Overview

- Net-Zero Class-A Office Building
- Height: 13-story
- Total SF: 415,000 SF
- Project Timeline: April, 2012 – April, 2014
- “The Largest Net-Zero Building in the US”
Location

4707 Executive Drive
San Diego, CA 92121

La Jolla Commons
4747 Executive Drive
San Diego, CA 92121
Motivation

• Available Land
• Reliable Tenant with 100% Single Lease
• JV with JP Morgan $22 million fund

“Sustainability comes after financial feasibility.”

Burnham-Moores Center, MSRE
Program, University of San Diego
Team

Hines

100% - LPL Financial

Bloomenergy

AECOM

Whiting-Turner

WSP • Flack + Kurtz
Sustainability Background

- Pre-Certified Silver
- Potential LEED Platinum
- Net-Zero Energy
- Hines purposefully chose San Diego to do a net-zero project
Amenities

• Café
• Gym and Training Area
• Locker Rooms and Showers
• Conference Rooms
• Small Lobby
Amenities

- Basketball court (half)
- Volleyball courts
- Bocce-Ball

- Ping-Pong Table
- Extra Parking
- Putting Green

Burnham-Moores Center, MSRE Program, University of San Diego

(Hines, 2013) (Connors, 2013)
Challenges Encountered

The biggest challenge was not technical, but institutional.

- Height issues with Miramar Marine Base
- Complexities working with CA subsidies
- City of San Diego and local utility rules
- Biogas supply for the fuel cells

Hines Value Add

- BIM was not used
- Hines Conceptual Team
La Jolla Commons Tower II
Building Features

- Floor Plan – Space Planning Efficiency
- Foundation
- Core and Shell
- Mechanical Systems - HVAC
- Unique Features / Designs
- Energy “Net-Zero”
Building Floor Matrix

### SQUARE FOOTAGE SUMMARY: OFFICE TOWER

<table>
<thead>
<tr>
<th>PARKING SPACES</th>
<th>BASEMENT B2</th>
<th>BASEMENT B1</th>
<th>GROUND LEVEL</th>
<th>LEVEL 2</th>
<th>LEVEL 3</th>
<th>LEVEL 4</th>
<th>LEVEL 5</th>
<th>LEVEL 6</th>
<th>LEVEL 7</th>
<th>LEVEL 8</th>
<th>LEVEL 9</th>
<th>LEVEL 10</th>
<th>LEVEL 11</th>
<th>LEVEL 12</th>
<th>LEVEL 13</th>
<th>PENTHOUSE</th>
<th>TOTAL - ACTUAL (W/O BASEMENTS)</th>
<th>TOTAL - BASEMENTS</th>
<th>TOTAL</th>
<th>TOTAL - ALLOWABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA (SF)</td>
<td>38,441</td>
<td>31,119</td>
<td>27,022</td>
<td>26,728</td>
<td>30,124</td>
<td>30,124</td>
<td>30,124</td>
<td>30,124</td>
<td>30,124</td>
<td>30,124</td>
<td>30,124</td>
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<td>30,124</td>
<td>30,124</td>
<td>6,378</td>
<td>391,492</td>
<td>69,560</td>
<td>461,052</td>
<td>460,000</td>
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</table>

Gross square footage is shown. San Diego gross square footage is to outside face of building. Basement is not included in San Diego gross.

### SQUARE FOOTAGE SUMMARY: GARAGE EXPANSION

<table>
<thead>
<tr>
<th>PARKING SPACES</th>
<th>B1</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>AREA (SF)</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>18,685</td>
<td>475</td>
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</tbody>
</table>

### SQUARE FOOTAGE SUMMARY: EXECUTIVE DRIVE PARKING

<table>
<thead>
<tr>
<th>PARKING SPACES</th>
<th>B2</th>
<th>B1</th>
<th>GRADE</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>AREA (SF)</td>
<td>91,808</td>
<td>91,808</td>
<td>82,808</td>
<td>266,424</td>
</tr>
</tbody>
</table>
Floor Plan – Ground Level

Lobby

Lease Space

Elevator Lobby
Foundation

• Mat Foundation – Slab On-Grade
• Concrete (Flyash) – Finely divided residue resulting from the combustion of ground or powdered coal.
• Environmental advantages by diverting material from the wastestream and conserving virgin materials
• All concrete materials used within 500 miles of project site

Burnham-Moores Center, MSRE Program, University of San Diego
(Sustainable Sources, 2013)
(CMD Civil Construction, 2010)
Lobby

Burnham-Moores Center, MSRE Program, University of San Diego (Pacifici, 2013) (AECOM 2011) (Connors, 2013)
Glass Curtain Wall

- Title 24 Standards
- U.S. Consumer Product Safety Commission (CPSC) Glazing Standards
- Manufactured within 500 miles of project site
- Low-Emissivity Coatings (Low E)
  - Reflects invisible long-wave infrared or heat
  - Reduces heat gain or loss in a building by redirecting the heat
  - Provides greater light transmission
  - Low reflection and reduces heat transfer

Burnham-Moores Center, MSRE Program, University of San Diego

(VIRACON, 2013) (AECOM, 2011)
Ground Level Glazing - Curtain Wall

- Herculite Glass Doors – Frameless
- Clear monolithic all glass glazing system
- Viracon VE 1-2M Clear Low-E Insulated
Glass Curtain Wall

Typical Facade **North / West** Vision Viracon VRE 1-46 Clear Low E - Insulated

**West** Window Vision
Viracon VY1-08
Clear Insulated

**East / West** Vision
Viracon VA 1-13 Clear Insulated

**South / East** Vision Viracon VRE 1-46 Clear Low E - Insulated

Burnham-Moores Center, MSRE Program, University of San Diego

(Earthcam, 2013)  (VIRACON, 2013)
Restroom Mock Up

Quality control – 3rd Floor
Electrical Outlets, Ceiling Tiles, Mirror, Water Closets

Burnham-Moores Center, MSRE Program, University of San Diego

(Hines, 2013) (Connors, 2013)
Mechanical System – HVAC

• Air Conditioning consists of chilled water floor by floor Variable Air Volume (VAV) dual path Air Handling Units (AHU’s)

• Each AHU will provide cooling through overhead air distribution at 55°Fahrenheit for perimeter

• Each AHU will provide ventilation and cooling through underfloor air distribution (UFAD) at 68 Fahrenheit
HVAC Floor-By-Floor AHU’s

- Intake Air
- Coils
- Filters
- Perimeter Air
- Raised Floor
- Return Air

Burnham-Moores Center, MSRE Program, University of San Diego

(Connors, 2013)
Mechanical Systems - HVAC

• TEMTROL – Located in building’s penthouse

• Air Handling Unit (AHU) provides outside air to each fan room via dedicated supply shaft

• FANWALL Technology

• AHRI certified fans aid in building designs that verify system performance for LEED Certification
HVAC - Filters

• AHU’s Filters

• High efficiency Merv-7 & 13 filters

• Filters capture airborne particles/allergens

• Does not promote the growth of bacteria, mold, mildew, or fungi
Mechanical – HVAC

- Baltimore Air Company (BAC) Cooling Tower
- Serves basement chiller
- Connected to Recycled Water
- Two condenser water pumps located at the roof will circulate water throughout the building
- (2) 560 ton cooling towers
- Cooling loads 15 tons per floor

Burnham-Moores Center, MSRE Program, University of San Diego

(Connors, 2013) (AECOM, 2011)
HVAC – Chillers

Carrier
- Basement chiller plant
- 460 tons (cooling capacity)

Burnham-Moores Center, MSRE
Program, University of San Diego

(Hines, 2013) (Connors, 2013)
Typical Water Cooled Chiller System

![Diagram of a water cooled chiller system]

- **Condenser water pump**
- **Cooling tower**
- **Fan**
- **Chiller**
- **Chilled water pump**
- **Air-handling unit cooling coil**

*Courtesy: E source; adapted from EPA*

Burnham-Moores Center, MSRE Program, University of San Diego

(Energy Star Building Upgrade Manual, 2013)
Unique Features

I. Cooling Tower Reclaimed Water System

- Two Cell Cooling Tower uses 22,650 gal a day
- Blowdown uses 60 gal. a day through zero bleed treatment program
- Eliminates need for traditional chemical blowdown of condenser water
- Calcium and magnesium are removed with a water softener
- Result is minimal blowdown PH and TDS (total dissolved solids) levels rise creating an unsustainable environment for microbiological organisms to prosper
- Reduces corrosion
- Uses substantially less water because minimal blowdown is used to reduce chemical concentration and TDS in condensed water
- Reduced sewer capacity fees by $ 90,000

Burnham-Moores Center, MSRE Program, University of San Diego

(WSP Flack + Kurtz, 2013)
Cooling Tower – Media Filters

PuroFlux

• Particle retention resulting in higher water quality

Burnham-Moores Center, MSRE Program, University of San Diego

(Puroflex Corporation, 2013) (Connors, 2013)
Cooling Tower Reclaimed Water System

1) Reclain water is treated via water softening system (consisting of zeolite water softeners, controllers, controls, and valves)
   a) Salt discharge will go to brine tank
   b) Backwash of water softeners from regeneration will go to drain
2) Reclain water (soft make-up water) is sent through building via riser to the roof where it feeds two (2) 560 ton cooling towers
II. Energy – Net Zero

• Net-Zero Efficiency – annually the building must produce at least as much power as it consumes

• Achieve by reducing consumption through efficient design and sustainable practices plus on-site generation.

• Baseline Historical Data: the building should consume approximately 4.5 M kWhr (megawatt-hours)

• Fuel Cell generation approximately 5.4 M kWhr
# Fuel Cells

## Technical Highlights

<table>
<thead>
<tr>
<th>Inputs</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Fuels</td>
<td>Natural Gas, Directed Biogas</td>
</tr>
<tr>
<td>Input fuel pressure</td>
<td>15 psig</td>
</tr>
<tr>
<td>Fuel required @ rated power</td>
<td>1.32 MMBtu/hr of natural gas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nameplate power output (net AC)</td>
<td>210kW</td>
</tr>
<tr>
<td>Base load output (net AC)</td>
<td>200kW</td>
</tr>
<tr>
<td>Electrical efficiency (LHV net AC)</td>
<td>&gt; 50%</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>480V @ 60 Hz, 3 or 4-wire 3 phase</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>19.4 tons</td>
</tr>
<tr>
<td>Size</td>
<td>26' 5&quot; x 8' 7&quot; x 6' 9&quot;</td>
</tr>
</tbody>
</table>
Solid Oxide Fuel Cell

• Video

Burnham-Moores Center, MSRE Program, University of San Diego

(Bloom Energy, 2013)
La Jolla Commons II – Fuel Cells

- The site will eventually be fed with biogas
- Reduces energy costs
- Generate electricity for less than they pay the utility company
- Savings typically provide a 3-5 year payback on their capital investment

Burnham-Moores Center, MSRE Program, University of San Diego

(Bloom Energy, 2013)
Electrical Site Plan – Fuel Cell Addition

Burnham-Moores Center, MSRE
Program, University of San Diego

(AECOM, 2011)
III. Management and Control Systems

• Electronic Based Digital Control of Mechanical, Electrical, and Plumbing Systems
  o Cooling Towers
  o AC units
  o Outside air fans

• Features:
  o Configured with two types of network
  o Real time web operator interface
  o Graphical based displays
  o Alarm annunciation and reporting
  o Historical data recording and reporting
  o Remote access with hand held devices
Unitary Controls

Burnham-Moores Center, MSRE Program, University of San Diego

(Johnson Controls, 2013)  (Connors, 2013)
La Jolla Commons II - Success

Building Costs

- Core and Shell: $185 SF
- Tennant Improvements: $80 SF
- Tower II: 2% more than a standard Hines office building

Energy Consumption – Net Zero

- Contribute approximately 1 million megawatt hours back to the grid

Payback

- LEED Features offer 6 year payback on a 15 year lease

Burnham-Moores Center, MSRE Program, University of San Diego

(Hines, 2013)
# Water Use Reduction

La Jolla Commons Tower I

- 10 million gallons of annual savings

<table>
<thead>
<tr>
<th>Description</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Tower (avg. daily make-up water)</td>
<td>10,362 gallons per day (100 % RW)</td>
</tr>
<tr>
<td>Building Plumbing Fixture</td>
<td>14,345 gallons per day (78% RW) / (22% DW)</td>
</tr>
<tr>
<td>Assumed hose bib use</td>
<td>150 gallons per day (100% DW)</td>
</tr>
<tr>
<td>Irrigation</td>
<td>4,055 gallons per day (100% RW)</td>
</tr>
<tr>
<td>Total gallons per day</td>
<td>28,912 gallons per day</td>
</tr>
<tr>
<td>Domestic water use</td>
<td>3,308 gallons per day</td>
</tr>
<tr>
<td>Reclaimed water use</td>
<td>25,604 gallons per day</td>
</tr>
<tr>
<td>Total domestic water use reduction (%)</td>
<td>87%</td>
</tr>
</tbody>
</table>

Burnham-Moores Center, MSRE
Program, University of San Diego

(Hines, 2013)
La Jolla Commons II
Lessons Learned

Financially Feasible Net-Zero Building

Innovative technologies with advanced sustainable features

Class A office with a focus on the wellness of the employee

Space efficiency – Higher costs but beneficial

Net Zero – Experimental Phase
## Codes and Standards

<table>
<thead>
<tr>
<th>Codes</th>
<th>Standards</th>
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</thead>
<tbody>
<tr>
<td>2010 City of San Diego Municipal Code based on 2010 CBC</td>
<td>AABC  Associated Air Balance Council</td>
</tr>
<tr>
<td>2010 California Fire Code</td>
<td>AAMA  American Architectural Manufactures Association</td>
</tr>
<tr>
<td>2010 California Electric Code</td>
<td>ACI   American Concrete Institute</td>
</tr>
<tr>
<td>2010 Mechanical Code</td>
<td>ADA   Americans with Disabilities Act</td>
</tr>
<tr>
<td>2010 California Plumbing Code</td>
<td>ANSI  American National Standards Institute</td>
</tr>
<tr>
<td>2010 California State Building Standards Code</td>
<td>ASHRAE American Society of Heating, Refrigeration and Air Conditioning</td>
</tr>
<tr>
<td>California Code of Regulations, Title 24</td>
<td>ASTM  American Society for Testing and Materials</td>
</tr>
<tr>
<td>2010 September, American’s With Disabilities Act</td>
<td>ESC   Elevator Safety</td>
</tr>
<tr>
<td>Accessibility Standards, Title III</td>
<td>ISO   Insurance Services Office</td>
</tr>
<tr>
<td>Cal OSHA</td>
<td>NAAMM National Association of Architectural Metal Mfg</td>
</tr>
<tr>
<td></td>
<td>NEMA  National Electrical Manufacturers Association</td>
</tr>
<tr>
<td></td>
<td>NFPA  National Fire Protection Association</td>
</tr>
<tr>
<td></td>
<td>NRCE  National Roofing Contractors Association</td>
</tr>
<tr>
<td></td>
<td>SMACNA Sheet Metal &amp; Air Conditioning Contractor's National Association, Inc.</td>
</tr>
<tr>
<td></td>
<td>UL    Underwriters’ Laboratory, Inc.</td>
</tr>
<tr>
<td></td>
<td>OSHA  Occupational Safety and Health Administration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entitlements</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCD-RP099-0762(MMRP) and 2006 PCD Amendments</td>
</tr>
</tbody>
</table>

Burnham-Moores Center, MSRE
Program, University of San Diego
(Himes, 2013)
Owner, Designers, Vendors


AECOM http://www.aecom.com/


Whiting-Turner http://www.whiting-turner.com/

Bloom Energy http://www.bloomenergy.com/


Baltimore Aircoil Company http://www.baltimoreaircoil.com/english/

Temtrol http://www.temtrol.com/

Viracon http://www.viracon.com/

Puroflux http://www.puroflux.com/
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References

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Burnham-Moores Center, MSRE
Program, University of San Diego
References

- Sustainable Sources. (2013, April 21). Flyash Concrete. Retrieved from Sustainable Sources: http://sustainablesources.com/
References


Thank You

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Samantha Shaughnessy, Assistant Construction Manager, Hines

for the project information, site tour, and for your time.
Questions?