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To: CARB AB 32 Scoping Plan Update

CC: Environmental Justice Advisory Committee
Physicians for Social Responsibility
Rocky Mountain Institute
Energy Efficiency For All
NRDC
Mothers Out Front
Collaborative for High Performance Schools

Date: October 22, 2021

Re: Sept. 30, 2021 Workshop on 2022 Scoping Plan Update - Scenario Inputs Technical Workshop

Thank you for outlining the scenarios at the September 30 workshop. I would like to chime in with some initial reactions to the presentation.

Overall, I was disappointed that the health analyses will not be drafted until early next year, and that the approach does not include health impact assessments that include indoor or personal exposures. Indoor exposures to heat or combustion pollutants can dominate the adverse health impacts, especially for vulnerable populations. And the current use of the Cal Enviroscreen tool or other Heat Vulnerability Indices greatly underestimates the population exposures to heat stress because they do not include housing characteristics data that largely determine a home's ability to cool (Samuelson et al. 2020). Thus, relying on outdoor exposure estimates alone and Cal Enviroscreen to identify vulnerable populations will mislead our efforts to assess and optimize health benefits from the Scoping Plan. Those approaches will also miss a great window of opportunity to reap the health and other social benefits of climate action.

In addition, energy equity, or affordable home energy costs, is another social cost that needs to be addressed up front. For example, the health impacts of indoor overheating, electrification of home gas appliances, and weatherization on health and productivity benefits can be substantial. This is especially important in our vulnerable populations, which are increasing rapidly in size as our population ages and housing affordability decreases. At least one city is already considering an energy equity requirement in its GHG Plan to limit cost increases for home energy. Improving energy equity can produce more economic value than the energy savings alone, especially when combined with health home interventions for asthma, combustion safety, and lead poisoning.

Below are some specific comments on the scenario inputs.

Slide 7, "Quantify air quality, health, and economic impacts for each scenario."

1. I strongly concur with the speakers who pointed out that health impacts need to be addressed upfront and throughout the whole project.

2. In order to use the best science and practices, CARB should make sure that environmental health, exposure, and building science experts are at the table from the start. A task force of independent experts should be advising CARB on how to use the best available science to assess the health impacts on indoor and outdoor exposures to heat and air pollution. Several example of indoor overheating standards and how to build or retrofit buildings to avoid overheating and reduce carbon emissions are already available (Phillips and Higbee, 2021; RDH, 2020). It might be beneficial to start with a broad Health Impact Analysis screening, similar to what San Francisco did years ago in a CDC BRACE project.

3. The health impact analyses need to be conducted on a life cycle basis, and not just to a target such as 2030 or 2045, because the infrastructure and health impacts from climate change will persist for many decades, if not centuries, while our climate changes drastically over this century. For example, the carbon emissions of building materials will frontload substantially our GHG emissions, and inefficient building structures will lock in high emissions and operating costs for several decades (Slide 21 addresses building decarbonization, but not embedded carbon). Other fields such as urban forestry, natural forestry, and agriculture are already designing or selected species that will thrive in our changing climate over this century. We should also be taking the long view for mitigating and adapting our built infrastructure to climate change.

4. The model should use multi-objective optimization to address together the interrelated impacts on health, GHGs, air quality, waste heat, cost, etc., because AB 32, AB 197, and various other state laws and policies require the state to also address health and other social costs. Designing for energy efficiency alone will not assure adequate protection from overheating under current or future climates, unless solar heat gain and internal heat gains are controlled adequately. In addition, installing a more efficient HVAC system could result in poor performance when a building is retrofitted later, due to short cycling because the system has become oversized.

   However, a recent modeling study of a new Phoenix building illustrates how avoided health and climate costs could total around 40% of the utility costs, including the costs of airborne infectious disease (Baniassadi et al., 2021). Building designers and researchers are already using machine learning and other software to conduct multi-objective optimization to holistically address carbon, energy, indoor overheating, noise, cost, jobs, grid reliability, etc. It is reasonable to expect such a large economy as ours to use a similar approach.

Slide 21, Residential and Commercial Building Decarbonization

1. Building energy efficiency needs to be included, especially in existing buildings where most of the carbon emissions occur in that sector and where energy equity and thermal health are major and growing problems. For example, existing buildings already overheat, and Cal Adapt predicts that cooling needs will increase by 60% or more in the Central Valley by mid-century while heating needs decreases markedly. Many older buildings in Los Angeles and probably other coastal locations in California (pre 1990s construction) have a very high risk of overheating quickly to dangerous temperatures during a current or future heat wave (Nahlik et al. 2017; Chester et al., 2015).

   Plus, many households throughout the state cannot afford to add or operate air conditioning. However, passive and active efficiency measure packages can be very cost effective and adapted to future climates. Besides the health and equity benefits, a more efficient, future proof building structure (envelope, façade) will allow HVAC systems to be downsized, peak energy demand on the grid to be reduced, and passive survivability during a power outage to be extended.

2. California should learn from and build on the decarbonization approaches used by other regions. For example:

   - RMI, the IEA, and countries such as Canada, England, and EU nations have included energy efficiency of both building structures and systems in existing and new buildings as a key component of decarbonization programs and plans. Proposed funding for the national and EU programs are at the level of several billion dollars over the next few years.

   - Washington State and New York City require energy and carbon reductions in existing buildings. New York City's Resiliency Plan requires future climate to be factored in for all city projects, including increasing temperatures.

   - British Columbia's Energy Step Code includes overheating and air quality guidance. England's draft Future Home Standard includes requirements to avoid overheating impacts under future climates and due to urban heat islands.

3. The scenarios should include different levels of weatherization, retrofits, and decarbonization. We need to be removing carbon from the atmosphere. But to achieve at least the zero carbon emission goals, we need to greatly ramp up our building retrofit efforts. Progress on this front so far has been sluggish in California.

4. In this climate crisis, because the timing of climate change, adaptation, and emission reductions are critical, all sectors in the Scoping Plan should include adjustments for the rapid increase in average and peak heat over this century, e.g., use future weather files from climate models. Increasing heat and drought will affect nearly everything, e.g., heat pump and power generation efficiency, cooling demand, energy costs, grid and equipment reliability, and health vulnerability.

   Overheating in new and existing buildings is a major health and equity problem, under the current and future climates, the big increases in power outages, and our growing vulnerable populations are exacerbating this problem. However, including resilient cooling measures in low-income weatherization can achieve carbon, cost, and health benefits rapidly. Similarly, cool roofs and walls can also be very cost effective in a package of passive and active cooling measures. Whereas, tree planting will take many years to provide significant cooling, and will be expensive to water and maintain.

5. The state of California should be building and retrofitting its own buildings to adapt to future climates, in order to demonstrate and jump-start this approach in California. Some subsidies may be needed initially to get designers and builders up to speed, but costs will come down after that.

Thank you for the opportunity to comment. I hope and expect that CA will again become a world leader in addressing climate change and reducing its health impacts, using the best available science. To request additional supporting references, please contact me at tjp835@gmail.com.