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Carl J. Kunasek
Chairman

Arizona Corporation Commission

DOCKETED

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JIM IRVIN
Commissioner

JUL 30 1999

WILLIAM A. MUNDELL
Commissioner

DOCKETED BY *W.A.M.*

IN THE MATTER OF THE GENERIC) DOCKET NO. E-00000A-99-0205
INVESTIGATION OF THE DEVELOPMENT)
OF A RENEWABLE PORTFOLIO STANDARD)
AS A POTENTIAL PART OF THE RETAIL) NOTICE OF FILING DIRECT
ELECTRIC COMPETITION RULES.) TESTIMONY OF VINCENT HUNT
_____)

Pursuant to the Commission's Procedural Order dated June 16, 1999, counsel for City of Tucson herein undersigned, hereby provides notice of the filing of the Direct testimony of Vincent Hunt in the above-captioned docket.

DATED THIS 30th day of July, 1999.

David L. Deibel
Senior Assistant City Attorney
City of Tucson - City Attorney's Office
P. O. Box 27210
Tucson AZ 85726-7210

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AN ORIGINAL AND TEN COPIES
Of the foregoing Notice of Filing
Direct Testimony of Vincent Hunt
Filed this 30th day of July, 1999, with:

Arizona Corporation Commission
Docket Control
1200 W. Washington
Phoenix AZ 85007

Copies of the foregoing mailed
this 30th day of July, 1999, to:

Service List for RE-00000C-94-0165

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Office of the City Attorney
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Tucson, Arizona 85726-7210

DIRECT TESTIMONY OF VINCENT HUNT

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

2 A. Vincent Hunt, Department of Operations, City of Tucson, 4004 S. Park Ave.,
3 Bldg. #1, Tucson, AZ, 85714.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I work for the City of Tucson, Department of Operations, as the Energy
6 Manager. I have worked for the City since November 1994 and have been in
7 my current position since July 1995.

8 **Q. WHAT ARE YOUR QUALIFICATIONS TO TESTIFY IN THIS PROCEEDING
9 AND WHAT HAS BEEN YOUR INVOLVEMENT IN SOLAR ENERGY?**

10 A. I have Bachelors and a Masters Degree in Mechanical Engineering from
11 Stevens Institute of Technology in Hoboken, New Jersey. I am a Certified
12 Energy Manager. My master's project was a computer model of a solar
13 powered Rankine Cycle. This was a basic steam cycle using a parabolic
14 trough solar collector as the boiler and then using a conventional steam cycle
15 for power generation. The purpose of the study was to determine the most
16 efficient fluid to utilize in the power plant. The City of Tucson is currently
17 installing a 5kW net AC output photovoltaic system as part of a new City
18 building being constructed. I have been involved in all aspects of the project
19 from the concept, to securing funding, design, and construction. My role has
20 been to coordinate and review the project. I am also the City's liaison to the
21 Tucson Coalition for Solar.

22 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

23 A. I am testifying on behalf of the City of Tucson.
24
25
26

DIRECT TESTIMONY OF VINCENT HUNT

1 **Q. WHY ARE YOU TESTIFYING TODAY?**

2 A. Chief Hearing Officer Rudibaugh issued a procedural order on June 16, 1999,
3 requesting that parties involved in the Renewable Portfolio Standard docket
4 respond to questions put forward in that order. Since the order required that
5 certain parts of the responses be put forward as testimony, it was decided that
6 all responses be in the form of testimony.
7

8 **Q. HOW IS YOUR TESTIMONY ORGANIZED?**

9 A. The following are questions put forward by Chief Hearing Officer Rudibaugh
10 and my responses to them.
11

12 **1. A. SHOULD THERE BE AN ENVIRONMENTAL STANDARD IN ARIZONA**
13 **AND WHY?**

14 Yes. The community of Tucson has shown a favorable response to the solar
15 portfolio standard (SPS) throughout the development of the proposed rules for
16 retail electric competition. Arizona is a net consumer of energy, yet has an
17 abundant natural energy resource if solar energy can be utilized. The use of
18 renewable energy sources for electric generation will allow Arizona to diversify
19 the generation mix and reduce demands on the transmission and distribution
20 system.

21 An Environmental Standard, with an emphasis on renewable energy such as
22 solar, will encourage economic development within the state. Economic
23 development issues have been addressed in Arizona Energy Outlook 2010:
24 Energy Efficiency and Renewable Energy Technologies as an Economic
25 Development Strategy, prepared by Economic Research Associates in July
26 1997.

The Commission Staff Discussion of the Proposed Rule on Electric Industry
Restructuring dated October 4, 1996, contains many reasons for implementing
a solar portfolio standard. Some of the reasons cited are a hedge against fossil
fuel price increases, environmental benefits, and support of institutions to
effectively apply renewables.

**B. IF SO, WHAT SHOULD BE THE OBJECTIVES OF AN ENVIRONMENTAL
STANDARD AND WHO SHOULD BEAR THE COSTS OF THE STANDARD
AND HOW SHOULD THOSE COSTS BE COLLECTED?**

DIRECT TESTIMONY OF VINCENT HUNT

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Eleven objectives of the Solar Portfolio Standard were developed during Commission workshops held in 1997. These objectives represent a sound basis for the objectives of the Environmental Standard as well. The 11 objectives from the workshop report are provided below with some suggestions in ***bold italics***:

- ★ Encourage the use of solar ***and renewable energy sources*** to increase the fuel diversity in the electricity generation mix.
- ★ Increase utility and electric service provider expertise and experience in the procurement, installation, and operation of solar electric systems or in the purchase and transmission of solar electricity from other sources.
- ★ Encourage new solar electric technologies as a reasonable percentage of competitive retail electric sales that is significantly less than the annual growth of demand for electricity.
- ★ Encourage the use of modest-sized, distributed solar generators to reduce the loading on existing transmission lines and also reduce the need to build new, expensive transmission lines as the demand for electricity increases in the future.
- ★ Contribute to the commercialization of solar electric technologies, thus reducing the cost of solar electricity to Arizona customers in the future.
- ★ Contribute to economic benefits throughout Arizona
- ★ Encourage environmental benefits.
- ★ Encourage a market-based solar electric industry.
- ★ Increase public information/awareness of solar electricity, ***solar water heating, and renewables***.
- ★ Reach an acceptable cost/benefit point.
- ★ Encourage solar resource development, rather than payment for non-compliance.

An Environmental Standard will provide overall societal benefits. Competitive energy suppliers and electricity consumers in the competitive market should bear the cost of the standard. As proposed, the standard allows for a variety of approaches to meet its requirements. Such approaches include, but are not limited to, owner purchased and installed systems, energy provider installed on-site generation, and merchant plant sources.

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2. WILL THE PROPOSED NEW PORTFOLIO STANDARD MEET THE DESIRED OBJECTIVES OR WOULD YOU PROPOSE AN ALTERNATIVE MECHANISM?

The City feels that the Environmental Standard will meet the desired objectives. There is some concern that by including solar water heating and other forms of renewable electric generation technologies that the desired critical mass of solar generation manufacturing and installation will not take place. The City would not be supportive of further reductions to solar electric generation percentages.

3. ARE YOU SUPPORTIVE OF THE PROPOSED PORTFOLIO STANDARD AND, IF NOT, DESCRIBE ANY MODIFICATIONS THAT YOU WOULD MAKE TO THE PROPOSED PORTFOLIO STANDARD (INCLUDING RESPONSES TO 6 BELOW) OR DESCRIBE YOUR COMPANY'S PROPOSED ALTERNATIVE MECHANISM.

The City supports the Solar and Environmentally-Friendly Portfolio Standard as it has been proposed. It is somewhat concerned that by including solar water heating and other forms of renewable electric generation technologies, a critical mass of solar generation manufacturing and installation will not take place as desired and the City would not be supportive of further reductions to solar electric generation percentages.

4. IF YOU ARE PROPOSING AN ALTERNATIVE TO THE PROPOSED STANDARD, INCLUDE A DETAILED DESCRIPTION OF: (1) TECHNOLOGIES TO BE INCLUDED; (2) TIMING; (3) ANY INCENTIVES; (4) COST PROJECTION OF THE ALTERNATIVE OVER THE LIFE OF THE ALTERNATIVE; (5) IMPACT ON CUSTOMER RATES; (6) ALL MAJOR ASSUMPTIONS FOR THE PROPOSED ALTERNATIVE.

At this time, the City is not proposing any alternatives to the standard.

5. A. SHOULD THE STANDARD BE IMPOSED ONLY ON SALES IN THE COMPETITIVE MARKET?

Yes, the standard should apply to all electric sales of energy service suppliers in the competitive market and to electric power supply sales made by the utility distribution companies as part of their standard offer rates. Once the market is opened to full competition, any standard offer service must have the electric supply competitively purchased.

B. INSTEAD OF IMPLEMENTING A STANDARD AS PART OF THE RETAIL ELECTRIC COMPETITION RULES, SHOULD THE MARKET (THE RETAIL CONSUMERS THEMSELVES) DICTATE THE AMOUNT OF "GREEN"

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DIRECT TESTIMONY OF VINCENT HUNT

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POWER TO INCLUDE IN COMPETITIVE ENERGY CHOICES? SHOULD THE COMMISSION ENCOURAGE ENERGY SERVICE PROVIDERS TO OFFER PROGRAMS, INSTEAD OF MANDATING RIGID TARGETS, ALLOWING THE MARKET FOR SUCH PRODUCTS TO DEVELOP NATURALLY?

The standard provides minimum requirements that should not preclude market forces to dictate higher amounts of "green" power.

C. WOULD IT BE APPROPRIATE TO INCLUDE RECOVERY OF COSTS OF RENEWABLE SYSTEMS IN A SYSTEMS BENEFITS CHARGE RATHER THAN THE GENERAL COST/RATE STRUCTURE?

The City does not feel that recovery of renewable costs through the system benefits charge is the correct approach in the competitive market. The standard as it is structured allows for the correct incentives for all energy service providers to supply renewable energy. Very little in the way of renewable generation has resulted from the system benefits charges.

6. PLEASE COMMENT ON THE FOLLOWING ASPECTS OF THE PROPOSED NEW PORTFOLIO STANDARD:

6A. NEW SECTION N ALLOWS FOR "ENVIRONMENTALLY-FRIENDLY RENEWABLE ELECTRICITY TECHNOLOGIES" OTHER THAN SOLAR. WHICH TECHNOLOGIES SHOULD BE INCLUDED IN THIS SUBSECTION? WOULD THOSE TECHNOLOGIES BE AVAILABLE IN ARIZONA OR WORK IN ARIZONA?

The City feels that it is appropriate to allow other environmentally friendly electricity technologies to be included as a small percentage of the standard. The City recommends that the appropriateness and percentage of renewables in the standard be evaluated in the future. It is recommended that the Solar Electricity Cost Evaluation Working Group include this in their report to the Commission.

The City suggests that electricity generated by wind and new hydroelectric power be allowed as part of the standard.

6B. IN SUBSECTIONS A AND B OF THE PROPOSED PORTFOLIO STANDARD, A SCHEDULE OF PORTFOLIO PERCENTAGES IS DEFINED. IS THE SIZE OF PORTFOLIO PERCENTAGE AND TIMING OF INCREASES, A REASONABLE STRATEGY TO BE INCLUDED IN THE COMPETITION RULES? WHAT ALTERNATIVES WOULD YOU PROPOSE AND WHY?

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DIRECT TESTIMONY OF VINCENT HUNT

1 The current percentages and timing of the generation requirements along with
2 the multiple-credit incentives seem to present a reasonable balance between
3 cost and supply.

4 The Commission might consider shifting the percentage requirements from a
5 starting date of January 1, 1999 at 0.2% to requiring 0.2% at the start of
6 competition. It is recommended that the portfolio percentage of 1% by 2005 be
7 maintained.

8 **6C. THE PROPOSED PORTFOLIO STANDARD INCLUDES INCENTIVES
9 FOR IN-STATE MANUFACTURING AND IN-STATE INSTALLATION OF
10 SOLAR AND OTHER ENVIRONMENTALLY FRIENDLY TECHNOLOGIES.
11 ARE THOSE INCENTIVES APPROPRIATE AND SUBSTANTIAL ENOUGH
12 TO HAVE A POSITIVE IMPACT ON ARIZONA'S ECONOMY AND ON
13 ARIZONA'S ECONOMIC DEVELOPMENT? WHAT ALTERNATIVES
14 WOULD YOU PROPOSE AND WHY?**

15 **6D. WHAT LONG-TERM BENEFITS WILL THE PROPOSED PORTFOLIO
16 STANDARD HAVE ON THE STATE OF ARIZONA AND ITS RESIDENTS?
17 SPECIFIC ITEMS TO BE ADDRESSED INCLUDE JOB CREATION,
18 MAINTENANCE OF ENERGY DOLLARS IN THE LOCAL ECONOMY, LOAD
19 DIVERSIFICATION, AND POLLUTION PREVENTION.**

20 Economic development issues have been addressed in Arizona Energy
21 Outlook 2010.

22 **6E. WHAT WOULD THE IMPACT BE ON AN AVERAGE COMPETITIVE
23 (RESIDENTIAL AND COMMERCIAL) CUSTOMER'S MONTHLY BILL
24 (ASSUME 1,000 KWH/MONTH USAGE FOR RESIDENTIAL) OF THE
25 PROPOSED PORTFOLIO STANDARD? (PLEASE STATE ASSUMPTIONS,
26 INCLUDING TECHNOLOGY COSTS).**

Using a cost of electric generation estimated from a current installation of PV by the City of \$0.31/kwh conventional generation at a cost of \$0.03/kWh is displaced, a customer using 1,000kWh/month will see an increase in their electric bill of \$2.80 per month, \$33.60 annually or less than a penny per day. This is about a 2.8% cost increase. This assumes no multipliers and a customer requirement of the full 1% of 1,000 kWh. See Number 8 for the information utilized to determine the City's cost of electric generation through its PV system.

It should be noted that some consumers in a competitive marketplace are likely to purchase renewable energy and will pay a premium to do so. These "green" consumers will reduce the amount of renewable energy, which must be purchased by others in the system thereby reducing the cost to those non-green consumers.

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1
2 The City has presented its cost information as an example. This is the City's
3 first such project and we expect to achieve lower costs through the purchase of
4 larger systems, as we gain experience, by combining several small projects into
5 a larger purchasing pool and by overall industry cost reductions.

6
7 **6F. SECTION 1609.B.2 PROVIDES FOR DETERMINATION OF A
8 COST/BENEFIT POINT IN 2001 PRIOR TO AN INCREASE IN THE
9 PERCENTAGE IN 2002. IS IT APPROPRIATE TO DETERMINE THE
10 COST/BENEFITS POINT DURING THIS PROCEEDING (AND THE
11 CORRESPONDING IMPACT ON CUSTOMERS) OR IN 2001? SHOULD THE
12 COMMISSION CAP THE IMPACT THAT THE PORTFOLIO STANDARD MAY
13 HAVE ON CUSTOMERS?**

14
15 There have been studies determining estimates of the cost due to
16 implementation of the original SPS. The City feels that it is time to implement
17 the standard, and as is called for in the proposal, review the real costs and
18 benefits prior to December 31, 2002.

19
20 On August 6, 1997, the Commission's Solar Portfolio Working Group requested
21 an independent study be done in an attempt to quantify the impact of the
22 various options being proposed for the SPS. The Pacific Energy Group (as a
23 subcontractor to NREL) performed this study. This study estimated the rate
24 impact to be between a 0.3% and 1.7% rate increase. Even the highest
25 estimated rate increase is less than rate decreases customers of the State's
26 largest IOUs have recently been enjoying.

Overall benefits to the State should also be considered in any cost/benefit
analysis. By that, it is meant job creation and pollution prevention. Arizona
Energy Outlook 2010 describes potential economic benefits from increasing
energy efficiency and renewable energy investments.

27
28 **6G. SECTION 1609.I OF THE PROPOSED PORTFOLIO STANDARD
29 ALLOWS FOR THE "BANKING" OR SALE OF EXCESS SOLAR KWH. THIS
30 COULD CREATE A TRADING PROGRAM, SIMILAR TO THE EPA'S
31 SULFUR DIOXIDE TRADING PROGRAM. DO YOU HAVE ANY
32 SUGGESTIONS ABOUT CREATING A CREDIT TRADING OR BANKING
33 PROGRAM?**

34
35 No, not at this time. The City would be interested in reviewing any proposals in
36 this regard and we would expect that a trading program would allow for overall
cost reductions. For example, the City could sell credits to an energy service
provider that would offset our overall cost of electricity.

**7. SHOULD THE PROPOSED STANDARD OR ANY ALTERNATIVE THAT YOU
ARE PROPOSING APPLY TO STANDARD OFFER CUSTOMERS IN 2001? IF**

DIRECT TESTIMONY OF VINCENT HUNT

1 YES, SHOULD THE STANDARD OR ALTERNATIVE AS APPLIED TO
2 STANDARD OFFER BE ENERGY DRIVEN (KWH) OR DOLLAR DRIVEN TO
3 LIMIT OR CAP THE IMPACT ON STANDARD OFFER CUSTOMERS? WHAT
4 WOULD THE IMPACT BE ON AN AVERAGE RESIDENTIAL AND
5 COMMERCIAL CUSTOMER'S MONTHLY BILL? (PLEASE STATE
6 ASSUMPTIONS, INCLUDING TECHNOLOGY COSTS.) WHAT MECHANISM
7 SHOULD THE COMMISSION PUT IN PLACE TO RECOVER THE COSTS FROM
8 STANDARD OFFER CUSTOMERS?
9

10 Once all customers are eligible for competitive services after January 1, 2001,
11 Standard Offer Customers will, in effect, have made their choice to stay with the
12 Standard Offer service provider. The standard should be applied uniformly to
13 all customers including the Standard Offer Customers. Therefore, the
14 Standard Offer Customers will have the standard applied on an energy basis.

15 Commission staff analysis of the original SPS expected that its cost impact will
16 be smaller than the savings which can occur through competition, especially as
17 stranded cost recovery concludes (Staff Discussion of the Proposed Rule on
18 Electric Industry Restructuring October 4, 1996).

8. OTHER RELEVANT COMMENTS?

19 The City is currently installing a 5kW net AC output PV system. The estimated
20 cost per generated kWh is \$0.31. If a grant subsidy is included in the
21 calculations, the cost per kWh generated is estimated to be \$0.26/kWh. The
22 system is being installed as part of the construction of a new City facility. The
23 PV system will be grid connected using a bi-directional meter. Installation cost
24 including a design fee is approximately \$47,800. For the analysis, the City
25 assumed a 15-year life of the inverter and a 30-year life on the panels.
26 Electricity generation was estimated at 10,000kWh annually. A simple interest
rate of 5% was used. The spreadsheet analysis is attached.

The City supports the Solar and Environmentally-Friendly Portfolio Standard as
it has been proposed. The changes to the original SPS incorporated into the
standard are in keeping with the original intent of the SPS. Inclusion of
renewable and solar water heaters for a portion of the portfolio will allow for
further choice by consumers and electric service providers. The City has
participated in the Solar Portfolio Standard Subcommittee in 1997 and will
participate in the Solar Electricity Cost Evaluation Working Group proposed for
establishment by January 1, 2001.

The City feels that the use of solar energy for electric generation is the most
applicable renewable energy technology available for electricity generation at
this time for Arizona and strongly supports its utilization. The City plans to
continue investing in both solar water heating and PV systems. City staff,
including code officials, engineers, architects and maintenance personnel, as

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well as local installers and designers are gaining experience in applying solar resources to commercial facilities.

Q. Does this conclude your testimony?

A. Yes.

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ELECTRICAL OUTPUT COSTS FOR SOUTHEAST SERVICE CENTER PV INSTALLATION

City of Tucson
 Department of Operations
 Technical Planning and Resources

Prepared by Vincent Hunt

Installed Capacity - 5 KW net AC Output

Estimated Annual Electric Generation 10,038 kwh

Installation Cost

Design and Construction	\$ 43,492	
Added Structural (est.5%)	\$ 2,175	
A/E Perf. Spec Design and CA (est. 5%)	\$ 2,175	With \$8,750 subsidy
Total Installed Cost	\$ 47,841	\$ 39,091

Annual Maintenance est. 150

PV System Life - years 30

Assume Invertor Replace at 15 years
 at a cost of \$3,000 \$ 3,000

Assumed Interest Rate - % 0.05

Calculations

NPV of Annual Maintenance (\$2,305.87)
 NPV of Invertor Replacement \$ (694)

Present Cost Including Annual
 Maintenance and Invertor
 Replacement \$50,841 42,091.20

Annualized Cost for System (\$3,149.80) (\$2,607.71)

Bottom Line Cost Per KWH 31 cents/kwh 26 cents/kwh