November 18, 2021
To: California Air Resources Board
From: Muriel Strand, P.E.
Re: 2022 Scoping Plan Electricity Sector

There are many plans for replacing fossil fuel combustion with renewable energy that's harvested as electricity by nonrenewable harvesters. But 'we can't solve our problems using the same mindset that created them.' During the workshop we heard various presentations about some likely obstacles for this engineering solution, such as possible resistance from local jurisdictions about siting various PV and windmill farms. Battery manufacturing might also be viewed skeptically.

We need more open discussion and more plans about our actual energy priorities, rather than just assuming we should electrify almost everything and continue with our present lifestyles and trends of increasing energy use. Fossil fuels are very cheap, and have allowed many societies to evolve in many technological ways that would have been impossible otherwise. Thus our current infrastructure and markets are larded with energy use that is frittered away on paper profits rather than being used effectively for people's well-being. We need a paradigm shift, as outlined here: https://bio-paradigm.blogspot.com/2010/09/mechanical-logic-vs-biological-logic.html

The technocratic solution of near-total electrification seems to have already been selected and local cities and counties are so far in pro forma agreement. But I don't believe they have grappled with some long-term practical difficulties nor considered alternative paradigms. **How can a town become a Transition Town**, become locally and totally self-reliant for its basic needs for clean air and water, healthy food, and comfy shelter for the whole community? (Trade at a distance is best reserved for nonessentials.)

Towns need to organize themselves to answer that question for their local ecological niches rather than automatically accepting the external reflexive solution of electrifying everything as recommended by the meritocracy. **Role models for sustainable communities can be found** via the Foundation for Intentional Community at https://www.ic.org/ and the Global Ecovillage Network at https://ecovillage.org/ . And several papers outline some of the possibilities and constraints of relocalization:
Sustainable Investment Means Energy Independence From Fossil Fuels
https://www.researchgate.net/publication/256048802_Sustainable_Investment_Means_Energy_Independence_From_Fossil_Fuels
and
Is it true that 'Small Is Beautiful'? [Yes]
https://www.researchgate.net/publication/333581837_Is_it_true_that_'Small_Is_Beautiful'
and
The Farm Bill IS Climate Legislation
https://www.researchgate.net/publication/350327927_The_Farm_Bill_IS_Climate_Change_Legislation

Prescriptions for meeting our predicted physical energy 'needs' must be directly connected to our actual underlying and ultimate biophysical needs: clean air and water, healthy food, cooking, comfy shelter, and plenty of sleep and exercise. SB100 calls for renewable zero-carbon energy sources. But the discussion so far is basically all about hard energy sources such as electricity harvested from renewable sources by nonrenewable harvesters, and contrived solutions such as biogas from dubious processes such as anaerobic digestion of CAFO manure slurries. One energy storage method not mentioned during the workshop is thermal energy storage, which includes a variety of designs.

We need to be talking a lot more about less obvious and more thrifty sources, in particular conservation and abstinence. Conservation is about doing things with less energy and simpler materials. Abstinence is about not doing things that are self-indulgent or not necessary. Low-income people in particular should be supported in choosing to achieve individual netzero through conservation and cost-effective, low-energy, appropriate-technology lifestyles. Bicycles or live-in jobs are a lot more affordable than EVs. Like Amory Lovins' negawatts, avoiding what's unnecessary or even harmful means no external 'side' effects, no increase in entropy or waste, no increased emissions of CO2 or short-lived climate pollutants, no more open-pit mining, and no extra wasted money and resources.

Our monetary system and our price structures are trapped in the cheap fossil fuel economy. One step out of that trap would be to require henceforth and always that prices be shown in parallel, not just dollars but also in measurements of embedded kwhr and GHG emissions, particularly in any models of emissions reductions. Financial prices are based on expediency, not on stable values. Energy and matter are conserved, but money is not, as we all saw in 2008.

Thus, dollar prices can't provide complete and accurate market signals to consumers. Seeing kwhr and GHG price-measurements, together with per-capita kwhr and GHG quotas for achieving netzero and then 350 ppm or 300 ppm, can offer consumers good market information and accurate price signals for thinking globally and acting locally. And the design criteria for a 'climate-smart' market arise from the possibilities, realities, and trade-offs entailed by our priorities and from reliable information about such measures and quotas.

We already know that current market patterns of consumption are failing to include people such as the homeless – aka refugees from the economic growth paradigm. Thus, fundamental reconsideration of individual and societal priorities is in order, if we want to achieve thrifty consumption efficiency and not just decreasing marginal improvements in production efficiency. Conventional monetary economic indicators like GDP growth are misleading.

Affordability is a concern that was mentioned many times during the workshop, in connection with how to pay for electrifying everything in ways that are feasible for low-income rate-payers. At the same time, economic growth was also mentioned as a positive

factor going forward. But there seems to be a strong correlation between economic growth and the dwindling of both the affordability and availability of basic needs such as clean air and water, healthy food, and comfy shelter. **An economy whose primary goal is monetary profit is an economy that will short-change basic needs.** 'The love of money is the root only of evil.'

Similarly, we should analyze the types of jobs that can directly meet those needs in ways that use humanpower. Climate plans to date implicitly assume that current occupations (which are referenced in the SIC codes) will continue, simply by replacing engines with motors. **Existing jobs should be carefully analyzed in terms of the kwhr and GHG emissions entailed by their processes.** The specific tools, raw materials, and processes by which each job directly supplies basic needs for clean air and water, healthy food, and comfy shelter should be explicitly described in order to plan appropriate and sustainable jobs, processes and systems.

We must bear in mind the limits to growth. The metals and minerals required for building all the PVs and windmills needed to replace fossil fuels and provide California's current and predicted energy 'needs' may be obtainable, but they require fossil fuels for mining and refining. The amount of energy that will be needed for future recycling and replacement remains to be seen. And this plan doesn't scale nationally let alone globally. These concerns are felt by diverse stakeholders:
https://energyideasca.com/2021/07/21/californias-electric-car-revolution-designed-to-save-the-planet-also-unleashes-a-toll-on-it/

During the first year of the Covid-19 pandemic, we heard a lot about "essential jobs." But we haven't been talking about them recently, and we never talked much about why so many less essential jobs (which generally involve talking and writing about projects that indirectly support the provision of needs) paid more and offered better protections for workers. **Just because a job makes money doesn't mean it's worth doing. While chambers of commerce like to take credit for being job creators, consumers are the real job creators; without their needs and wants to satisfy, no jobs would be required.**

Taking landscaping as a case study, we can analyze the job of mow-and-blow landscape maintenance as being economically unnecessary. Whether gasoline or electric equipment is used, lawns and landscapes that look like Sunset magazine are totally irrelevant to any real human need. Operator resistance to substituting motorized electric equipment for gasoline-engine equipment is a combination of attachment to habit and fear of homelessness. The best replacement for gasoline-engine landscaping equipment is retraining for urban farming which leads to local self-reliance while also reducing the volume and length of supply chains: http://motherearthhome.blogspot.com/ New habits are developed and fears of economic irrelevance and homelessness are routed. But if we can't even stop using unnecessary and widely despised leafblowers, we deserve to be toast.

Over the years, I have observed that it's at the local level where decisions about political trade-offs are often the most controversial, likely because that's where the rubber really hits the road. The trade-offs that are inevitable in any situation must be grappled with for a local solution, while it's relatively easy for distant centralized decision-makers to be impractical. Can state and federal agencies learn from the local solutions that may arise if local jurisdictions become committed to real change, and are supported in replacing the temporary fossil fuel foundations of our economy with a durable ecological foundation?

When large state or regional legislatures create one-size-fits-all statutes that apply elsewhere, distant decision-makers' misunderstanding of local priority and constraints can cause policy mismatches, where good intentions pave the way to irritation at best, dysfunction at worst.

All technological solutions come with trade-offs that are too often glossed over. For example, I recently got an email from PG&E about a workshop on proper charging of heat pump refrigerants. I know that engineering is never 100.000% perfect, and that there are plans to install millions of heat pumps in millions of homes. I emailed the workshop instructor, who is also a trainer and general contractor, inquiring about my concerns:

1. leakage of refrigerant due to unskillful work on first installation, whether of poorly made piping connections or poor charging procedures.
2. leakage during normal operation of properly installed equipment
3. leakage during unskillful recharging.

in view of the fact that thousands if not millions of new units will be installed in the next few years as a climate change preventive, i am wondering about your predictions of unexpected emissions due to high numbers and poor quality installations.

His response:

I think that leakage of refrigerant under the scenarios you outlined is going to occur. I worry that the scale of the problem is large, as you noted.

CARB would be the organization watching this.
Leakage as percentage of total installs is impossible to say, maybe 60% have some leak
Ammonia is going back into use on commercial refrigeration currently, I think

So the plan to convert all furnaces and water heaters to heat pumps would mean increased emissions of one short-lived climate pollutant. This is but one example of the unwelcome side effects we can expect from implementing expedient engineering solutions.

I believe that relocalization is the best means to achieve long-term equilibrium. But local, state and federal laws and regulations are so intertwined that it's not at all obvious how to reconnect local authority with real and complete local and ecological responsibility. That's why consumers should see reliable retail measurements for embedded kwhr and GHG which will empower them with solid information directly

related to fossil fuel externalities. Another educational approach is shown here: https://vimeo.com/96637576

In general, though, we can assume that any biological, soft energy solution to a goal will have a thermodynamic advantage over an artificial material solution. For example, trees are self-winding whereas manufactured solar collectors don't grow from seeds and bugs won't recycle them. So when selecting and specifying our methods for achieving our collective needs, biological solutions should be the initial default preference. For example, planning on the development of carbon capture and storage resembles the plan to build a perpetual motion machine. Reforestation and other ecological restoration and regeneration projects are far more realistic, especially as we move up that learning curve.

It is certainly very complicated to keep track of all the legislation and government agencies that are involved in these mandates and implementation processes. Much research and theorizing have resulted, with minimal apparent change to date. And there is a certain amount of wishful thinking in legislating technological outcomes, like decreeing netzero by a certain year. It's reminiscent of jokes about laws declaring that pi = 3. Again, we have paradigm growing pains. Yet, one hopeful observation came from the faculty of UC Berkeley's Energy & Resources Group; in the mid-1980s they noted that while short-term changes after the oil crises of the 1970s were minimal, far more progress was made over the medium term of the intervening decade than had been initially hoped for.

I believe that keeping our final purposes and vision firmly in mind—in 4-dimensional detail at the local, state, and global levels—is the best way to navigate the various means at our disposal and benefit from the best. I believe local consensus solutions that are stable and healthy for all offer clues to more centralized jurisdictions for avoiding mismatches due to the information silos that are inevitable in larger hierarchical organizations, whether corporate or governmental. The diversity of panelists featured in the workshop was wide and synergistic, yet it's inevitable that large organizations are further away from each other than are their local analogues.

I believe most people realize that we need to make substantial changes but lack a tangible bipartisan vision and understanding of what a steady-state dynamic economic/ecological carrying capacity equilibrium could look like. The transition from where we are now to such a fundamentally different future reminds me of insect metamorphosis, where somehow the insect DNA knows where everything goes but the transition is completely nonlinear. **The final 2022 Scoping Plan should include a complete menu of diverse alternatives for achieving netzero carbon and climate stability so individuals and jurisdictions can tailor their local optimal solutions.**

Thank you for the opportunity to comment.