

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF SOUTHWESTERN )  
PUBLIC SERVICE COMPANY'S ANNUAL )  
RENEWABLE ENERGY PORTFOLIO REPORT )  
FOR 2005, ITS APPLICATION FOR APPROVAL )  
OF THE 2006 ANNUAL RENEWABLE ENERGY )  
PORTFOLIO PLAN, AND ITS EVALUATION )  
OF NON-WIND RENEWABLE RESOURCES )  
AVAILABLE IN ITS AREA, )  
)  
)  
SOUTHWESTERN PUBLIC SERVICE )  
COMPANY, )  
Applicant. )  
\_\_\_\_\_ )

Case No. 06-00360-UT

**DIRECT TESTIMONY OF**

**DR. BENJAMIN P. LUCE**

**On Behalf of the**

**Coalition for Clean Affordable Energy**

**October 25, 2006**

1 **Q. PLEASE STATE YOUR NAME, POSITION AND BUSINESS ADDRESS.**

2 **A.** My name is Benjamin P. Luce. I am the Director of the Coalition for  
3 Clean Affordable Energy (CCAЕ). My address is 802 Early Street, Santa Fe, New  
4 Mexico  
5 87505.

6  
7 **Q. PLEASE SUMMARIZE YOUR PROFESSIONAL BACKGROUND AND**  
8 **QUALIFICATIONS.**

9 **A.** I have a PhD in Physics from Clarkson University, with additional education in electrical  
10 systems, and have been employed at Los Alamos National  
11 Laboratory since 1993 where I specialized in the modeling of complex systems (I  
12 am currently on leave). I have participated in many Commission proceedings  
13 since 1999 on matters related to electricity, including the Renewable Portfolio  
14 Standard and its implementation, net-metering, the Afton Certificate of Convenience and  
15 Necessity, energy efficiency, and others. I have extensive experience with renewable  
16 energy systems, ranging from actual installation and operation experience to cost analysis  
17 and R&D related to fundamental components. I have also participated in many energy  
18 related task forces in New Mexico. My resume is attached as CCAE Exhibit \_\_ (BL-1).

19

20 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

21 **A.** I am testifying on behalf of CCAE, a coalition of environmental and consumer groups  
22 focused on the development of renewable energy resources in New Mexico.

23

24 **Q. DO YOU SUPPORT PNM's RPS PROCUREMENT PLAN AS SUBMITTED BY**  
25 **PNM?**

26 **A.** Yes. CCAE supports PNM's proposal to purchase power from a 32 MW biomass plant  
27 in Estancia for 20 years, and PNM's proposal to remove the annual cap on PNM's Small  
28 PV Program, provided that the biomass project adheres to the forest restoration principles  
29 established by PNM's biomass working group.

30  
31 **Q. WHY DO YOU BELIEVE THAT THE BIOMASS POWER PLANT THAT PNM**  
32 **PROPOSES TO PURCHASE POWER FROM IS BENEFICIAL?**

33 **A.** Biomass is a carbon-neutral renewable energy source, and hence its development in New  
34 Mexico will further decrease the harmful greenhouse gas emissions and other emissions  
35 associated with fossil fuel based generation. Biomass plants can be highly reliable, and  
36 in particular, dispatchable, giving them a distinct advantage over wind and some forms of  
37 solar power. The facility PNM proposes to buy power from is located close to  
38 Albuquerque, which could directly offset the need for transmission upgrades. Finally, if  
39 managed correctly, the associated forest thinning efforts can have some beneficial  
40 environmental impacts.

41  
42 **Q. WHY DO YOU BELIEVE THAT PNM's PROPOSAL TO REMOVE THE**  
43 **ANNUAL CAP FROM THE SMALL PV PROGRAM AT THIS TIME IS**  
44 **APPROPRIATE?**

45 **A.** The Small PV Program is very small from a total rate impact perspective, both due to the  
46 very small amount of generation it represents compared to PNM's total generation  
47 capacity (only a few hundred kilowatts at the moment compared to PNM's total in-state

48 peak demand of well over 1.6 million kilowatts), as well as the fact that PNM counts each  
49 of the associated PV RECs as equal to 3 wind RECs, thereby mitigating the cost impact  
50 of the program. Because the cost of the program is relatively very small, and because the  
51 total cost of the program is also capped, an annual cap seems simply unnecessary to us,  
52 and its value is essentially arbitrary and not based on real world experience. The annual  
53 cap also seems to be counter productive, given the purpose of the program is to  
54 encourage the development of distributed, grid-tied photovoltaics: Having potential  
55 customer-generators deferred to the following year whenever the annual cap is suddenly  
56 met could needlessly discourage the public, and create problems for the developing solar  
57 energy industry in the state.

58

59 **Q. HOW WOULD YOU PROPOSE THE COMMISSION APPROACH**  
60 **DETERMINING THE SIZE OF THE PROGRAM IN THE FUTURE?**

61 **A. I believe** the Commission should focus only on the total program size and the price paid  
62 for PV RECs as the primary means of governance. In setting these parameters, the  
63 Commission should weigh the cost of the program against both the potential benefits of  
64 the program, both short term (immediate) and long term (over many decades). The  
65 Commission should also consider the widespread public interest in the program as a form  
66 of electric service and also as a diversifying element in PNM's RPS generation portfolio.

67

68 **Q. WHAT FACTORS SHOULD THE COMMISSION RELY ON IN MAKING**  
69 **THESE DETERMINATIONS?**

70 **A.** Assuming that distributed photovoltaics will remain a relatively small part of PNM's  
71 overall load for at least the next decade, the Commission's justification for its decisions

72 about the program should rely mainly on the requirements of the Renewable Energy Act  
73 that RPS generation portfolios shall be diversified, and on the factors that the  
74 Commission may take into account when setting reasonable cost thresholds (RCTs). The  
75 Act states that:

76

77 “In establishing and modifying the reasonable cost threshold, the commission  
78 shall take into account:

79 (1) the price of renewable energy at the point of sale to the public utility;

80 (2) the transmission and interconnection costs required for the delivery of  
81 renewable energy to retail customers;

82 (3) the impact of the cost for renewable energy on overall retail customer rates;

83 (4) the overall diversity, reliability, availability, dispatch flexibility, cost per  
84 kilowatt-hour and life cycle cost on a net present value basis of renewable  
85 energy resources available from suppliers; and

86 (5) other factors, including public benefits, the commission deems relevant;

87 provided that nothing in the Renewable Energy Act shall be construed to

88 permit regulation by the commission of the production or sale price at the

89 point of production of the renewable energy.”

90

91 Distributed photovoltaics have a number of attributes that relate directly to the factors  
92 listed in the Act, including reduced load on transmission lines and other components of  
93 the grid, and public benefits such as creation of local jobs.

94 **Q. HOW LARGE A PROGRAM DO YOU FEEL THE COMMISSION SHOULD**  
95 **ALLOW?**

96 **A.** The Commission should seek to allow the program to develop in an uninhibited way for  
97 at least the next five years.

98

99 **Q. DO YOU SUGGEST THAT THE SMALL PV PROGRAM BE MODIFIED IN**  
100 **ANY OTHER WAY?**

101 **A.** Yes. I suggest that PNM and the Commission consider modifying the program such that  
102 all customer-generators receive the same length of contract, say, 15 years. The  
103 justification for this is it creates a more uniform and understandable program for the  
104 public. Currently, the length of contract decreases by one year in each successive year,  
105 which we feel is confusing to the public. Germany, for example, has a “feed-in” rate  
106 program that is similar to PNM’s PV Program, and it offers a 20-year contract.

107

108 **Q. DO YOU BELIEVE THAT PNM’S RPS PROCUREMENT PLAN SHOULD BE**  
109 **MODIFIED IN ANY OTHER WAYS?**

110 **A.** Yes, I believe that PNM and the Commission should jointly explore the possibility of and  
111 possibly undertake a Concentrating Solar Power (CSP) pilot project or projects.  
112 Furthermore, additional wind generation projects should also be considered that can  
113 diversify PNM’s supply of wind power, both in terms of geographical location and  
114 ownership.

115 **Q. WHAT TYPES OF CSP TECHNOLOGY DO YOU BELIEVE SHOULD BE**  
116 **CONSIDERED?**

117 **A.** Only CSP projects that can incorporate thermal energy storage and be integrated with  
118 existing power plants should be considered at this time.

119

120 **Q. WHY DO YOU BELIEVE THAT IT IS IMPORTANT FOR PNM TO DEVELOP**  
121 **“THERMAL” CSP?**

122 **A.** The development of thermal CSP is an essential and desirable component for a fully  
123 diversified renewable energy portfolio, because thermal CSP technologies that  
124 incorporate thermal energy storage and/or are integrated with thermal existing plants are  
125 the only renewable energy source today that can provide a fully dispatchable and cost  
126 effective renewable energy source capable of essentially unlimited potential.

127

128 **Q. WHAT IS THE POTENTIAL FOR CSP DEVELOPMENT IN NEW MEXICO?**

129 **A.** The Western Governors’ Association has recently published data suggesting that up to  
130 1940 gigawatts could be developed in New Mexico. This is clearly much larger than any  
131 amount of CSP that would likely need to be developed for the foreseeable future.

132

133 **Q. ARE THERE ANY SPECIFIC TYPES OF CSP TECHNOLOGY AND/OR**  
134 **PROJECTS THAT YOU BELIEVE PNM SHOULD EXPLORE AND POSSIBLY**  
135 **DEVELOP?**

136 **A.** Yes. I would suggest that PNM and the Commission consider a small pilot project, on the  
137 scale of 1-20 megawatts, using Compact Linear Fresnel Reflector (CLFR) as a  
138 supplemental heat source on an existing power plant, such as the Afton Plant. CLFR

139 appears to have several intrinsic advantages over other forms of CSP: It avoids the use of  
140 expensive strongly curved glass, and delicate evacuated receivers. CLFR also appears to  
141 have a much less costly mirror-support structure, and is well matched to underground  
142 thermal energy storage. Cost estimates given in the paper "Design of a 200 MWe Solar  
143 Plant," available at [www.solarheatpower.com](http://www.solarheatpower.com), suggest that CLFR plants as small as 200  
144 MWe range could achieve costs as low as \$45 per megawatt-hour, and that the cost of  
145 underground thermal energy storage could be as inexpensive as 1/10 of 1 cent per kWh. I  
146 also believe that PNM should consider adding a CLFR or other type of thermal-CSP  
147 steam source to the San Juan Generating Station, as a means of reducing harmful air  
148 emissions and increasing renewable energy generation.

149

150 **Q. WHAT DID YOU HAVE IN MIND WHEN YOU SUGGESTED THAT PNM AND**  
151 **THE COMMISSION CONSIDER ADDING ADDITIONAL WIND GENERATION**  
152 **TO PNM'S PLAN?**

153 **A.** Geographical diversification of wind generation would be helpful because it would  
154 provide a total wind resource to PNM that is somewhat more spread out in time in terms  
155 of its output. Diversification of ownership of wind facilities may also be beneficial in  
156 some ways. It would, for example, increase the number of likely wind providers who  
157 would be interested in expanding their involvement in New Mexico as New Mexico  
158 strives to further develop its wind power resources.

159

160 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

161 **A.** Yes, it does.

**CCAIE Exhibit \_\_ (BL-1).**

## **Benjamin P. Luce, Ph. D.**

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**Summary:** Theoretical physicist and clean energy advocate with eleven years professional research experience in applied mathematics and physics, and eight years experience with renewable energy technology and energy efficiency, energy policy advocacy, and public education.

### **Education**

- **Ph.D. Physics, Clarkson University, New York, 1993**
- **M.S. Physics, Clarkson University, New York, 1991**
- **B.S. Physics/B.S. Sound Recording Technology, State University of New York at Fredonia, 1989**  
(1989 Phi Beta Kappa Award Recipient)
- **Coursework in Electricity, Electronics, Physics, Psychology, Mathematics, Erie Community College, 1982-1983**
- **Coursework in C++ & Geology, University of New Mexico Los Alamos, 2000**

### **Research Experience**

- **Staff Member, Los Alamos National Laboratory, 1996-present**
- **Postdoctoral Fellow, Los Alamos National Laboratory, 1993-1996**  
(LANL Outstanding Performance Award, 1996)
- **Teaching Assistant, Clarkson University, 1989-1991 Research Assistant, Clarkson University, 1991-1993**
- **Undergraduate Research in Nonlinear Dynamical Systems, University of Tennessee/Oakridge National Laboratory, summer 1989**
- **Undergraduate Research in Detector Data Acquisition, High Energy Physics Group, SUNY at Stony Brook, summer 1988**

Applied dynamical systems theory to a variety of complex physical phenomenon described by nonlinear partial differential equations, including fiber optical pulse propagation, fluid convection, microwave heating, bioremediation, and ocean current circulation. Additional research experience in carbon sequestration, fuel synthesis, renewable energy technology, and energy program development.

### **Renewable Energy Advocacy Experience**

- **President: New Mexico Solar Energy Association, 1999-2004**  
Recipient: NMSEA Outstanding Contributions Award, 2001
- **Public Education Work: New Mexico Solar Energy Association, 1997-2002**
- **Co-Chair/Chair: Coalition for Clean Affordable Energy, 2000-2005**
- **Chair: Governor Richardson's Distributed Solar Task Force, 2004.**
- **Member: Western Governor's Association Solar and Clean Coal Task Forces; Governor Richardson's Electricity Transmission and Concentrating Solar Task Forces; New Mexico Sustainable Energy Collaborative; New Mexico Project Power Working Group; nE2 - New Energy Economy Network.**

Working to advance energy policy in New Mexico through policy advocacy as the Chairman and Policy Director of the Coalition for Clean Affordable Energy (CCAIE), and increase public awareness of renewable energy and energy efficiency issues through public education efforts with the New Mexico Solar Energy Association (NMSEA). Participated actively in proceedings of the New Mexico Public Regulatory Commission, negotiated numerous agreements among energy policy stakeholders, and lobbied and/or testified for legislators at the New Mexico State and United States Legislatures. Created NMSEA's extensive online renewable energy curriculum and passive solar guidelines, maintained and expanded both NMSEA's and CCAIE's websites. Demonstrated renewable energy technology at over sixty New Mexico schools, organized six energy fairs and exhibited at many others, gave numerous invited presentations to local organizations, published numerous articles and provided information to local media.

### **Skills**

Applied Mathematics and Physics; Computer Modeling; Energy Systems and Energy Policy Analysis; Website Management; Unix and Windows Computing Platforms; MS PowerPoint, Access, etc; Public Speaking.