



C.R.E.A.M. (Carbon Rules Everything Around Me)

# ASHRAE LowDown Showdown

## 2019 Building Performance Analysis Conference

Building Type: City Hall

Total Floor Area: 90,000 ft<sup>2</sup>

Location: San Diego, California

Total Energy Usage

621 MWh

Site EUI

23.9 kBtu/ft<sup>2</sup>

Annual Water Usage

785 kGal

Annual Electricity Cost

-0.137 \$USD/ft<sup>2</sup>

Annual Water Costs

0.077 \$USD/ft<sup>2</sup>

Total Annual Costs

-5,324 \$USD

CPSF

-0.06 \$USD/ft<sup>2</sup>

Total Energy Generation

699 MWh

Net Zero Energy

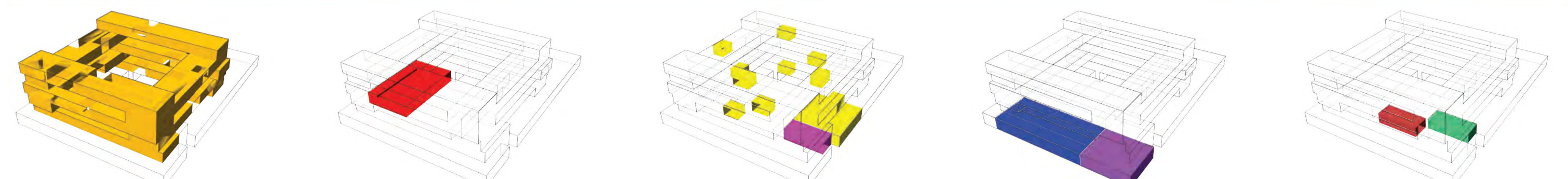
78 MWh

Carbon Equivalent

-29.6 tons CO<sub>2</sub>

### Team

Team Captain Jason Lackie	Resiliency Specialist Audrey Ng
Carbon Specialist Zachary Stevens	Energy & Comfort Modeler Mohammad Abbasi
Energy Architect Elliot Glassman	Architect Joelle Jahn
Energy & Daylight Modeler Xinxin Hu	Resiliency Specialist Kristy Kwong
Resiliency Claudia Mezey	Coaches Konstantin Udilovich; PE Chad Spencer; PE



**Offices** benefit from narrow floor plates enabling natural ventilation and daylight autonomy. The staggering of the office blocks creates adjacent outdoor spaces.

**Holding Cells** are humane and secure during normal and emergency operations.

**Meeting, Training and Public Waiting Rooms** receive ample daylight. The design promotes integration of people and a connection to nature.

**Fitness Center and Locker Rooms** supports healthy lifestyles, reducing vulnerability.

**Data Center and EOC** enable continuous operation during emergency. These critical functions are located on the second floor above any potential flooding but able to be accessible without elevators.

### Model Description

The new 88,740 ft<sup>2</sup> City Hall proposed for San Diego is envisioned as a center for local governance than can also act as an Emergency Operation Center (EOC) for the area. The PV array can provide enough power for net positive energy during normal operation, but also can enable the building to serve the community during natural disasters.

In addition to being an exemplar of resiliency, the design provides abundant planted outdoor spaces on all floors to increase the occupants' connection to nature, thereby improving health and wellness. The use of mass timber and CLT construction provide additional natural elements while reducing embedded carbon.

To integrate multiple design objectives into the project, the team relied heavily on computational design in Grasshopper, tying parametric design models to performance simulation engines such as Energy Plus and Radiance.

### Energy Savings Strategies

- Self shading staggered massing and orientation specific local shading reduce solar loads
- Narrow floor plates abundant daylight to offset lighting energy use
- High performance façade
- Cutting edge air cooled heat recovery chillers with low global warming potential refrigerant
- Mixed mode natural ventilation turns off HVAC system
- Recirculating showers reduce domestic hot water energy use

