

PRISM Bibliography

Main Background Documents

M. Fels, ed. (1986) "Measuring Energy Savings: The Scorekeeping Approach," Special PRISM Issue of Energy and Buildings, 9, #1-2, 180 pages [sixteen papers describing background on PRISM and sample applications; primary background reference for PRISM users]

M. Fels (1986) "PRISM: An Introduction," Energy and Buildings 9, #1-2, pp. 5-18 [essential reference for PRISM users, containing derivation of method and early applications] **Copy of paper is included at the end of this Users' Guide.**

E. Mills, M. Fels and C. Reynolds (1987) "PRISM: A Tool for Tracking Retrofit Savings," Energy Auditor and Retrofitter, Nov/Dec, pp. 27-36 [an informal article describing the PRISM method, with illustrative example of Sliding PRISM]

M. Fels and C. Reynolds (1990) "Now that I've Run PRISM, What Do I Do with the Results?" Home Energy, Sep/Oct, pp. 27-34 [an informal article, discussing reliability and interpretation of results]

G. Dutt and M. Fels (1989) "Keeping Score in Electricity Conservation Programs," in Electricity: Efficient End-Use and New Generation Technologies, and Their Planning Implications (for Vattenfall Electricity Congress, held in Goteberg, Sweden), Lund University Press, Lund, Sweden, pp. 353-388 [a summary of PRISM applications to electricity data]

Heating-and-Cooling (HC) PRISM

M. Fels and C. Reynolds (1993) "Heating-and-Cooling (HC) PRISM: Background, Sample Applications, and Validation Studies," Report for Advanced PRISM Project, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ [main background reference for HC PRISM; includes study of effect of humidity on PRISM results, and study of one-month cooling]

M. Fels, C. Reynolds and D. Stram (1993) "Heating-and-Cooling (HC) PRISM: Sample Applications and Preliminary Documentation," Report for Advanced PRISM Project, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ [includes additional applications]

PRISM Bibliography (cont'd)

D. Stram and M. Fels (1986) "The Applicability of PRISM to Electric Heating and Cooling," in Special PRISM Issue of Energy and Buildings, 9 #1-2, pp. 101-110.

Automated Model Selection

M. Fels, K. Kissock and M. Marean (1994) "Model Selection Guidelines for PRISM (or: Now that HC PRISM Is Coming, How Will I Know When to Use It?)," Proceedings of ACEEE 1994 Summer Study on Energy Efficiency in Buildings, Washington, DC, pp. 8.49-8.61 [main reference for description of

automated model selection procedure, with schematic showing pre-modeling and post-modeling criteria in Figure 1 of the paper]

M. Fels, K. Kissock and M. Marean (1994) "Model Selection Guidelines for Advanced PRISM," Report for Advanced PRISM Project, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ.

R. Brown (1986) "The Princeton Scorekeeping Method: Electricity Consumption in a Cooling-Intensive Climate," PU/CEES Working Paper #85, Princeton University, Princeton, NJ.

Robust PRISM

M. Fels and C. Reynolds (1993) "Robust PRISM: Background, Sample Applications, and Preliminary Documentation," Report for Advanced PRISM Project, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ [main background reference for Robust PRISM]

C. Hurvich and M. Fels (1986, Revised 1989) "Improving the Outlier Resistance and Accuracy of PRISM: Description and Sample Analysis," PU/CEES Report No. 265, Princeton University, Princeton, NJ [technical report on the development of the Robust model]

M. Fels (1993) "Model Tuning and Data Pruning with PRISM: Enhanced Uses of Billing Data to Measure Whole-building Energy Saving," Proceedings of 1993 Energy Program Evaluation Conference, Argonne, IL, pp. 199-208 [includes sample applications of Robust and HC PRISM]

PRISM Bibliography (cont'd)

Reliability Criteria/Flatness Index

C. Reynolds and M. Fels (1988) "Reliability Criteria for Weather Adjustment of Energy Billing Data," Proceedings of ACEEE 1988 Summer Study on Energy Efficiency in Buildings, Washington, DC, pp. 10.236-10.251 [illustrates CV(NAC) and R^2 reliability; uses Robust PRISM in Home Energy Report study]

C. Reynolds, P. Komor and M. Fels (1990) "Using Monthly Billing Data to Find Energy Efficiency Opportunities in Small Commercial Buildings," Proceedings of ACEEE 1990 Summer Study on Energy Efficiency in Buildings, Washington, DC, pp. 10.221-10.232 [uses flatness index (FI) in reliability assessment of commercial buildings]

K. Kissock and M. Fels (1994) "Modeling Monthly Commercial-Building Energy Use with Advanced PRISM," Draft Report, PU/CEES, Princeton University, Princeton, NJ [reliability assessment of PRISM applied to a variety of commercial buildings]

L. Okstein (1991) "Measurement of Energy Savings in a Utility Performance Contracting Program," PU/CEES Working Paper No. 123, Princeton University, Princeton, NJ [PRISM reliability studies using a New England Electric System data base of commercial buildings]

Number of Data Points

M. Fels and C. Reynolds (1994) "Three-Point HO/CO PRISM in Advanced Version of PRISM," Report for Advanced PRISM Project, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ [summary reference for three-point PRISM, with examples; illustrates importance of summer and winter data]

J. Rachlin, et al., (1986) "The Stability of PRISM Estimates," in Special PRISM Issue of Energy and Buildings, 9, #2, pp. 149-157 [an analysis of the stability of PRISM model results for different numbers/combinations of data points]

Aggregate PRISM

M. Fels and C. Reynolds (1994) "Aggregate PRISM in Advanced Version of PRISM," Report for Advanced PRISM Report, Center for Energy and Environmental Studies, Princeton University, Princeton, NJ [summary reference for Aggregate PRISM]

PRISM Bibliography (cont'd)

M. Fels and M. Goldberg "Using the Scorekeeping Approach to Monitor Aggregate Energy Consumption," in Special PRISM Issue of Energy and Buildings, 9 #1-2, pp. 162-168 [includes sample application of Aggregate HO PRISM to New Jersey data, showing post-embargo conservation]

M. Goldberg and M. Fels (1986) "Refraction of PRISM Results into Components of Saved Energy," in Special PRISM Issue of Energy and Buildings, 9, #1-2, pp. 169-180 [an extension of Aggregate PRISM to decompose the energy savings into physically meaningful components; includes estimates of interior temperature changes and the takeback effect]

M. Fels and T. Woteki (1980) "Indices of Energy Consumption: An Exploratory Analysis of a Utility's Monthly Billing Data," Energy, 5, #11, pp. 1117-1130 [original PRISM analysis of aggregate data]

Specialized PRISM Studies

M. Fels and C. Reynolds (1992) "Energy Analysis in New York City Multifamily Buildings: Making Good Use of Available Data," Report NYSERDA 93-3, New York State Energy Research and Development Authority, Albany, NY [includes PRISM applications to oil-heated as well as gas-heated multifamily buildings; uses studentized residuals for outlier detection; illustrates sliding PRISM; includes CV vs. R^2 reliability assessment]

M. Fels, M. Goldberg and M. Lavine (1986) "Exploratory Scorekeeping for Oil-heated Houses," in Special PRISM Issue of Energy and Buildings, 9, #2, pp. 127-136 [an assessment of how well PRISM works on oil delivery data in single-family houses]

M. Fels and D. Stram (1986) "Does PRISM Distort the Energy Signature of Heat-pump Houses?" in

Special Issue of Energy and Buildings, 9 #2, pp. 111-118 [exploration of the application of PRISM to houses heated by heat-pump systems; shows no deterioration in the reliability of PRISM results, but with determinable small bias in the model estimates]

M. Fels and D. Stram (1986) "The Effect of Burning Wood on Saving Electricity," in Special PRISM Issue of Energy and Buildings, 9, #2, pp. 119-126 [the reliability of scorekeeping results when wood is supplementing electricity used for heating; the benefits of separating woodusers from non-woodusers in the evaluation]

PRISM Bibliography (cont'd)

M. Fels, J. Rachlin and R. Socolow (1986) "Seasonality of Non-heating Consumption and Its Effect on PRISM Results," in Special PRISM Issue of Energy and Buildings 9, #1-2, pp. 139-148 [validation of the "heating" estimate in PRISM, with a quantification of the seasonality effect]

J. DeCicco, et al. (1986) "PRISM Applied to a Multifamily Building: the Lumley Home Case Study," in Special PRISM Issue of Energy and Buildings, 9, #1, pp. 77-88 [a pilot application of PRISM to a multifamily building; model validation using instrumented data]

C. Goldman and R. Ritschard (1986) "Energy Conservation in Public Housing: a Case Study of the San Francisco Housing Authority," in Special PRISM Issue of Energy and Buildings, 9, #1, pp. 89-98 [application of PRISM to several multifamily buildings]

Note: for PRISM applications to commercial buildings, see Reynolds et al. (1990), Kissock and Fels (1994), and Okstein (1991), in Reliability Criteria section of this bibliography.

Sample PRISM-based Evaluations

M. Brown, L. Berry and L. Kinney (1993) "Weatherization Works: An Interim Report of the National Weatherization Evaluation," Report No. ORNL/CON-373, Oak Ridge National Laboratory, Oak Ridge, TN.

M. Brown and K. Keating (ed.). (1989) "Special Issue Devoted to The Hood River Conservation Project," Energy and Buildings, 13, #1, 91 pages.

E. Hirst, R. Goeltz and D. Trumble (1989) "Effects of the Hood River Conservation Project on Electricity Use," Energy and Buildings, 13, #1, pp. 19-30.

E. Hirst, (1986) "Electricity Savings One, Two, and Three Years After Participation in the BPA Residential Weatherization Program," in Special PRISM Issue of Energy and Buildings, 9, #1-2, pp. 45-53.

J. Haberl, et al. (1989) "Whole-Campus Performance Analysis Methods: Early Results from Studies at

the Princeton Campus," Proceedings of 6th Annual Symposium on Improving Energy Efficiency in Hot and Humid Climates, Texas A&M Univ., Dallas, TX.

PRISM Bibliography (cont'd)

M. Goldberg (1986) "A Midwest Low-income Weatherization Program Seen through PRISM," in Special PRISM Issue of Energy and Buildings, 9, #1-2, pp. 37-44 [illustrates median savings for all houses vs. good-house subsample]

G. Dutt, et al. (1986) "The Modular Retrofit Experiment: Design, Scorekeeping and Evaluation," in Special PRISM Issue of Energy and Buildings, 9, #1-2, pp. 21-33 [original PRISM evaluation]

J. Gregory (1987) "Ohio Home Weatherization Assistance Program Final Report," Office of Weatherization, Ohio Dept. of Development, Columbus, OH.

M. Hewett, et al. (1986) "Measured vs. Predicted Savings from Single Retrofits: a Sample Study," in Special PRISM Issue of Energy and Buildings, 9, #1, pp. 65-73 [use of PRISM to assess the accuracy of savings predictions]

E. Hirst (1986) "Electricity Savings One, Two, and Three Years After Participation in the BPA Residential Weatherization Pilot Program," in Special PRISM Issue of Energy and Buildings, 9, #1, pp. 45-53 [a complete evaluation, based on NAC's from PRISM; illustrates Two-stage PRISM]

L. Rodberg (1986) "Energy Conservation in Low-income Homes in New York City: the Effectiveness of House Doctoring," in Special PRISM Issue of Energy and Buildings, 9, #1, pp. 55-64 [successful application of PRISM to data set with considerable data problems]

Technical Papers on Origins of Methodology

T. Schrader (1987) "A Two-parameter Model for Assessing the Determinants of Residential Space Heating," MS Thesis for Dept. of Mech. and Aer. Engineering, Princeton University, PU/CEES Report No. 69, Princeton, NJ [the physical underpinnings of the model]

M. Goldberg (1982) "A Geometrical Approach to Nondifferentiable Regression Models as Related to Methods for Assessing Residential Energy Conservation," Ph.D. Thesis for Dept. of Statistics, Princeton University, PU/CEES Report No. 142, Princeton, NJ [derivation of rigorous statistics underlying PRISM]

PRISM Bibliography (cont'd)

PRISM in a Broader Context

M. Fels and K. Keating (1993) "Measurement of Energy Savings from Demand-Side Management Programs in US Electric Utilities," Ann. Rev. Energy Envir., 18, pp. 57-88.

M. Fels and C. Reynolds (1991) "Toward Standardizing the Measurement of Whole-building Energy Savings in DSM Programs," Proceedings of 1991 Energy Program Evaluation Conference, Argonne, IL, pp. 75-85.