Comment Received From: Clean Coalition
Submitted On: 9/14/2022
Docket Number: 22-IEPR-05

Clean Coalition Comments on FaÃ§ade-Integrated Solar

Comments introducing FaÃ§ade-Integrated Solar and a request for the CEC to label it as Energy Efficiency.

Additional submitted attachment is included below.

14 September 2022

California Energy
Commission
715 P Street,
Sacramento,
CA 9581
Via Electronic Filing

RE: CEC Docket 22-IEPR-05: Clean Coalition Comments on Façade-Integrated Solar for the Emerging Technologies section of the 2022 Integrated Energy Policy Report

Dear Chair, California Energy Commission Members, and Staff,

The events of the past week — a heat wave causing unprecedented electrical demand as residents struggled to stay cool and immense strain on the electric grid that caused the grid operator to call multiple Energy Emergency Alert 3s — were another rude awakening about the scale of transformation that needs to occur to ensure that the grid is capable of handling the everyday stresses of climate change and a fully electrified society. California needs a significant amount of new capacity to come online within the next few years, especially if the state intends to close the Diablo Canyon powerplant following the SB 846 extension. In past estimates from the Integrated Resources Planning proceeding, the CPUC has determined that the state needs an additional 3,300 MW[1] of qualifying capacity and subsequently increased that to 11,500 MW.[2] Yet, if anything, recent events have proven that past estimates were overly conservative. We need additional capacity and more urgently than previously considered.[3]

During the heat wave, it was encouraging that distributed energy resources ("DER"), energy storage devices, and demand response programs were able to provide a significant amount of energy during the day and help bring down the peak load, preventing rolling blackouts. Before the next situation occurs where the grid is placed into emergency conditions, California needs multiple times the amount of DER that were available. This necessitates broader DER adoption of existing technologies as well as promoting emerging technologies. Increasing the accessibility of DER and providing appropriate value-based incentives to ratepayers of all customer classes dually benefits the technology-adopter as well as the grid. Deploying DER results in profit via a reduced energy bill or energy sale/grid services. For the grid operator, local generation, and reduced load (either temporary via demand response or permanent via energy efficiency) both lower the amount of transmission energy required, reducing transmission congestion.

[1] D. 19-11-016
[2] D. 21-06-035
[3] CPUC R. 20-05-003 ADMINISTRATIVE LAW JUDGE'S RULING SEEKING COMMENTS ON STAFF PAPER ON PROCUREMENT PROGRAM AND POTENTIAL NEAR-TERM ACTIONS TO ENCOURAGE ADDITIONAL PROCUREMENT (filed September 8, 2022)

The Emerging Technologies section of the IEPR has the potential to increase the number of value-creating deployments a ratepayer can choose from, moving toward a more ideal future where each ratepayer/facility/community can have an energy solution tailored to its needs. The IEPR is a policy guidebook that categorizes California's energy landscape. Each update provides a list of ongoing and new issues related to efficiency, reliability, health/safety standards, and affordability. As a result, the Emerging Technologies section is particularly important, given the necessity of a speedy transition over the next decade to replace polluting resources with renewable resources and electrify the state. We urge the Commission to identify a number of nascent technologies and use the more in-depth proceedings to consider which technologies are complicated enough to merit significant discussion versus uncontroversial technologies that will only require some basic oversite. By broadening the number of technologies available to choose from, customer groups which have historically been left out[4] will be able to find options that benefit both them and the grid.[5]

A cursory look at the Emerging Technologies docket shows that the main topic thus far has been the role of hydrogen. Given the importance of the new format of the IEPR — with a shorter summary report and multi-year in depth proceedings for analysis — the summary report should cover a broader range of nascent technologies. In doing so, the Commission can prescribe some commonsense directives to avoid future regulatory hurdles that can arise when a new technology is first adopted en masse and provide the public (including ratepayers, developers, governments, CCAs, and utilities) with information about new types of resources.

The Clean Coalition is a nonprofit organization whose mission is to accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise. The Clean Coalition drives policy innovation to remove barriers to procurement and interconnection of distributed energy resources ("DER") — such as local renewables, demand response, and energy storage — and we establish market mechanisms that realize the full potential of integrating these solutions for optimized economic, environmental, and resilience benefits. The Clean Coalition also collaborates with utilities, municipalities, property owners, and other stakeholders to create near-term deployment opportunities that prove the unparalleled benefits of local renewables and other DER.

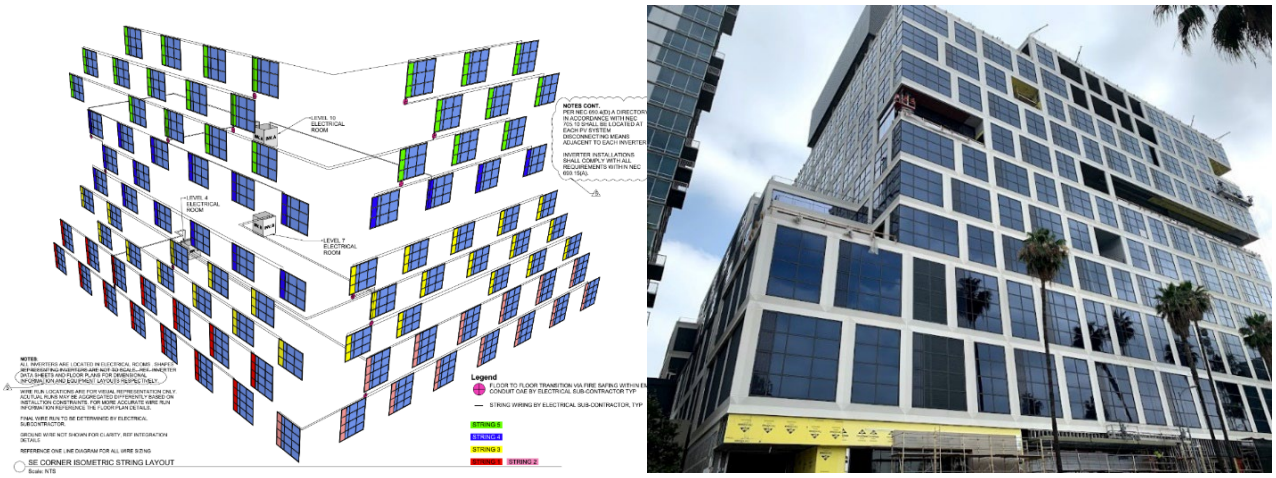
While the introductory comments above address broader issues within the IEPR framework, the main comments today will address a group of nascent technologies, called Façade-Integrated Solar ("FIS"). Given the broad scope of the Order Instituting Informational Proceeding ("OIIP") on DER, we feel that addressing a few definitional issues related to these nascent technologies is most appropriate in this forum.

COMMENTS

[4] Such as renters, disadvantaged communities, or mixed-use developments.
[5] E.g., an individual deployment or combination of generation technologies, electric vehicles, energy storage, flexible load/demand response, energy efficiency, etc.

Defining Façade-Integrated Solar

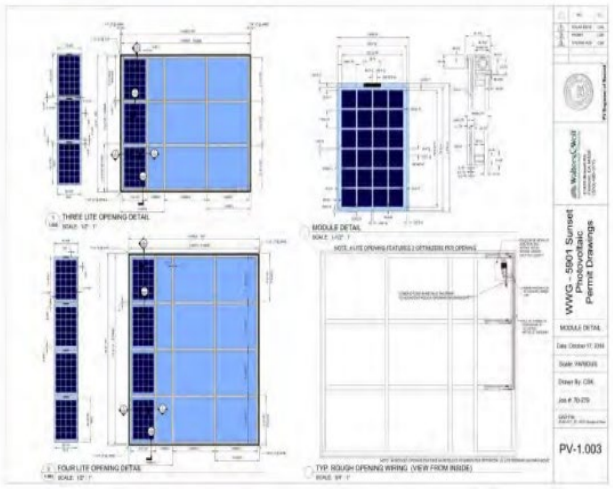
The term "Façade-Integrated Solar" encompasses generating technologies that are deployed as part of the building envelope. These resources — like solar windows and solar shades — help maximize the efficiency of a facility as a generating resource, without increasing grid usage due to increased energy exports. Unlike rooftop solar, south/west facing vertically integrated solar production is maximized in that later parts of the day when the grid is most vulnerable. East facing vertical solar can be utilized to offset buildings that are designed to time their cooling/heating resources with solar resources. Full sun in the early hours of the day can help offset a building's need to pre-cool or pre-heat. In turn, FIS is poised to add value to the built environment and foster the transition to Grid-Efficient Buildings ("GEB"). It should also be known that FIS typically only sustains a fraction of real-time load, meaning that it can be classified as a non-export technology. Even during periods of peak solar production, a facility that has fully integrated FIS will not produce enough energy to completely net zero the property.[6] Below are a few examples of FIS:



System Schematic and Post-Construction view of the Netflix building[7]

[6] Clean Coalition Opening Comments on NEM ALJ Ruling and Questions, at p. 5

[7] These are images of the Netflix building in Los Angeles (located at 3901 Sunset Blvd), an early adopter of FIS. There are two arrays, one the South wall and the other on the East wall that total 31.3 kW. The total annual production, around 26,685 kWh, reflects slightly more than 1% of the total load of the 15-story, 489,000 square foot building.



Tower shop drawing, showing the integration of the polycrystalline solar cells into the windows. Shop drawing by Walters and Wolf.

Configuration of the devices used in the Netflix Building (left) and NEXT Energy's Solar Window (right)

FIS is a great complement to rooftop solar and other traditional generating resources, particularly when paired with energy storage that can provide a layer of resilience. In the event that FIS is paired with a rooftop system that exports, technology can be utilized to ensure that the FIS is curtailed or disconnected from the grid. Such technologies include curtailable inverter technologies and reverse-power relays.

Existing barriers to widespread deployment of FIS

With a status as nascent technologies that have seldom been deployed, there has not been a significant need to create technology-specific rules to govern deployment/interconnection of FIS. However, to achieve market readiness and begin widespread deployments across the state of ready-to-scale FIS resources, it would be beneficial to have foreseeable regulatory hurdles cleared in advance. The issue that needs to be addressed is that FIS are currently treated as generating resources. Consider two scenarios under which FIS might be deployed currently: 1) Net Energy Metering ("NEM") export and 2) Rule 21 non-export.

1. Under the existing rules for NEM, the maximum system size is determined by the historical load (the amount of energy it would take to achieve zero net energy). As a result, adding FIS would take away from the amount of rooftop solar that could be deployed on the property. Moreover, a FIS project would have to go through the Rule 21 interconnection process, creating unnecessary waiting times before the technology could be deployed, potentially delaying the normal construction process.
2. Other than a NEM tariff, a facility that deployed a FIS project could only choose a Rule 21 non-export tariff. If a building included a rooftop system, the NEM tariff would likely be preferred. Selecting a non-export tariff for FIS would be suitable but precludes other DER of substantial capacity from being included.

In both tariff scenarios, the property owner is unable to realize the full value from a FIS

deployment, due to interconnection costs/timelines and a reduced capacity to deploy other DER. Unlike rooftop PV, which can be sized to reach zero net energy and export significant amounts of energy, deployments of FIS have the effect of reducing the real time load. Based on value offering alone, FIS is starkly different than PV and that is without mentioning differences in deployment timelines. The two technologies should not be treated as one and the same; doing so sends an incorrect price signal to consumers about the value of FIS.

Request to label FIS as energy efficiency and include it in the IEPR

We contend that Façade-Integrated Solar is more like energy efficiency than a generating resource and request that the CEC categorize it as such in the IEPR. For FIS to truly thrive, it needs to be ubiquitously available as a standardized plug-and-play product which can be specified by any architect without extensive or unnecessary design, integration or interconnection restrictions. Essentially, continuing to label FIS as a generating resource eligible for service under NEM and subject to interconnection requirements will surely slow down adoption of the technology, as opposed exempting it from NEM and labelling it as energy efficiency.[8]

Energy efficiency is a more apt comparison for FIS than generating resources

The CEC definition of energy efficiency is, "adapting technology to meet consumer needs while using less energy," which applies directly to FIS. When a facility self-generates and consumes the energy on-site, the real effect is a reduction in the net load, making it much more like energy efficiency than importing energy from the grid.[9] Therefore, while FIS technologies are resources that generate energy, they most closely align with the definition of energy efficiency.

The closest existing energy efficiency measure that can be compared to deploying FIS is installing insulated windows. Replacing the windows in an existing facility is a standard energy efficiency measure that increases insulation, reducing heat loss and lowering the facility's annual carbon footprint by around 12%.[10] In comparison, one type of FIS, solar windows, are insulated windows coated with photovoltaic layers that enable a small amount of generation.[11] Solar windows also have a much lower Solar Heat Gain Coefficient — the fraction of solar radiation admitted through a window, door, or skylight — compared to traditional efficient windows, meaning they provide greater solar control and let in less solar heat. A recent study conducted under the Wells Fargo Innovation Incubator found that NEXT Energy's solar windows (pictured above on page 4) have a Solar Heat Gain Coefficient of below 0.2, whereas the typical commercial window has a coefficient in the range of 0.25-0.8.[12] In other words, for retrofits to existing buildings, deploying FIS has the dual benefits of acting as insulated windows and producing enough energy to reduce the total facility load. For new constructions, since all load is incremental load, FIS reduces the load that comes online when construction is complete and the

[8] Ibid, at p. 8
[9] Ibid, at p. 3
[10] On average Energy Star certified insulated windows reduce the annual carbon footprint of a facility by 12%. https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights/benefits
[11] The effectiveness of energy generation varies based on the amount of sunlight, positioning of the windows, and the transparency of the glazes used.
[12] https://www.pacbiztimes.com/2022/08/26/goleta-startup-next-energy-passes-test-for-its-solar-windows/

building is occupied, thereby reducing the amount of standby generation the incumbent utility needs to reserve.

The table below compares the overall effect of traditional energy efficiency measures with the generational profile of Façade-Integrated Solar (without also factoring in the extra insulation that comes with an installation of energy efficient windows).

Table 1: Relative Savings from different energy efficiency measures

Energy Efficiency Measure	**Average Percentage of Savings**
Switching to LED light bulbs	15% of energy bill[13]
Installing insulated windows	12-14% of heating bill[14]
Installing a heat pump	20-40% reduction in energy consumption[15]
Proper insulation/re-roofing	11% of total energy costs[16]
Façade-Integrated Solar	**<20% reduction of energy usage[17]**

When measured against other types of upgrades categorized as "energy efficiency", FIS fits right in by providing benefits on multiple levels (through decreased demand for grid energy and better insulation, leading to a lower energy bill and a lower heating bill).

Configuration differences of FIS as compared to PV

FIS resources are nascent technologies with non-standard configurations that depend on the size of a facility, the positioning of the building, the total electrical load, and any existing generation. While the operational similarities of a FIS installation would be most like a Rule 21 non-export system, the actual configuration is nothing like any other PV installation. Due to the unique configurations of FIS projects (with micro-inverters and direct connections to power electrical outlets/devices), current interconnection tariffs cannot be effectively applied. Interconnection timelines would cause unnecessary delays in the building process. While traditional PV is added once a roof is finished, FIS is deployed during the construction of the building. FIS is deployed by the glazing subcontractor, who finishes the glaze and wires sections on curtainwall on the floor of a shop before it is delivered to the site and put in place in sections by the general contractor. Whereas the interconnection process for PV does not usually impact the functionality of a facility it is being deployed on, a new construction building cannot be completed/functional

[13] https://www.energysage.com/energy-efficiency/why-conserve-energy/environmental-impact-of-ee/
[14] https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights/benefits
[15] https://www.blocpower.io/posts/do-heat-pumps-save-money#:~:text=According%20to%20the%20Environmental%20Protection,annual%20heating%20and%20cooling%20bills.
[16] https://www.energystar.gov/campaign/seal_insulate/methodology
[17] Based on estimates of NEXT Energy's solar window technology

until the full building façade is deployed. As a result, it is integral that FIS is not constrained by an interconnection process and can be deployed during the normal construction timeline.[18]

It is important that FIS meet technical standards, yet not necessary to create a new interconnection process specific to FIS, given the number of variables involved with FIS projects. The base load of most of the buildings that currently host FIS or would benefit from FIS typically exceeds the output of the FIS system. Moreover, current FIS power management systems can restrict back-feeding via rapid shutdown devices or microinverters (when they are operationalized for FIS), making the need for grid connection unnecessary. In fact, FIS-generation will not trigger a Net Generation Output Meter ("NGOM").[19] Therefore, eliminating the possibility of energy back feeding to the grid should end the need for FIS installations to go through the arduous interconnection process.[20]

FIS is a green building solution

FIS allows building owners to take advantage of tailor-made solutions to meet Green Building and Authorities Having Jurisdiction ("AHJ") Sustainability code requirements, when they may have limited roof space to do so. For example, to gain a LEED platinum rating, a building is required to source 5% of its energy from on-site renewables. Moreover, the next update to the CEC Title 24 Building Energy Efficiency Standards, in January 2023, will set a date by which all single-family homes must be "electric ready", a transition that will require the rapid adoption of nascent energy efficiency technologies like FIS. In addition, it is worth noting that there is existing precedent in other jurisdictions to treat FIS as energy efficiency. The Energy Efficiency Code for the city of Boulder, CO states, "On-site renewable energy generated by a system installed as part of this [a FIS] project that is used by the building shall be subtracted from the proposed design energy consumption prior to calculating the proposed building performance."[21] By designating FIS as energy efficiency, the CEC will be encouraging green building throughout California.

FIS works well with other resources

FIS is a great complement to rooftop solar and other traditional generating resources. Since the FIS meets a portion of the on-site load in real time, a greater amount of energy from other DER can be exported to the grid. With an energy storage device, FIS energy can power facility loads at peak times, reducing the amount of grid energy needed at the most expensive times of the day. In addition, when paired with energy storage, a deployment of FIS can provide a layer of resilience or form an islanded microgrid — if the facility is properly equipped with grid isolation switches and microgrid monitoring, communications, and controls ("MC2"). A valuable application of FIS might be at a number of facilities within a business park participating in the same Community Microgrid for resilience purposes.[22]

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[18] Moreover, because FIS will not back feed to the grid, having an existing grid connection should not be a requirement to deploy a FIS project.
[19] An NGOM is used to measure the backwards flow of energy (energy exports) from a NEM system.
[20] Clean Coalition Opening Comments on NEM ALJ Ruling and Questions, at p. 7
[21] City of Boulder, CO, Energy Efficiency Code, Section C407.5, on Solar requirements at Page C75 https://bouldercolorado.gov/sites/default/files/2020-12/2020cityofboulderenergycode2ndptg1.pdf
[22] See the Clean Coalition's Resilient Energy Subscription Webinar on Financing Community Microgrids at Critical

CONCLUSION

The Clean Coalition appreciates the opportunity to submit comments and wishes to reiterate the importance of providing ratepayers with additional DER solutions that can provide value, especially those that do not increase demand for grid energy. We urge the Commission to include FIS, labelled as an energy efficiency measure, in the Emerging Technologies section of the IEPR. FIS should not be treated like a generating resource and subject to interconnection rules; it would be far more effective/accurate that FIS be subject to energy efficiency rules.

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Facilities.
https://clean-coalition.org/news/webinar-resilient-energy-subscription-res-a-streamlined-market-based-approach-to-financing-community-microgrids-wednesday-31-august-2022/