



Association of
Professional
Energy Managers



APEM OREGON - WINTER FORUM

Linfield College

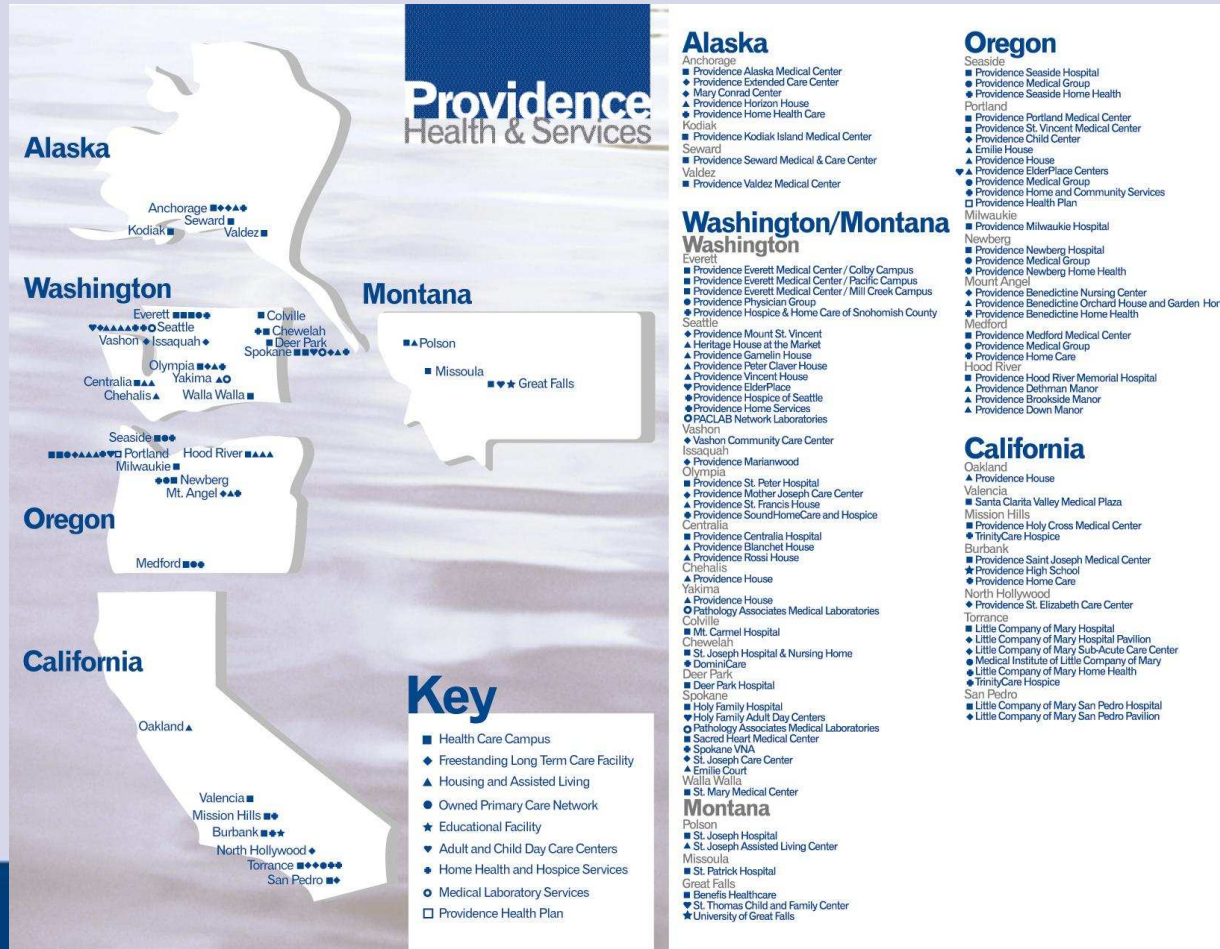
December 2, 2011

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The Model Said What?

Providence Oregon Energy Efficiency Chumps & Champs

Providence Health & Services



Providence Newberg Medical Center

- Nation's Greenest Hospital
- First LEED Gold Hospital in The World
- Energy Champ or Chump?

- In the beginning ...

Providence Newberg



- 138,000 gsf acute care hospital, 40 beds
- 45,000 gsf medical office building
- \$49.3 million construction cost
- \$70.6 million total project cost
- Design development began in 2001
- Facility opened June 2006
- < 2% cost impact to achieve LEED Gold

Providence Newberg Medical Center

- PNMC Video – 5 Minutes

Providence Newberg Medical Center Construction Video



FROM GUINNESS TO GREEN



LEED Financials

< 1.4% cost impact to achieve LEED Gold

- **LEED costs** **\$690,200**
 - Oregon energy tax credits **\$214,345**
 - Energy & sustainability grants **\$277,040**
 - **Net incremental cost \$198,615**
- Projected**
- **Annual energy savings \$178,753**



Providence Newberg Medical Center

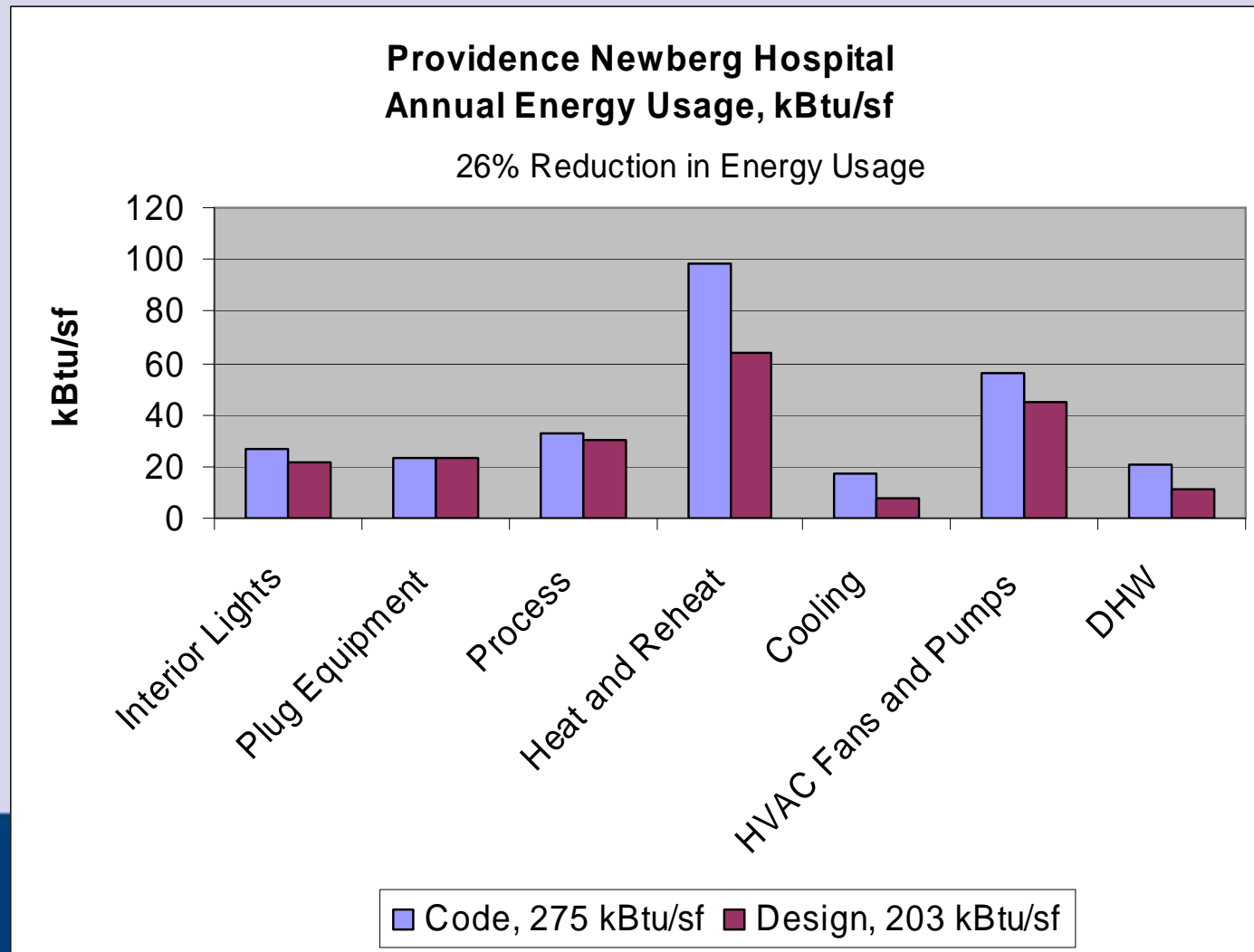
- The Energy Model Said ...

Energy Efficiency Expectations at DD



ENERGY STAR
Certified
Hospital
Score of 75+

Current –
268 kBtu/SF



EEMs

		Incremental Cost (1)
EEM #	Baseline Building	---
A	Design Dev. Pkg.	\$ 399,415
B1	N Window SC	\$ -
B2	Daylighting-Selected	\$ 24,476
B3	Occ Sensors-HVAC	\$ 21,598
B4	Condensing Boilers	\$ 132,100
B5	Static Pressure Reset	\$ 375
B6	Air Temperature Reset	\$ 375
	Pre-Interactive A, B1-6	\$ 556,741
C*	ETO Grant Award	\$ (199,585)
TOTAL	Incremental Cost	\$ 356,833
Simple Payback	= 1.99 Years	
IRR	= 54%	\$ 85,000

“in Kind Assistance”

Energy Savings Calcs



Providence Newberg Hospital - Pro Forma Analysis of EE Base Case vs. Code Minimum

SELP Financing - 10 years @ 6%

Assessment Criteria

Cost of SELP Financing	6.00%	(Preliminary pending review of a complete credit package)
Term of Agreement	10	
Cost of Capital (Discount Rate)	9.3%	(Estimated weighted average cost of capital assuming 60% de
Expected Life of Savings	10 Years	
Energy and Repairs Inflation Rate	3.0%	Estimated based on consensus projection
Capital Investment: Facility Improvement Measures	\$357,156	Balance of \$556,741 Incremental Cost of Energy Efficiency Pa
Annual Utilities Cost for Entire Facility	\$1,650,000	
Annual Utilities and Repairs Cost Savings	\$178,753	

Base Case: Hospital Built to Oregon Code Minimum

Description	Construction	Year 1	Year 2	Year 3	Year 4
Current Utilities and Repairs Cost	(1,650,000)	(1,699,500)	(1,750,485)	(1,803,000)	(1,857,090)
Cumulative Cash Flow	(1,650,000)	(3,349,500)	(5,099,985)	(6,902,985)	(8,760,074)
PV of Cash Flow for Construction + 10 Yr Term	(\$12,559,371)				

Alternate Approach: EE Base Case Installed and Financed with SELP

Description	Construction	Year 1	Year 2	Year 3	Year 4
Principal and Interest on 100% Financing	0	(47,582)	(47,582)	(47,582)	(47,582)
Utilities and Maintenance Cost with SELP	(1,650,000)	(1,515,384)	(1,560,846)	(1,607,671)	(1,655,901)
Cash Flow	(1,650,000)	(1,562,966)	(1,608,428)	(1,655,253)	(1,703,483)
Cumulative Cash Flow	(1,650,000)	(3,212,966)	(4,821,394)	(6,476,648)	(8,180,131)
PV of Cash Flow for Construction + 10 Yr Term	(\$11,638,023)				

Difference: Advantage of Alternate Approach

Description	Construction	Year 1	Year 2	Year 3	Year 4
Annual Cash Flow Improvement w/ Alternate	0	136,534	142,057	147,746	153,606
Cumulative Cash Flow	0	136,534	278,591	426,337	579,943
NPV of Cash Flow for Construction + 10 Yr Term	\$921,347				

Self Funding Alternative

Cash Flow	(\$357,156)	184,116	189,639	195,328	201,188
Internal Rate of Return	54%				

Providence Newberg Analysis I.xls
 Total E. E. Package Incremental Cost is \$556,741
 Energy Trust of Oregon Contribution is \$199,858

Results & Realities...

- ENERGY STAR Score on Anniversary: 25
- Building Programming Changed
- Accelerated Move Into Building
- Commissioning Not Completed Prior
- Systems Not Ready for Commissioning
- Condensing Boilers Alternative Fuel Test
Soots Boilers and Stack!

Owner Inattentiveness to Energy Modeling Effort

Realities

1. Value Engineering of E.E. Elements
2. Facilities Staff Overwhelmed by Startup
3. Facilities Staff – Lack of Training of Systems
4. Boilers Not Condensing / Operators Not Understanding
5. Steam Boiler Plant Over-sized by OAR
6. 100% Outside Air /Heat Recovery
 1. Too Large an Energy Penalty?

Owner Inattentiveness to Energy Modeling Effort

Model Variances

1. Post-occupancy Engineer's Review
 - 14% > kWh Consumption than Model
 - 46% > Therms Consumption than Model
2. Model Assumes Surgery Suites Supply Airflow @ 50% When Unoccupied.
 - Actually operating 24/7 @ 100% Air Flow
3. AH-3 thru AH-8: 16,500 CFM Higher Airflow than the Model. Significant because these run 24/7 100% OSA.
4. Plug-load Not Fully Accounted For/Increased
5. Model Assumes MOB Closed on Weekends.
 - MOB Operates 7 am – 6 pm on Saturdays
 - Different Tenant with larger plug loads than modeled...

Energy Modeling Lessons Learned



- Owner Owns Inputs
- Owner Must Stay Engaged in Modeling
- Changes from DD to Occupancy Must Be Accounted for in the Model
- Owner Must Invest in Maximum Staff Training / Continuous Commissioning
- Do Not Publicize Energy Expectations

Current Status



- ENERGY STAR Score – 64 (268 kBtu/SF/Yr.)
- Installed New Smaller Steam Boiler
- DDC Controls Upgrade
- Installed 94 KW Solar Array (1-3% of demand)
- Considering Return Air Retrofit!

Providence Portland Medical Center Central Utility Plant Project



Providence Portland Medical Center

Central Utility Plant, Portland, OR



- 2007 ASHRAE Technology Award, First Place, New Health Care Facilities Category, ASHRAE Puget Sound Chapter
- 2007 ASHRAE Technology Award, First Place, New Health Care Facilities Category, ASHRAE Regional
- 2006 ASHE Vista Team Award for Infrastructure, American Society for Healthcare Engineering
- 2006 Oregon ACEC Grand Engineering Excellence Award, Oregon ACEC Engineering Excellence Awards

Providence Portland Medical Center



Central Utility Plant Portland, Oregon



Construction Cost: \$31 million

- Demolition/renovation/expansion of existing central plant; build-out of new space within existing parking garage
- New 3,600-ton chilled water plant
- Expansion of existing boiler plant, upgrades of other mechanical systems
- Facilities fully operational throughout construction and cut-over of systems
- Energy rebates
- 2006 ASHE Vista Team Award for Infrastructure (American Society for Healthcare Engineering)

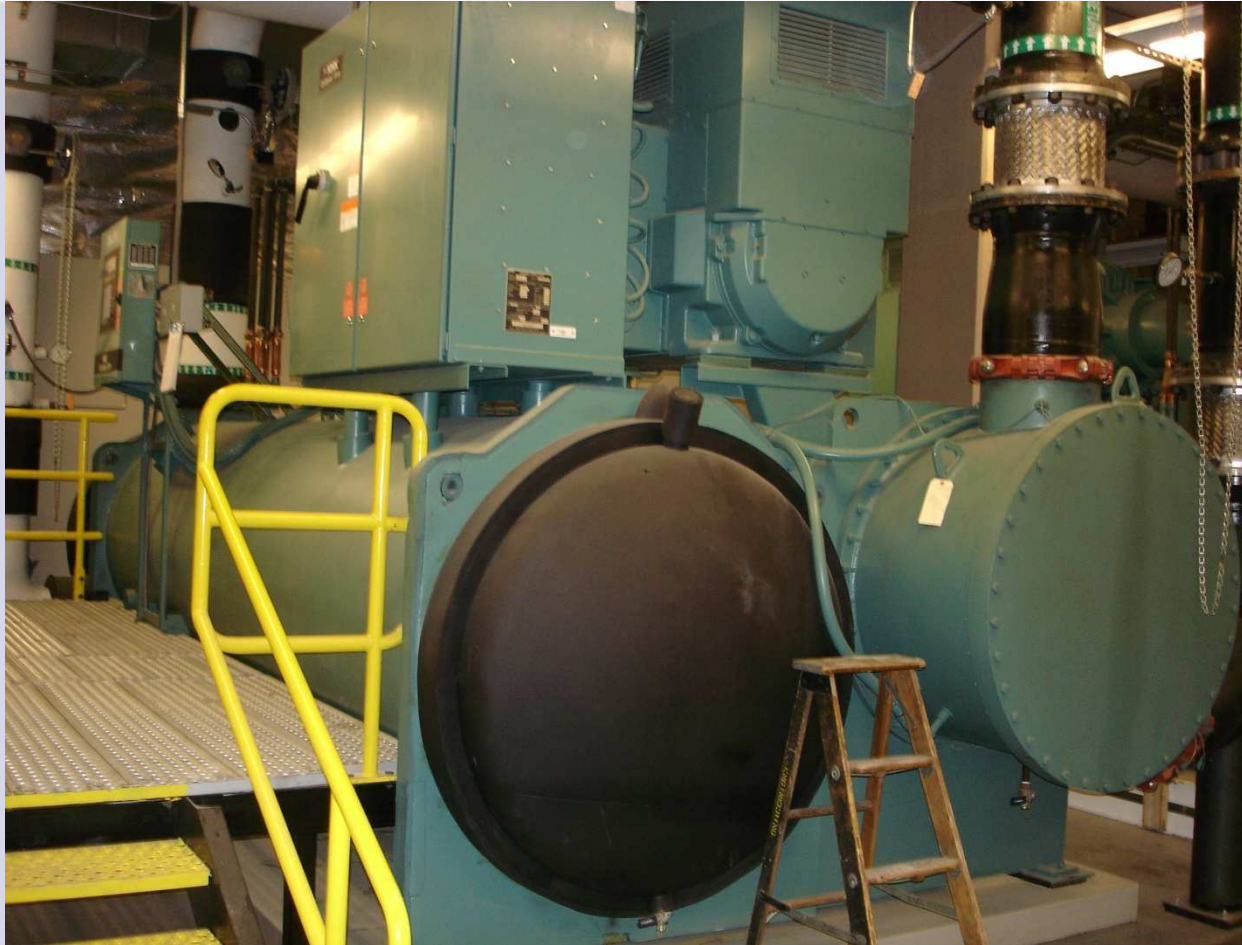
Energy Strategies - Cooling

- **Variable speed chillers**
- **Variable/primary chilled water pumping with high delta T**
- **Condenser water reset**
- **Process cooling free cooling heat exchanger**









Providence Portland Medical Center Central Plant Financials



- 11 ECMs
- Incremental Cost: \$792,000.
- Energy Savings:
 - 2.68 Million KWh/year
 - 153,800 Therms/year
- ETO Incentives Paid – \$217,278.
- PGE DG Incentives Paid - \$1.2 Million
- ENERGY STAR Certified Hospital

Thank You, APEM

HAPPY HOLIDAYS!!