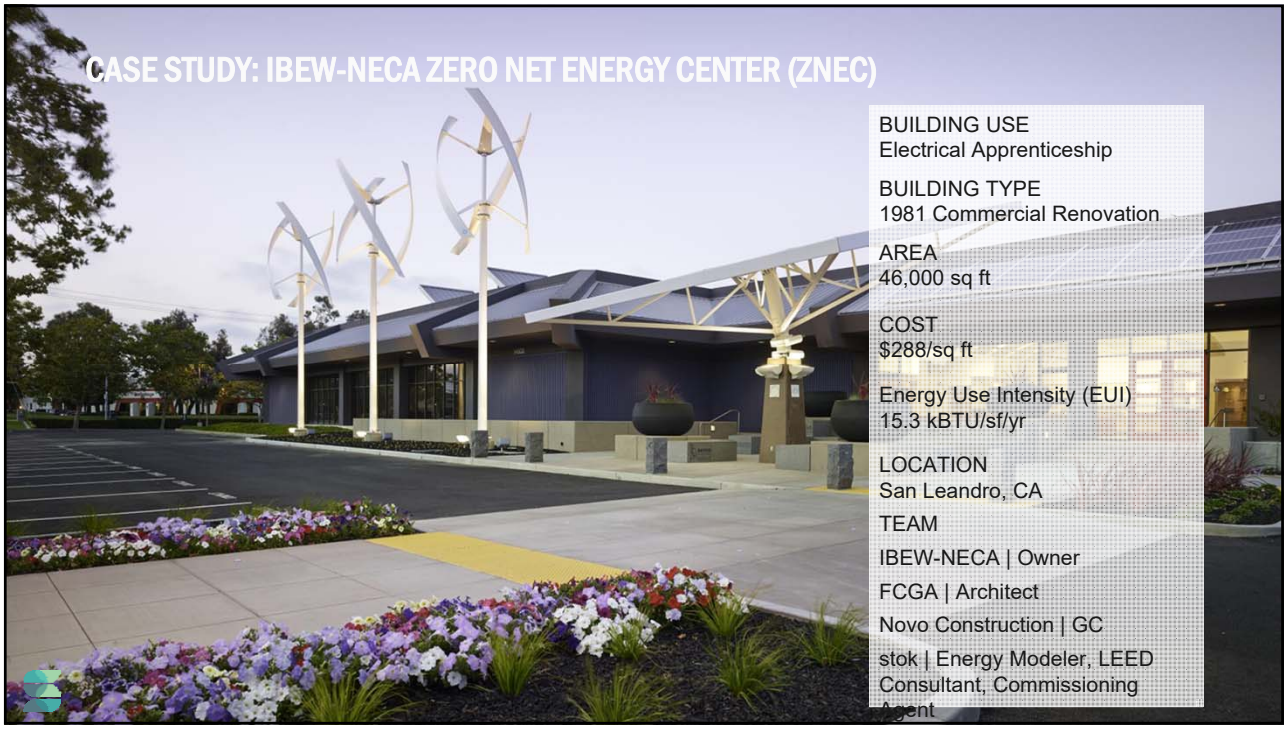

DESIGN VS REALITY:
LESSONS LEARNED FROM
OPERATIONAL NET ZERO
ENERGY BUILDINGS
stōk


CASE STUDIES



CASE STUDY: IBEW-NECA ZERO NET ENERGY CENTER (ZNEC)

BUILDING USE
Electrical Apprenticeship

BUILDING TYPE
1981 Commercial Renovation

AREA
46,000 sq ft

COST
$288/sq ft

Energy Use Intensity (EUI)
15.3 kBTU/sf/yr

LOCATION
San Leandro, CA

TEAM

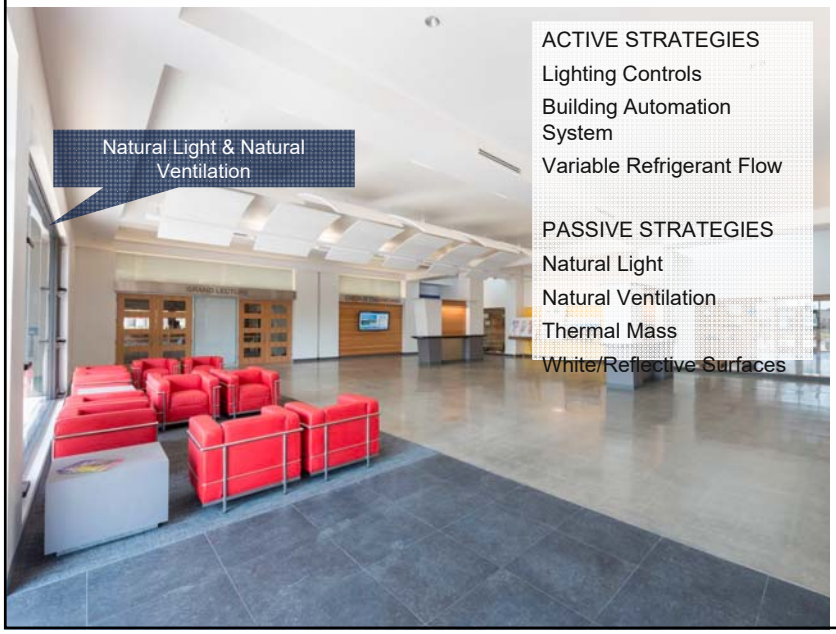
IBEW-NECA | Owner

FCGA | Architect

Novo Construction | GC

stok | Energy Modeler, LEED Consultant, Commissioning Agent

CASE STUDY: IBEW-NECA ZERO NET ENERGY CENTER (ZNEC)



ACTIVE STRATEGIES

Lighting Controls

Building Automation System

Variable Refrigerant Flow

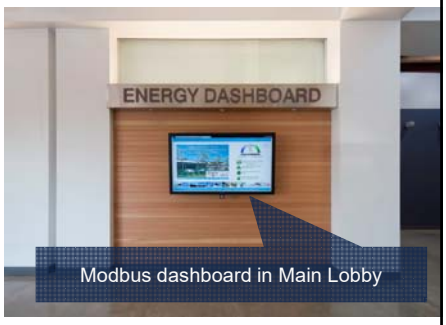
PASSIVE STRATEGIES

Natural Light

Natural Ventilation

Thermal Mass

White/Reflective Surfaces



CASE STUDY: IBEW-NECA ZERO NET ENERGY CENTER (ZNEC)

ANNUAL ELECTRICITY GENERTION (ACTUAL)

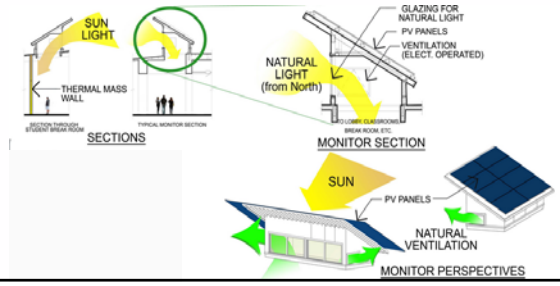
263,500 KWH DC

ANNUAL ELECTRICITY USE (ACTUAL)

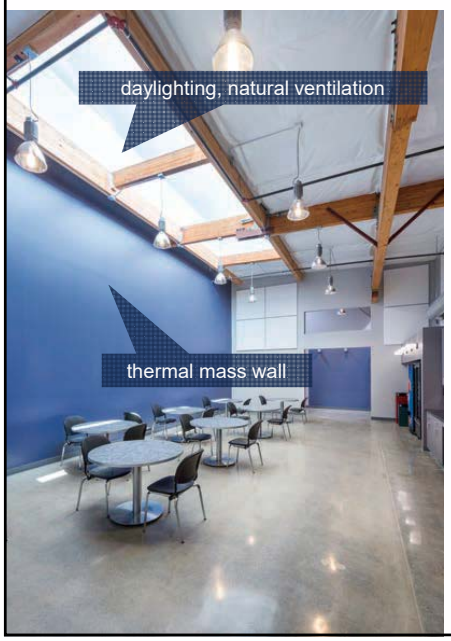
227,500 KWH DC

% OF ENERGY ONSITE

116%



CASE STUDY: IBEW-NECA ZERO NET ENERGY CENTER (ZNEC)

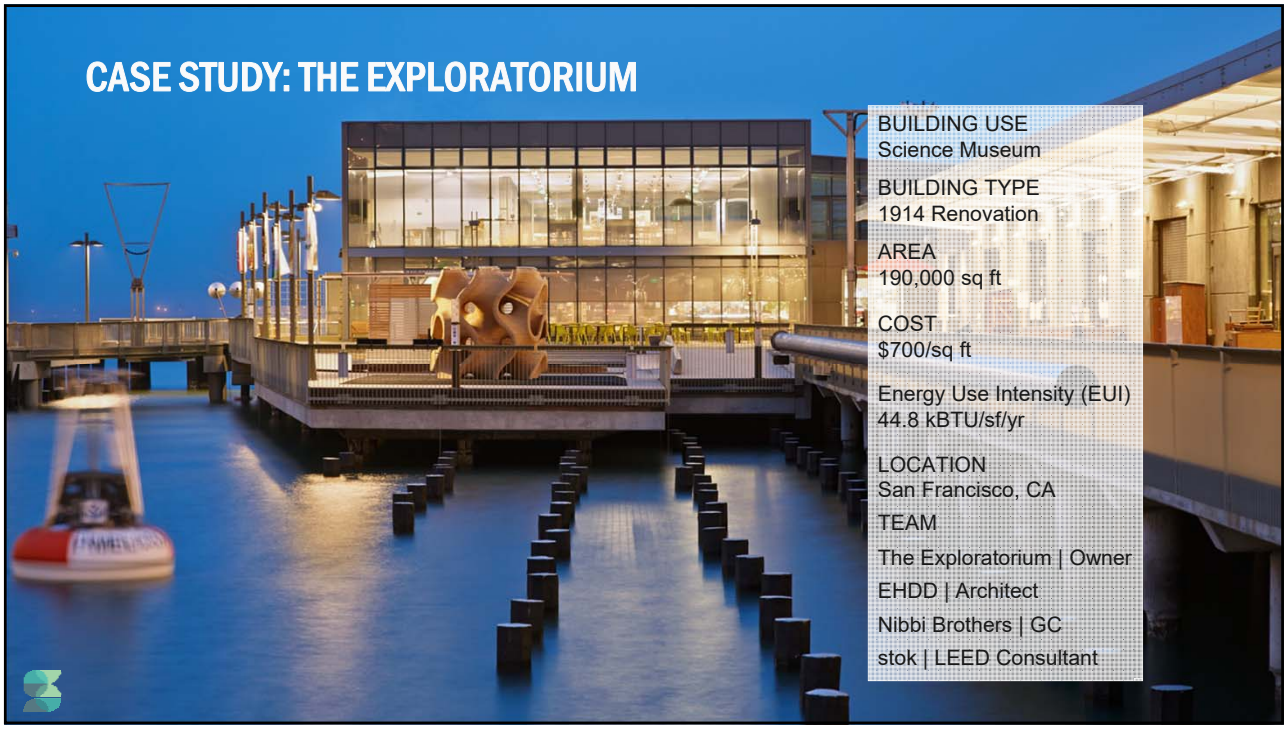



IBEW-NECA ZNEC CHALLENGES
Design & Construction
Financing
Early project team onboarding
Integrated systems contractor in Design Phase


IBEW-NECA ZNEC CHALLENGES
Design & Construction
Financing
Early project team onboarding
Integrated systems contractor in Design Phase
Operations
Lighting control system

IBEW-NECA ZNEC LESSONS LEARNED

- Firm up financing sooner
- Engage integrated systems contractor early
- Define configurations for optimal performance
- Use same manufacturer for all lighting control components
- Install additional solar tubes
- Explore other heating options



CASE STUDY: THE EXPLORATORIUM

BUILDING USE
Science Museum

BUILDING TYPE
1914 Renovation

AREA
190,000 sq ft

COST
$700/sq ft

Energy Use Intensity (EUI)
44.8 kBTU/sf/yr

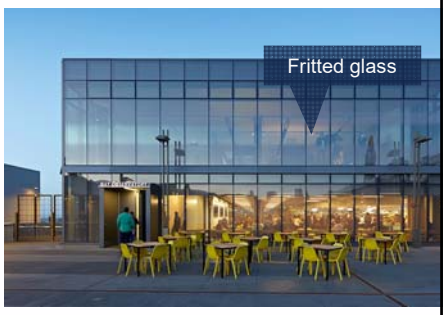
LOCATION
San Francisco, CA

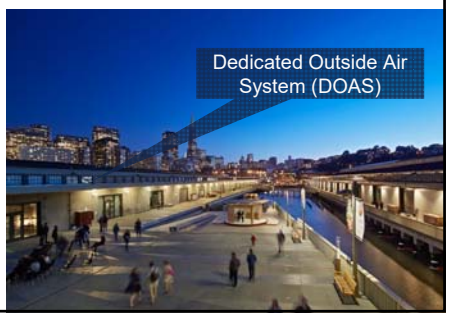
TEAM
The Exploratorium | Owner
EHDD | Architect
Nibbi Brothers | GC
stok | LEED Consultant

CASE STUDY: THE EXPLORATORIUM

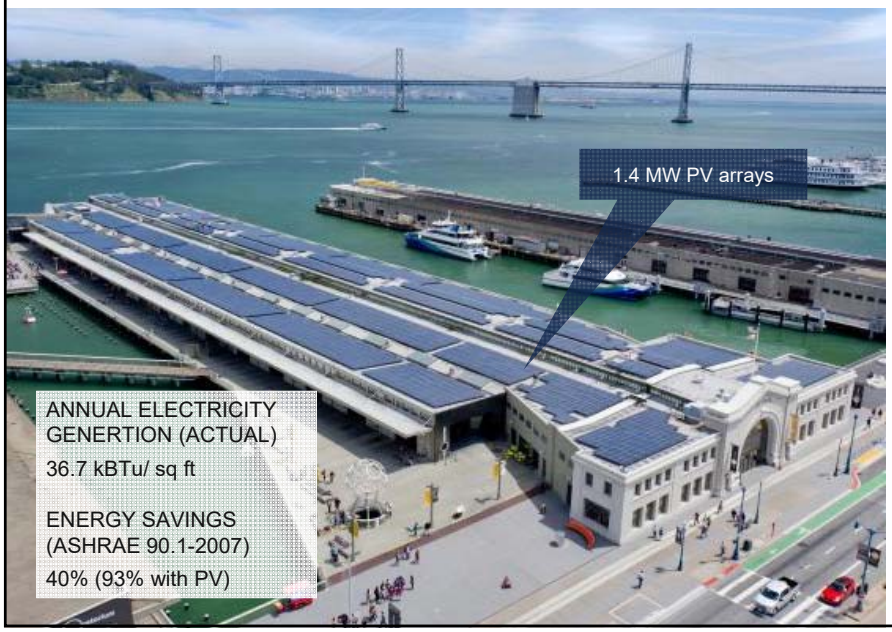
ACTIVE STRATEGIES
- Radiant Heating & Cooling
- Dedicated Outside Air System (DOAS)
- Lighting Controls
- Renewables

PASSIVE STRATEGIES
- Natural Light
- Natural Ventilation





CASE STUDY: THE EXPLORATORIUM

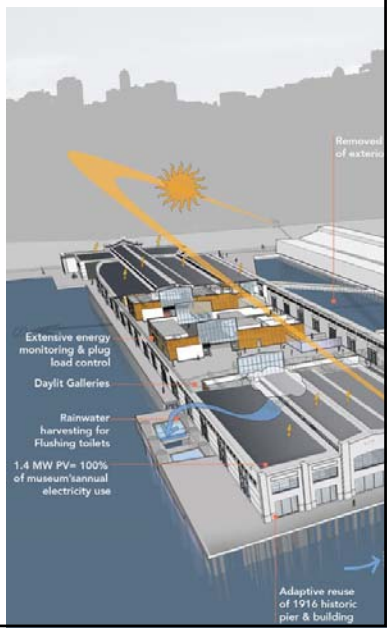


ANNUAL ELECTRICITY GENERTION (ACTUAL)

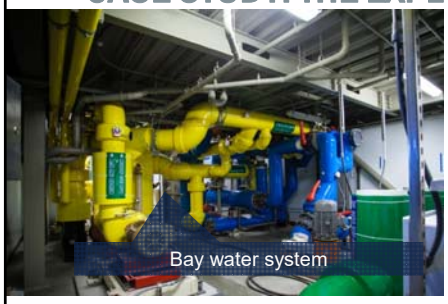
36.7 kBTu/ sq ft

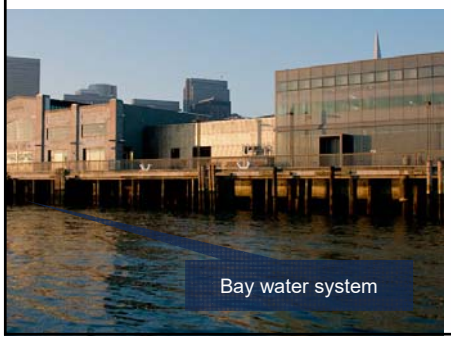
ENERGY SAVINGS (ASHRAE 90.1-2007)

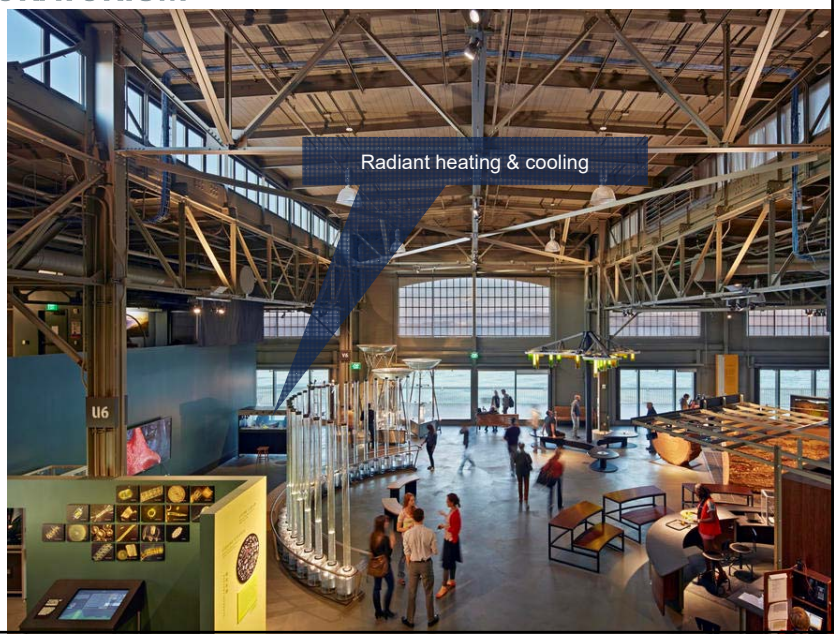
40% (93% with PV)



CASE STUDY: THE EXPLORATORIUM



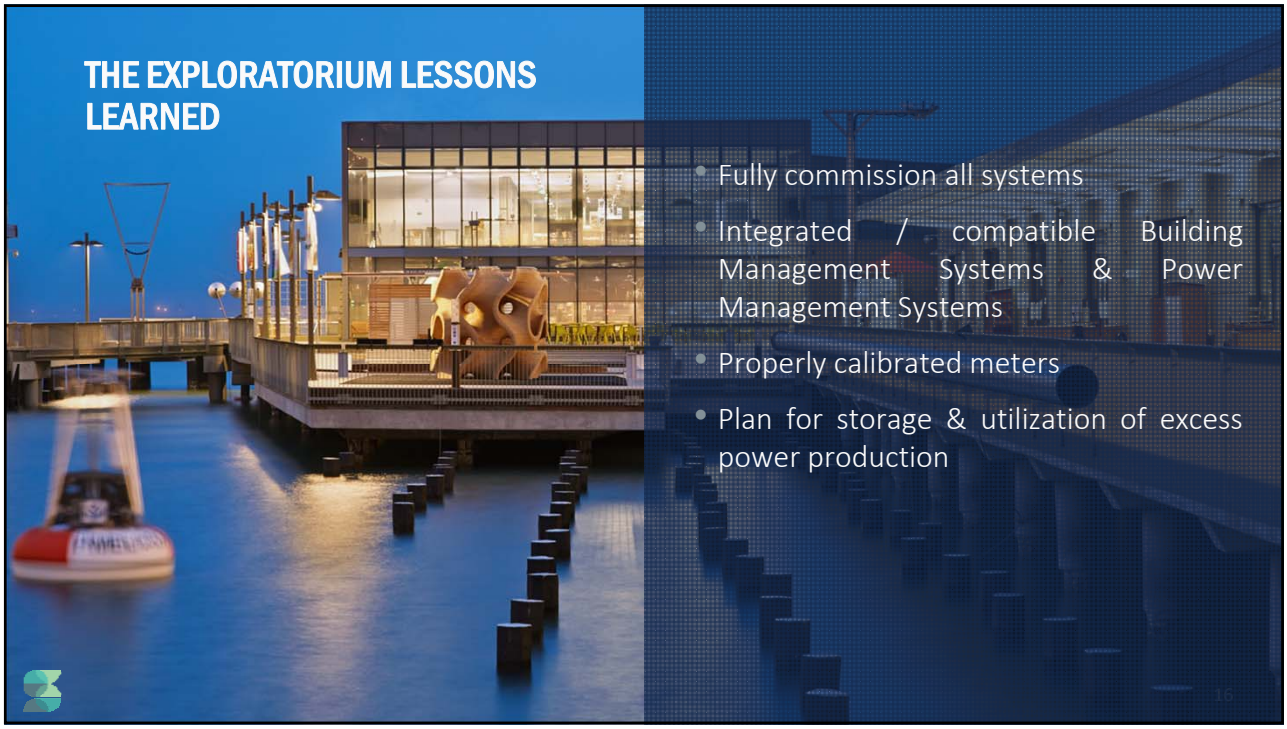




THE EXPLORATORIUM CHALLENGES

- Design & Construction
  - Projected solar performance


THE EXPLORATORIUM CHALLENGES
Design & Construction
Projected solar performance
Operations
Operating assumptions – more open hours, more staff, more attendance
Lighting controls
Actual solar performance
Staff engagement / education
water
15


THE EXPLORATORIUM LESSONS LEARNED
Fully commission all systems
Integrated / compatible Building Management Systems & Power Management Systems
Properly calibrated meters
Plan for storage & utilization of excess power production
16


THANK YOU
WARREN@STOK.COM
BBENTON@595JATC.ORG
17