37 Hudson
Target Net Zero
Columbia City - Mixed Use Housing
Cascade Built & NK Architects
March 11th, 2016
Outline

Where are we going?

A. **Big Hairy Audacious Goal**
B. **Reality Check**
C. **What is Net Zero target?**
D. **Comments - Responses**
Built Using Passive House Standards:

- **SolHaus**
- **Mini-B backyard cottage**
- **Park Passive**
- **View Haus 5**

Passive House Certified Projects:
B.H.A.G. Opportunity
*(Big Hairy Audacious Goal)*

**Net Zero APARTMENTS in 4-stories:**

- Small Lot of 4900 square feet
- 35 small dwelling units averaging 400 SF
- 800 square foot corner retail
- Solar PV array to achieve Net Zero annual **ON-SITE** performance

**PROTOTYPE?**
A Passive House approach:

**Basic Systems to achieve Market Rate:**

1. 2x6 wood stud + 3-inch Mineral Wool wrap
2. Sealed Sheathing for Airtightness
3. (8) Shared Energy Recovery Ventilators
4. Large Windows with Operable Shading
5. Cross Ventilation for Summer Cooling

*Will this get the project to B.H.A.G?*
A few challenges:

1. SEDU’s = small footprint
   -----------------------
   more people & stuff PSF

2. Open walks and stairs
   -----------------------
   many entry doors

3. Cross ventilation
   -----------------------
   less Treated Floor Area

4. Big west facing windows
   -----------------------
   Few South Windows

5. Not the ideal orientation
Building Plan - Upper Levels

Typical Floor Levels 2 - 4
Building Plan - Ground Level

- Trash & Recycle
- Bike Storage
- Open Court
- Amenity: 355 sf
- Type A: 335 sf
- Type A: 335 sf
- Live Work: 335 sf
- Live Work: 335 sf
- Live Work: 335 sf
- Retail: 820 sf

Ground Level Plan
Net Zero Strategy:

PV Area

20 kWh/sf/yr

1 sf Production

= 4 sf Use

Building Floor Area

5 kWh/sf/yr

5 kWh/sf/yr

5 kWh/sf/yr

5 kWh/sf/yr

x 3.412 kbtu/kWh

= 17 EUI
Maximum PV array design

- Elevated PV for total lot coverage
- 5% slope for passive washing
- Elevated for Fire Access
- Exceeds Zoning Height Limit
Reality Check:

Land Use pushback on Height of PV Cap
Cost of Raised PV Structure
Fire Department requires pathway on all sides

ELEVATED ARRAY:
72,000 kW array provides 18.0 kBtu/SF/year = 18 EUI
Meets the Passive House target of PHIUS+2015

ON-ROOF ARRAY:
48,000 kW array provides 12.0 kBtu/SF/year = 12 EUI

Not the Net Zero target intended!
On-Roof Array:

ON-ROOF ARRAY:

48,000 kW array provides 12.0 kBtu/SF/year = 12 EUI
On-Roof Array:

**ON-ROOF ARRAY:**

48,000 kW array provides 12.0 kBtu/SF/year = 12 EUI
2000 watt Society
1998 Swiss global target of personal performance

A. 2,000 watts of energy flow per person – source energy

B. 12,000 watts of energy flow is US average today

C. 1,470 kWhrs/year “SITE” energy per person

What if we apply this principal to 3700 S Hudson?
Ventilation Strategy - I

Distributed ERV’s

TYPICAL FLOOR LEVEL
Ventilation Strategy - 2

Distributed ERV’s

EXHAUST AIR DUCTS

TYPICAL FLOOR LEVEL

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DESIGN FOR A SUSTAINABLE FUTURE
Summer Shading Strategy

- **SUMMER - am**
- **SUMMER - pm**
- **WINTER - am**
- **WINTER - pm**
3700 S Hudson - as 2000 watt building

Operating as a 2000 watt building “IN THE FUTURE”

13,000 SF = 12 EUI

Initial PHPP:
5.11 kBtu / SF / year
(close but needs work!)
The Brussels Experience

Exemplary Buildings Program
Thank you!