

## Thomas A.V. Cassel, Ph.D.

### Office:

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### EDUCATION

**Harvard Business School (1992-1994).** Owner/President Management (OPM) Program. An executive program in entrepreneurial business leadership attended by owners of privately held companies from around the world.

**University of Pennsylvania; Ph.D. (1979).** Energy Management and Power Program. NSF-sponsored Research Fellowship. Dissertation: "Stochastic Multiobjective Decision Analysis -- Investment Behavior by Energy Resource Firms."

**University of Pennsylvania; M.Sc. (1973), B.Sc. (1968).** Mechanical Engineering. Academic honors, Research Fellowship, Ford Foundation Scholarship.

### POSITIONS

**University of Pennsylvania, School of Engineering & Applied Science (1999-present).** Director, Engineering Entrepreneurship Program. Joined Penn's faculty in mid-1999 as a Senior Fellow to create the Engineering Entrepreneurship Program. Position changed to that of a Lecturer in September 2000. Appointed full Practice Professor in July 2002. Details provided under *Highlights*, below.

**Reading Energy Holdings, Inc.; Philadelphia, PA (1978-1998).**

Co-founder, president, chairman and majority shareholder. Led the company from its founding in 1978 through the sale of its power plant assets 20 years later. Details provided under *Highlights*, below.

**University of Pennsylvania, School of Public & Urban Policy (1977-1978).**

Adjunct research faculty member, under contract with the U.S. Department of Energy to investigate the investment behavior of corporations in the development of alternative energy resources.

**Bechtel Corporation, Research & Engineering, San Francisco, CA (1974-1977).**

Engineering Specialist and project manager. Performed and directed engineering and economic evaluations of advanced power technologies, including client-funded and in-house projects on cogeneration systems, geothermal energy, and fission, fusion and fossil fuels. Received several corporate awards for professional publications.

**University of Pennsylvania, National Center for Energy & Power (1972-1974).**

Research Fellow. While completing M.Sc. studies, performed component tests and developed analytic models to assess the performance and economics of several advanced energy conversion and storage systems.

**Kingdom of Lesotho, Africa, Ministry of Agriculture (1969-1972).**

Mechanical Engineer. Implemented a cooperative program to provide rural water supplies and irrigation systems under United Nations (UNICEF) and U.S. State Department (Peace Corps) sponsorship. Responsibilities included site selection, engineering, materials procurement, and construction management.

**Short-term Engineering & Design Positions.**

Carrier Corporation Research Division, Syracuse, NY (heat exchanger research: summer 1973); Westinghouse Electric Company Gas Turbine Division, Philadelphia, PA (gas turbine engineering: 1969); U.S. Army Corps of Engineers, Philadelphia (marine dredge equipment engineering: summer 1968); United Engineers & Constructors, Inc., Philadelphia (draftsman: summers 1966, 1967); Cambridge Filter Company, Syracuse (draftsman: summers 1964, 1965); and Smith & Caffrey Steel Company, Syracuse (draftsman: summer 1963).

**PRIOR TEACHING EXPERIENCE**

- University of Pennsylvania, graduate lecturer in Energy Management (1977-79).
- University of California at Berkeley, guest lecturer in Mechanical Engineering (1975).

**HONORS, PROFESSIONAL SOCIETIES, ETC.**

- Provost's Award; University of Pennsylvania's highest award for distinguished teaching (2007).
- Ford Motor Company Award for Faculty Advising (2007).
- D. Robert Yarnall Award: distinguished alumnus; University of Pennsylvania Engineering Alumni Society (2005).
- S. Reid Warren Jr. Award: outstanding professor and intellectual mentor; University of Pennsylvania (2003).
- American Society for Engineering Education, Entrepreneurship Division, Member (2000-present), Executive Board (2003-present).
- "Perfect Professor," Penn Course Review (2001).
- American Society of Mechanical Engineers, Member (1974-present).
- Anthracite Region Independent Power Producers Assoc, Executive Committee (1991-96).
- *Philadelphia Business Magazine's* "People to Watch" (1995).
- Integrated Waste Services Association, Board Member (1990-94).
- Listed in United Nations' *Guide to Energy Specialists*, New York (1979).
- Listed in *Who's Who in the East* (1983-) and *Who's Who in the Delaware Valley* (1991-).

## **PUBLICATIONS AND PRESENTATIONS**

Addressed numerous professional conferences, public hearings, newspaper editorial boards, government agencies, congressional and legislative committees, corporate boards of directors, and other public and private forums on energy and related matters. Appeared in both television and radio media. Published a book and more than 50 articles and reports related to technical, economic and environmental aspects of energy and waste processing technologies. A list of selected publications and presentations is attached.

## **CIVIC AND NONPROFIT INVOLVEMENT**

- Undine Rowing Club of Philadelphia: Member and Chair of Capital Campaign.
- Church Council Member, Treasurer and Chair of Capital Campaign.
- Philadelphia Boys Choir: Past Board and Executive Committee Member and Treasurer.
- University of Pennsylvania Engineering Alumni Society: Past Associate Director.
- Union League of Philadelphia: Past Member.
- Sunday Breakfast Club (Philadelphia business leaders): Past Member.
- Harvard Business School Club of Philadelphia: Past Member.
- Returned Peace Corps Volunteers: Member and School Speaker.
- Robbins (IL) Council for Educational Opportunity: Past President.
- Lutheran Home at Moorestown (NJ): Past Board Member.

## **PERSONAL PROFILE**

Born and raised in Syracuse, NY. Rowed competitively on championship college and club crews. Extensive international travel, including motorcycling through much of Africa, the Middle East and Europe. Raced open-wheel formula-type cars for several years. Married: Christine is a Gettysburg College graduate and faculty member at Rider University. Three active sons: Thomas, Bradley and Joseph. Enjoy reading, writing, competitive auto racing, camping, fishing, skiing, rowing, road bicycling and golf.

**HIGHLIGHTS OF EDUCATIONAL AND RELATED PROFESSIONAL EXPERIENCE****University of Pennsylvania, School of Engineering & Applied Science (1999-present).**Courses Taught:

- ***EAS445/545 Engineering Entrepreneurship I (1.0 CU)***. Developed and update course content, recruit guest speakers, and teach this class to juniors, seniors and graduate students. The course focuses on knowledge helpful to engineers and scientists in shaping high-tech ideas into viable products and then in creating and leading high-tech ventures to commercialize these products. Taught in 1999C and every fall and spring term thereafter. Recruited additional faculty members to handle student demand. Five sections now taught each academic year, two by Dr. Cassel. Typical enrollment: 35-50 students per section.
- ***EAS446/546 Engineering Entrepreneurship II (1.0 CU)***. Developed and update course content, recruit guest panelists, and teach this class to select graduates of EAS445/545. The course focuses on knowledge helpful to engineers and scientists in planning high-tech venture strategies, and preparing and presenting high-tech business plans. Taught in 2000A and every year thereafter. Recruited additional faculty member to handle student demand. Three sections now taught each academic year, one by Dr. Cassel. Typical enrollment: 15-20 students per section.
- ***ESE400/540 Engineering Economics (1.0 CU)***. Taught this class during the 2000C term, the 2002C term and every fall term thereafter. Also began teaching the class in 2005A and every spring term thereafter. The course covers economic analysis and capital allocation related to engineering projects. Typical enrollment: 60-80 students per term.
- ***BE602 From Laboratory to Market (1.0 CU)***. Developed course content, recruited guest speakers, and co-taught (with Prof. Ducheyne) this class to SEAS graduate and undergraduate students. The course focuses on skills helpful to engineers and scientists in moving bioengineering device and pharmaceutical discoveries to the market via entrepreneurial ventures. Co-taught in 2000C during Prof. Pollack's sabbatical. Enrollment: 26 students.
- ***EMTM675 Technology Entrepreneurship (0.5 CU)***. Developed and update course content and teach this class to students in the Executive Masters in Technology Management program. The course is a condensed version of EAS545. Taught in 2001A and annually thereafter. Typical enrollment: 40 students each year.
- ***ESE099/EAS499/MSE099/MEAM099 Independent Studies (1.0 CU each)***. Acted as the instructor of record for independent studies for select SEAS undergraduate students in 2000 and every year thereafter.
- ***Senior Design Projects (1.0 CU each)***. Advised select SEAS undergraduates on their senior design projects in 2001 and every year thereafter.

Seminars, Panels, Committees, Addresses and Special Programs:

- Bergen County Academy for Business and Computer Technology. Developed class content and taught one-week courses at SEAS on high-tech entrepreneurship for high-achieving high school students from Bergen County, NJ. August 1999 and 2000.
- Executive Masters in Technology Management (EMTM) 10<sup>th</sup> Anniversary Panel on Venture Capital. Planned, recruited guest speakers and moderated this panel discussion of players in various aspects of the high-tech venture capital industry. March 24, 2000.
- SEAS Alumni Day Panel: “The Engineer as Entrepreneur in the 21<sup>st</sup> Century.” Organized and moderated this panel discussion by an engineering entrepreneur, legal expert, and venture capitalist for Alumni Day on May 20, 2000.
- FEBES Lectures on “Leadership in High-Tech Ventures” and “Disruptive Technology” for the student organization, For Engineers By Engineers, during the spring term 2000.
- Instrumental in launching the cross-listed LAW623/EAS547 course, “High-Tech Ventures: Legal Aspects and Negotiations.” Spring 2001.
- EMTM Sponsors Evening keynote speaker on high-tech entrepreneurial ventures and strategic alliances with industry. March 23, 2001.
- SEAS Technology Entrepreneurship Club. Advisor to this SEAS student-run organization. Assist with event planning and recruiting guest speakers. 2001 to present.
- University Guest Speaker Programs. Arranged campus-wide presentations by Andy Rachleff, Ted Schlein and Jerry Kaplan including private lunch sessions with student leaders and faculty from SEAS and Wharton.
- Communitech Board of Advisors. Advisor to this SEAS student-run organization, which serves to expand technology resources into the community beyond Penn’s walls.
- Wharton Business Plan Competition. Help to coordinate Wharton and SEAS activities on the annual BPC including the promotion of SEAS student involvement.
- Venture Initiation Program (VIP). Served as a SEAS representative and advisor to this initiative of the Wharton Small Business Development Center. The purpose of the program is to assist Penn students in the creation of entrepreneurial ventures.
- SEAS Intellectual Property Committee. Participated as a member on this ad hoc committee in the spring of 2001 at the request of the Deputy Dean to review intellectual property issues related to the School.
- MEAM Student Dinner keynote speaker, March 2003.
- EMTM Faculty Steering Committee member, 2003-2004.
- Faculty mentor for Penn Lightweight Crew program, 2003 to present.
- SEAS Masters Commencement Ceremony speaker, May 2003.
- “E-Week” keynote speaker, Spring 2004.
- Philomathean Society speaker, October 2004.
- Management & Technology Program student recruitment speaker, July 2005.
- EMTM Commencement Ceremony speaker, August 2005.
- SEAS Pre-Freshman Program speaker, August 2005.
- SEAS Communication Requirement ad-hoc committee member, 2006 to present.

Development:

- Support the SEAS Development Office, meet with alumni and potential corporate donors, and arrange guest-speaking opportunities within the School to enhance alumni relations and development activities.

Conferences:

- ***American Society for Engineering Education.*** Annual conference in Nashville, TN 2003, Salt Lake City, UT 2004 and Portland, OR 2005. Presenter in Entrepreneurship Division session. Member of Entrepreneurship Division Executive Committee.
- ***Roundtable on Entrepreneurship Education for Engineers.*** Represented SEAS at this annual 3-day conference hosted by Stanford University in October 1999. Attended by about 50 faculty representatives from the country's major engineering schools.
- ***Asian Venture Conference: The Asia-Silicon Valley Capital Highway.*** 3-day meeting in Palo Alto, CA by the Asian American Manufacturers Association. June 1999.

Book Reviews:

Critically reviewed the following book manuscripts under contracts with the publishers:

- Sullivan, William G., et al. Engineering Economy, 13<sup>th</sup> Ed. Upper Saddle River, NJ: Pearson/Prentice Hall, 2004. (Acknowledged in the book's preface.)
- Higgins, Robert C. Analysis for Financial Management (7<sup>th</sup> Ed.). New York: McGraw-Hill, June 2004. (Acknowledged in the book's preface.)
- Dorf, Richard C. and Thomas H. Byers (Stanford University). Technology Ventures. New York: McGraw-Hill, 2004.
- Bodde, David L. and Patricia Greene. The Intentional Entrepreneur. Cambridge MA, The MIT Press, 2002.
- Knott, Anne Marie (Wharton faculty member). Venture Design – An Analytical Tool Kit. New York: McGraw-Hill, January 2001.

Article Reviews:

Critically reviewed and/or edited numerous articles for the following journals and annual conference proceedings:

- *Energy – The International Journal*; Elsevier Publishers (2005-present).
- American Society for Engineering Education – Entrepreneurship Division (2001-present).
- American Society for Engineering Education – Engineering Economics Division (2004-present).
- National Collegiate Inventors and Innovators Alliance (NCIIA) (2004-present).
- *Journal of Engineering Education*; American Society for Engineering Education (2004-present).

Engineering Entrepreneurship Minor:

- Instrumental in launching the University of Pennsylvania's Engineering Entrepreneurship minor field of study in 2005. Select and develop courses for this minor, and advise students with regard to the minor.

Advising:

- A substantial amount of office hours are devoted to the following:
  - Current Penn students (from all Schools) regarding academic performance, course selections, employment opportunities, career direction and personal issues.
  - SEAS high school prospects.
  - SEAS alumni regarding employment opportunities, career direction and entrepreneurial venture opportunities.

## HIGHLIGHTS OF BUSINESS EXPERIENCE

### **Reading Energy Holdings, Inc. - Philadelphia, PA (1978-1998).**

Founded as Technecon Consulting Group in 1978, the firm originally provided engineering, economic and financial consulting services pertaining to the development of independent electric power facilities. Co-founders were Dr. Peter Blair and Dr. Robert Edelstein, then members of the faculty of the University of Pennsylvania's Engineering School and Wharton School, respectively. Clients included government agencies, small and large corporations, and private investors. The company grew to a reputable firm of a dozen consultants and researchers prior to its acquisition by Reading Company (one-time owners of the Reading Railroad) in 1985.

Renamed Reading Energy Group, a startup division of Reading Company, the group developed independent power plants in three states. As president of the division, and soon elected vice president of the parent Reading Company, Dr. Cassel led all aspects of the growing enterprise. Three years later in 1988, he initiated and negotiated a leveraged management buyout of Reading Energy Group with support from a major European bank. Assets purchased from Reading Company included plants then under development in California, Pennsylvania and Illinois.

Following the buyout, Reading Energy Holdings, Inc. (now privately held) developed, owned and/or operated waste-fueled power plants having an aggregate capital cost exceeding \$600 million. Based upon their innovative engineering, each of the company's plants represented a significant advancement in the state of the art of power plant engineering and environmental design. Moreover, these plants created hundreds of new employment opportunities and enhanced the economies of their host communities. As the company grew they acquired two companies, started six more, and formed strategic alliances with a number of major technology corporations. They also worked with a number of the world's leading banking institutions and a number of the country's largest law firms in structuring and negotiating complex project financing transactions.

During this period, Dr. Cassel also published a number of journal articles and conference papers, appeared in television, radio and printed media, and was frequently called upon to testify in legislative hearings in Harrisburg PA, Springfield IL and Washington DC. Dr. Cassel negotiated the sale of the company's plant assets, at the completion of which in 1998 the company's shareholders realized a return of 35 times invested capital; i.e., an annual rate of return in excess of 55% for the 10-year average investment period.

*Updated: June 2007*

## SELECTED PUBLICATIONS AND CONFERENCE PRESENTATIONS

(Note: Co-authors names are provided where available but are missing for several publications from the 1970s and 1980s.)

### Book:

Peter Blair, Thomas Cassel and Robert Edelstein. Geothermal Energy: Investment Decisions and Commercial Development. John Wiley & Sons, Inc.: New York, 1982. Based largely on Thomas Cassel's doctoral dissertation.

### Journal and Magazine Articles:

Thomas Cassel. Engineering Entrepreneurship at Penn. *Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition*. 2003.

Thomas Cassel and Terence Walmsley. Environmental Justice in Siting a Waste-to-Energy Facility. *Journal of Environmental Law and Practice*. May/June 1995, pp. 48 ff.

Thomas Cassel. The Integrated Approach to Solid Waste Disposal. *Independent Energy Magazine*. November 1990, pp. 76 ff.

Thomas Cassel. "The Future of Geothermal Energy – Projections for U.S. Growth", in Geothermal Energy Technology, J.C. Bresee & P.A. Witherspoon, ed., Decker Publishing Company, 1984.

Thomas Cassel, Robert Edelstein and Peter Blair. Optimal Investments in Geothermal Electricity Facilities; A Theoretic Note, *Journal of Business Administration*, v.12, n.2, pp.197-212; Spring 1981. (Reprinted in *Energy Crisis – Policy Response*, Chapter 11, P.N. Nemetz, ed., Institute for Research in Public Policy, Montreal; 1981.)

Thomas Cassel, Robert Edelstein and Peter Blair. Analysis of Public Policy Incentives for Commercializing Geothermal Electric Power, *Research in Public Policy Analysis and Management*, Vol. 2 p. 49-71; 1981.

Thomas Cassel, Robert Edelstein, Peter Blair and Inja Paik. The Economics of Optimal Geothermal Resource Extraction for Electric Power, *Journal of Energy Systems and Policy*, v.4, n.3, p.157ff; 1980.

### Conference Proceedings:

Thomas Cassel. Robbins Recycling and Trash-to-Energy Facility, Solving a Regional Waste Problem Through A Public/Private Alliance; presented at the *Forbes Rebuilding America Conference*, New York City, January 21, 1994.

Thomas Cassel. Cogeneration with Circulating Fluid Bed Boilers Burning Low-BTU Anthracite Mining Refuse; Anthracite Institute of Mining Engineers; Hazleton PA; Oct 1986.

Thomas Cassel. Cogeneration with Circulating Fluid Bed Boilers Burning Low-BTU Mining Refuse; Pennsylvania Electric Association System Planning Committee; Pittsburgh PA; May 1986.

Congressional Office of Technology Assessment. Electric Generating Technologies for the 1990's; Primary reviewer and panelist; Washington DC; June 1984

Thomas Cassel. Economic Considerations for the Development of 10,000 MW of Geothermal Power by 2000. *Proceedings of the 7<sup>th</sup> Annual Geothermal Conference and Workshop*; Electric Power Research Institute; Palo Alto, CA; June 1983.

Thomas Cassel. Geothermal electric Power Forecast in the United States and the Impact of R&D Advancements: 1982-2000. *Transactions of the Geothermal Resources Council 1982 Annual Meeting, San Diego, CA*; Geothermal Resources Council, Davis CA; 1982.

Thomas Cassel. National Outlook for Geothermal Electric Power Development. *Energy Technology IX – Energy Efficiency in the Eighties*; Government Institute, Inc., Rockville, MD; July 1982. (Presented at the 9<sup>th</sup> *Energy Technology Conference*, Washington, DC; February 1982).

Thomas Cassel, Peter Blair and Robert Edelstein. Analysis of Public Policy Incentives for Commercializing New Energy Technology: Case Study of Geothermal Electric Power Production. *Research Conference on Public Policy and Management*, Chicago; October 1979.

Thomas Cassel, Peter Blair, Robert Edelstein and Inja Paik. The Economics of Optimal Geothermal Resource Extraction for Electric Power Production. *International Atlantic Economic Conference*, Vienna, Austria; May 10-18, 1979.

Thomas Cassel and Peter Blair. Analysis of Resource Pricing for Geothermal Electric Power Production. *The 10<sup>th</sup> Annual Pittsburgh Conference on Modeling and Simulation*; April 26, 1979.

Thomas Cassel, Peter Blair, Robert Edelstein and Chris Amundsen. Marginally Competitive Pricing of Geothermal Resources for Electric Power Production. *Transactions of Geothermal Resources Council 1979 Annual Meeting*, Reno, Nevada, publ. Geothermal Resources Council, Davis, CA; Sept 24-27, 1979.

Thomas Cassel and Peter Blair. Optimal Resource Extraction strategies for the Development of Geothermal Resources, proceedings: *1978 Joint Automatic Control Conference*, Philadelphia; October 18-20, 1978.

U.S. Department of Energy. Workshop on Geothermal Electric Energy Cost Analysis, Speaker and discussant. McLean, VA; June 28-30, 1978.

Thomas Cassel and Robert Edelstein. Forecasting Investment Behavior in the Development of Geothermal Resources, presented at the *Western Economic Association 53<sup>rd</sup> Annual Conference*, Honolulu; June 21, 1978.

Thomas Cassel, et al. Effect of Reservoir Temperature Decline on Geothermal Power Plant Design and Economics, *Proc. 12<sup>th</sup> Intersociety Energy Conversion Engineering Conference*, Washington, D.C.; August 1977; publ. American Nuclear Society, La Grange Park, IL.

Thomas Cassel, et al. Solar Assisted Heat Pumps and Direct Heating Systems, *Heat Pump Technology Conference*, Oakland State University, Stillwater, Oklahoma; October 1975.

Thomas Cassel, et al. Solar Heat Pump Comfort Heating Systems; *Proc. 10<sup>th</sup> Intersociety Energy Conversion Engineering Conference*, University of Delaware, Newark DE; August, 1975; publ. Institute of Electrical and Electronics Engineers, New York.

**Client-Funded Reports:**

Thomas Cassel, et al. Heber Binary Cycle Demonstration Project; prepared for the U.S. Dept of Energy under Contract DE-AC03-83SF11722; Sept 1984.

Thomas Cassel, et al. Federal Geothermal Royalty Income Derived from the Benefits of Government-Sponsored R&D; Report No. DOE/SF/11727-T1; National Technical Information Service, Springfield, VA; Jan 1984.

Thomas Cassel, et al. U.S. Department of Energy Geothermal R&D, Industry Response and Projected Impact; for the U.S. Dept of Energy under Contract DE-AC01-81RA50415; Nov 1983.

Thomas Cassel, et al. Geothermal Power Plant R&D - An Analysis of Cost-Performance Tradeoffs and the Heber Binary-Cycle Demonstration Project; Report No. DOE/CS/30674-2; National Technical Information Service; Springfield VA; June 1983.

Thomas Cassel, et al. Economic Analysis of the Heber Binary-Cycle Geothermal Demonstration Project; Report No. DOE/CS/30674-T1 prepared for the U.S. Dept of Energy; Nov 1982.

Thomas Cassel, et al. Solar Energies Technologies: Market Estimates and Federal R&D Payoff, prepared for the U.S. Department of Energy; July 1982.

Thomas Cassel, et al. End-Use Investment Decisions in the Electric Utility Industry, prepared for the Electric Power Research Institute under Contract TPS81-802, Palo Alto, CA; Mar 1982.

Thomas Cassel, et al. National Forecast for Geothermal Resource Exploration and Development – With Techniques for Policy Analysis and Resource Assessment; Report No. DOE/ET/27242-T2; available from NTIS; March 1982.

Thomas Cassel, et al. Feasibility of Cogeneration from Silicate Furnace Heat Recovery; prepared for The PQ Corporation, Philadelphia; 1982.

Thomas Cassel, et al. Geologic and Economic Evaluation of United States' Geothermal Ventures, with Cascadia Exploration Corporation, prepared for the Standard Oil Company (Ohio); August 1981.

Thomas Cassel, et al. Geothermal Well Field and Power Plant Investment Decision Analysis, Document #DOE/ET/27242-T1; prepared for the U.S. Department of Energy; May 1981.

Thomas Cassel, et al. Present Value Analysis of Possible Geothermal Resources Underlying the XYZ Property, Imperial County, California; prepared for Safeco Title Insurance Company, March 1981.

Thomas Cassel, et al. Economic Incentive of Geothermal Resource Development for Direct Applications, Document #COO-27242-03, U.S. Department of Energy; February 1980.

Thomas Cassel, et al. Geothermal Power Plant Investment Decisions – Interim Report, Document #COO-27242-1, prepared for the U.S. Department of Energy; December 1979.

Thomas Cassel, et al. Effect of Proposed Federal Tax Credits and Forgivable Loans on Geothermal Electric Power Development, Document #COO-27242-2, prepared for the U.S. Department of Energy; November 1979.

Thomas Cassel, et al. Geothermal Investment and Policy Analysis with Evaluation of California and Utah Resource Areas, Document #DOE/RA/4713/1, available from NTIS; October 1979.

Thomas Cassel, et al. Geothermal Investment Analysis with Site-Specific Applications to Roosevelt Hot Springs and Cove Fort-Sulphurdale, Utah, Report COO-4713-1 prepared for U.S. Department of Energy; December 1978.

Thomas Cassel, et al. Design and Performance Cost Relationships for Geothermal Power Plants, intra-corporation report (165 pages), Bechtel Corporation; December 1977.

Thomas Cassel, et al. Advanced Design and Economic Considerations for Commercial Geothermal Power Plants at Heber and Niland, California, report SAN-1124-2 prepared for U.S. Department of Energy; Bechtel Corporation, San Francisco; October 1977.

Thomas Cassel, et al. Technical and Economic Review of the Steam-Iron and Steam-Oxygen Processes, a report to the Institute of Gas Technology; Bechtel Corporation, San Francisco; July 1977.

Thomas Cassel, et al. Energy Storage in Electric Utilities, intra-corporation report (64 pages), Bechtel Corporation; June 1977.

Thomas Cassel, et al. Solar Energy Systems for Space Conditioning And Domestic Water Heating in Commercial Buildings, intra-corporation report (101 pages), Bechtel Corporation; April 1977.

Thomas Cassel, et al. Advanced Energy Conversion Systems – Plant Conceptual Design and Balance of Plant Cost, *Energy Conversions Alternatives Study (ECAS) Final Report*, prepared by Bechtel Corporation for General Electric Company under contract to NASA, Report NASA-CR 134949; 1976.

Thomas Cassel, et al. Geothermal and Coal Power Plant Comparison Study, prepared for Standard Oil Company of California, Bechtel Corporation, San Francisco; August 1976.

Thomas Cassel, et al. Geothermal and Mineral Lease Valuation Study – Imperial County, California, prepared for Moron-Norwich, Inc., Bechtel Corporation, San Francisco; July 1976.

Thomas Cassel, et al. Analytical Comparison of Solar Assisted Heat Pump Systems, *Solar Energy Heat Pump Systems for Heating and Cooling Buildings*, ERDA Document COO-256-1; The Pennsylvania State University, University Park , Pennsylvania; June 1975.

Thomas Cassel, et al. Integrated Solar Energy Assisted Vapor Compression Heat Pump Systems, Report NCEMP-24; National Center for Energy Management and Power, University of Pennsylvania, Philadelphia; May 1974.

Thomas Cassel, et al. Design and Performance of a Prototype 4 by 4 Foot Inclined Solar Collector, Report NCEMP-23, National Center for Energy Management and Power, University of Pennsylvania, Philadelphia; 1974.