHER, PG&E'S HIGH RATES ON ELECTRIC POWER WILL INCREASE THE HOMEOWNER'S ENERGY COST OVER THREE TIMES (3X). FINALLY, SINCE BROAD APPLICATION OF THIS REACH CODE WILL INCREASE OVERALL GHG EMISSIONS, IT IS HIGHLY QUESTIONABLE THAT IT CAN AVOID CEQA REQUIREMENTS.

CALIFORNIA ELECTRIC POWER GENERATION AND USE – 2020

- In 2020, the State of California actually consumed 272,600 gigawatt-hours of electric power.
- One gigawatt-hour equals one million kilowatt-hours (KWH), so use was 272 billion kilowatt-hours.
- California has consumed between 272 to 292 billion KWH every year for the last five years.
- 2020 sources of power generation were:

| | |
|--|-------------|
| Natural Gas | 34% |
| Solar & Wind | 16 |
| Hydroelectric, Nuclear, Geothermal & Biomass | 20 |
| Subtotal, in-state generation | <u>70%</u> |
| Imported Power from out of state | 30 |
| Total generation & use | <u>100%</u> |

- Imported power is reported to be 20% gas & coal, 28% solar & wind, 34% hydro, nuclear, geothermal & biomass. Remaining 18% is of “unspecified origin”.

Source: CA State Energy Commission

CALIFORNIA'S POWER GRID

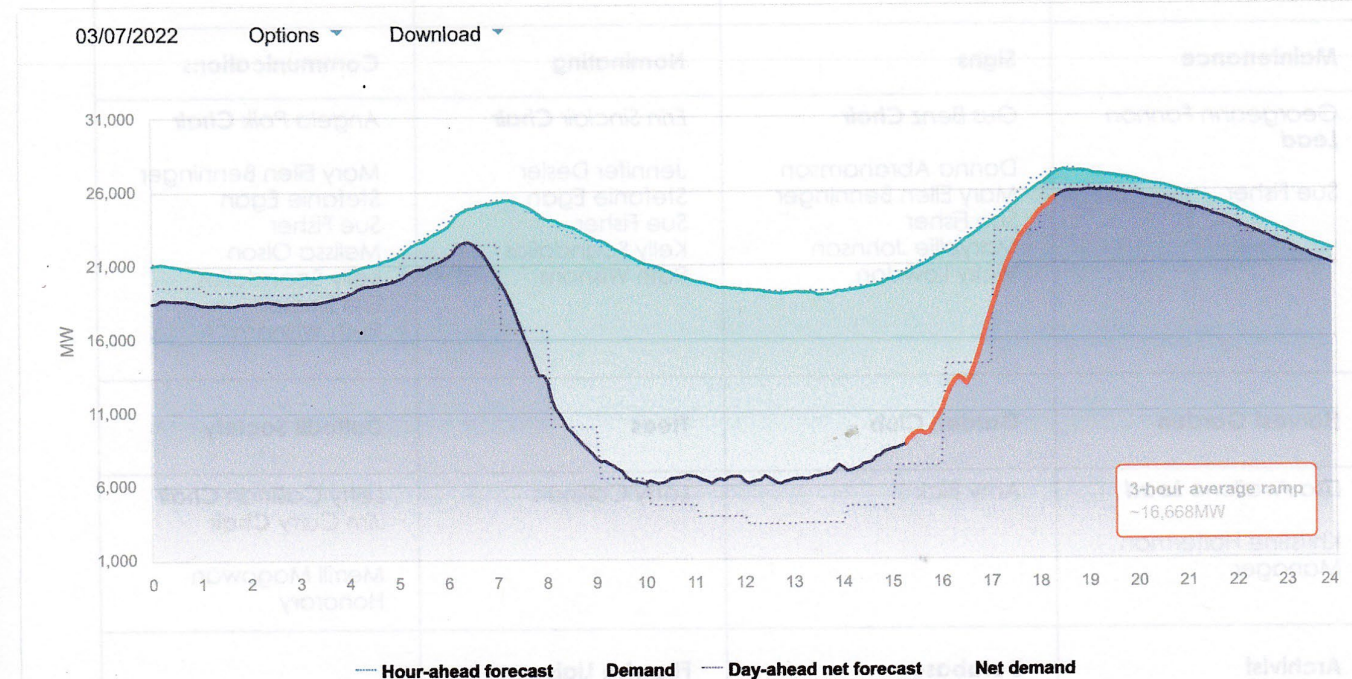
- The California power grid includes over 26,000 miles of high-voltage transmission lines and more than 1000 unique power generation facilities.
- Major California power generation plants include:
 - 73 natural gas-fired plants
 - 53 solar and wind plants
 - 53 large hydroelectric plants
 - 29 nuclear, geothermal and biomass plants.
- The grid is managed and controlled by the non-profit California Independent System Operator (Cal-ISO), which oversees the operation of California's bulk electric power system and transmission lines, in order to economically balance the availability and reliability of electricity generation and transmission by its member utilities with actual, real-time power demands across the entire state.

TYPICAL MILD-WEATHER CALIFORNIA DAILY POWER USAGE

- Shown below is the CAL-ISO plot of actual hour-by-hour power demand and use in megawatts (MW) for March 7, 2022.
- The light blue area shows usage in MW supplied by wind and solar, the dark blue area shows usage supplied by all other sources.
- Note that power demand peaks at about 25,000 MW at 7 AM, drops to about 19,000 MW at 2PM, and peaks again at 29,000 MW at 6PM. Note also that wind & solar supplies about 60% of power demand between 10 AM and 2 PM, but less than 10% of demand between 6 PM and 6 AM.

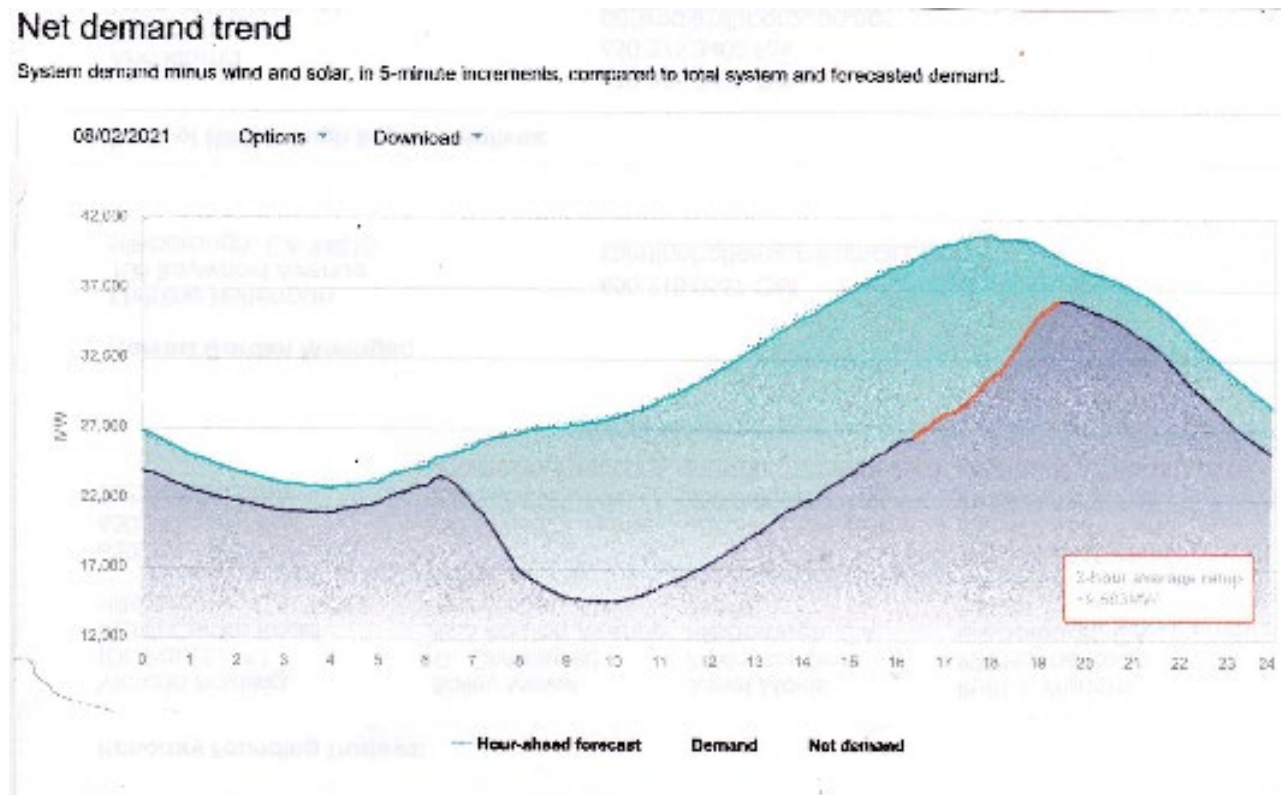
Net demand trend

System demand minus wind and solar, in 5-minute increments, compared to total system and forecasted demand.



TYPICAL HOT-WEATHER CALIFORNIA DAILY POWER USAGE

- This is the CAL-ISO plot of hour-by-hour power demand and use for August 2, 2021, a typical hot summer day.
- Note also that power demand grows steadily from about 23,000 MW at 4AM to a peak of about 41,000 MW at 6PM. This 41,000 MW peak is more than 40% higher than the peak demand for a typical mild-weather day.
- Note that wind & solar supplies only about 50% of power demand at 10 AM and correspondingly less as the day progresses, providing only 20 to 25% of demand at the 6 PM peak.



WHERE DOES ADDED ELECTRIC POWER COME FROM?

- Solar & Wind sources produce power at the lowest operating cost and therefore normally operate at max capacity, even though this power is generally only available 8 to 10 hours per day.
- The “base-load” power sources (Hydro, Nuclear, Geothermal, Biomass) also produce power at low operating cost and therefore also normally run at max capacity.
- The “variable-load” power sources (natural gas & coal fired plants) produce power at the highest operating cost and therefore operate at reduced capacity except during periods of high power demand.
- The power grid operator (Cal-ISO) selects power sources based on availability, cost and reliability, using solar/wind and baseload plants first, then using the variable-load plants to balance total power demand across the state. These variable load sources are always in operation at some capacity since they are used to balance instantaneous power demand.
- California’s gas fired power plants operate at an average of only 35% capacity because of the large daily and seasonal variation in power demand and the uncertain availability of solar and wind power.

So, incremental added electric power demand in California is primarily supplied by natural gas power plants.

ENERGY EFFICIENCY OF POWER DELIVERED TO CALIFORNIA HOMES

- Gas Turbine Combined Cycle (GTCC) technology is state-of-the-art for natural gas power plants.
- The most advanced GTCC plants now operate at 60% thermal efficiency under ideal design conditions, but they operate at lower efficiency when run at partial load.
- Older GTCC plants are less efficient, in the 50-55% range.
- Gas-fired GTCC plants in California vary in age and therefore average about 55% thermal efficiency.
- Efficiency loss between power generation plants and end-users due to resistance losses in the transmission and distribution system averages 9% in California.
- Electric power sourced from natural gas is therefore delivered to California homes at 55% less 9%, or about 50% net thermal efficiency. This results in about twice the Greenhouse Gas emissions, compared to direct combustion of natural gas.
- Natural gas delivered to California homes loses only about 2% to fuel compression during distribution.

So, natural gas is delivered to our Hillsborough homes at about 98% thermal efficiency, whereas natural-gas-sourced electric power is delivered to our homes at about 50% thermal efficiency and with about twice the Greenhouse Gas emissions.

ENERGY EFFICIENCY RATING FOR GAS & ELECTRIC HEATING APPLIANCES

| <u>APPLIANCE</u> | <u>Electric</u> | <u>Natural Gas</u> | <u>Nat Gas High Efficiency</u> |
|----------------------------|-----------------|--------------------|--------------------------------|
| Hot Air Furnace | 96-98% | 80-90% | 90-96% |
| Tank-type Hot Water Heater | 96-98% | 80-85% | 90-95% |

Electric appliances are actually only 2% to 6% more efficient than the high efficiency natural gas units. Clearly, installation of high efficiency natural gas units should be encouraged in Hillsborough.

Note that these efficiencies apply only to the appliance itself as installed within our homes.

The minor efficiency advantage of electrical appliances does not compensate for the low overall efficiency of natural-gas-sourced electric power.

ENERGY COSTS TO HILLSBOROUGH HOMEOWNERS

(ACTUAL JANUARY 2022 PG&E RATES)

| | | <u>Tier 1</u> | <u>Tier 2</u> | <u>Tier 3</u> |
|--|---------------|---------------|---------------|---------------|
| Electricity - | ¢/KWH | 28.2 | 35.5 | 44.0 |
| Natural Gas - | \$/therm | 2.10 | 2.56 | 2.56 |
| | ¢/KWH equiv.* | 7.2 | 8.7 | 8.7 |
| Cost of electricity/cost of natural gas | | 4X | 4X | 5X |

* 1 therm = 100,000 Btu = 29.3 KWH

CONCLUSION: On an equivalent energy basis, electric power from PG&E costs four to five times the cost of natural gas. So, implementation of the Reach Code actually increases rather than reduces homeowner energy costs.

REACH CODE - CONCLUSION & RECOMMENDATION

THE PROPOSED “REACH CODE” IS TECHNICALLY FLAWED AND ITS IMPLEMENTATION WILL INCREASE GREENHOUSE GAS EMISSIONS WITHIN CALIFORNIA AND NEARBY STATES, AND IT WILL MORE THAN TRIPLE THE COST OF ENERGY FOR HEATING OUR HILLSBOROUGH HOMES.

THE HILLSBOROUGH CITY COUNCIL IS URGED TO REJECT THIS FAULTY REACH CODE PROPOSAL.

IF THE TOWN ELECTS TO ADD REGULATIONS IN ORDER TO COMBAT CLIMATE CHANGE, IT SHOULD INSTEAD CONSIDER REGULATORY CHANGES WHICH ACTUALLY DECREASE OVERALL ENERGY CONSUMPTION WITHIN OUR HOMES. REDUCING NATURAL GAS USE BY INCREASING ELECTRIC POWER USE IS A MISTAKE.

THIS IS PARTICULARLY TRUE CONSIDERING THAT CALIFORNIA’S ELECTRICAL GRID IS ONE OF THE MOST UNDEPENDABLE GRIDS IN THE NATION, AND OVERLOADING THE GRID IS NOT WISE.

FURTHER, SINCE REACH CODE IMPLEMENTATION WILL ALMOST DOUBLE GHG EMISSIONS FOR HOME HEATING, THIS REACH CODE PROBABLY DOES NOT MEET CEQA EXCLUSION REQUIREMENTS.

THE FACT THAT OTHER CITIES HAVE FOOLISHLY IMPLEMENTED SIMILAR REACH CODES IS NO REASON FOR OUR TOWN TO FOLLOW. WE CAN EXPECT THAT THESE OTHER CITIES WILL ULTIMATELY INSTEAD ADOPT PRUDENT ENERGY REDUCTION REGULATIONS.