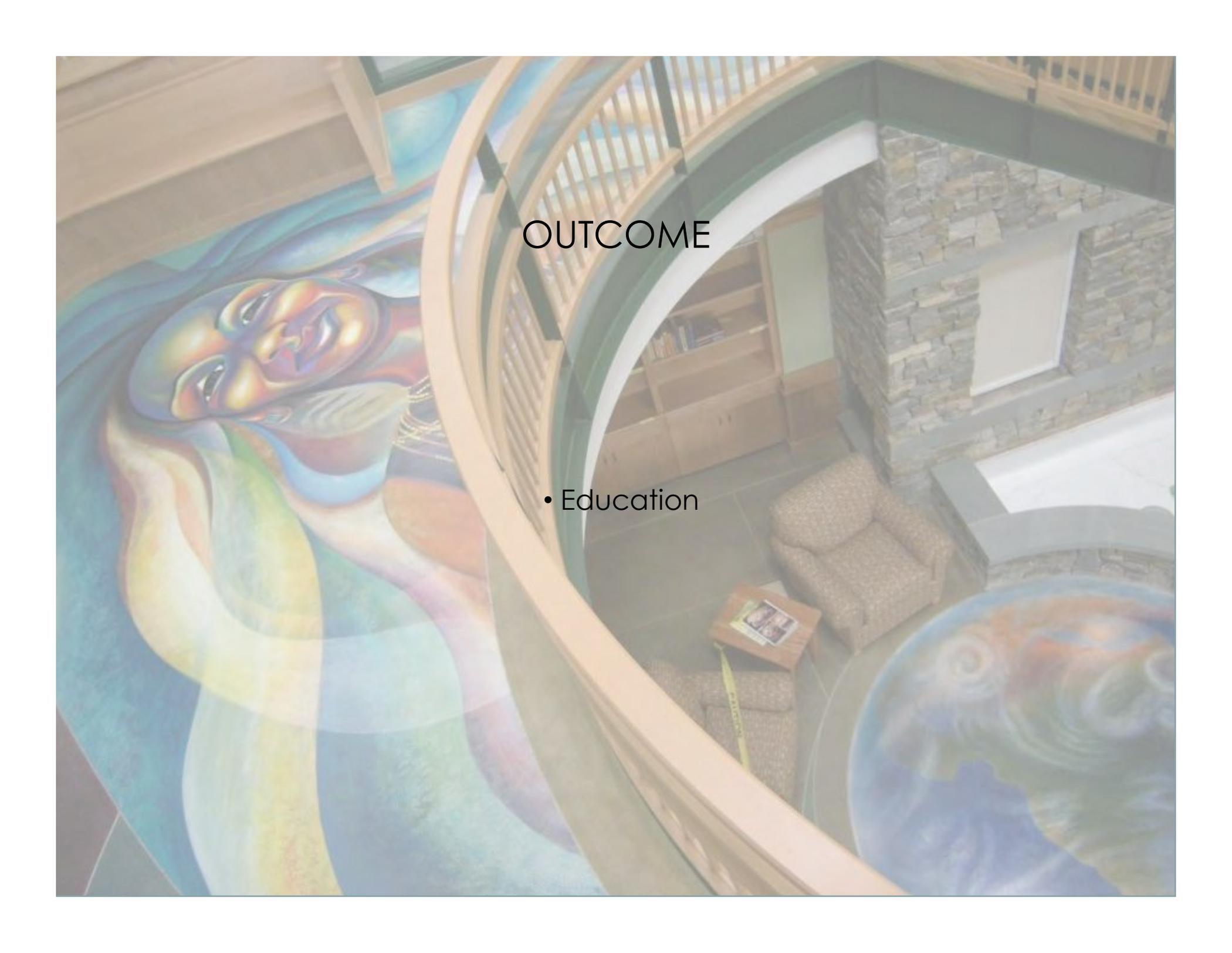




Enhanced energy conservation
Simplified mechanical systems
Hybrid steel/wood structure



OUTCOME

- Education

The Bosarge Family Education Center at Coastal Maine Botanical Gardens

- Net Zero since 2011
- NESEA Net Zero Award - 2013
- Connection to Nature
- SF: 8,200
- EUI: 19.2 kBtu/sf-yr (actual)
 - 20 kBtu/sf-yr (modeled)
- EUI w/ Renewables: -4.3 kBtu/sf-yr
- LEED Cert: Platinum

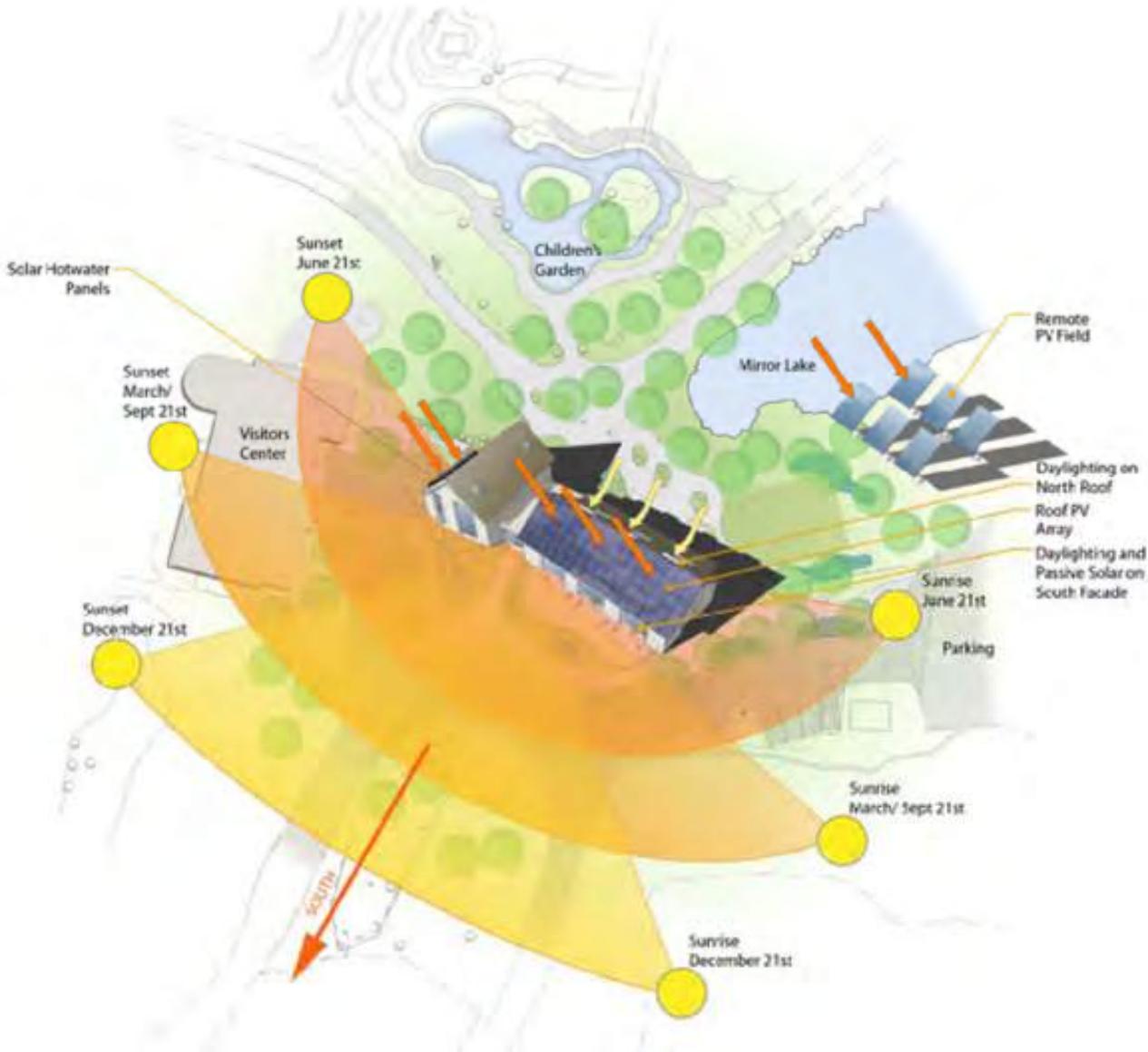




Central Gardens Master Plan



Solar considerations

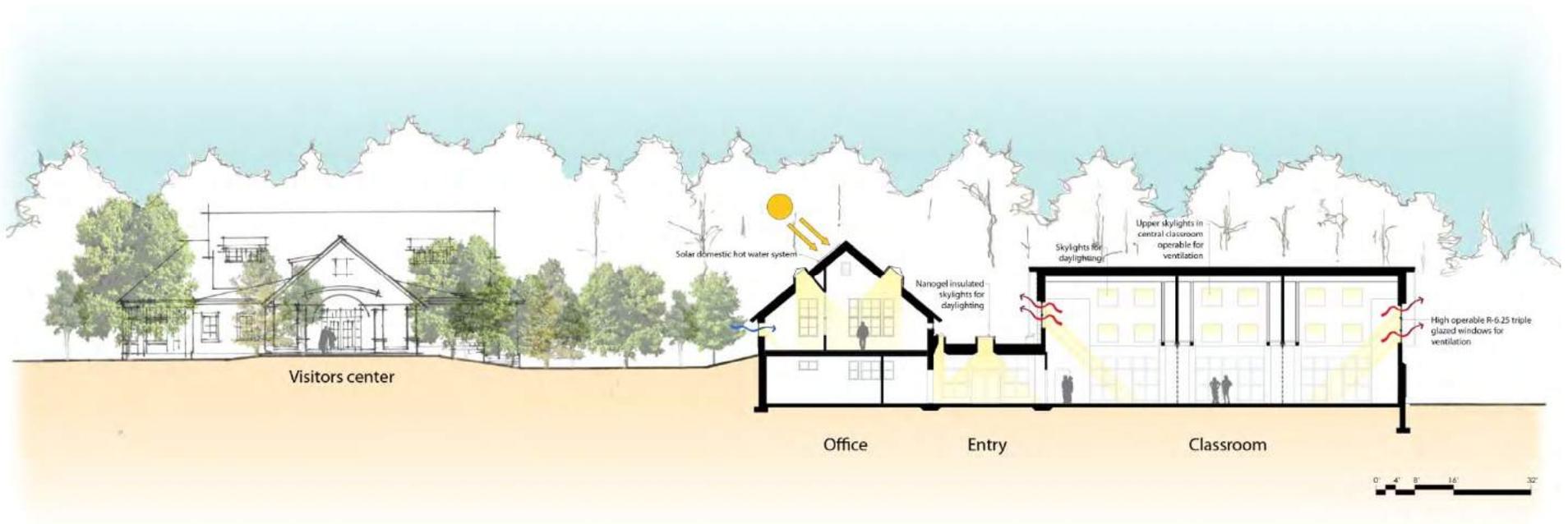


Design charrette

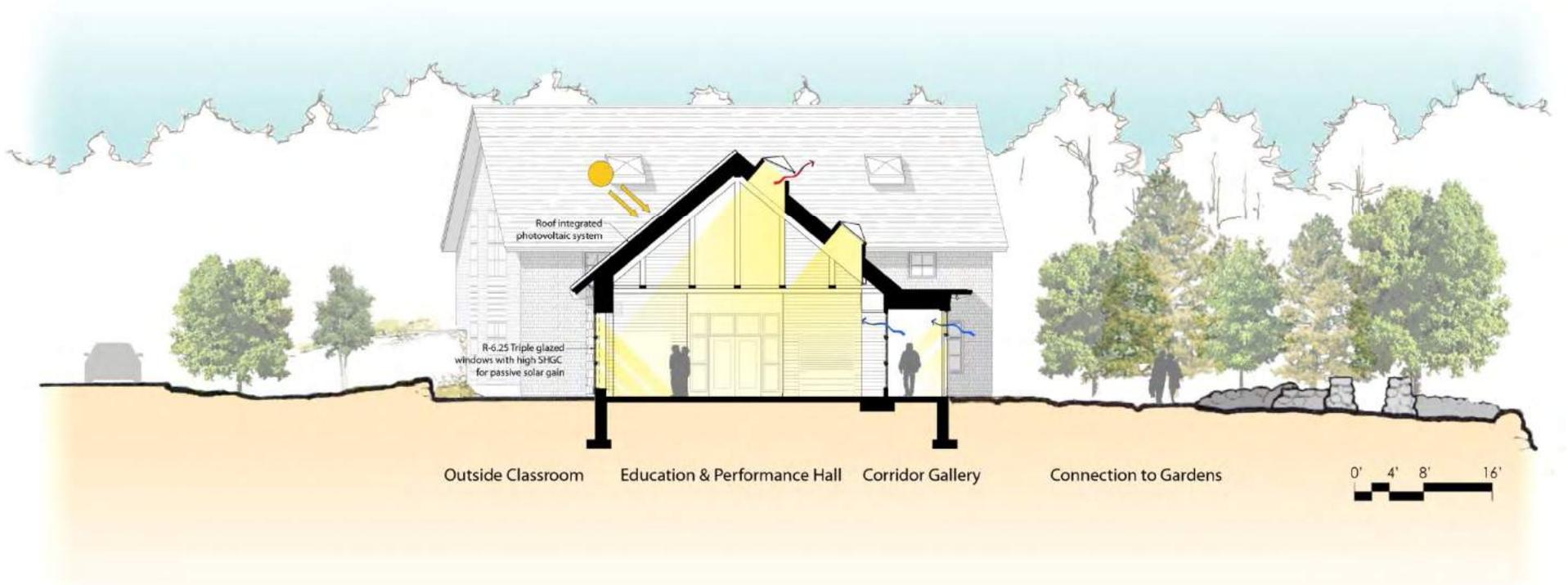




Building section



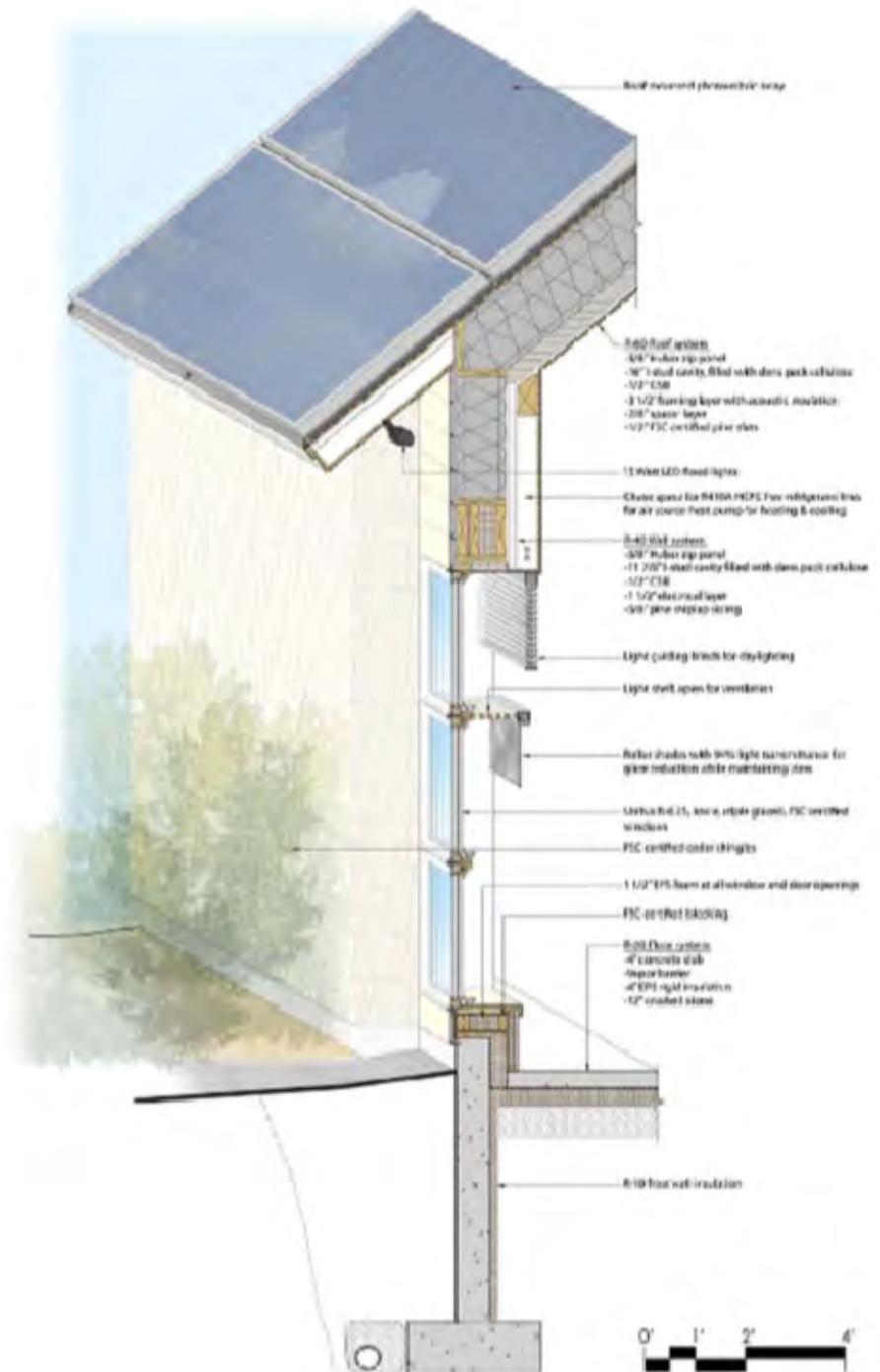
Building section



Metrics

- **Net-Zero Metrics**
-
- R-40 Walls,
- R-60 Roof,
- R-5 Windows
- 10-20 kBtus
- Max 0.1 cfm50/SF infiltration

Total usage, kWh/yr		EUI, kBtu/sq.ft.-yr
Actual	41,958	21
Predicted	35,778	18
PV Production		49,924



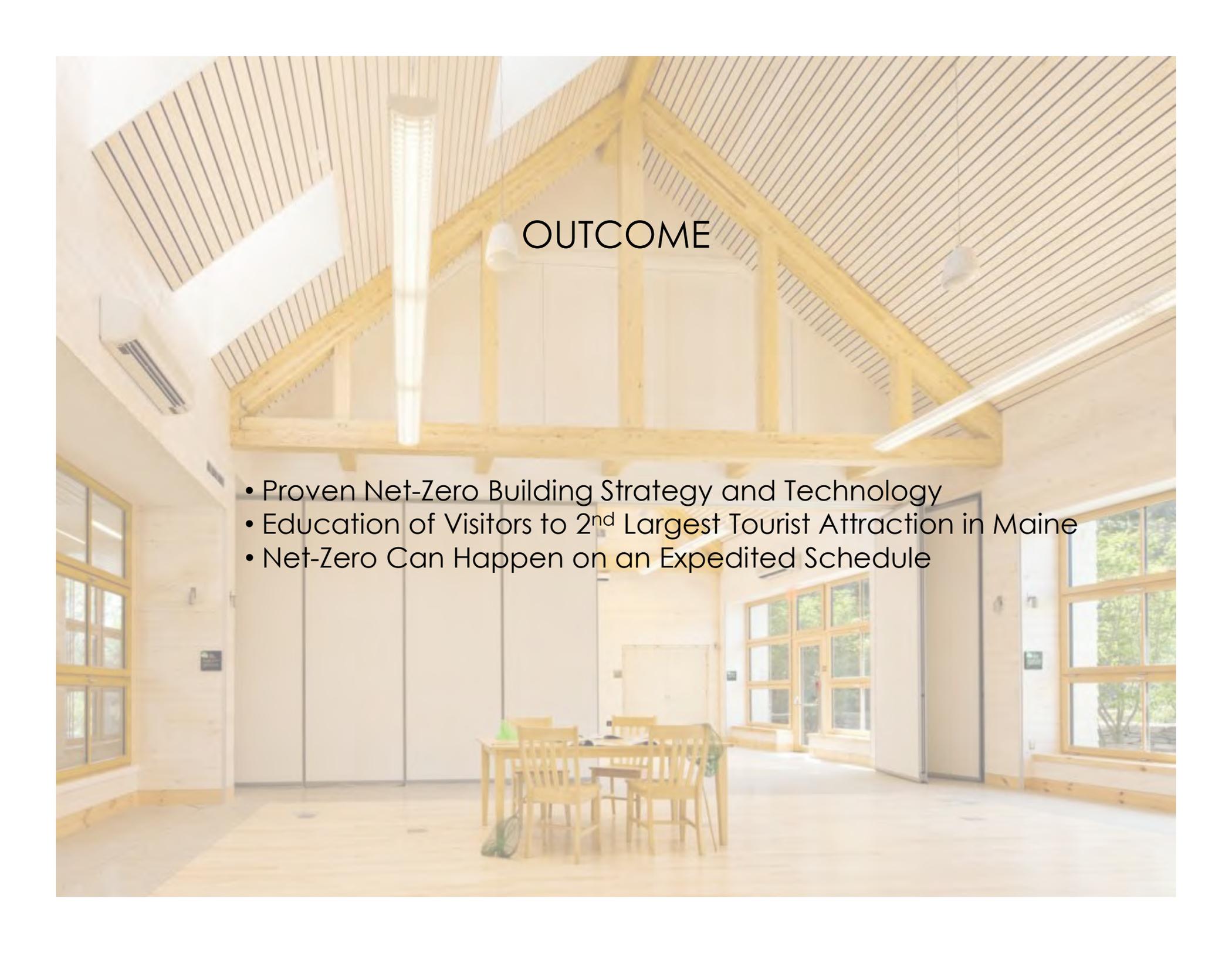
Panelized construction system



Integrated design strategies



- Heavily insulated envelope
- Minimal air infiltration
- Maximize winter solar gain & daylight
- Minimize water consumption
- Maximize water reuse
- Simple air source heat pumps
- Minimal mechanical distribution

The image shows the interior of a modern building with a high, vaulted ceiling. The ceiling is constructed from light-colored wood slats and features a prominent wooden truss structure. A large, white, rectangular skylight is positioned on the left side of the ceiling. The walls are also finished with light-colored wood paneling. Large windows with wooden frames are visible on the right side, providing a view of greenery outside. In the center of the room, there is a wooden dining table with four chairs. The floor is made of light-colored wood. The overall atmosphere is bright and airy.

OUTCOME

- Proven Net-Zero Building Strategy and Technology
- Education of Visitors to 2nd Largest Tourist Attraction in Maine
- Net-Zero Can Happen on an Expedited Schedule

Maclay Architects' Office

- Model deep energy net-zero office and apartment renovation
- Marketable, affordable, high performance rental units
- Model historic and energy compatibility
- Prudent long term, low maintenance, investment

- SF: 2,568 sf
- EUI: 38 kBtu/sf/yr
- EUI with Renewables: -3 kBtu/sf/yr

NZ office renovations

Open trusses, open office = daylighting



Light guiding blinds

Laptop computers



Ceiling fans and efficient light fixtures

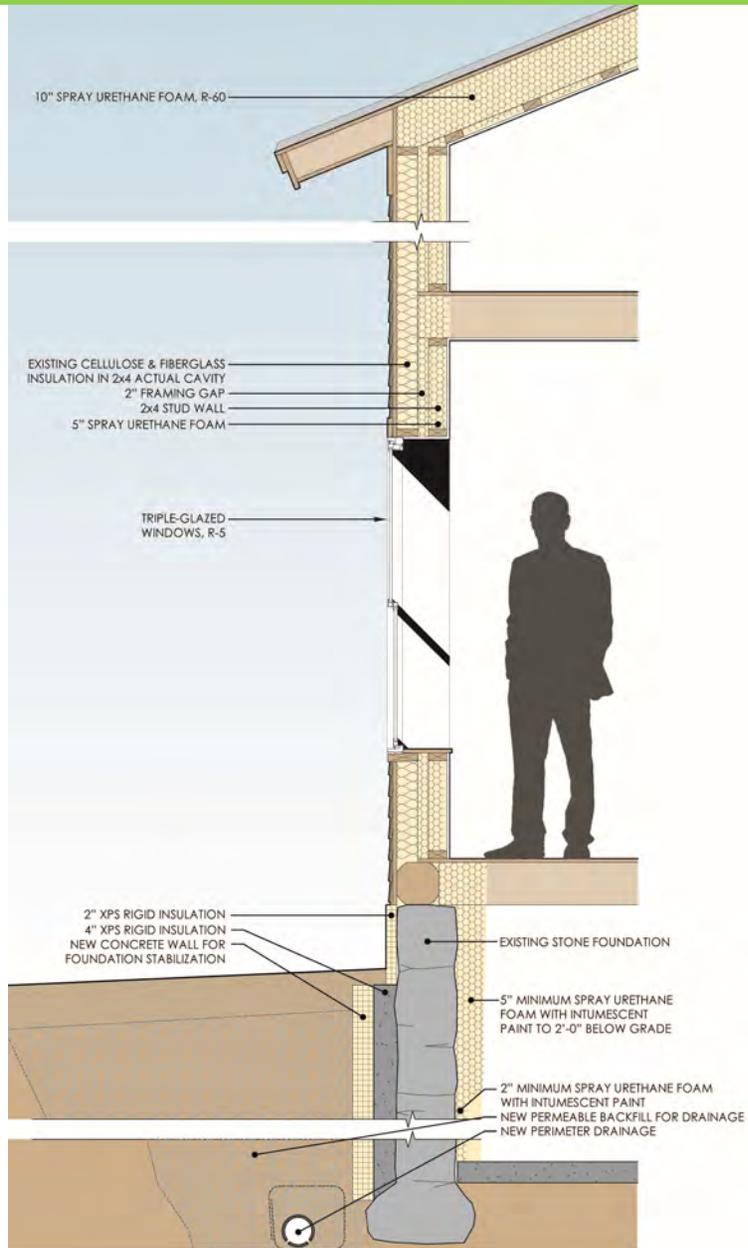


Minisplits/heat pumps

Additionally:

- ERV's*
- Distribution –radiant and air*

NZ residential deep energy retrofit



Timeline

Metrics and Office NZR Phase I

1. Minimize energy loads to renewable ready EUI metrics;

1998-2003

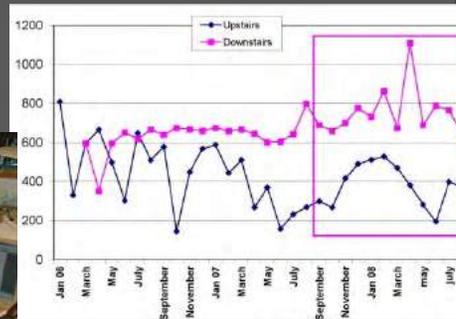
- Purchase property
- NZR envelope metrics
- Phased NZR office renovation
- Apartment energy upgrades



Apartment NZR Phase II

2. Optimize systems for comfort and efficiency consistent with EUI metrics

Evaluate and minimize office loads



2003, 2006- Renovation:
2 step - office renovation downstairs
with energy improvements



2009-Renovation:
Apartment renovation
from 1 unit to 2

ASHP + Renewables Phase III

3. Provide power with renewable energy systems

2004 Install 2 kW Tracker



2010 Install 17 kW carport



2011 Install 20 kW in Warren



2015 22 kW Community Solar Waitsfield





Historic Waitsfield Village



PV systems



offsite PV - PPA



onsite PV - Financed

Group net meter PV

Office
17 kW carport
2 kW tracker

Trackers
22 kW
PPA



Warren, VT residence