

EnergySmart Office Rx Package RTF Proposal

BPA proposes this EnergySmart Office Prescriptive (Rx) Package as a regionally consistent offering that exceeds code. The savings for the EnergySmart Office Rx Package have been modeled and have an average deemed value of 1.7 kWh per square foot. It is proposed that this value be available in the PTR system starting October 1, 2007. For continuity purposes, BPA's willingness to pay will be the same across the region, and the savings will be calculated based on the building location and conditioned area. Similar prescriptive packages for small retail, schools, public assembly and warehouses, as well as additional "stretch" Office measures, are anticipated in the future.

Background

The EnergySmart Office Prescriptive (Rx) Package is aligned with the ASHRAE "Advanced Energy Design Guide", Advanced Building Core Performance Guidelines and the LEED prescriptive path. A Commercial New Construction (CNC) RTF Sub-Committee consisting of Charlie Grist, Michael Mann, David Hales, Ken Eklund, Michael Rosenberg, Jill Steiner, Tim Steele, Mira Vowles and Will Miller. Consultants Mark Frankel, Brian Thornton and David Baylon also provided assistance. The Sub-Committee vetted the energy model, discussed the savings and the measures in seventeen 90 minute conference calls. The EnergySmart Office Prescriptive (Rx) Package has also been discussed with the Commercial New Construction Strategy Group and several developers, engineers and commissioning agents.

EnergySmart Office Prescriptive (Rx) Package

The following EnergySmart Office Prescriptive (Rx) Package of measures which exceed code, will provide an average of 1.8 kWh per square foot and a Benefit-Cost ratio of 1.15:

Description	Requirement (Documentation)
1) Cooling System minimum efficiency level	CEE Tier 2 (cut sheet)
2) Effective Window U-Value	0.35 Maximum –punched openings 0.40 Maximum –punched openings or Code, where more stringent (NFRC rating)
3) Window SHGC	0.30 Maximum –punched openings 0.35 Maximum –punched openings or Code, where more stringent (cut sheet)
4) Enhanced economizer, including dedicated thermostat stage, differential changeover with both a return and outside air dry-bulb sensors, and low ambient outside air compressor lock-out	Required (commissioning report summary)

5) Integrated Design of HVAC System, including Fan Power reduction	Required (commissioning report summary)
6) Lighting Budget (whole building)	0.78 Watts/SF Maximum, while providing illuminance levels as recommended by IESNA (copy of code lighting budget form required for permit)
7) Lighting Controls	Occupancy Sensors-install where lighting loads are over 150 watts and sensors are not required by code (commissioning report summary)

Next Steps

Vetting with architects, engineers, commissioning agents, building owners, developers and property managers, will continue in order to obtain additional feedback. A program theory, identifying program goals, success metrics and a marketing and outreach plan is being developed. Technical specifications are being developed; a draft will be available for discussion September 19, 2007, with an RTF subcommittee conference call scheduled for September 27, 2007. An evaluation plan will be vetted with the RTF subcommittee before the end of the year. Additional program materials and resources, such as sample lighting designs to meet the lighting power budget, will be developed. Work has been initiated to align the EnergySmart Office Rx Package with the federal Energy Policy Act Tax Deduction, ODOE Business Energy Tax Credit, LEED and Advanced Building Core Performance.

APPENDIX

Baseline Adjustment

The EnergySmart office prototype was developed for the ASHRAE “Advanced Energy Design Guide” and Advanced Building Guidelines. Since the prototype was modeled with ASHRAE 90.1, 2004 as the baseline, it was modified for an Oregon code baseline. 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.

The energy use index (EUI) for this preliminary prototype baseline were between 32,000 and 35,000 Btu per square foot, depending on system type; these were decided to be an unrealistic starting point for a baseline building. The baseline was adjusted with extended evening hours, off-hour lighting was increased 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 resulting baseline energy use index (EUI) for this adjusted prototype baseline between 46,000 and 51,000 Btu per square foot, depending on system type. These baseline EUIs were comparable with Oregon SEED buildings, LEED buildings and other new buildings that the RTF sub-committee were familiar with.

Modeling Issues

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.

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Measures Considered

The 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