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Rondo Energy Comments on EPIC 4 July 16th Industrial Decarbonization Workshop

Rondo appreciates the opportunity to submit the attached comments.

Additional submitted attachment is included below.

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California Energy Commission
Docket Unit

July 23, 2021

Via electronic submittal: EPIC 4 Docket--
https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01

Re: Rondo Energy Comments on EPIC 4 July 16th Industrial Decarbonization Workshop

Rondo Energy appreciates this opportunity to submit comments regarding the EPIC 4 workshop on industrial decarbonization. Rondo strongly supports CEC's ongoing efforts to solicit the latest information and the lowest-cost, lowest-risk pathways to achieve California's climate, environmental, and economic goals. We respectfully recommend that the final EPIC report include indirect electrification of industrial heat as an eligible project type.

Rondo is a California company developing and delivering a new technology that delivers zero-carbon energy for industrial processes and power generation. We see an opportunity to cut the cost of clean energy below the cost of fossil energy, and we see California's policies as critical drivers of the transition to a low-cost, low-carbon future.

California is a global leader in decarbonizing its electricity grid — leadership that has yielded considerable benefits while also creating some significant new obstacles. While renewable power gets cheaper every year, we've done little to address the impacts of 1) output variability and 2) the mismatch between peak solar generation and peak electricity demand. These factors present growing challenges to the operation of conventional power plants, the reliability of the electricity grid, and wholesale pricing and rate design.

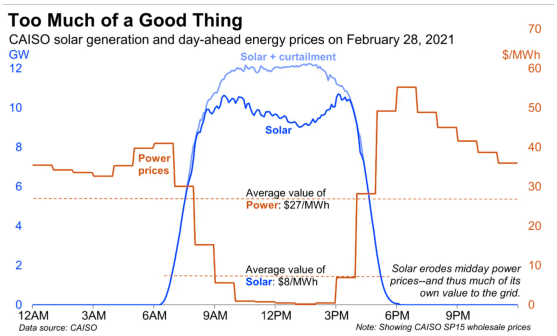

Figure 1 Growing impacts of load-generation mismatch (BloombergNEF)

At the same time, California has not yet achieved similar success in decarbonizing its industrial energy use. Industrial CO_2 emissions are larger than emissions from the electricity sector and have remained level over the past decade. It's clear that enormous amounts of low-cost, zero-carbon industrial energy are needed to keep California's economy growing without sacrificing its climate goals.

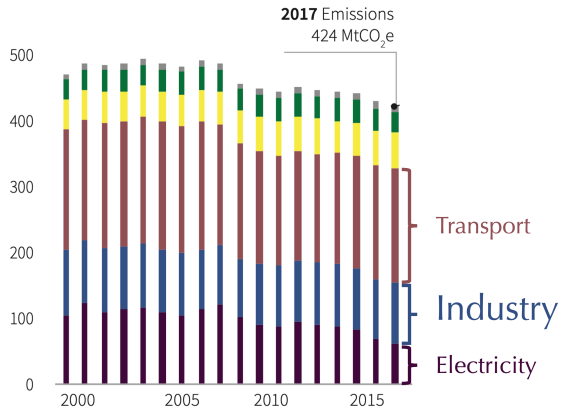

Figure 2 California emissions by sector
(EFI/ Stanford. "Action Plan for Carbon Capture and Storage," October 2020.)

Each of these problems holds the solution to the other. Industrial heating systems that are indirectly electrified can become large *dispatchable loads* that absorb intermittent peak-hour electricity at very large scale and also serve the substantial heating energy needs of industrial facilities. The deployment of such systems can significantly reduce electricity costs for ratepayers, speed the deployment of renewable generation resources, and greatly improve the resiliency and reliability of the grid.

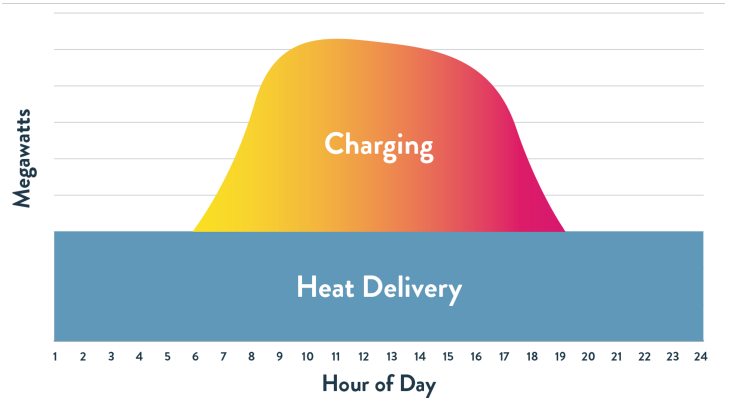

Figure 3 Indirect electrification: intermittent power to continuous heat

Research by others[1] has identified strong potential for flexible electricity loads in tomorrow's grid. Rondo Energy has developed new technology which greatly extends this potential. Rondo's Heat Battery captures solar, wind or grid electricity for continuous delivery as zero-carbon industrial heat. The Heat Battery can be charged and discharged an unlimited number of times, and is designed to serve over 95% of California's industrial heat demand.

Storing electricity as heat for industrial use is far cheaper than any electric-to-electric battery, making indirect industrial heat a compelling opportunity for California's industries and for its electricity grid.

[1] e.g. Ruggles, Caldeira et al. https://doi.org/10.1016/j.adapen.2021.100051

The California Air Resources Board previously recognized the potential benefits of renewable heat in the development of the Low Carbon Fuel Standard, placing value on low-carbon energy for both biofuel production and innovative crude production. This policy has successfully stimulates technology development and market initiatives that will drive down criteria pollutants and carbon emissions at low costs. CEC's EPIC program can drive wide commercial adoption of indirect industrial electrification by supporting pilot projects in several industrial applications.

A wider look at renewable heat is a major opportunity to develop technologies that will drive *decarbonization without deindustrialization*: zero-carbon energy supplies for industrial users that become permanently lower cost than today's carbon-based energy.

Though historically overlooked, there are huge opportunities for renewable heat, and the EPIC program can focus on this underserved market in a significant yet practical way. Renewable thermal heat can meaningfully reduce direct combustion emissions from most of California's manufacturing and process industries, including the production of cement, glass, food and beverage, fuels, and metals. Pilot projects for each of these industries would bridge different knowledge gaps — this includes high-pressure steam, seasonal operations, high-temperature steam, and more.

Renewable thermal heat replaces combustion, meaning these solutions can decarbonize the "hard to get" reductions that have eluded previous planning efforts. And because this technology directly reduces in-basin combustion, the benefits to local air quality — and the impacted communities in which industrial facilities operate — are direct, significant, and permanent.

As part of this EPIC update, CEC should consider mechanisms that go beyond the historic technology presented at the workshop. Given the critical and challenging goals of the State (2045 Carbon Neutrality), and the readiness of a variety of new renewable thermal technologies, such an inclusion of indirect electrification could be hugely successful in motivating innovation, investment, and industrial growth in the State.

We respectfully suggest that the indirect electrification of industrial heat should be a key focus topic in CEC's program development. We recommend that CEC include a robust program for identifying and piloting indirect electrified heat across industrial applications, from cement to metals and minerals to food processing. The projects ought to be measurable. They should be big enough to be meaningful, they should require an industrial heat off-taker, and they should incorporate technologies with demonstrated success in industrial use.

These pilot projects will have a big impact on in their respective industries, speeding market introduction by years. That's going to yield benefits for impacted communities with lower emissions, and for ratepayers through lower cost electricity. It's also going to mean that California's zero-carbon policies will provide competitive benefits, not burdens, to California manufacturers, tapping into a large and growing source of low-cost, zero-carbon process heat.

Thank you for the opportunity to provide these comments. We look forward to continued discussions.

Sincerely,

/s/

John O'Donnell
CEO, Rondo Energy

