CARB
ELECTRICITY SECTOR WORKSHOP : SCOPING PLAN 2022
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Submitted by David Bezanson, Ph.D., CA voter

Thank you for presenting yet another informative workshop re. The Scoping Plan. This sector is the most important to prioritize because our grid will power the electrification of other sectors including industry, transportation, SORE, and buildings . The sum of this electrification, which displaces primarily fossil fuel energy, will decrease GHG and toxic/criteria co-pollutant emissions in CA by well over 50%. Please keep the pace of renewable generation well ahead of the pace of electrification of other sectors. In the absence of such pacing, electrification will be powered by about 40% dirty electricity in the near term.

Throughout this document, renewable energy excludes sources that spew GHGs or toxics in Scope 2 or Scope 3. Nuclear reactors, e.g., emit water vapor and ionizing radiation throughout their operating phase. Vapor is a GHG and radiation is toxic in any amount of exposure (see Linear No Threshold model). The lifecycle carbon intensity of reactors is significantly higher than that of renewables, , , . Biofuels, dirty H2, biogas, and biomass energy entail GHG and toxic/criteria pollutants in at least one Scope.

Both utilities and CCAs are publicly-owned in different ways. To distinguish the two, the acronym SOU (shareholder-owned utilities) is to be used for the former while POU (publicly-owned utilities) is to be used for the latter.

Some recommendations herein require collaboration with other agencies or the Legislature. Please take the lead to decarbonize the electricity sector promptly. Use 2 year interim targets for each policy.

TIMELINE TO DECARBONIZE GRID ELECTRICITY

Set a goal of powering the grid with 100% renewables by 2035. Set interim targets every two years to increase the percent of renewable electricity by at least 7% while decreasing the percent of dirty electricity (biomass and fossil) by at least 7%.

DEMAND ATTENUATION

Accelerate the timeline for meeting efficiency goals including replacement of NG appliances and baseboard heating with more efficient electric (especially heat pumps) and establishing more stringent insulation standards for new buildings as well as retrofits of existing buildings .

Establish higher surcharges on the highest tiers of electricity and NG usage. Create 5 tiers The highest tier rate should be at least triple that of the lowest tier. Rates for each tier of NG should be at least double the rate for electricity, to internalize externalities

of fossil energy (NG). Provide partial rebates to households in the federal poverty range.

One way to decrease emissions and usage of electricity is to retard economic growth to zero or less. At some point this may be necessary to solve climate change. In the near future it would help to decrease the growth rate to 1% and transition from an infinite growth paradigm to a sustainability paradigm. Using voluntary educational and financial incentives, the population of CA should be stabilized at its present level or less. These economic and population stabilization goals are two of the many proven policies that are necessary if one adheres to the precautionary principle of managing the climate crisis.

COST OF ELECTRICITY

One of the objectives of the federal and CA government is to decrease the cost/kW of electricity. Failure to internalize externalized social costs of fossil fuel energy into fossil fuel prices drives up electricity rates . Policies to internalize costs are needed and some examples follow.

- Establish a higher fossil fuel production tax (The current tax is far lower than the tax rate in other states.)

- Increase sales taxes on all fossil fuels (diesel, gasoline, oil, propane, NG, LNG, etc.) and bio-energy

- Raise the floor price of allowances at Cap & Trade auctions to the cost of C removal (currently $150 - $600 per MT), sunset free allowances by 2023, and discontinue handing out free allowances.

- Create a Clean Electricity Performance Plan akin to the one that was deleted from the federal reconciliation bill (Build Back Better). SOUs and POUs that generate/procure at least 5% more renewable energy than in the prior year would receive an incentive while those failing to meet it would be penalized. This will scale up renewable energy, driving down the price.

- Rapidly phase out the use of reactors and of biomass electricity. The former has a cost per kW that is 4 to 5 times higher than that of renewables while the latter has a cost per kW that is about 50% higher than that of renewables. Each is heavily subsidized.

BENEFIT : COST ANALYSIS

Public statements from CEC, CARB, and CPUC indicate that the cost of a rapid transition to renewables is higher than a transition that reaches neutrality by 2045. This is true if the gross investment in renewables is the sole metric. However, research indicates that the maximum net benefit : cost ratio is achieved by a rapid transition. Energy and non-energy benefits include public health and consequent increases in productivity, increased net job growth in the energy sector, increased income tax revenue, increased GDP, decreased cost of electricity, EJ, avoidance of fossil fuel "shortages" and price spikes, deceleration of climate change, more food security, and a more sustainable economy. Because the fossil fuel industry has a rate of occupational injuries that exceeds that of most construction sectors, Workers' Compensation claims would subside. In addition, the influence of the fossil fuel industry upon climate legislation would diminish. There is probably a massive economic value of this curtailed influence and research is needed to quantify such , , , ., , , , , ,.

Define EJ zones and toxic hot spots on the scale of miles instead of meters. Urban areas that are up to 100 miles downwind from toxic and criteria pollutant sources may be showered with some of these toxics. Some of these, e.g., PM, may remain airborne for a week. This is critical when performing cost : benefit analyses.

Another model for evaluating policies to further the transition from current BAU to C neutral is Return on Investment. This would examine the costs of achieving various kinds of returns and the sustainability of returns.

In 2018, 8.7 million people suffered premature mortality from fossil fuel industry emissions. A 2021 study estimated 10.2 million , . (Note that the studies calculated mortality only from PM. Combustion of FF emits about one dozen toxics. These two studies did not estimate mortality from the other toxic co-pollutants.) Estimates of the number of annual premature deaths from fossil fuel PM in the US range from 335,000 and 350,000. Using 340,000 and dividing this by the population of the US in 2018 (327 million) equals 0.1%. The CA population in 2018 was 39 million. 0.1% of 39 million is 39,000. The value of a statistical life in the US is $10,000,000 (8, 9,10). 39,000 times ten million is $ 390 billion .

CLEAN FIRM 24/7 SOURCES

The source to scale ahead of all others in geothermal. CA has extensive geothermal potential. The co-development of geothermal energy and lithium extraction from the same regions is being studied by The Lithium Valley Commission of the CEC. Co-develop geothermal generation in nearby states with natural geothermal resources and increase imports to displace fossil energy imports.

The second priority is to scale the most cost-effective forms of storage to increase the capacity factor of renewables. Commercially-available options include various battery technologies, renewable electrolytic H2, and hydro.

The third priority is to replace stationary fossil fuel generators with renewable electrolytic H2 fuel cell generators.

Due to cost, a fourth priority - tidal - is to be studied every two or three years by reviewing cost : benefit research. Expedite development when the cost : benefit ratio is near that of other renewables.

RELIABLE GRANULARITY 24/7 and ACROSS SEASONS

Build excess renewable generation capacity. Use it to store energy for use when demand exceeds supply. An example is salt caverns for renewable electrolytic H2. See SB 67, introduced in 2021 and destined to be a 2-year bill for 2022 for policy guidelines.
Bill Text - SB-67 Clean energy: California 24/7 Clean Energy Standard Program.
Scale smart grids and microgrids interfaced with community and rooftop solar, to improve granularity and resilience of DRE

Incentivize installation of PV solar panels over parking lots, freeways, driveways, canals, and floatation atop reservoirs. This form of DER has multiple benefits including improved grid resilience. Fast track offshore wind turbine energy .

CARBON CAPTURE ENGINEERING

Smokestack carbon capture is a cost-prohibitive, unproven technology that increases energy prices (e.g., of NG and electricity). Research that examines the complete lifecycle of emissions and finds net capture has not been published. It does not decrease toxic or criteria co-pollutants. By extending the number of years of reliance upon fossil fuel energy, it increases cumulative toxic and criteria co-pollutants emitted over the years. See the link below for guidelines on using carbon capture technologies and references to the literature.
CARBON CAPTURE DECISION TREE - Google Docs
Instead of using smokestack carbon capture on fossil fuel power plants, these plants should be replaced by renewable energy/storage plants. This has a superior cost : benefit profile than adding smokestack capture to fossil fuel power plants.

NATURAL GAS

Do not use a mix of RNG and NG for residential buildings, due to health hazards. Do not use a mix of H2 and fossil NG in any pipelines. To achieve our climate and emissions objectives, the use of all forms of NG needs to be swiftly phased out. We have ample renewable and storage resources to retire NG. Replace the use of NG in buildings with electricity, for which we have a distribution network. Retire NG power plants by 2030.

HYDROGEN ,,

Permit the generation and sale only of renewable electrolytic H2 in CA effective 2023. If other H2 generation technologies are invented that are combustion-free and have a comparable lifecycle carbon intensity, permit the generation and sale of such when each becomes commercially feasible.

Construct new dedicated renewable H2 pipelines only in industrial zones outside of residential areas. Do not use blends of NG and H2 in existing NG pipelines. Even sections of NG pipelines that are currently leak-free are unsuitable because H2 molecules are much smaller than CH4 molecules and H2 will leak, especially when transported under typical pressures used for NG. Leakage of each gas is inefficient, toxic, and presents risk of fire and explosion.

Develop programs for conversion of metals and concrete manufacture to renewable electrolytic H2 powered or 100% renewable electricity-powered. These are commercially available and are further decarbonized by efficient electric arc furnaces for steel and cement substitutes that require lower energy input for concrete manufacture.

IMPORTED ELECTRICITY

Import only renewable energy. Upgrade our high-voltage transmission line network connecting CA to other Western states and B.C. These upgrades will enable us to profit from exporting electricity. It will also improve 24/7 reliability of electricity supplies in networked states including CA.

CONCLUSION

Target 2035 as the year to achieve powering our grid with 100% combustion-free and toxin-free renewable electricity. Establish aggressive interim targets every two years, especially during the initial 8 years. Use modular design principles to accelerate scaling Clean energy is favored by over 80% of voters nationwide .

See the graph near the end of this 3-minute video on net zero. Please make plans to achieve the lowest emissions trajectory .