

How a Crisis Led to Zero Net Energy

By Jennifer Fragomeni

We often hear the saying, “When life gives you lemons, make lemonade.” This article is about how the Exploratorium’s Campus Facilities department “made lemonade” to help the Exploratorium’s bottom line during 15 months of pandemic closure and beyond.

Facility professionals at every cultural institution in the U.S. will remember the declaration of a national health emergency that happened in mid-March 2020. A mysterious new respiratory virus—SARS-CoV-2, known commonly as COVID-19—was making people sick. It was deadly for many, and we didn’t know how it was spread. People were told to shelter at home to prevent the spread of disease, and “non-essential businesses,” such as our beloved cultural institutions, were temporarily shuttered.

When the Exploratorium shut down, our facilities technicians used well-known best practices to conserve energy: setpoints for the heating and cooling system were (mostly) broadened from a 5-degree band to a 10-degree band, and lighting and ventilation schedules were minimized to accommodate the



The Exploratorium at Pier 15.

few security guards, building technicians, and other staff performing “minimum basic operations” on campus.

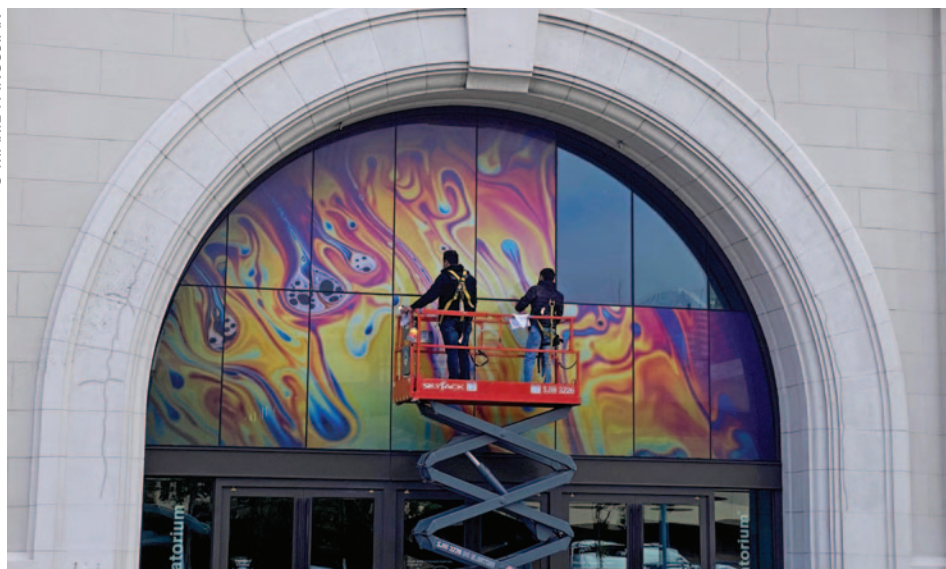
Minimized occupancy also meant maximum savings in water usage and waste disposal. Using best practices to establish standard building setbacks had created “automatic” offsets to the revenue loss the Exploratorium was experiencing by being closed.

Many of us initially thought that the pandemic would be over in a few weeks. By late May 2020, however, the

Exploratorium was just beginning to allow a restricted number of “non-essential” staff access to campus. These restrictions loosened very gradually over the following months as the pandemic unfolded. And, as more people returned to campus, the Exploratorium’s facilities technicians kept the buildings tuned to accommodate the number of people onsite.

By the time the winter surge had subsided in March 2021, the Exploratorium had been closed for a year, but things were looking up. It was now understood that COVID-19 transmission was primarily through respiratory droplets, and vaccines were becoming available. Our ventilation systems were operating at 100 percent capacity, except for a few areas that remained unoccupied.

Economizers were disabled to maximize fresh air. The ventilation system in our LEED Platinum building at Pier 15 had already been using MERV 13 filters and supplied 100 percent outside air to most spaces. We upgraded to MERV 14 filters at Pier 15. We also supplied portable air filters in the unimproved, back-of-house Pier 17 spaces. Staff members were encouraged to wear better-quality masks throughout.



Exploratorium preparing for reopening with new window graphics.

By May 2021, we were preparing for reopening by thinning out our exhibit floor to make room for social distancing. We were purchasing hand sanitizer and plexiglass shields, and updating signage. Many of our museum colleagues in the San Francisco Bay Area had reopened ahead of us, but the guidance of our local health department had specifically restricted hands-on, interactive experiences, which kept the Exploratorium closed longer. After 15 months of closure, the Exploratorium was finally able to reopen to the public on July 1, 2021.

IAMFA members who attended the Pittsburgh conference in 2019 may remember the Exploratorium presentation called “Zero Net Energy is a Process Not an Endpoint.”* The presentation was about the sustainable features of Pier 15, including our photovoltaic array and our goal of Zero Net Energy (ZNE). By 2019, we had achieved up to 80 percent ZNE, and in the presentation, we discussed

*“Zero Net Energy is a Process Not an Endpoint” is available in the Member’s Only section of the IAMFA website. Log in and go to: https://iamfa.memberclicks.net/index.php?option=com_content&view=article&id=52:conference-presentations&catid=20:site-content&Itemid=131



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Photovoltaic array on Pier 15.

what it might take for us to reach our goal. “Pandemic” was not on the list.

It did not surprise us that we finally achieved Zero Net Energy in 2020, when we were closed for nine months of the year, and again in 2021 when we were closed for six months. What did surprise us, however, was that we achieved greater energy savings during the year in which we were closed for less time. In 2020, the Exploratorium consumed 38 percent less energy than in 2019, and in 2021, the Exploratorium consumed 42 percent less energy than in 2019. How did we achieve more energy savings when we were opened twice as long?

The secret is twofold.

Firstly, during our closure, we weren’t satisfied with the savings we were achieving using our standard setbacks. We took advantage of the quiet time to examine where our setbacks were working well, and where they could be better optimized. For example, we found that some lighting was left on overnight because egress lighting was too minimal for security guards working the graveyard shift. By adjusting egress lighting and educating security about our goals for energy savings, we were able to find the appropriate nighttime lighting levels.

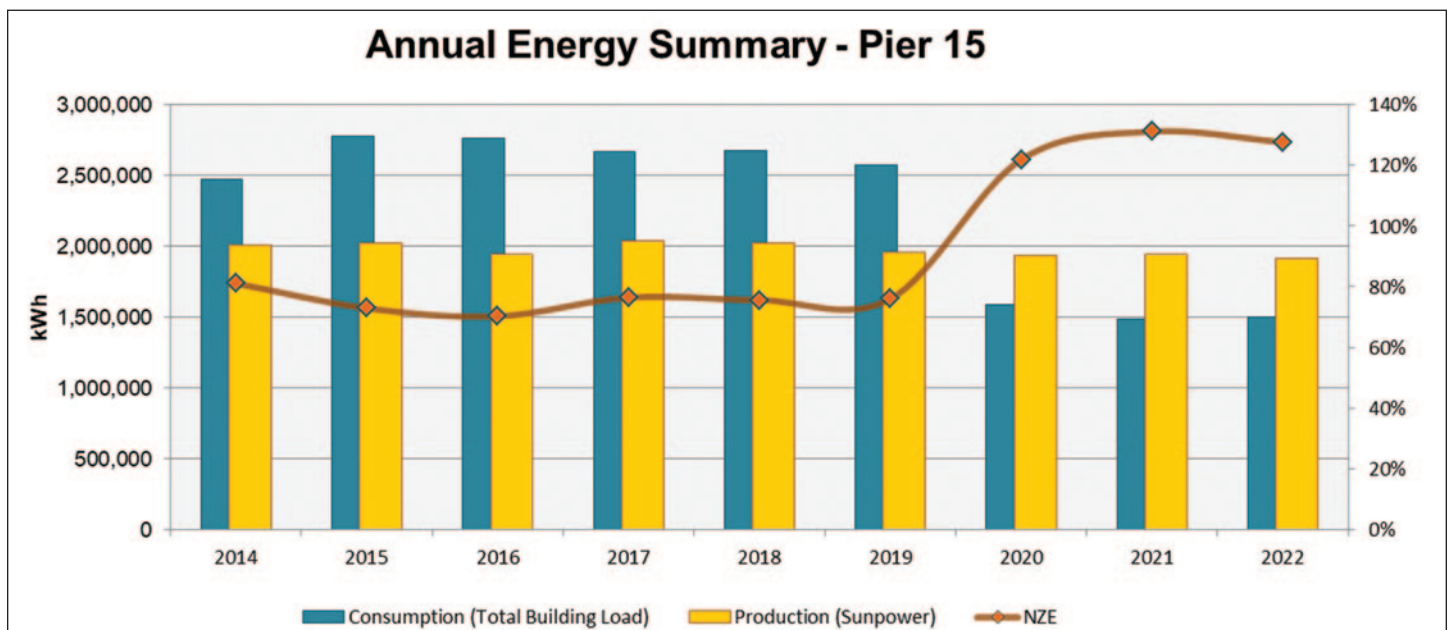


Figure 1: Exploratorium’s Pier 15 annual electrical production, consumption, and Zero Net Energy.

Another example involved our exhibit plug load. There were a number of exhibits that had been placed on circuits that had a 24-hour power supply because a previous exhibit had required it, and when the exhibits were moved, the power programming had not been updated. Our facilities team worked with floor teams to bring the receptacle programming up to date. We also removed “vampire loads” from the office areas by unplugging unused computer monitors and other equipment.

Secondly, we continued with other energy-reduction work that had already been scheduled. Our program of replacing fluorescent lighting with LEDs had a major impact. We also replaced old copy/printer multi-function machines with new, more energy-efficient ones.

The change in work habits had an impact, too. Energy use remained low in the office areas, with many staff continuing to work remotely even after they were allowed back on campus. Additionally, overall building load was kept lower than pre-pandemic days by keeping staff access to campus more restricted than in pre-pandemic times. Previously, staff were allowed on campus from 7:00 a.m. to midnight, seven days a week. During most of the closure, staff access was restricted to

Monday through Friday, 7:00 a.m. to 7:00 p.m. Then, in preparation for opening and beyond, access expanded back to seven days a week, but we kept the 7:00 a.m. to 7:00 p.m. hours (with some exceptions).

It is clear from Figure 1 above that even after a full year of regular operations in 2022, the Exploratorium was able to maintain better than Zero Net

Energy. The pandemic closure had threatened the viability of our organization, but it had also afforded some downtime for our team to dive deeper into our energy savings work. The lemonade we made from those lemons has been far sweeter and longer-lasting than expected, and we hope to continue improving our efficiencies into the future. 🍷

Jennifer Fragomeni



Jennifer Fragomeni is the Director of Campus Facilities at the Exploratorium, a world-renowned, LEED Platinum-certified science museum located in San Francisco. She began her professional career as an educator with informal science teaching at several museums, but became involved with Facilities Administration when she joined the Exploratorium’s facilities team in 1999. In 2007, she was promoted to Director of Facilities and Operations, a role in which she has excelled, both at the Exploratorium’s original location at the Palace of Fine Arts, and at its new location (since 2013) at Piers 15 and 17 along San Francisco’s waterfront. In 2019, her title was changed to Director of Campus Facilities to reflect the scope of her responsibilities more accurately.

Jennifer’s history with IAMFA began in 2003, when she joined the organization and attended the first IAMFA conference

held in San Francisco. From 2009 to 2010, she served on the host committee for the second San Francisco IAMFA conference and, from 2020 to 2022, she was Chair of the San Francisco Conference Planning Committee for San Francisco’s third IAMFA conference. In 2013, she succeeded Joe Brennan as Chair of the Northern California and Nevada Chapter, and in 2017 was awarded IAMFA’s George Preston Memorial Award for her “outstanding contributions to our facilities administration field through your work with the Exploratorium and your extensive contributions to IAMFA for many years.” Jennifer was also recently appointed to VP Regional Affairs to fulfill the remainder of Tiffany Romano’s term after Tiffany was made VP Administration.

In her personal time, Jennifer enjoys hiking with her dog, knitting, and having impromptu dance parties with her grandchildren.

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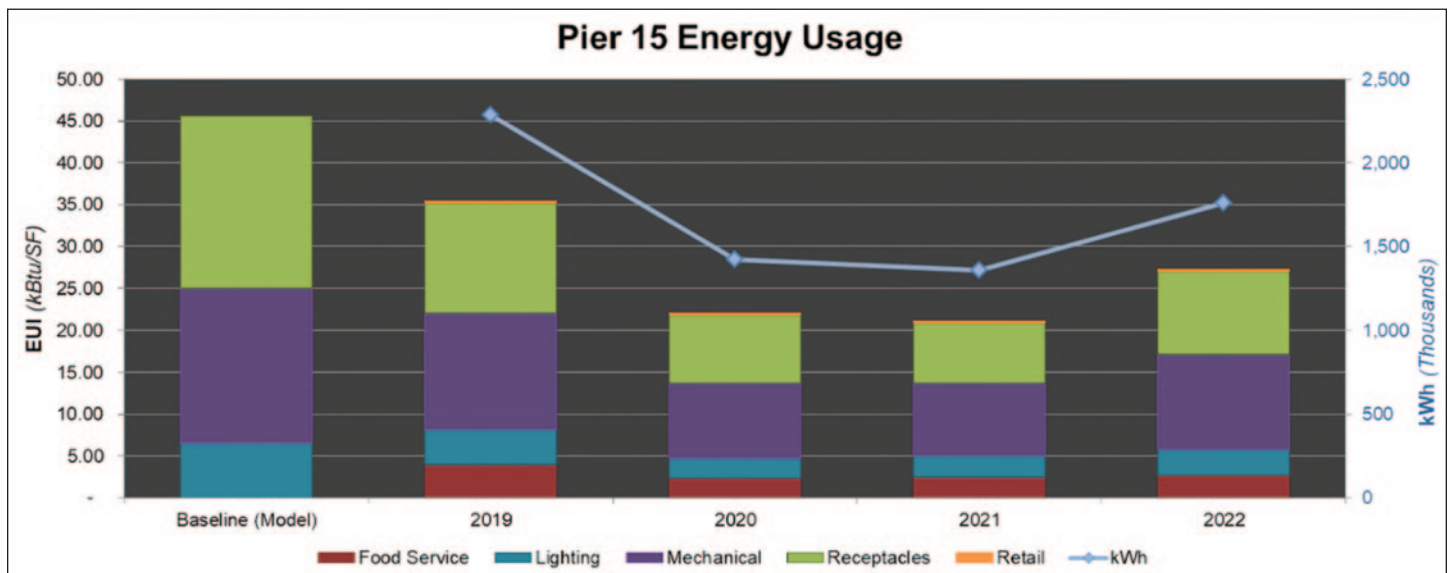


Figure 2: Comparison of Exploratorium’s Pier 15 Energy Use Intensity by end-use category 2019–2022 against the original building model.