

ORIGINAL

OPEN MEETING



0000108421

MEMORANDUM

RECEIVED

Arizona Corporation Commission

DOCKETED

2010 MAR 16 P 4:40

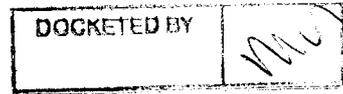
MAR 16 2010

AZ CORP COMMISSION
DOCKET CONTROL

TO: THE COMMISSION

FROM: Utilities Division

DATE: March 16, 2010



RE: UNS ELECTRIC POWER COMPANY-APPLICATION FOR APPROVAL OF ITS PROPOSED ZERO-NET ENERGY HOMES PILOT PROGRAM (DOCKET NO. E-04204A-07-0365)

BACKGROUND

On March 30, 2009, UNS Electric, Inc. ("UNSE" or "Company") filed an application for approval of its proposed Zero-Net Energy Homes ("ZEH") Pilot Program. On July 17, 2009, UNSE filed a revised version of its application. The proposed ZEH Pilot Program expands on the current New Home Construction Program (marketed as the Energy Smart Homes ("ESH") Program) approved by the Commission on September 30, 2008 (Decision No. 70522). In Decision No. 70522 the Commission required UNSE to "build on its current residential energy efficiency program [and]...outline what Zero-Net technologies and incentives...can be incorporated into the Company's existing DSM programs."

PROGRAM DESCRIPTION

UNSE's proposed ZEH Pilot Program which is an expansion of the current New Home Construction Program ("Tier 1") incorporates two new tiers: Tier 2-Energy Efficient Home Construction ("Tier 2") and Tier 3-Near Zero-Net Energy Homes ("Tier 3") into the existing New Home Construction Program. According to UNSE, incorporating the two additional tiers will help keep the program administrative costs down. UNSE intends to merge the ZEH Pilot Program with the existing ESH Program. According to the proposed Program, homes will qualify for one of the three tiers in the program based on a Home Energy Rating System ("HERS")¹ Index score. The HERS awards a numerical value for gauging a home's performance. Higher performing homes achieve a lower HERS score. Tier 1 requires a HERS score that is less than or equal to 85, Tier 2 will require a HERS score that is less than or equal to 70, and Tier 3 will require a HERS score that is less than or equal to 45. Table 1 illustrates the HERS Index Scores for the Residential New Home Construction Program.

Table 1

Tier 1 (Existing Program)	HERS Index Score of ≤ 85
Tier 2 (Energy Efficiency Only)	HERS Index Score of ≤ 70
Tier 3 (50% Zero-Net Energy)	HERS Index Score of ≤ 45

¹ The HERS Index was developed by the Residential Energy Service Network.

The proposed ZEH Pilot Program design will allow UNSE to use existing delivery infrastructure and marketing to promote all three program tiers. According to UNSE, although the proposed addition of Tier 2 and Tier 3 would improve the energy efficiency of the New Home Construction Program, they do not achieve 100 percent zero-net energy due to cost-effectiveness concerns. UNSE defines the term *zero-net energy* as “the ratio between annual energy generated by the house through the on-site renewable devices to the total annual energy used by the house.” Therefore, a home is considered to be a 75 percent ZEH if 75 percent of the total annual energy a home uses (including energy from both gas and electric for dual fuel homes) comes from on-site generation.

UNSE’s existing residential New Home Construction Program currently offers two options; the Energy Smart Homes Program (“ESH Program”) and the Energy Smart Solar Home Program (“ESSH Program”). UNSE anticipates that the ESSH Program will be replaced by the new Tier 3 option.

According to UNSE, with the addition of the new Tier 2 and Tier 3 options, there will be additional construction standards in order for builders to achieve Tier 2 and Tier 3. As a result, the incremental costs for builders will increase to meet the increased standards for Tier 2 and Tier 3 as well as the recommended incentive to the builders. Table 2 illustrates the proposed ZEH Pilot Program Builder Incentives. The additional construction standards for Tier 2 and Tier 3 homes include:

- Greater envelope and Heating, Ventilating, and Air Conditioning (“HVAC”) energy efficiency standards;
- Ducts are located within conditioned space;
- Both photovoltaic and solar water heating on the ZEH;
- Passive solar design that incorporates passive solar heating in the winter and shading in the summer for the highest efficiency homes;
- Energy Star® fixed appliances; and
- Compact Fluorescent Lamps (“CFLs”)

Table 2

ZEH Tier Level	HERS Index	Builder Incentive
Tier 1 (Existing Program)	≤ 85	\$400 per home
Tier 2 (Energy Efficiency Home)	≤ 70	\$1,500 per home
Tier 3 (50% Zero-Net Energy Homes)	≤ 45	\$3,000 per home

According to information provided by UNSE, the additional \$1,500 above Tier 2 incentive paid to builders for Tier 3 from this program will be in addition to the incentives paid

from UNSE's REST Program. Despite the addition of the \$1,500 increase in incentives between Tier 2 and Tier 3, the total incentives paid for Tier 3 will not exceed the sixty percent (60%) cap approved in its 2010 REST Implementation Plan (Decision No. 71464). UNSE indicated that builders would not pursue the available federal and state tax credits for photovoltaic ("PV") and solar water heaters as they may not be eligible to receive those credits because the builder would not be the actual owner of the home. In addition, UNSE indicated that the actual home owner would be eligible to pursue the available federal and state credits for PV and solar water heaters. Therefore, UNSE chose to increase the incentive levels for those builders who invested in the construction of a home that qualifies for the Tier 3 level (HERS \leq 45) because the builder may not be able to qualify for the available federal and state tax credits for solar technologies.

TARGET MARKET

According to UNSE, the target market for the ZEH Pilot Program is new homes within UNSE's service territory. UNSE intends to market the ZEH Pilot Program to all builders within its service territory. The tiered program approach allows UNSE to promote the Tier 2 level of the ZEH Pilot Program for homes that are constructed with a combination of electric and natural gas.

Because the ZEH Pilot Program does not achieve a true zero-net energy level and is designed for a 50 percent zero-net energy level (Tier 3), the size of the PV system built would need to be large enough to produce at least 50 percent of the total energy (gas and/or electric) used in the home. In addition, UNSE states that if a home is designed with gas water heating and gas heating to meet the 50 percent zero-net energy level (Tier 3), then a gas/electric home would qualify as a Tier 3 level home. This home would also qualify for the Tier 3 incentive level payments. UNSE stated that it chose to focus its marketing on an all electric option for Tier 3. However, Staff believes that for Tier 3 that UNSE's marketing efforts should include gas/electric homes.

PROGRAM OBJECTIVES

The objectives of the ZEH Pilot Program are the following:

- Reduce peak demand and overall energy consumption (electric) in new homes;
- Implement programs that include more aggressive energy efficiency standards that produce savings of at least 20 percent above baseline (HERS 70) and a near zero-net percentage of at least 50 percent (HERS 45) where approximately 50 percent of annual energy used by the home will come from on-site renewable generation;
- Stimulate the installation of solar photovoltaic systems and solar water heaters in new homes;

- Stimulate energy efficiency standards that are higher than Environmental Protection Agency/Department of Energy, Energy Star Homes® performance standards;
- Stimulate construction of new homes that are inspected and tested to assure energy performance;
- Stimulate the installation of high efficiency heating and cooling systems, envelope, lighting, and fixed appliances (Energy Star® products);
- Assist sales agents with promoting and selling of zero-net energy homes;
- Provide information to help explain the benefits of zero-net home features;
- Train builder construction staff and sub-contractors in advanced building-science concepts to reach zero-net energy goals through improved design and installation practices, and through the installation of renewable energy devices;
- Increase homebuyer awareness and understanding of the benefits they receive from living in a zero-net energy home and how they can improve the performance of their home; and
- Educate builders who: 1) are not familiar with energy savings and on-site generation potential; 2) may be uncertain about zero-net energy performance; and 3) may be concerned about high initial costs for construction measures.

PRODUCTS AND SERVICES

According to UNSE, the ZEH Pilot Program would provide the following products and services:

- Promotion of builders and subdivisions that achieve zero-net energy levels of at least 50 percent;
- Builder and sub-contractor education and training;
- Educational and promotional materials for builders and new home buyers; and
- Homeowner or builder incentives for achieving increasing energy efficiency and zero-net energy levels as measured by a HERS index score of either ≤ 70 or ≤ 45 .

ZEH PILOT PROGRAM METHODOLOGY

To determine the feasibility for a ZEH program, UNSE developed a baseline simulation model of a new home; then several versions of the baseline model with increasing levels of energy efficiency; and finally several versions of the energy efficiency models with increasing levels of zero-net energy targets.

There were four stages of the study:

- Define and simulate a baseline home, reflecting current practice for new single family homes in Kingman, Arizona, as an approximate representative location for UNSE territory. The home was modeled as all-electric.
- Define and simulate three homes with increasing levels of efficiency. The targets for the models were a 30 percent, 40 percent, and 50 percent reduction in annual energy use.
- Simulate three homes with increasing levels of zero-net energy by adding both solar water heating and solar PV. The targets for the models were 50 percent, 75 percent, and 100 percent zero-net energy levels. These models were based on either the 30 percent or the 50 percent energy efficiency home.
- Combine estimated demand and energy savings from all of the models, incremental costs over baseline costs, and other utility data to produce a benefit-cost test result for each model. This was done in the format of a Measure Analysis Sheet.

According to UNSE, the baseline home simulation was an all-electric, 1,850 square-foot home in Kingman, Arizona. A combination of three sources was used to determine the level of efficiency in the baseline model: 1) the 2007 Enovity Report², 2) the 2003 International Energy Conservation Code for residential new construction, and 3) a 2009 study completed by Summit Blue Consulting. The models were developed using the eQuestTM simulation software which generates savings estimates. The homes were also modeled with REM/Rate simulation software that determines the HERS index the homes would achieve. UNSE developed a total of nine cases; three of which were energy efficiency models, three zero-net models based on a 30 percent energy efficient house, and three zero-net models based on a 50 percent energy efficient home.

For the energy efficiency-only models, UNSE set a goal of 30 percent, 40 percent, and 50 percent reduction in annual energy usage over the baseline model. In addition, UNSE added the following energy efficiency measures to the baseline model to generate increasing levels of savings:

² Residential Home Standards: Energy Analysis and DOE-2 Simulation, Prepared by Enovity, Inc. for Tucson Electric Power Company, February 12, 2007.

- **Orientation:** Orienting a house in a north-south direction. (Not normally achievable in a subdivision design and can usually only be applied to custom homes.)
- **Windows:** reducing total window area; increasing window area on south-facing wall to increase passive solar heating; and reducing glass heat transfer coefficient (“U-Value”) and Solar Heat Gain Coefficient (“SHGC”) value. The SHGC value indicates how well a window blocks the transmission of heat from sunlight. The SHGC is expressed as a number between 0 and 1. The lower the SHGC of a window, the more efficiently it blocks the transmission of heat.
- **HVAC Measures:** Reducing infiltration, reducing duct leakage, heat pump quality installation, increasing heat pump Seasonal Energy Efficiency Ratio (“SEER”) and Coefficient of Performance (“COP”) or Heating Seasonal Performance Factor (“HSPF”) values, and moving ducts into conditioned space. Running HVAC ductwork through air conditioned or semi-conditioned spaces avoids temperature extremes and allows the system to work more efficiently. SEER ratings reflect the ratio of cooling output to kWh used and measure efficiency over an entire cooling season.
- **Envelope:** Increasing thermal resistance values (“R-values”) in walls and ceiling.
- **Lighting:** Reducing lighting power density.
- **Appliances:** Replacing standard fixed appliances with Energy Star® fixed appliances.

For the zero-net models, the estimated hourly output from a solar water heating system and a solar PV system were subtracted from the hourly total energy use of the 30 percent energy efficiency or 50 percent energy efficiency model results, providing the net hourly and annual use of the home. UNSE estimated the solar output using PVWatts simulation software for the solar PV system. UNSE also used an in-house built spreadsheet model for the solar water heating system. The coincident and non-coincident peak demand for each case was determined by the hourly model results.

BUDGET AND ENERGY SAVINGS

UNSE estimated only the additional incremental costs related to the promotion of the proposed multi-tiered approach. Table 3 and Table 4 below show the estimated ZEH Pilot Program budget over a three-year period, from 2010-2012. The estimated budget represents only the incremental increase in the approved budget for the existing Energy Smart Homes Program.

Table 3

Year	2010	2011	2012
Financial Incentives	\$48,000	\$52,500	\$55,500
Total Direct Implementation	\$7,068	\$7,106	\$7,143
Total Marketing Allocation	\$860	\$929	\$997
Total Admin and O&M Cost Allocation	\$696	\$752	\$808
Total EM&V Cost Allocation	\$158	\$170	\$183
Total Program Budget (above ESHP)	\$56,782	\$61,457	\$64,631

Table 4

Year	2010	2011	2012
Total Program Budget	\$56,782	\$61,457	\$64,631
Incentives	\$48,000	\$52,500	\$55,500
Admin Costs	\$8,782	\$8,957	\$9,131
Incentives as % of Budget	84.5%	85.4%	85.9%

The baseline home simulation model used by UNSE has a consumption of 14,880 kWh per year and the HERS index is 104. With the addition of Tier 2 and Tier 3, energy consumption decreases and the HERS index improves as energy efficiency measures, efficient designs, and renewables are incorporated. Table 5 below compares the annual consumption, peak demand, and annual savings with the baseline model, the existing program (Tier 1), and the addition of Tier 2 and Tier 3.

Table 5

	Baseline Home Model	Existing Program Tier 1: HERS Index ≤ 85	Proposed Tier 2: HERS Index ≤ 70	Proposed Tier 3: HERS Index ≤ 45
Modeled Annual Consumption (kWh)	14,880	13,077	11,186	4,451
Peak Demand-Coincident (kW)	6.45	4.4	3.85	2.44
Annual kWh Savings	n/a	1,803	3,694	9,247
Annual Peak kW Savings	n/a	1.32	2.71	3.39

- Tier 1 is the existing Energy Smart Homes. Tier 1 has a qualifying HERS index of ≤ 85 . UNSE did not include a re-analysis of this existing program in the ZEH Pilot Program.
- Tier 2 is the proposed new Energy Smart Homes Plus Program. Tier 2 has a qualifying HERS index of ≤ 70 . The Tier 2 home is modeled to be approximately 30 percent more efficient than the baseline home.
- Tier 3 is the proposed new Energy Smart Homes Near Zero-Net Program. Tier 3 has a qualifying HERS index of ≤ 45 . The Tier 3 home is modeled to be approximately 50 percent zero-net energy and is based on the home that is approximately 50 percent more efficient than the baseline home model.

UNSE anticipates a maximum of 25 participants in 2010, estimating that 70 percent would achieve the Tier 2 standard and 30 percent would achieve the Tier 3 standard. In addition, UNSE is anticipating a 10 percent increase in participation per year. Participation in the existing ESH Program is not included in UNSE's forecast. Table 6 below shows UNSE's total participation goals and energy savings.

Table 6

Year	2010	2011	2012	Total
Tier 2 Participants-HERS Index ≤ 70	18	19	21	58
Tier 3 Participants-HERS Index ≤ 45	7	8	8	23
Tier 2 and Tier 3 Total Participants/year	25	27	29	81
Total Annual Energy Savings (MWh)	139	293	454	-

BENEFIT-COST ANALYSIS

The Commission's 1991 Resource Planning Decision established the Societal Test as the methodology to be used for determining the cost-effectiveness of a DSM program. Under the Societal Test, in order to be cost-effective, the ratio of benefits to costs must be greater than one. That is, the incremental benefits to society of a program must exceed the incremental costs of having the program in place. The societal costs for a DSM program include the cost of the measure and the cost of implementing the program, excluding rebates. The societal benefits of a DSM program include the avoided demand and energy costs as well as the avoided environmental impacts, which are quantified, but do not have to be monetized. The projected environmental and estimated energy savings are discussed in the next section. Staff did not conduct a benefit-cost analysis of UNSE's proposed Tier 3 option because according to information provided by UNSE, the only difference between the incremental costs for a home that qualifies for UNSE's Tier 2 and UNSE's Tier 3 option is the costs for solar measures.

In its application, UNSE included potential costs of complying with carbon dioxide (CO₂) regulation in its benefit-cost calculations. UNSE has estimated low, medium, and high carbon values of \$14, \$25, and \$43/ton respectively. Staff understands that the Commission has yet to make a determination as to the potential value of CO₂ or its inclusion in the calculation of the Societal Test. Staff conducted its benefit-cost analysis including and excluding the CO₂ values provided by UNSE. Without any value of CO₂ included in its analysis, Staff has concluded that UNSE's Tier 2 option for the ZEH Pilot Program is cost-effective, with an incremental builder cost of \$4,110 and a benefit/cost ratio of 1.16. With the inclusion of a low CO₂ value, UNSE's Tier 2 option continues to be cost-effective with a benefit-cost ratio of 1.43.

ENVIRONMENTAL AND ENERGY SAVINGS

Table 7 below represents the estimated lifetime environmental savings from all of the ZEH Pilot Program homes projected to be built over a three-year period. These savings represent the incremental savings above the estimate for the UNSE Tier 1(existing program). Staff notes that the projected environmental savings listed below reflect a thirty-year lifespan for the qualified homes built under this program and that longer life spans would result in higher savings.

Table 7

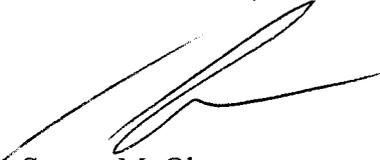
Type of Emission	Savings
MWh	8,539
CO ₂ (lbs)	10,158,956
NO _x (lbs)	1,016
SO _x (lbs)	47
Water (gals)	2,134,665

RECOMMENDATIONS

Staff makes the following recommendations concerning the UNSE ZEH Pilot Program:

- Based upon Staff’s typical review and analysis of the benefits and costs of UNSE’s application, Staff recommends that UNSE’s proposed ZEH Pilot Program, as discussed herein, be approved.
- In addition, Staff recommends that UNSE’s proposed ZEH Pilot Program be approved until further order of the Commission.
- Staff further recommends that UNSE include information regarding its ZEH Pilot Program in its compliance filing with the requirements established for the existing New Home Construction Program in Decision No. 70522. The information reported should be broken down by tier. In addition, the information and data reported for all of the tiers should include the following information:
 1. Progress toward the goal of zero-net energy homes;
 2. Information on whether incremental measure and program costs are conforming to expectations;
 3. Data indicating whether the energy savings estimated for each tier have actually occurred and been verified in practice;

4. Explanations and proposed solutions provided in cases where participation, incremental and program costs, or energy savings are significantly different than originally estimated.
 5. Any other information necessary for the Commission to understand the progress and status of the program; and
- Staff recommends that forty-two months after the date of a Decision in this matter, UNSE file, for Commission approval, an application to continue, modify, or terminate the ZEH Pilot Program. Staff believes that a forty-two month timeframe is reasonable for UNSE to sufficiently implement the Pilot Program, measure the results, and file its application.



Steven M. Olea
Director
Utilities Division

SMO:CLA:lhm\KOT

ORIGINATOR: Candrea Allen

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

BEFORE THE ARIZONA CORPORATION COMMISSION

KRISTIN K. MAYES
Chairman
GARY PIERCE
Commissioner
PAUL NEWMAN
Commissioner
SANDRA D. KENNEDY
Commissioner
BOB STUMP
Commissioner

IN THE MATTER OF THE APPLICATION)
OF UNS ELECTRIC, INC FOR APPROVAL)
OF ITS PROPOSED ZERO-NET ENERGY)
HOMES PILOT PROGRAM)

DOCKET NO. E-04204A-07-0365
DECISION NO. _____
ORDER

Open Meeting
March 31 and April 1, 2010
Phoenix, Arizona

BY THE COMMISSION:

FINDINGS OF FACT

1. UNS Electric, Inc. ("UNSE" or "Company") is certificated to provide electric service as a public service corporation in the State of Arizona.

BACKGROUND

2. On March 30, 2009, UNSE filed an application for approval of its proposed Zero-Net Energy Homes ("ZEH") Pilot Program. On July 17, 2009, UNSE filed a revised version of its application. The proposed ZEH Pilot Program expands on the current New Home Construction Program (marketed as the Energy Smart Homes ("ESH") Program) approved by the Commission on September 30, 2008 (Decision No. 70522). In Decision No. 70522 the Commission required UNSE to "build on its current residential energy efficiency program [and]...outline what Zero-Net technologies and incentives...can be incorporated into the Company's existing DSM programs."

...

...

PROGRAM DESCRIPTION

3. UNSE’s proposed ZEH Pilot Program which is an expansion of the current New Home Construction Program (“Tier 1”) incorporates two new tiers: Tier 2-Energy Efficient Home Construction (“Tier 2”) and Tier 3-Near Zero-Net Energy Homes (“Tier 3”) into the existing New Home Construction Program. According to UNSE, incorporating the two additional tiers will help keep the program administrative costs down. UNSE intends to merge the ZEH Pilot Program with the existing ESH Program. According to the proposed Program, homes will qualify for one of the three tiers in the program based on a Home Energy Rating System (“HERS”)¹ Index score. The HERS awards a numerical value for gauging a home’s performance. Higher performing homes achieve a lower HERS score. Tier 1 requires a HERS score that is less than or equal to 85, Tier 2 will require a HERS score that is less than or equal to 70, and Tier 3 will require a HERS score that is less than or equal to 45. Table 1 illustrates the HERS Index Scores for the Residential New Home Construction Program.

Table 1

Tier 1 (Existing Program)	HERS Index Score of < 85
Tier 2 (Energy Efficiency Only)	HERS Index Score of < 70
Tier 3 (50% Zero-Net Energy)	HERS Index Score of < 45

4. The proposed ZEH Pilot Program design will allow UNSE to use existing delivery infrastructure and marketing to promote all three program tiers. According to UNSE, although the proposed addition of Tier 2 and Tier 3 would improve the energy efficiency of the New Home Construction Program, they do not achieve 100 percent zero-net energy due to cost-effectiveness concerns. UNSE defines the term *zero-net energy* as “the ratio between annual energy generated by the house through the on-site renewable devices to the total annual energy used by the house.” Therefore, a home is considered to be a 75 percent ZEH if 75 percent of the total annual energy a home uses (including energy from both gas and electric for dual fuel homes) comes from on-site generation.

...

...

¹ The HERS Index was developed by the Residential Energy Service Network.

1 5. UNSE's existing residential New Home Construction Program currently offers two
2 options; the Energy Smart Homes Program ("ESH Program") and the Energy Smart Solar Home
3 Program ("ESSH Program"). UNSE anticipates that the ESSH Program will be replaced by the
4 new Tier 3 option.

5 6. According to UNSE, with the addition of the new Tier 2 and Tier 3 options, there
6 will be additional construction standards in order for builders to achieve Tier 2 and Tier 3. As a
7 result, the incremental costs for builders will increase to meet the increased standards for Tier 2
8 and Tier 3 as well as the recommended incentive to the builders. Table 2 illustrates the proposed
9 ZEH Pilot Program Builder Incentives. The additional construction standards for Tier 2 and Tier 3
10 homes include:

- 11 • Greater envelope and Heating, Ventilating, and Air Conditioning ("HVAC") energy
12 efficiency standards;
- 13 • Ducts are located within conditioned space;
- 14 • Both photovoltaic ("PV") and solar water heating on the ZEH;
- 15 • Passive solar design that incorporates passive solar heating in the winter and shading in
16 the summer for the highest efficiency homes;
- 17 • Energy Star® fixed appliances; and
- 18 • Compact Fluorescent Lamps ("CFLs")

Table 2

ZEH Tier Level	HERS Index	Builder Incentive
Tier 1 (Existing Program)	< 85	\$400 per home
Tier 2 (Energy Efficiency Home)	< 70	\$1,500 per home
Tier 3 (50% Zero-Net Energy Homes)	< 45	\$3,000 per home

23 7. According to information provided by UNSE, the additional \$1,500 above Tier 2
24 incentive paid to builders for Tier 3 from this program will be in addition to the incentives paid
25 from UNSE's REST Program. Despite the addition of the \$1,500 increase in incentives between
26 Tier 2 and Tier 3, the total incentives paid for Tier 3 will not exceed the sixty percent (60%) cap
27 approved in its 2010 REST Implementation Plan (Decision No. 71464). UNSE indicated that
28 builders would not pursue the available federal and state tax credits for photovoltaic ("PV") and

1 solar water heaters as they may not be eligible to receive those credits because the builder would
2 not be the actual owner of the home. In addition, UNSE indicated that the actual home owner
3 would be eligible to pursue the available federal and state credits for PV and solar water heaters.
4 Therefore, UNSE chose to increase the incentive levels for those builders who invested in the
5 construction of a home that qualifies for the Tier 3 level (HERS \leq 45) because the builder may not
6 be able to qualify for the available federal and state tax credits for solar technologies.

7 TARGET MARKET

8 8. According to UNSE, the target market for the ZEH Pilot Program is individually-
9 metered new homes within UNSE's service territory. UNSE intends to market the ZEH Pilot
10 Program to all builders within its service territory that are either all electric or have a combination
11 of electric and natural gas energy supplies. The tiered program approach allows UNSE to promote
12 the Tier 2 level of the ZEH Pilot Program for homes that are constructed with a combination of
13 electric and natural gas.

14 9. Because the ZEH Pilot Program does not achieve a true zero-net energy level and is
15 designed for a 50 percent zero-net energy level (Tier 3), the size of the PV system built would
16 need to be large enough to produce at least 50 percent of the total energy (gas and/or electric) used
17 in the home. In addition, TEP states that if a home is designed with gas water heating and gas
18 heating to meet the 50 percent zero-net energy level (Tier 3), then a gas/electric home would
19 qualify as a Tier 3 level home. This home would also qualify for the Tier 3 incentive level
20 payments. UNSE stated that it chose to focus its marketing on an all electric option for Tier 3.
21 However, Staff believes that for Tier 3 that UNSE's marketing efforts should include gas/electric
22 homes.

23 PROGRAM OBJECTIVES

24 10. The objectives of the ZEH Pilot Program are the following:

- 25 • Reduce peak demand and overall energy consumption (electric) in new homes;
- 26 • Implement programs that include more aggressive energy efficiency standards that
27 produce savings of at least 20 percent above baseline (HERS 70) and a near zero-net
28 percentage of at least 50 percent (HERS 45) where approximately 50 percent of annual
energy used by the home will come from on-site renewable generation;

- 1 • Stimulate the installation of solar photovoltaic systems and solar water heaters in new
- 2 homes;
- 3 • Stimulate energy efficiency standards that are higher than Environmental Protection
- 4 Agency/Department of Energy, Energy Star Homes® performance standards;
- 5 • Stimulate construction of new homes that are inspected and tested to assure energy
- 6 performance;
- 7 • Stimulate the installation of high efficiency heating and cooling systems, envelope,
- 8 lighting, and fixed appliances (Energy Star® products);
- 9 • Assist sales agents with promoting and selling of zero-net energy homes;
- 10 • Provide information to help explain the benefits of zero-net home features;
- 11 • Train builder construction staff and sub-contractors in advanced building-science
- 12 concepts to reach zero-net energy goals through improved design and installation
- 13 practices, and through the installation of renewable energy devices;
- 14 • Increase homebuyer awareness and understanding of the benefits they receive from
- 15 living in a zero-net energy home and how they can improve the performance of their
- 16 home; and
- 17 • Educate builders who: 1) are not familiar with energy savings and on-site generation
- 18 potential; 2) may be uncertain about zero-net energy performance; and 3) may be
- 19 concerned about high initial costs for construction measures.

18 PRODUCTS AND SERVICES

- 19 11. According to UNSE, the ZEH Pilot Program would provide the following products
- 20 and services:
- 21 • Promotion of builders and subdivisions that achieve zero-net energy levels of at least
 - 22 50 percent;
 - 23 • Builder and sub-contractor education and training;
 - 24 • Educational and promotional materials for builders and new home buyers; and
 - 25 • Homeowner or builder incentives for achieving increasing energy efficiency and zero-
 - 26 net energy levels as measured by a HERS index score of either ≤ 70 or ≤ 45 .

27 ...

28 ...

1 **ZEH PILOT PROGRAM METHODOLOGY**

2 12. To determine the feasibility for a ZEH program, UNSE developed a baseline
3 simulation model of a new home; then several versions of the baseline model with increasing
4 levels of energy efficiency; and finally several versions of the energy efficiency models with
5 increasing levels of zero-net energy targets.

6 13. There were four stages of the study:

- 7 • Define and simulate a baseline home, reflecting current practice for new single family
8 homes in Kingman, Arizona, as an approximate representative location for UNSE
9 territory. The home was modeled as all-electric.
- 10 • Define and simulate three homes with increasing levels of efficiency. The targets for
11 the models were a 30 percent, 40 percent, and 50 percent reduction in annual energy
12 use.
- 13 • Simulate three homes with increasing levels of zero-net energy by adding both solar
14 water heating and solar PV. The targets for the models were 50 percent, 75 percent,
15 and 100 percent zero-net energy levels. These models were based on either the 30
16 percent or the 50 percent energy efficiency home.
- 17 • Combine estimated demand and energy savings from all of the models, incremental
18 costs over baseline costs, and other utility data to produce a benefit-cost test result for
19 each model. This was done in the format of a Measure Analysis Sheet.

20 14. According to UNSE, the baseline home simulation was an all-electric, 1,850
21 square-foot home in Kingman, Arizona. A combination of three sources was used to determine the
22 level of efficiency in the baseline model: 1) the 2007 Enovity Report², 2) the 2003 International
23 Energy Conservation Code for residential new construction, and 3) a 2009 study completed by
24 Summit Blue Consulting. The models were developed using the eQuest™ simulation software
25 which generates savings estimates. The homes were also modeled with REM/Rate simulation
26 software that determines the HERS index the homes would achieve. UNSE developed a total of
27 nine cases; three of which were energy efficiency models, three zero-net models based on a 30
28 percent energy efficient house, and three zero-net models based on a 50 percent energy efficient
home.

² Residential Home Standards: Energy Analysis and DOE-2 Simulation, Prepared by Enovity, Inc. for Tucson Electric Power Company, February 12, 2007.

1 15. For the energy efficiency-only models, UNSE set a goal of 30 percent, 40 percent,
2 and 50 percent reduction in annual energy usage over the baseline model. In addition, UNSE
3 added the following energy efficiency measures to the baseline model to generate increasing levels
4 of savings:

- 5 • **Orientation:** Orienting a house in a north-south direction. (Not normally achievable in
6 a subdivision design and can usually only be applied to custom homes.)
- 7 • **Windows:** reducing total window area; increasing window area on south-facing wall to
8 increase passive solar heating; and reducing glass heat transfer coefficient (“U-Value”)
9 and Solar Heat Gain Coefficient (“SHGC”) value. The SHGC value indicates how
10 well a window blocks the transmission of heat from sunlight. The SHGC is expressed
11 as a number between 0 and 1. The lower the SHGC of a window, the more efficiently
12 it blocks the transmission of heat.
- 13 • **HVAC Measures:** Reducing infiltration, reducing duct leakage, heat pump quality
14 installation, increasing heat pump Seasonal Energy Efficiency Ratio (“SEER”) and
15 Coefficient of Performance (“COP”) or Heating Seasonal Performance Factor
16 (“HSPF”) values, and moving ducts into conditioned space. Running HVAC ductwork
17 through air conditioned or semi-conditioned spaces avoids temperature extremes and
18 allows the system to work more efficiently. SEER ratings reflect the ratio of cooling
19 output to kWh used and measure efficiency over an entire cooling season.
- 20 • **Envelope:** Increasing thermal resistance values (“R-values”) in walls and ceiling.
- 21 • **Lighting:** Reducing lighting power density.
- 22 • **Appliances:** Replacing standard fixed appliances with Energy Star® fixed appliances.

19 16. For the zero-net models, the estimated hourly output from a solar water heating
20 system and a solar PV system were subtracted from the hourly total energy use of the 30 percent
21 energy efficiency or 50 percent energy efficiency model results, providing the net hourly and
22 annual use of the home. UNSE estimated the solar output using PVWatts simulation software for
23 the solar PV system. UNSE also used an in-house built spreadsheet model for the solar water
24 heating system. The coincident and non-coincident peak demand for each case was determined by
25 the hourly model results.

26 ...

27 ...

28 ...

BUDGET AND ENERGY SAVINGS

17. UNSE estimated only the additional incremental costs related to the promotion of the proposed multi-tiered approach. Table 3 and Table 4 below show the estimated ZEH Pilot Program budget over a three-year period, from 2010-2012. The estimated budget represents only the incremental increase in the approved budget for the existing Energy Smart Homes Program.

Table 3

Year	2010	2011	2012
Financial Incentives	\$48,000	\$52,500	\$55,500
Total Direct Implementation	\$7,068	\$7,106	\$7,143
Total Marketing Allocation	\$860	\$929	\$997
Total Admin and O&M Cost Allocation	\$696	\$752	\$808
Total EM&V Cost Allocation	\$158	\$170	\$183
Total Program Budget (above ESHP)	\$56,782	\$61,457	\$64,631

Table 4

Year	2010	2011	2012
Total Program Budget	\$56,782	\$61,457	\$64,631
Incentives	\$48,000	\$52,500	\$55,500
Admin Costs	\$8,782	\$8,957	\$9,131
Incentives as % of Budget	84.5%	85.4%	85.9%

18. The baseline home simulation model used by UNSE has a consumption of 14,880 kWh per year and the HERS index is 104. With the addition of Tier 2 and Tier 3, energy consumption decreases and the HERS index improves as energy efficiency measures, efficient designs, and renewables are incorporated. Table 5 below compares the annual consumption, peak demand, and annual savings with the baseline model, the existing program (Tier 1), and the addition of Tier 2 and Tier 3.

Table 5

	Baseline Home Model	Existing Program Tier 1: HERS Index ≤ 85	Proposed Tier 2: HERS Index ≤ 70	Proposed Tier 3: HERS Index ≤ 45
Modeled Annual Consumption (kWh)	14,880	13,077	11,186	4,451
Peak Demand-Coincident (kW)	6.45	4.4	3.85	2.44
Annual kWh Savings	n/a	1,803	3,694	9,247
Annual Peak kW Savings	n/a	1.32	2.71	3.39

- Tier 1 is the existing Energy Smart Homes. Tier 1 has a qualifying HERS index of ≤ 85 . UNSE did not include a re-analysis of this existing program in the ZEH Pilot Program.

- 1 • Tier 2 is the proposed new Energy Smart Plus Program. Tier 2 has a qualifying HERS
2 index of ≤ 70 . The Tier 2 home is modeled to be approximately 30 percent more
3 efficient than the baseline home.
- 4 • Tier 3 is the proposed new Energy Smart Near Zero-Net Program. Tier 3 has a
5 qualifying HERS index of ≤ 45 . The Tier 3 home is modeled to be approximately 50
6 percent zero-net energy and is based on the home that is approximately 50 percent
7 more efficient than the baseline home model.

8 19. UNSE anticipates a maximum of 25 participants in 2010, estimating that 70 percent
9 would achieve the Tier 2 standard and 30 percent would achieve the Tier 3 standard. In addition,
10 UNSE is anticipating a 10 percent increase in participation per year. Participation in the existing
11 ESH Program is not included in UNSE's forecast. Table 6 below shows UNSE's total
12 participation goals and energy savings.

Table 6

Year	2010	2011	2012	Total
Tier 2 Participants-HERS Index < 70	18	19	21	58
Tier 3 Participants-HERS Index < 45	7	8	8	23
Tier 2 and Tier 3 Total Participants/year	25	27	29	81
Total Annual Energy Savings (MWh)	139	293	454	-

17 BENEFIT-COST ANALYSIS

18 20. The Commission's 1991 Resource Planning Decision established the Societal Test
19 as the methodology to be used for determining the cost-effectiveness of a DSM program. Under
20 the Societal Test, in order to be cost-effective, the ratio of benefits to costs must be greater than
21 one. That is, the incremental benefits to society of a program must exceed the incremental costs of
22 having the program in place. The societal costs for a DSM program include the cost of the
23 measure and the cost of implementing the program, excluding rebates. The societal benefits of a
24 DSM program include the avoided demand and energy costs as well as the avoided environmental
25 impacts, which are quantified, but do not have to be monetized. The projected environmental and
26 estimated energy savings are discussed in the next section. Staff did not conduct a benefit-cost
27 analysis of UNSE's proposed Tier 3 option because according to information provided by UNSE,
28 ...

1 the only difference between the incremental costs for a home that qualifies for UNSE's Tier 2 and
2 UNSE's Tier 3 option is the costs for solar measures.

3 21. In its application, UNSE included potential costs of complying with carbon dioxide
4 (CO₂) regulation in its benefit-cost calculations. UNSE has estimated low, medium, and high
5 carbon values of \$14, \$25, and \$43/ton respectively. Staff understands that the Commission has
6 yet to make a determination as to the potential value of CO₂ or its inclusion in the calculation of
7 the Societal Test. Staff conducted its benefit-cost analysis including and excluding the CO₂ values
8 provided by UNSE. Without any value of CO₂ included in its analysis, Staff has concluded that
9 UNSE's Tier 2 option for the ZEH Pilot Program is cost-effective, with an incremental builder cost
10 of \$4,110 and a benefit/cost ratio of 1.16. With the inclusion of a low CO₂ value, UNSE's Tier 2
11 option continues to be cost-effective with a benefit-cost ratio of 1.43.

12 ENVIRONMENTAL AND ENERGY SAVINGS

13 22. Table 7 below represents the estimated lifetime environmental savings from all of
14 the ZEH Pilot Program homes projected to be built over a three-year period. These savings
15 represent the incremental savings above the estimate for the UNSE Tier 1 (existing program). Staff
16 notes that the projected environmental savings listed below reflect a thirty-year lifespan for the
17 qualified homes built under this program and that longer life spans would result in higher savings.

18 Table 7

Type of Emission	Savings
MWh	8,539
CO ₂ (lbs)	10,158,956
NO _x (lbs)	1,016
SO _x (lbs)	47
Water (gals)	2,134,665

22 RECOMMENDATIONS

23 23. Staff has made the following recommendations concerning the UNSE ZEH Pilot
24 Program:

- 25 • Based upon Staff's typical review and analysis of the benefits and costs of UNSE's
26 application, Staff has recommended that UNSE's proposed ZEH Pilot Program, as
discussed herein, be approved.
- 27 • In addition, Staff has recommended that UNSE's proposed ZEH Pilot Program be
28 approved until further order of the Commission.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

- The Tier-3 marketing efforts should include gas/electric homes.
- Staff has further recommended that UNSE include information regarding its ZEH Pilot Program in its compliance filing with the requirements established for the existing New Home Construction Program in Decision No. 70522. The information reported should be broken down by tier. In addition, the information and data reported for all of the tiers should include the following information:
 1. Progress toward the goal of zero-net energy homes;
 2. Information on whether incremental measure and program costs are conforming to expectations;
 3. Data indicating whether the energy savings estimated for each tier have actually occurred and been verified in practice;
 4. Explanations and proposed solutions provided in cases where participation, incremental and program costs, or energy savings are significantly different than originally estimated.
 5. Any other information necessary for the Commission to understand the progress and status of the program; and
- Staff has further recommended that forty-two months after the date of a Decision in this matter, UNSE file, for Commission approval, an application to continue, modify, or terminate the ZEH Pilot Program. Staff believes that a forty-two month timeframe is reasonable for UNSE to sufficiently implement the Pilot Program, measure the results, and file its application.

CONCLUSIONS OF LAW

1. UNSE is an Arizona public service corporation within the meaning of Article XV, Section 2, of the Arizona Constitution.
2. The Commission has jurisdiction over UNSE and over the subject matter of the Application.
3. The Commission, having reviewed the application and Staff's Memorandum dated March 16, 2010, concludes that it is in the public interest to approve the UNSE request for approval of its Zero-Net Energy Homes Pilot Program, as discussed herein.

...
...
...

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

ORDER

IT IS THEREFORE ORDERED that UNS Electric, Inc.'s request for approval of its Zero-Net Energy Homes Pilot Program be and hereby is approved, as discussed herein.

IT IS FURTHER ORDERED that this Order shall become effective immediately.

BY THE ORDER OF THE ARIZONA CORPORATION COMMISSION

CHAIRMAN

COMMISSIONER

COMMISSIONER

COMMISSIONER

COMMISSIONER

IN WITNESS WHEREOF, I, ERNEST G. JOHNSON, Executive Director of the Arizona Corporation Commission, have hereunto, set my hand and caused the official seal of this Commission to be affixed at the Capitol, in the City of Phoenix, this _____ day of _____, 2010.

ERNEST G. JOHNSON
EXECUTIVE DIRECTOR

DISSENT: _____

DISSENT: _____

SMO:CLA:lhm\KOT

1 SERVICE LIST FOR: UNS Electric, Inc.
2 DOCKET NOS. E-04204A-07-0365

3 Mr. Michael Patten
4 Roshka DeWulf & Patten, PLC
5 One Arizona Center
6 400 East van Buren Street, Suite 800
7 Phoenix, Arizona 85004

8 Mr. Philip J. Dion
9 UniSource Energy Services
10 One South Church Avenue, Suite 200
11 Tucson, Arizona 85701

12 Mr. Steven M. Olea
13 Director, Utilities Division
14 Arizona Corporation Commission
15 1200 West Washington Street
16 Phoenix, Arizona 85007

17 Ms. Janice M. Alward
18 Chief Counsel, Legal Division
19 Arizona Corporation Commission
20 1200 West Washington Street
21 Phoenix, Arizona 85007

22
23
24
25
26
27
28