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**Maltaâ€™s Comments following the Senate Bill 423 Emerging
Renewable and Firm Zero Carbon Resources Workshop**

Additional submitted attachment is included below.



December 1, 2023

Agency: California Energy Commission (CEC)
Docket No.: 21-ESR-01
Subject: Senate Bill 423 Emerging Renewable and Firm Zero Carbon Resources
Email: docket@energy.ca.gov

Re: Malta's Comments following the Senate Bill 423 Emerging Renewable and Firm Zero Carbon Resources Workshop

Dear California Energy Commission (CEC) staff,

Malta, Inc. (Malta) appreciates the opportunity to submit these comments following the Lead Commissioner Workshop on Senate Bill (SB) 423 Emerging Renewable and Firm Zero Carbon Resources ("Workshop") held on November 17, 2023. In these comments, Malta provides our feedback and recommendations on the proposed analytical approach for developing the SB 423 Emerging Renewable and Firm Zero Carbon Resources Report ("Report"), which will be submitted to the Legislature by December 31, 2023.

Malta is a privately held company that was spun out from X (Alphabet's "Moonshot Factory," formerly known as Google X) in 2018 and offers a long-duration pumped heat energy storage (PHES) system, providing energy storage capacity from 8 hours to 8 days or longer. Malta's PHES system consists of commercially-available and proven technologies and equipment, with the innovation coming from the integration of these components. Malta's PHES technology combines and integrates various technologies commercially available today with a high degree of maturity from the power plant as well as the oil and gas industry and integrates them into a new high-temperature heat pump storage system as one of the few synchronous long-duration energy storage (LDES) technologies commercially available today.

I. INTRODUCTION & SUMMARY.

Malta appreciates this opportunity to comment on the proposed analytical approach for the SB 423 Report – a critical assessment that will inform how California should plan for multi-day extreme or atypical weather events on its path to full decarbonization of the electric sector by 2045. As outlined in SB 423 and largely mirrored in the CEC's proposed definition, firm zero-carbon resources ("FZCRs") will play a critical role in achieving the state's clean energy objectives while maintaining electric grid reliability and resiliency. With the SB 423 Report due to the Legislature before the end of the year, Malta recognizes that there is little time for major changes or additional analyses, but this report nonetheless will serve as a critical foundation to guide the 2025 SB 100 analysis occurring in parallel and potentially to guide regulators, policymakers, and load-serving entities (LSEs) in taking actions with FZCRs in the form of policies, regulations, programs, and procurement. In particular, Malta emphasizes that FZCRs will support resource diversification, enhance grid reliability, and advance the state toward its decarbonization goals.

With this in mind, Malta offers the following comments and recommendations as the CEC staff finalizes the analytical approach and drafts the report to be submitted to the Legislature:

- The definition of FZCRs should ensure that resources are truly zero emissions and not allow for partial counting of less than 100% carbon capture or flex/blended fuel technologies.
- The CEC should add utility-scale thermal storage systems in the technology assessment with technology readiness levels (TRLs) between 6-9 and develop a methodology for composite TRL scores for integrated resources using mature and widely-demonstrated components.
- Future reliability assessments should look at the role of FZCRs in generating portfolio cost savings, the timing and magnitude of FZCR deployment, the location-specific needs for FZCRs, and the other reliability attributes needed from FZCRs as like-for-like replacements for firm fossil resources.
- Key barriers and potential solutions should be included in the final SB 423 Report, including gaps in valuation for synchronous LDES attributes, and stopgap incentives and funding should be considered until market products recognizing these reliability attributes are developed.
- A future refresh of the SB 423 report is encouraged given the fast-changing state of FZCRs, with the timing of the next update aligning with the SB 100 analysis in order to be incorporated into the 2025 SB 100 report to the Legislature.

II. DEFINITION OF FIRM ZERO-CARBON RESOURCES.

The CEC proposed that the FZCR definition as resources or combination of resources that reliably produce zero-carbon electricity on demand, ensuring a consistent and stable power supply for extended periods and/or are eligible for the Renewable Portfolio Standard (RPS). For the purposes of this analysis, the CEC proposed that an FZCR must satisfy the following criteria (with Malta's edits offered below):

- **Provides steady electricity output:** It does not include standalone wind or solar resources, but it may include zero-carbon fuels storage (e.g., hydrogen storage, reservoirs) and natural gas pairing with CCUS allowable (100% capture rate ~~or partial counting for less than 100%~~). ~~Flex fuel may be acceptable.~~
- **Enables multi-day operations:** Resources must be able to operate during subsequent days of an extreme event, and systems must be dispatchable or baseload, though not necessarily 24/7.

Malta supports most of the proposed definition of FZCRs, particularly the inclusion of various LDES technologies as a key option in this asset class.

However, Malta recommends that the CEC modify its definition of FZCRs to ensure that all such resources are truly zero emissions. That is, there should be no partial counting for less than 100% carbon capture technologies or for flex/blended fuel technologies. There should be no tolerance for resources to qualify as an FZCR until they reach zero-carbon emissions, and this determination should be a binary determination. This definition should govern any policies, regulations, or programs developed toward FZCRs. Otherwise, Malta believes that there is significant stranded asset risk if these resources never achieve 100% capture rates or zero-carbon fuel blends and could counteract the very goals set forth in SB 100. Other programs, tax incentives, and mechanisms at the federal level are in place to support their transition to eventual FZCR status, but California's definitions should not put this risk on its taxpayers and ratepayers.

III. TECHNOLOGY ASSESSMENTS.

Malta recommends that the CEC modify its current emerging technology assessment based on the commonly-used TRL scale. First, Malta recommends that the CEC include utility-scale thermal storage systems in the technology assessment, such as Malta's synchronous PHES system. Even if the CEC is not inclined to incorporate specific technologies, such as those of Malta, it should include thermal storage as its own category of LDES technology type, consistent with the Department of Energy's (DOE) *Pathways to Commercial Liftoff* Report on LDES.¹ The sensible heat category of thermal LDES technologies itself (where Malta's technology falls) is scored by the DOE as TRL 6-9, showing its market adoption readiness. This represents a critical oversight in the SB 423 Report that should be corrected in the final report to the Legislature.

Furthermore, Malta recommends that the CEC develop a composite TRL methodology and score that assesses the TRL on a physical component level and applies the appropriate weights to each component. An overall technology-specific TRL may be more appropriate for LDES that is "storage in a box" and/or invents a new chemistry or storage medium to provide long-duration storage capabilities. There are other LDES technologies such as that of Malta where the innovation comes in the form of integrating mature and tested physical components into operational LDES power plant. In Malta's case, every one of the components in our PHES system can be scored with a TRL between 6 and 9, making it one of the most market-ready LDES technologies available, even though a fully-integrated commercial deployment has yet to be achieved. By virtue of using mature components, Malta's technology also has a ready supply chain that does not need to be custom built for a specific new storage chemistry or solution since they serve other industries as well. Such composite TRL scoring of FZCRs may not be limited to Malta's PHES system but also to other technology types, such as floating offshore wind, which use many of the same mature components as anchored offshore wind except with several new components (*e.g.*, floating sub-structure platform, mooring lines) and with certain site-specific uncertainties.

¹ DOE. *Pathways to Commercial Liftoff: Long Duration Energy Storage*. March 2023. At 13. <https://liftoff.energy.gov/wp-content/uploads/2023/03/20230320-Liftoff-LDES-vPUB.pdf>

IV. RELIABILITY ASSESSMENTS.

Malta is generally supportive of the preliminary reliability assessments underscoring the need for FZCRs, which looks at how they impact the requirement for other resources and the mitigation of multi-day extreme weather events. We look forward to further reviewing the methodology and analysis involved in the final SB 423 Report. However, we have several key areas of feedback, potentially addressed qualitatively in the final report by December 31, 2023 and addressed in earnest and detail in the future report update.

First, consistent with the comments made at the dais during the Workshop, Malta recommends that the CEC incorporate an economic analysis of the portfolio cost savings of incorporating more FZCRs (and, in turn, reducing overbuild of other resources) and the timing of the FZCR deployments, which will be critical insights for the SB 100 analysis and future modeling efforts in Integrated Resource Planning (IRP) efforts at the California Public Utilities Commission (CPUC) and individually by municipal utilities. If a significant magnitude of FZCRs is needed, for example, in the 2030-2035 timeframe, it would inform how procurement activities and support mechanisms are needed earlier. In other words, actions would be taken now or in the near term to broadly commercialize and deploy FZCRs, accounting for commercialization/construction timelines and interconnection backlogs.

Second, Malta recommends that the CEC consider location-specific needs for FZCRs in the SB 423 Report, such as transmission-constrained load pockets where many gas units exist today or for key transmission corridors where wildfire outage or related de-energization risks are high. FZCRs will likely play a critical role in not only system-level renewable droughts but also in providing location-specific resiliency while simultaneously supporting the retirement of key fossil units.

Third, Malta recommends that the CEC expand the assessment of the role of FZCRs to not only consider their role due to the expected duration of multi-day extreme and atypical weather events but also to consider the other reliability attributes needed to facilitate the integration of renewable resources in a zero-carbon electricity grid. With the reliability assessment more narrowly focused on the capacity and energy value of FZCRs in mitigating loss of load, it will overlook the other reliability attributes of firm fossil resources that FZCRs are intended to replace. The role of FZCRs should extend beyond capacity and energy services to include voltage regulation, short-circuit current, and synchronous inertia – all of which will be important considerations in a zero-carbon grid that will rely on high levels of inverter-based renewable resources. Recent tripping events of inverter-based resources, for example, led to the Federal Energy Regulatory Commission (FERC) directing the North American Electric Reliability Corporation (NERC) via Order No. 901 to develop standards to mitigate risks stemming from similar events. By procuring FZCRs with these “other” reliability attributes, which to date have been taken for granted as provided for “free” by firm fossil assets, reliability can be enhanced, and portfolio efficiencies can be gained. Malta’s synchronous PHES provides many of these very attributes, such that the state of California could stack these value streams from targeting and procuring such FZCRs.

V. IDENTIFICATION OF BARRIERS AND RECOMMENDATIONS FOR SOLUTIONS, PROJECTS, AND INCENTIVES.

Pursuant to SB 423, the CEC was directed to identify barriers to the development of FZCRs, recommend possible solutions to these barriers, recommend changes to research and development (R&D) and demonstration projects, and/or recommend changes to energy incentives. These elements of the report were not included in the presentation at the Workshop. As a (non-exhaustive) starting point, Malta highlights some of the barriers and proposed recommendations for inclusion in the final SB 423 Report or in the next report after further discussion and vetting with stakeholders.

Barrier	Potential Solution	Explanation
Insufficient valuation for multi-day long-duration capacity in slice-of-day constructs	Refine energy accounting for charging energy and capacity needs for multiple days, not a single worst day of the month	Incremental improvements have been made to add an energy accounting component, but it only focuses on a 24-hour period
Lack of standard resiliency planning and/or resiliency valuation	Establish a value of resiliency and/or plan and procure toward resiliency scenarios	High impact, low frequency (HILF) events (e.g., wildfires) may warrant unique resiliency-related services, planning, and procurement
Misaligned incentives for new-build local capacity resources with central procurement model	Shape and target location-specific procurement and/or modify current central procurement structures	LDES and other FZCRs are great fits as local capacity resources, but procurement incentives are not aligned
Lack of valuation and procurement for “other” reliability attributes traditionally provided by firm fossil resources	Co-optimize capacity expansion and/or develop market products for voltage regulation, black start, short circuit current, synchronous inertia, etc.	These attributes were provided for “free” by firm fossil resources, and heavy reliance on inverter-based resources have highlighted some of these risks (e.g., see Order No. 901)
Interconnection backlogs and permitting delays	Determine efficient, fast-track pathways to repower existing firm fossil assets with FZCRs, in addition to other reforms applicable to all resources	Siting FZCRs at or near existing firm fossil assets can more efficiently repurpose existing infrastructure and interconnection capacity

For many of the barriers above, a potential short-term solution could be the funding and development of deployment buydowns and incentives to mitigate “missing money” and first-of-a-kind (FOAK) commercial deployment challenges. The CEC’s LDES Program is one example that is intended for this very purpose, and it is fortunately funded and will soon be available for FOAK LDES deployments, but continued and sustained support is needed to facilitate the initial

commercial deployments and serve as stopgap incentives until market products and valuation mechanisms are developed to compensate these long-duration and/or “other” reliability attributes.

VI. CONTINUOUSLY REFRESHED ASSESSMENTS.

In our read of SB 423, the CEC is only directed to meet the December 31, 2023 Report submission deadline, with no requirement to continuously update this Report. By the nature of most FCZRs being “emerging” or early-stage technologies that are just starting to commercialize or will soon commercialize, this assessment will need to be regularly updated in order to capture the rapid evolution of the technology landscape, capabilities, and cost curves. Every year, some or many of the known FCZRs at this time will undergo learnings associated with FOAK commercial deployments and experience learning and scaling-related cost reductions with every “n-th” deployment of the FCZR project. It is also likely that new FCZR technology types may emerge, offering California with additional options to address the needs identified in SB 423 and in the inaugural SB 423 Report. As such, it is prudent to continuously evaluate the state of FCZR technologies, costs, and capabilities, as well as the underlying grid needs for FCZRs.

To this end, Malta was encouraged to hear at the Workshop that the CEC will conduct another iteration of SB 423 in two years. Establishing a clear intent and commitment to completing the next round of assessments in the near future will ensure that the CEC, Legislature, and other agencies are informed of developments of FZCRs. This will also guide LSEs who are all planning toward deeper and deeper decarbonization requirements for the electric grid, including the requirements from the CPUC to procure 1,000 MW each of LDES and firm clean resources by 2028 as part of the Mid-Term Reliability (MTR) procurement order. Over time, the CEC will have access to a clearer technological landscape and their associated commercialization statuses and have improved inputs for any future assessment.

While encouraged by the future commitment to update the SB 423 Report, Malta encourages the CEC to produce an updated report before the end of 2024 in order to inform the SB 100 analysis and report, which will be finalized before 2025. Since the 2025 SB 100 Report is modeling a Resource Diversification Scenario and a Gas Retirement Scenario, updated and clearer assessments of FZCRs could be an essential tool and input into these scenarios, especially as FZCRs serve as the foundation to address the needs in those respective scenarios. The short timeframe from now until the end of the year does not allow for a complete and clear assessment of FZCRs for all the reasons expressed above. Recognizing the statutory deadline for the SB 423 Report, an initial assessment must be submitted, but it should be refined and improved based on some of the recommendations above to ensure FZCRs are accurately represented and forecasted. With the additional time in 2024, the SB 423 Report could be enhanced with concrete identification of barriers, which can guide the development of policies, regulations, funding programs, and incentives, among other solutions, to overcome these barriers.

December 1, 2023

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VII. CONCLUSION.

Malta thanks the CEC for the opportunity to offer these comments and responses regarding the SB 423 Report's analytical framework and scenarios. Please do not hesitate to reach out if you have questions or wish to discuss any of the comments or responses above.

Sincerely,

A handwritten signature in black ink, appearing to read "Jin Noh". The signature is fluid and cursive.

Jin Noh
Director, Business Development & Policy
December 1, 2023