

2019 Building Performance Analysis Conference

Building Type: City Hall

Total Floor Area: 9,700 m²

Location: San Diego, California

Total Energy Usage

417.7 MWh

Site EUI

43.1 kWh/m²

Annual Water Usage

644 m³

Annual Electricity Cost

5.1 \$/m²

Annual Water Costs

0.09 \$/m³

Total Annual Cost

48,508 \$

CPSF

0.46 \$/ft²

Total Energy Generation

465 MWh

Net Zero Energy

-46 MWh

Carbon Equivalent

-32.5 Tons CO₂

Team

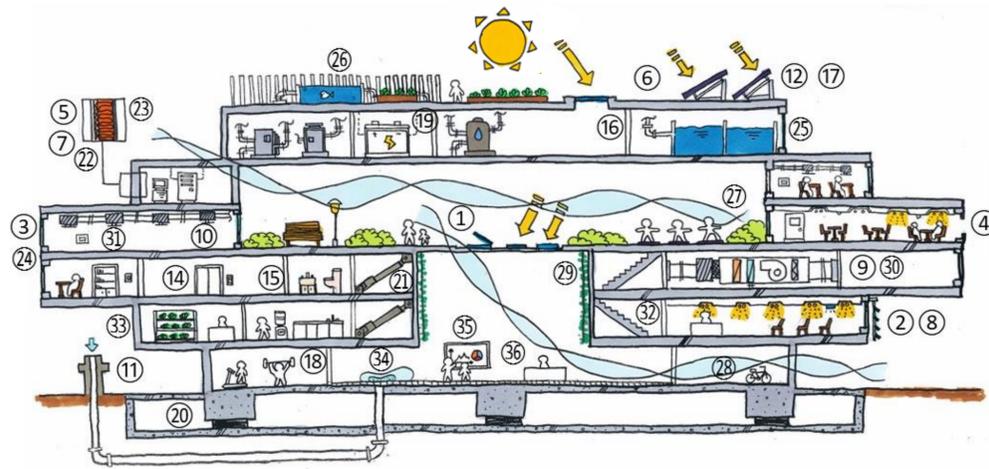
Captain/Energy Modeller/Engineer
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Programmer/Technical Support
Katsuya Obara, LEED AP BD+C, WELL AP

Energy Modeller/Engineer
Kenneth Leung, LEED AP BD+C

Engineer/Designer
Gary Chan

MEP Engineer
Arata Kiyono



Passive Design

- Natural ventilation
- External blinds automated control with solar sensor
- Improved SC value for glazing
- Daylight sensor lighting control
- Implement Passive House Standard envelope
- Cool roof (high SRI)
- Improved airtightness

Active Design

- Occupancy lighting sensor
- Air side heat recovery system
- Change setpoint temperature
- Earth tube system

- Solar hot water collector
- Energy efficient VRV system
- Lift regenerative system
- Water efficient fixture
- Rain water harvesting system
- PV System
- Gym power generator
- Water-based Li-ion Battery Storage

Resilience Features

- Base Isolator
- Fluid Viscous Damper
- Fire Resistant Coating on External Wall
- Fire Resistant Internal Wall
- Hurricane-resistance glazing

Wellness Features

- Urban farming + aquaponics
- Semi-outdoor physical fitness area
- Bike storage
- Biophilic design- Green wall, Skylight
- Advanced air filter
- Individual thermal control
- Staircase
- Circular Economy Shop
- Displacement ventilation

Innovation Features

- Environmental dashboard
- Thermal zoning (cool space at lobby)

Model Description

The Net-Zero new City Hall has been designed to manifest the beauty and cruciality of sustainability and resiliency amid the age of climate change and uncertainties, while being a welcoming and open communal space for the people of San Diego.

A 3-storey atrium provides ample space at the heart of the City Hall where green walls, skylight and natural breezes can be discovered. A spacious semi-outdoor area can be found on the 4th floor, where occupants can perform physical fitness activities overlooking the streets of San Diego.

Energy Savings & Resilience Strategies

Naturally conditioned:

Hybrid ventilation system allows the occupants to utilize natural ventilation with operable windows to meet thermal comfort. Connecting & permeable design of both indoor and semi-outdoor spaces also provide access to breezes.

Daylighting:

Combined with daylight sensors and automated blinds, the benefits of daylighting is optimized for the occupants while reducing glare.

Passive House Standard Building Envelope:

High degree of insulation reduces heat loss during winter and reduce heat gains during summer. High performance glazing also ensure comfortable and stable interior surface temperature.

Gym power generator:

Energy is harnessed from activities performed in the gym.

Base isolators:

Superstructure is isolated from the foundation to reduce building displacement under seismic activities.

Fire resistant internal wall:

Drywalls pre-fabricated with geopolymers technology and natural palm fiber provide excellent fire-resistance, acoustic and thermal insulation.

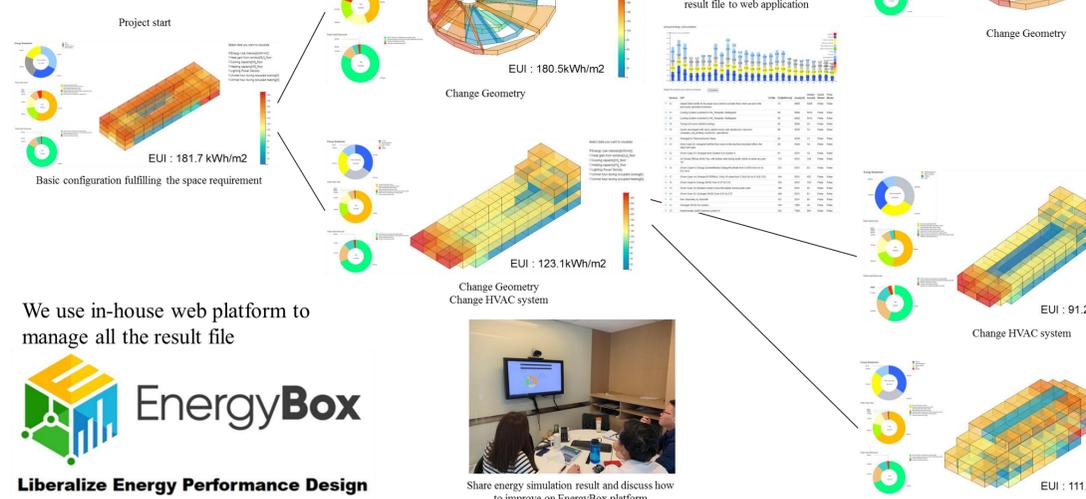
Water-based Li-ion Battery:

The source of backup power for 14 days, compact in size, safe, robust, produced and recycled by environmentally friendly means.

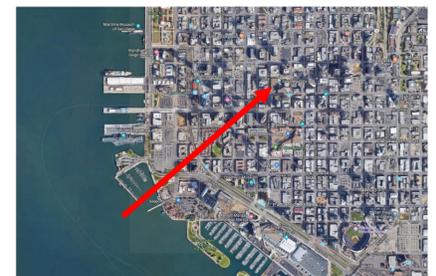
Re-create design process

to maximize the value of energy simulation

- Quick feedback loop
- Collaborative
- Incremental



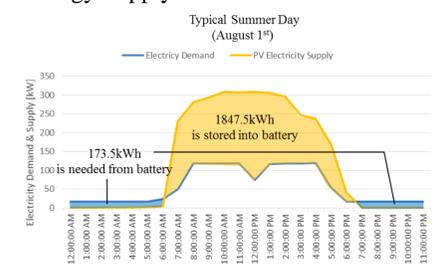
Site Location*



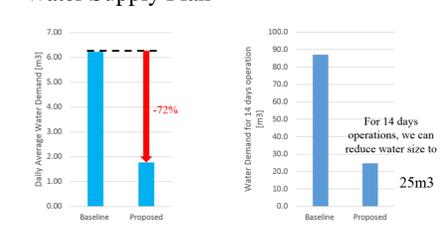
*500-year Floodplain with minimal flood hazard (FEMA)

Emergency Operations Center

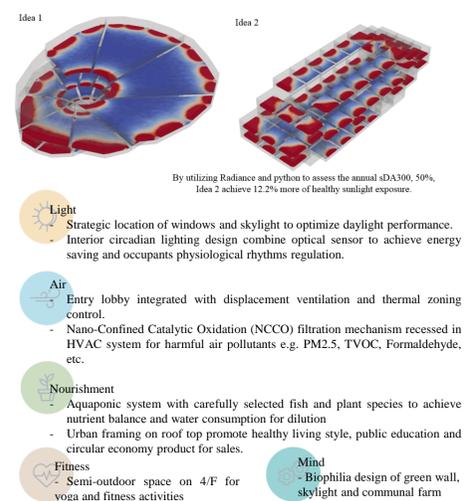
Energy Supply Plan



Water Supply Plan



Health and Wellness



Energy Simulation Final Result

