

**Carolyn J. Roos, Ph.D.**

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**Education**

Portland State University, Ph.D. Systems Science: Mechanical Engineering, 2002  
Portland State University, M.S. Mechanical Engineering, 1996  
The Evergreen State University, B.S. Physics, B.A. Education, 1987

**Employment**

Energy Engineer, Washington State University Energy Program, Olympia, WA, November 2004 to present. Provide technical assistance to commercial, industrial and agricultural clients on energy efficiency, renewable energy and financial analysis with a focus on combined heat and power systems and biopower applications. Develop spreadsheet-based tools, including CAFÉ Dairy, a comprehensive, industry-specific tool for energy analysis of dairies, and RELCOST, a financial analysis tool for energy projects and Combined Heat and Power system calculators

Adjunct Professor, Renewable Energy Systems and Mechanical Engineering Technology, Oregon Institute of Technology, Portland, OR, Fall and Winter 2007. Taught RES355 Photovoltaic Materials and MET407 Fluid Mechanics

Adjunct Professor, Portland Community College, Portland, OR, Spring and Summer 2006. Taught Phy202 and Phy203 General Physics

Mechanical Engineer, U.S. Army Corps of Engineers, Hydroelectric Design Center, Portland, Oregon, July 1998 to September 2004. Performed design and analysis related to maintenance and upgrade of hydroelectric facilities. Prepared plans and specifications for installation of designs, scopes of work, timelines, and budgetary estimates for engineering & construction projects.

Adjunct Professor, Portland State University, Mechanical Engineering Department, Portland, Oregon, Taught ME421/521 Heating Ventilation and Air Conditioning Design Fundamentals, Spring 2000 and Spring 2001

Research Engineer, Ecotope, Seattle, WA, March 1992 to July 1993. Studied residential energy use, including statistical analyses of submeter data and numerical modeling of heat transfer through building envelopes.

Energy Management Engineer, Puget Sound Energy, Olympia, WA, June 1989 to March 1992. Performed energy conservation analyses and prepared design specifications for commercial buildings

## **Fellowships and Recognition**

American Association of University Women, Graduate Fellow, 2001-2002  
National Science Foundation, Graduate Fellow, 1990, 1993 to 1995  
Outstanding Graduate Student, Mechanical Engineering Department, Portland State University, 2002

## **Publications**

Murray Jean P, Gilles Flaman and Carolyn J. Roos, “Silicon and Solar-Grade Silicon Production by Solar Dissociation of Si<sub>3</sub>N<sub>4</sub>”, International Solar Energy Society, SolarPACES Conference, Mexico, 2004

Roos, Carolyn J., “Numerical Modeling of Indoor Microenvironments with Experimental Validation”, Dissertation submitted for Ph.D. in Systems Science: Mechanical Engineering, Portland State University, July 2002

Cunningham, M.J., C. Roos, L. Gu and G. Spolek, “Predicting Psychrometric Conditions in Biocontaminant Microenvironments with a Microclimate Heat and Moisture Transfer Model – Description and Field Comparison”, Indoor Air, 2002

Tsongas, George, Doug Burch, Carolyn Roos and Malcolm Cunningham. “A Parametric Study of Wall Moisture Contents Using a Revised Variable Indoor Relative Humidity Version of the “Moist” Transient Heat and Moisture Transfer Model”, American Society of Heating, Refrigeration and Air Conditioning Engineers, 1995 Thermal Envelopes Conference

Roos, Carolyn, Ken Eklund and David Baylon. “The Thermal Performance and Air Leakage Characteristics of Six Log Homes in Idaho”. Prepared for the Bonneville Power Administration, Publication Number DOE/BP-2213, Ecotope, Inc., August 1993. Available from [www.ecotope.com](http://www.ecotope.com). (This publication became the basis for development of the energy code for log homes in the Pacific Northwest.)

Roos, Carolyn and David Baylon, “Comparison of PRISM Results with Submetered Energy Use Data in Manufactured Homes”, Residential Construction Demonstration Project, Cycle II, 1993. Available from [www.ecotope.com](http://www.ecotope.com)

Roos, Carolyn and David Baylon. “Non-Space Heating Electrical Consumption in Manufactured Homes”. Prepared for the Bonneville Power Administration, Publication Number DOE/BP-13330-2, Ecotope Inc., October 1992. Available from [www.ecotope.com](http://www.ecotope.com).

## **Guidebooks and Factsheets**

Roos, Carolyn, “Solar Electric System Design, Operation and Installation: An Overview for Builders in the Pacific Northwest”, Washington State University, Extension Energy Program, 2009, <http://www.energy.wsu.edu/documents/solarpvforbuildersoct2009.pdf>

Roos, Carolyn, "Selling Voluntary Carbon Offsets from your Clean Energy Project", Northwest Combined Heat and Power Application Center, November 2009  
[http://northwestchptap.org/NwChpDocs/Selling%20Carbon%20Offsets%20October%202009\\_Roos-2.pdf](http://northwestchptap.org/NwChpDocs/Selling%20Carbon%20Offsets%20October%202009_Roos-2.pdf)

Roos, Carolyn, "Industrial Services Factsheet: Industrial Heat Pumps for Low-Temperature Heat Recovery", Washington State University Extension Energy Program,  
<http://www.energy.wsu.edu/Documents/IndustServFactsheet-HeatPumps-May%2009.pdf>

Roos, Carolyn, "Clean Heat and Power Using Biomass Gasification for Industrial and Agricultural Projects", Northwest Combined Heat and Power Application Center, March 2009  
[http://northwestchptap.org/NwChpDocs/BiomassGasification\\_Roos\\_February2010.pdf](http://northwestchptap.org/NwChpDocs/BiomassGasification_Roos_February2010.pdf)

Roos, Carolyn, "An Overview of Industrial Waste Heat Recovery Technologies for Moderate Temperatures Less Than 1000°F", Northwest Combined Heat and Power Application Center, September 2009,  
<http://northwestchptap.org/NwChpDocs/AnOverviewOfIndustrialWasteHeatRecoveryTechForModerateTemps.pdf>

Roos, Carolyn, "Biomass Drying and Dewatering for Clean Heat & Power", Northwest Combined Heat and Power Application Center, September 2008  
<http://northwestchptap.org/NwChpDocs/BiomassDryingAndDewateringForCleanHeatAndPower.pdf>

Roos, Carolyn, "Product Technical Review: PaceController", EnergyIdeas Clearinghouse, 2008,  
<http://www.energyideas.org/documents/Factsheets/PTR/PaceController-Dec08.pdf>

Roos, Carolyn, "A Guide to Pumping Manure Slurries in Centralized Biogas Digester Systems", Northwest Combined Heat and Power Application Center, March 2007  
<http://northwestchptap.org/NwChpDocs/Manure%20pumping%20fact%20sheet.pdf>

Roos, Carolyn, "Product Technical Review: Ultra Concrete Barrier rFoil", EnergyIdeas Clearinghouse, 2006  
Available at [www.energyideas.org/documents/Factsheets/PTR/UltraCBF\\_rFOIL.pdf](http://www.energyideas.org/documents/Factsheets/PTR/UltraCBF_rFOIL.pdf)

Roos, Carolyn, "Product Technical Review: Principles of Heat Transfer", EnergyIdeas Clearinghouse, 2005.  
<http://www.energyideas.org/documents/factsheets/PTR/HeatTransfer.pdf>.

Roos, Carolyn, "Product Technical Review: DeltaPValve", EnergyIdeas Clearinghouse, 2005, <http://www.energyideas.org/documents/Factsheets/PTR/DeltaPValve.pdf>

### **“Technology Spotlight” Articles**

Roos, Carolyn, “Technology Spotlight: Energy-efficiency opportunities in dairy milking centers”, *Energy Services Bulletin*, Western Area Power Administration, April 2010,

Roos, Carolyn, “Technology Spotlight: Hybrid Evaporative/DX Compressor Air Conditioners”, *Energy Services Bulletin*, Western Area Power Administration, April 2010

Roos, Carolyn, “Technology Spotlight: Building a project team for solar photovoltaics” *Energy Services Bulletin*, Western Area Power Administration, February 2010

Roos, Carolyn, “Technology Spotlight: Organic Rankine Cycle harnesses moderate waste heat for combined heat and power”, *Energy Services Bulletin*, Western Area Power Administration, August 2009

Roos, Carolyn and William Kingrey, “Ductless Mini- and Multi-Splits for Residential Applications”, *Energy Services Bulletin*, Western Area Power Administration, December 2008

Roos, Carolyn, “Technology Spotlight: Residential heat-pump water heaters”, *Energy Services Bulletin*, Western Area Power Administration, August 2008

Roos, Carolyn, “Technology Spotlight: What's new in using solar for lighting”, *Energy Services Bulletin*, Western Area Power Administration, February 2008

Roos, Carolyn, “Solar thermal energy an option in large facilities”, *Energy Services Bulletin*, Western Area Power Administration, June 2007

Roos, Carolyn and Vicki Zarell, Reflective and low-e products: where they help, where they don't and why”, *Energy Services Bulletin*, Western Area Power Administration, April 2007

Roos, Carolyn, “The next generation of solar photovoltaic cells”, *Energy Services Bulletin*, Western Area Power Administration, August 2007

Roos, Carolyn, “Energy efficiency in new and existing computer data centers”, *Energy Services Bulletin*, Western Area Power Administration, February 2007

Roos, Carolyn, “Calculating energy savings of indoor swimming pool measures”, *Energy Services Bulletin*, Western Area Power Administration, October 2006,

Roos, Carolyn, “Low-mass, surface-mounted radiant heating panels in homes and offices”, *Energy Services Bulletin*, Western Area Power Administration, December 2006,

Roos, Carolyn, “Calculating ASD savings...without fudging fan laws”, *Energy Services Bulletin*, Western Area Power Administration, April 2005