Getting to Net-Zero Affordable Housing

Housing Colorado Now Conference
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VMWP

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Architect / Urban Designer
VMWP

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Principal
Affordable Housing Team Leader
Group 14 Engineering
Net-Zero Defined:

Department of Energy: An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.
Single-Family
- Roof Ratio Of 1:1
- Usually plenty of roof area to meet energy demand

Multi-Family
- Roof Ratio Of 1:5
- Usually not enough room to meet energy demand
Net-Zero Defined:

Our Definition: A building that is all electric with the goal of meeting energy demand through on-site renewable energy production. Off-site renewables may be purchased for any energy demand not produced on-site.
Van Meter Williams Pollack, LLP
Architecture & Urban Design
San Francisco / Denver

Getting To Net Zero
Affordable Housing:

Lessons Learned from California

• California AB 32

Valencia Gardens, San Francisco, CA
Getting To Net Zero
Affordable Housing:

- **PreDesign**
  Integrate the Full A&E Design Team and General Contractor
  Set Realistic Goals & Parameters
  Passive House Standard/Strategy Workshop
  Detailed Site, Environmental Program Analysis

2175 Market St, San Francisco, CA
Getting To Net Zero
Affordable Housing:

- **Schematic Design**
  BIM [Building Information Modeling]
  Keep it Simple / Form & Orientation
  Health & Wellness
  Shading of South and West Glass
  Glass to Mass
  Space Daylighting
  Preliminary Energy Modeling

Mural @ MacBART, Oakland, CA
Van Meter Williams Pollack, LLP  
*Architecture & Urban Design*  
*San Francisco / Denver*

Getting To Net Zero  
Affordable Housing:

- **Design Development**
  - Solar PV Assessment
  - Solar Thermal Hot Water Pre-Heat of De-Centralized Systems
  - Low Flow Fixtures
  - LED Lighting & Energy Star Appliances
  - De-Centralized Heat Recovery Ventilation
  - Envelope Design & Continuous Insulation
  - High Performance Glazing
  - Critical Sub-Contractor Involvement
  - Updated Energy Modeling

Cottonwood Place, Fremont, CA
Van Meter Williams Pollack, LLP
Architecture & Urban Design
San Francisco / Denver

Getting To Net Zero
Affordable Housing;

- **Construction Documents**
  - OVE Framing
  - Air Sealing Details
  - Thermal Bridging
  - Insulation Details

Space Heating / Cooling Specs & Details
Water Heating & Plumbing Details
Final Energy Modeling

ReBuild Potero, Block X, San Francisco, CA
Getting To Net Zero
Affordable Housing;

**Construction**
Pre-Construction Workshop
Material Assembly Mockups
Material Substitution Analysis
Air Tight Construction
Blower Door Measurement Testing
Commissioning of Mech. Equipment
Energy Performance Dashboards
Dwelling Unit Kill Switches
Submeter Systems / Energy Monitor
Performance Measures in the Contract

Warner Creek, Novato, CA
Getting To Net Zero
Affordable Housing;

- **Occupancy**
  Building Operator Workshop
  Verify Energy Performance
  Tenant Guidelines and Education
  Post Occupancy Evaluation

Del Corazon, Denver, C0
Net Zero for Colorado:

4 Energy Zones

All of Alaska is in Zone 7 except for the following boroughs in Zone 8:
Bethel, Northwest Arctic, Dillingham, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands
HildaHaus:

Test Case Laboratory

Tabernash, Colorado
Energy Zone 7b,
8665’ Elevation

The “Ice Box”
Ave year temp: 34 degrees

Heating Degree Days 12,265
HildaHaus:

1819 sf;
Grid Connected
NetZero
Carbon Neutral
All Electric

Heating Degree Days 12,265

18,198 btu/hr heatloss @
Design Temp. of -16F
HildaHaus:

Heating;
65% Passive Solar,
15% Internal Activity,
20% Fireplace / Heat Pump

Compact Shed Form
Smart Plumbing Wall
Mass Core

Super Insulated:
  R20 Slab
  R47 Walls
  R79 Roof
  R5.5 Windows
HildaHaus:

Harvested Beetle Kill Exterior Siding, Interior Ceiling & Framing

Corten & Corrugated Metal Siding
Cedar Accents

$305 sq. ft. all in less than area Code custom homes
HildaHaus:

Open Floor Plan
Thermal Flow: Comfort

Thermal Mass Core:
Interior Stone
5/8” Gyp Bd
Concrete Floor
HildaHaus: Alternative Construction Techniques

Shallow Frost Protected Foundation
R20 Slab
HildaHaus:

Advanced Framing: 24” oc
[harvested beetle kill trees]

Super Insulated [R20 Slab, R47 Walls, R 79 Roof, R5.5 Windows]

Air Tight [fussy air sealing details]
cfm@50 = .0587
HildaHaus:

Liquid Applied Air & Water Barrier

Exterior Insulation Jacket w/ Rain Screen R15
HildaHaus: Green Gadgets

Heat Pump Hot Water Heater [COP 2.5],

Heat Recovery Ventilator [83% eff]
HildaHaus:

Cold Weather, Multi Zone, 2 ton
Mini Split Heat Pump [COP +3]

4.5 kW bi-facial PV & Façade Summer
Sunshade
HildaHaus:

Induction Cooktop,

Condensing Ventless Dryer
HildaHaus:

iPhone Apps run the house:

Nest Thermostat
Renewable Energy Monitor
Heat Pump Hot Water Heater Monitor
Hilda Haus:

Year 1
Net Zero Positive
$24.25 back

Craft Beer Money
HildaHaus:

Lets Scale it Up Colorado!
GROUP 14 PROFILE

BUILDING ENERGY EFFICIENCY
- Energy Modeling
- Energy Efficiency Consulting
- Lighting/Daylighting
- Window/Wall Thermal Performance
- Building Research

LEED AND SUSTAINABILITY
- Green Building Certification
- Occupant Engagement
- Sustainability Planning
- EPB/ENERGY STAR Ratings

COMMISSIONING
- Fundamental Cx
- Enhanced Cx
- Warranty Inspection
- Owner Training
- Monitoring-Based Cx
- Facilities Conditions Assessments

EXISTING BUILDINGS
- Energy Audits
- Retro Cx
- Measurement & Verification
- Energy Efficiency
- Fault Detection & Diagnostics

Certified B Corporation
GREEN BUSINESS
PROVEN PROVIDER
Just. B the Solution
Getting to Near Net Zero

- Design Details and Commissioning Matter
- Leverage Net Operating Income
- Consider Electrification
- DOE Net-Zero Ready
HVAC

- High efficiency Split System Heat Pumps
- Central DOAS, In-Unit ERV, or Natural Ventilation
- Non-programmable thermostats
- Sizing and loads
Domestic Hot Water

- Central/shared heat pump hot water heaters
- Low flow fixtures
- Small Diameter Distribution Pipe
Lighting

- Max watts per sq ft
- All LED lighting packages
- Code required lighting controls
Appliances, Plug Loads, and Demand Control

- All Energy Star+ appliances
- Ceiling fans in bedrooms
- Kill switches and decals
- Demand Control of Thermal Loads
Building Envelope

- Code required roof and wall insulation
- Tuned window glazing by orientation
- Foundation insulation R-10 continuous insulation
Air Sealing Details

Eliminate Thermal Bridging and Leakage!
Renewables

• On-site solar
• Xcel Energy’s Renewable Connect program
• Community solar garden contracts
PRO-FORMA & INCENTIVES
Utility Allowances & Efficiency

By decreasing in-unit utility allowance, rental income increases.
# CHFA Utility Allowance Policy – 2018 Update

<table>
<thead>
<tr>
<th>Property Type</th>
<th>Utility Allowance Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Housing Services (RHS) properties, or any building in which any resident receives Rural Housing rental assistance, operating in combination with LIHTC and/or a CHFA Multifamily Loan</td>
<td>Use the project-specific utility allowances approved by RHS (i.e., USDA Rural Development)</td>
</tr>
<tr>
<td>HUD project-based Section 8 properties operating in combination with LIHTC and/or a CHFA Multifamily Loan</td>
<td>Use the project-specific utility allowances approved by HUD</td>
</tr>
</tbody>
</table>
| All other properties: LIHTC and/or CHFA Multifamily Loan developments that are not assisted by USDA Rural Development (Rural Housing Services) or regulated by HUD (project-based Section 8) | Utility allowances for rent restricted units may be determined using one of the following options:  
  1. Local Public Housing Authority Schedule  
  2. Actual Usage and Rate Estimate  
  3. HUD Utility Schedule Model  
  4. Energy Consumption Model |
JCHA Utility Allowance Schedule

JEFFERSON COUNTY HOUSING AUTHORITY
HOUSING CHOICE VOUCHER PROGRAM

Effective January 2018 UTILITY ALLOWANCE SCHEDULE

<table>
<thead>
<tr>
<th>Energy Use</th>
<th>Actual Number of Bedrooms in Dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Gas Heat (Natural)</td>
<td>25</td>
</tr>
<tr>
<td>Electric Heat (Resistance)</td>
<td>17</td>
</tr>
<tr>
<td>Electric Heat (Pump)</td>
<td>15</td>
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<tr>
<td>Gas Hot Water Heater</td>
<td>4</td>
</tr>
<tr>
<td>Electric Hot Water Heater</td>
<td>10</td>
</tr>
<tr>
<td>Gas Stove</td>
<td>7</td>
</tr>
<tr>
<td>Electric Stove</td>
<td>4</td>
</tr>
<tr>
<td>Electric Other (lighting,</td>
<td>22</td>
</tr>
<tr>
<td>refrigeration, etc.)</td>
<td></td>
</tr>
<tr>
<td>Water/Sewer</td>
<td>38</td>
</tr>
</tbody>
</table>

Trash Removal: $17 per month based on averages from residential trash pick up.

Typical 1 BR = $47, 2 BR = $60, 3 BR = $72
Net Income Impact – New Construction

Near Net Zero Utility Allowances
- ~$25/unit per month less than Section 8 Allowances
- 100 Apartment Building = $30,000 in additional rental income per year

Common Area OpEx Reduction
- ~$0.40/SF of common area in savings

Increased Asset Valuation and Borrowing Capacity
- For a 100-unit building, $760,000 at a 5% cap rate, with an additional $500,000 of borrowing capacity.
Other Considerations – Metering, Gross Rents, Application

• Electric sub-meters, gas and water master meters
• For Section 8, project-based voucher projects, consider gross rents
• At initial application, local PHA allowances are required for all projects
• At lease up, alternative utility allowances are allowed per CHFA's allowance policy at the time of tax credit award
Incentives

**Xcel Energy Design Assistance Program**
- Utility Incentive for above code design - free money and modeling for design teams
- Helps projects meet EGC 5.1
- For New Construction and Major Renovation projects larger than 50,000 SF

**Energy Outreach Colorado LIHTC Alternative Compliance Program**
- Low Income Utility Incentive Program - more free money than standard rebates
- Helps projects meet EGC 5.1
- For moderate and substantial rehab projects

**Renewable and Clean Energy - DOLA**
- $12,000,000 available
- Municipalities, counties, school districts, special districts and other political subdivisions

**Healthy Housing Index Rewards from Fannie Mae**
- 15 - 30 basis point pricing discount on loan
- Requires Fitwell certification or “Enhanced Resident Services” - Fannie Mae will help pay for either

**Enterprise Community Partners Grants**
- Annual Technical Assistance Grants (smaller)
- Larger HUD Section 4 Grants

**Charge Ahead Colorado**
- Grants to cover hard costs associated with electric car charging stations