

# Commercial New Construction Pilot Offering Concept Paper

The goal of this Commercial New Construction (CNC) Pilot Offering is to develop a regionally consistent prescriptive CNC package of measures beyond code. A prescriptive CNC package for small offices will be available for BPA incentives in the PTR system starting October 1, 2007, based on the building location and conditioned area. For continuity purposes, BPA's willingness to pay would be the same across the region. Similar prescriptive CNC packages for small retail, schools, public assembly and warehouses are anticipated as future offerings.

## Background

In the spring of 2006, a Commercial New Construction Regional Strategy Group was formed, which consists of BPA, the Energy Trust of Oregon, EWEB, Idaho Power, NEEA, NWPCC/RTF, PacifiCorp, Puget Sound Energy, Seattle City Light, Snohomish County PUD, Springfield Utility Board and Tacoma Power. This group has met six times to talk about their CNC Programs, regional needs and opportunities for regional continuity. The group identified a prescriptive CNC package of measures beyond code, as one of the region's priorities. The CNC Regional Strategy Group discussed a package of measures similar to the New Buildings Institute (NBI) Advanced Building (AB) Version 2.0, which builds on the millions of dollars already invested in the NBI AB Version 1.0.

Based on feedback from the CNC Regional Strategy Group and the work of the New Buildings Institute (NBI) Advanced Building (AB) Guidelines, at the Nov 13th RTF meeting Charlie Grist presented the CNC concept which consisted of having whole-building, integrated measure approach, with region-wide deemed or deemed calculated savings, based on eQUEST (DOE2) modeling. The RTF approved this approach, formed an RTF subcommittee and funded engineering review of analyses, development of prototypes and other key technical or market inputs. The RTF subcommittee, consisting of Charlie Grist, Michael Rosenberg, Michael Mann, David Hales, Ken Eklund, Jill Steiner, Tim Steele, Mira Vowles and Will Miller, and RTF funded consultants, Brian Thornton and David Baylon, has met with NBI fourteen times to vet the modeling procedures and prescriptive package for new offices with a window wall ratio less than 30 percent and a simple HVAC system (either packaged systems or rooftop units).

## Approach

The office prototype was developed for the ASHRAE "Advanced Energy Design Guide" and AB Guidelines. It was modified for code baselines, roof and ext wall insulation small changes, glass changed to 0.54 overall u-value and 0.57 shading coefficient, extended evening hours, increased off-hour lighting to 30%, off-hour plugs to 40%, plug power density was increased to 1.1 to account for task lighting and other equipment, fan static increased from 1.25 in to 2.5 in, or 0.00056 kW/cfm, night cycle control set to cycle on any rather than stay-off, all enclosed rooms less than 300 square feet were assumed to have lighting controlled by occupancy sensors, economizer maximum temperature was decreased from 75 F to 70 F, the maximum outside air fraction was reduced from 100% to 70% to reflect actual economizer performance and the cooling-EIR was increased from 0.3051 to 0.331 (equivalent cooling EER reduced from 11.2 to 10.3) to reflect Tier 1 as the baseline for 10 ton units. The following four system types were modeled: VAV with electric reheat, heat pump, single zone equipment with gas furnace, and

VAV with a hot water loop served by a gas boiler. It was decided not to incent for buildings with electric single zone equipment.

The initial prescriptive package used the best available data and will be revised as new data and evaluation results are available.

Some of the issues that the RTF subcommittee have discussed include applicability for buildings larger and smaller than 50,000 square feet, the four code baselines, Best of the Region code baseline, Northwest Best package of measures, the seven pacific northwest climate zones (east Oregon, west Oregon, east Washington, west Washington, Seattle and two zones in Idaho and Montana), using TMY data for one or more representative cities, the prototype buildings, including gas and electric savings, keeping the prescriptive CNC measure savings in a simple (kWh per square foot) format, measure costs beyond code, realistic code baseline EUI's, incremental costs, what measures are commercially available and should be in the package and which should be stretch measures.

RTF subcommittee initially considered the following list of potential prescriptive CNC measures:

- 1) R30 roof insulation [all but Oregon codes are already at R30]
- 2) R19 wall insulation [all but Oregon zone 1, Idaho and Montana are already at R19, and simple payback for selected prototype walls is over 50 years]
- 3) Windows, up to a 30% window-wall ratio,  $U=0.35$ ,  $SHGC=0.4$ ,
- 4) Skylights, 5% of roof area,  $U=0.40$ ,
- 5) Exterior shading of windows,
- 6) Occupancy and continuous dimming lighting controls and ballast upgrades,
- 7) Daylight controls (issues with ballast upgrade and Cx)
- 8) HVAC roof top unit (RTU) upgrade to 13 SEER (Oregon requires Tier 1 for units less than 13,000 Btuh)
- 9) HVAC RTU upgrade to 14 SEER (Tier 2)
- 10) Re-sizing HVAC for reduced, actual load, including improved part load efficiency,
- 11) Additional HVAC upgrades, including evaporative pre-cooler, premium efficiency motors, heat recovery, demand controlled ventilation (DCV) and variable frequency drives (VFD),
- 12) Advanced economizer control, including 2-stage cooling thermostat and "western premium economizer" features,
- 13) Building wide direct digital control (DDC) system.
- 14) Lighting power density less than 0.9 watts per square foot [LPD of 0.75 was chosen because it meets the Energy Policy Act tax deduction requirements]
- 15) Metering protocol requirement (\$800 upgrade)
- 16) Condensing domestic hot water in schools
- 17) HVAC and Lighting control strategies not required by code
- 18) VSD's on small motors or pumps or fans
- 19) Fan Power Requirement (improve 10%) or duct design or something else to reduce fan energy or dedicated outside air
- 20) Ground Source HP where cost-effective
- 21) ECM for VAV series fan powered boxes

**Intermediate Results**

A potentially cost effective package of prescriptive CNC office measures beyond code include:

<b>Energy Smart HVAC System</b>	<b>VAV with electric reheat</b>	<b>Heat Pump</b>	<b>Single zone equipment with gas furnace</b>	<b>VAV with a hot water loop served by a gas boiler</b>
<b>Cooling System minimum efficiency level</b>	CEE Tier 1	CEE Tier 1	CEE Tier 2	CEE Tier 1
<b>Window U-Value up to 30% window to wall area</b>	0.40 Maximum	0.40 Maximum	0.40 Maximum	0.40 Maximum
<b>Integrated Design of HVAC System, including Fan Power</b>	ECM on series fan powered boxes plus reduced static pressure and improved motor efficiency	Reduced static pressure and improved motor efficiency	Reduced static pressure and improved motor efficiency	Reduced static pressure and improved motor efficiency
<b>Lighting Budget</b>	0.75 Watts/SF Maximum	0.75 Watts/SF Maximum	0.75 Watts/SF Maximum	0.75 Watts/SF Maximum
<b>Lighting Controls</b>	Occupancy Sensors	Occupancy Sensors	Occupancy Sensors	Occupancy Sensors
<b>HVAC &amp; Lighting Controls System Commissioning</b>	Required	Required	Required	Required
<i>Simple Payback Range: XX Years</i>				

**Additional Requirements**

Need program materials, better cost information and an education, marketing and outreach plan.