

# Expanding alternative energy in North Carolina: A tool for educating the public

## **Abstract**

Interest in improving energy efficiency and expanding renewable energy are gaining momentum around the country and North Carolina is no exception. The state legislature is currently considering several bills to encourage development of these alternatives to traditional coal and nuclear power plants and the North Carolina Utilities Commission has hosted several public hearings on the topic during the past year. Additionally, more than a dozen environmental, health and religious organizations have joined together to champion clean electricity in North Carolina. During a recent meeting of this coalition the value of increasing public awareness of this issue was discussed, though no concrete arrangement were made to move forward on this idea in a large part because of concerns over insufficient resources. In an effort to assist this coalition the following report includes an outline and all relevant material for a public workshop about electricity generation and distribution in North Carolina, the advantages of renewable energy and energy efficiency, barriers to their implementation in North Carolina and alternatives to the current rate structure which could help overcome these barriers. In addition to the workshop materials the report begins by addressing these topics in greater detail.

## Table of Contents

<b>PART I: WRITTEN REPORT .....</b>	<b>1</b>
Introduction	1
Comparing electricity fuels	2
Barriers to expanding alternative in North Carolina	4
Overview of alternative rate structures	6
The need for public education on this issue	8
Works Cited	10
<b>PART II. WORKSHOP OUTLINE AND MATERIALS .....</b>	<b>12</b>
Activity 1: Pre-assessment	13
Activity 2: Introductions and agenda	15
Activity 3: Overview of electricity distribution and generation	17
Activity 4: What goes on behind the electrical outlet? ( <i>optional</i> )	19
Activity 5: Overview of electricity fuels	24
Activity 6: Wrap up of electricity fuels	28
Activity 7: Advantages of and barriers to alternative fuels in North Carolina	29
Activity 8: Alternatives to NC's electricity rates structure	31
Activity 9: What would you do?	45
Activity 10: What can you do?	46
Activity 11: Post-Assessment & Wrap up	48

## **Part I: Written Report**

### **Introduction**

Demand for electricity in North Carolina is on the rise because of a projected 51% increase in the population between 2000 and 2030 and expectations that energy consumption per person will continue to rise.(U.S. Census Bureau, 2004; EIA 2007) Local utility companies recognize that actions need to be taken sooner rather than later if they are to continue satisfying their customers so, for the first time in more than 20 years, these utilities are requesting permission from the state to build new coal and nuclear plants. But, many people question whether building these plants are the best alternative for North Carolinians. During the 2007 State of the State address Governor Easley stated that “[w]e cannot just keep building more and more power plants” and boasted that the state has saved millions of dollars by making government building more energy efficient.(Office of the Governor, 2007) And, the North Carolina General assembly is currently considering legislation that prompted several state lawmakers to sign a document in February asking the Utilities Commission to postpone a decision on Duke Energy’s request for permission to construct two new 800 MW power until the General Assembly could adequately consider alternatives to such a project. (Murawski, 2007)

Fortunately there are ample alternatives to the construction of new power plants in North Carolina largely due to technological innovations that improve the energy efficiency of common appliances and decreases in the costs associated with renewable energy. (LaCapra Associates LLC et al, 2006) Improving energy efficiency simply means eliminating wasteful practices so that less electricity is needed to get the services we expect from the light bulbs, computers and numerous other electrical devices we use every day. It is not a new idea; in fact research shows that energy efficiency has been improving for generations and it is clear that efforts to improve energy efficiency through technological innovation and behavior change can dramatically decrease the amount of electricity used by each person. (Kushler et al, 2006) Similarly, renewable sources of energy, such as wind, solar, and landfill and animal-waste methane, have been used for millennium and are readily available in large quantities throughout North Carolina and technology to utilize these resources for electricity generation already exists. (LaCapra Associates LLC et al, 2006)

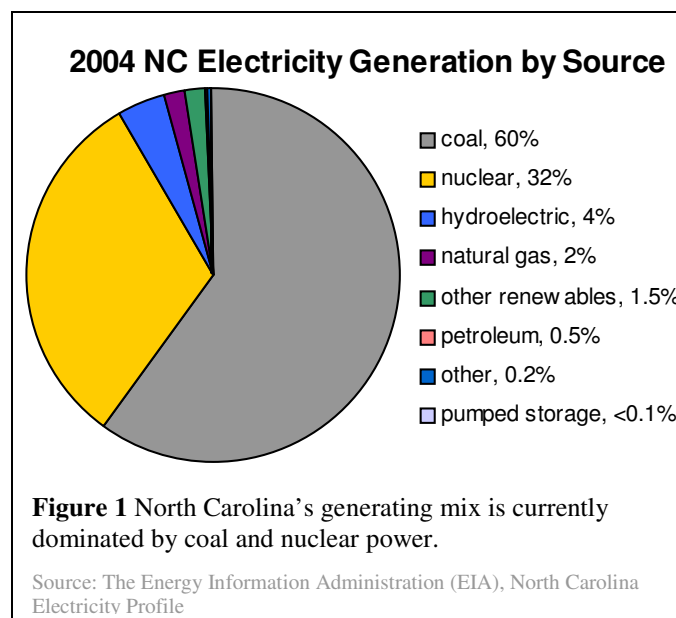
Over the past year more than a dozen environmental, health and religious organizations joined together to champion clean electricity, specifically energy efficiency and renewable energy, in

North Carolina. During a recent meeting of this coalition the value of increasing public awareness of this issue was discussed, though no concrete arrangement were made to move forward on this idea in a large part because of concerns over insufficient resources. In an effort to assist this coalition with public education the following report includes an outline and all relevant material for a 3 hour public workshop about electricity generation and distribution in North Carolina, the advantages of alternative energy, and alternatives to the current rate structure which could help overcome barriers to their implementation.

In addition to the workshop materials, the report examines these topics in greater detail. Following a brief overview of the current generation mix in North Carolina the report examines the advantages of alternative energy, specifically renewable energy and energy efficiency, and highlights barriers to their implantation in the state. A description of alternative rate structures in place throughout the country offer ideas as to how investment and energy efficiency and renewable energy can be encouraged. And, finally, the importance of informing the public about this issue is discussed.

### **Comparing electricity fuels**

A vast majority, 92%, of the electricity in North Carolina is generated in large coal and nuclear power plants (figure 1). (EIA, 2005) Similarly, nearly 95% of North Carolina’s electricity is produced using non-renewable resources that must be purchased out of state, specifically coal, uranium, natural gas, and oil; these purchases divert approximately \$1.6 billion from the states economy each year. (Environmental Defense et al, 2007)



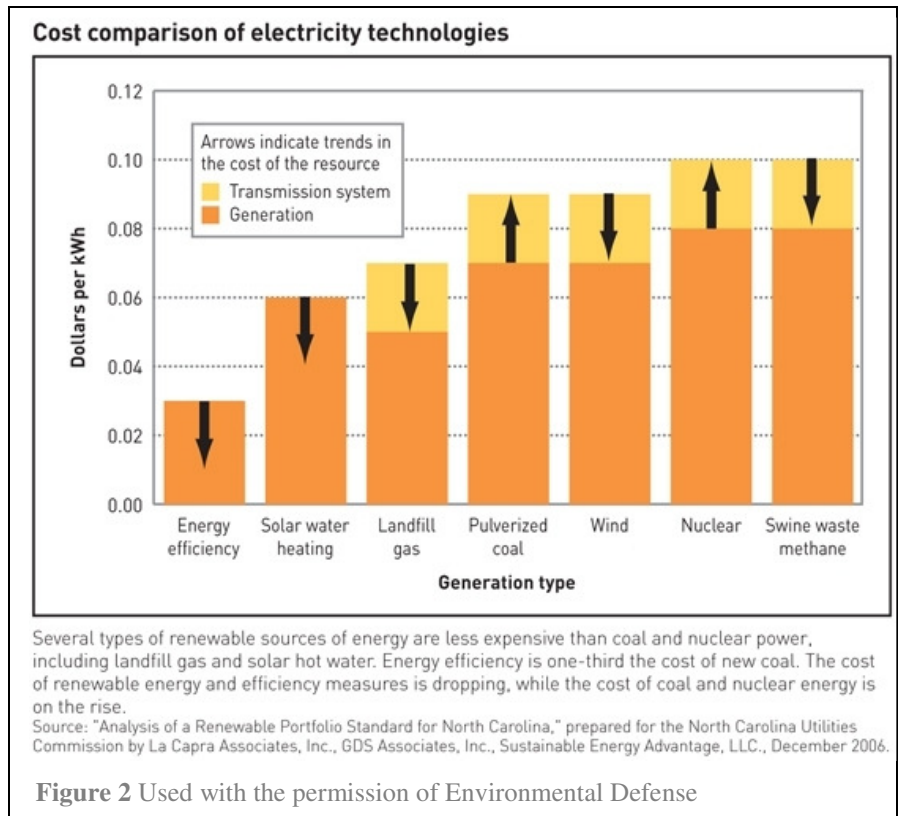
In addition to the direct financial costs, these power plants negatively impact human and environmental health throughout the state. Power plant emissions are linked to a host of cardiac, respiratory and neurological problems, including heart attacks and asthma. More than 1,100 premature deaths in North Carolina are linked to the fine particulate matter emitted from power

plants and additional deaths are likely caused by mercury emissions, ozone smog and other pollutants. (Schneider, 2004) Some of the same pollutants that threaten human health, NO<sub>x</sub> and SO<sub>2</sub>, also form acid rain which damages forest and aquatic habitats and harms the animals that live in them. (Schneider, 2004; US EPA, 2007) And, power plant emissions, particularly carbon dioxide, are known to contribute to global warming which is increasingly identified as a serious threat to all life on earth. (Environmental Defense)

Fortunately the state boasts a variety of alternatives to coal and nuclear power plants, including renewable energy and energy efficiency. Renewable energy is energy that is derived from resources that are regenerative or cannot readily be depleted. (US DOE, 2005) Wind, solar, animal waste and small scale hydro are just a few of the renewable resources readily available in NC. Renewable resources excluding large-scale hydro currently provide about 600 MW, or 1.5% of the electricity generated in the NC. A recent report commissioned by the North Carolina Utilities Commission concluded that more than 13% of our electricity consumption, or a total of about 5400 MW, could reasonably be provided from renewable energy given current technologies. (LaCapra Associates LLC et al, 2006) A second alternative to coal and nuclear power plants that is readily available in North Carolina is energy efficiency, which simply refers to technological innovations that reduce the amount of energy required to light a room, power a TV or provide any given energy service. The National Action Plan for Energy Efficiency released by a consortium of 50 leading organizations and the U.S. Department of Energy and U.S. Environmental Protection Agency states that “improving energy efficiency of our homes, businesses, schools, governments and industries...is one of the most constructive, cost-effective ways to address” concerns over energy security, high energy prices and other concerns that face our nation. (US DOE, US EPA et al, 2006)

The technology needed to create electricity in coal and nuclear power plants is well established, making it difficult for renewable energy and energy efficiency to enter the market. But, a variety of factors suggest that this is beginning to change. Analysis conducted by La Capra Associates for the North Carolina Utilities Commission suggests that the cost per kilowatt hour of several alternative technologies is decreasing in North Carolina and that three alternative technologies are already less expensive than coal and four are less expensive than nuclear power (Figure 2). (2006) This report lists several additional advantages of alternative energy. For example, efforts to expand alternative energy have been shown to provide local (in-state) economic development beyond that associated with traditional power plants. In fact the Blue Green Alliance

believes that efforts to expand alternative energy in North Carolina could lead to 44,000 additional new jobs between now and 2025. (Redefining Progress, 2004) The fact that alternative energy will help to diversify the states energy portfolio and hedge against price volatility and/or increasing fuel costs are two other oft-cited advantages of alternative energy which are particularly relevant to North Carolina given the dominance of coal and nuclear power in the states current generation mix. Another advantage is the fact that alternatives will reduce the environmental impact of electricity generation and, though not listed in the LaCapra report, also have less of a negative impact on human health that traditional electricity generation.(2006)



### Barriers to expanding alternative in North Carolina

Energy analysts have long identified shortcomings in the way that electricity rates are determined in regulated markets such as North Carolina. (Kushler et al, 2006) A December 2001 article in The Electricity Journal noted that the current approach “must be changed to reward utilities' for making more economically and environmentally efficient resource decisions. Adoption of these ratemaking reforms is critical to the effective integration of promising alternatives”. (Carter, 2001) The following explanation of the ways in which the North Carolina rate structure is set illustrates how the format almost encourages utilities to construct traditional large scale power plants while efforts to expand energy efficiency and renewable energy are inadvertently discouraged.

In a regulated market, like North Carolina, where consumers are unable to choose their utility providers the amount that utilities charge for the electricity they sell to consumers is set by an outside arbiter, the North Carolina Utilities Commission. In determining the price the Utilities Commission begins by calculating how much it costs the utility to bring electricity from the source to the consumer – including costs associated with the construction and maintenance of power plants and transmission lines, the purchase of fuel and the money spent on salaries, insurance and other business expenditures. Next the Utilities Commission estimates how much money would have been earned if that amount was instead invested in a broad range of stocks, bonds and other paper in the financial markets. Estimates of future electricity demand are then used to determine a price per kilowatt hour that will allow the utility to recover the money they spend plus a profit similar to that expected from the stock market. The Utilities Commission sets unique prices for each utility based on their costs and also offers unique prices for the different customer categories of each utility; for residential customers in North Carolina the average rate is 7.19 cents per kilowatt-hour. (EIA, 2007)

Setting electricity rates in this way creates two perverse incentives. First of all, the utilities make a profit on each kilowatt-hour of electricity they sell and so are encouraged to sell more electricity in order to increase revenues and raise the value of publicly traded shares. Energy efficiency initiatives are designed to reduce electricity consumption and can decrease utility revenues and drive away investors, thus discouraging investment in energy efficiency. Second, the utilities are allowed a profit on any new power plants they build since all the costs associated with a power plant are taken into consideration when the rate is determined. Consequently, the utilities have an incentive to build more plants and are discouraged from investing in renewable energy projects whose rate of return is less certain. It is also worth noting that this system does not take in to consideration the variability in costs to the utility of providing electricity to customers. Customers are charged the same price for electricity throughout the year but the cost to utilities of providing electricity varies throughout the day.

The state has already taken steps to address these concerns. In fact the law explicitly requires that that “the entire spectrum of demand-side options, including but not limited to conservation, load management and efficiency programs” should be used to “encourage and promote harmony between public utilities, their users and the environment”. (NC General Statues) Each year the utility companies must submit an Integrated Resource Plan (IRP) which details their plan for meeting future electricity demands and illustrates that they have evaluated all available options including

energy efficiency and renewable energy. (Nadel et al, 1995) The Utilities Commission, through docket E100 Sub 103, is currently evaluating claims that the IRP process does not appropriately assess the costs and benefits of alternative sources of energy. And, since July 2003 North Carolina has offered the NC GreenPower Program which allows customers the opportunity support renewable energy projects through a tax-deductible, voluntary donation. (NC GreenPower, 2003) Customers can make a one-time contribution to NC GreenPower or register through their electricity provider to buy one or more \$4 blocks each month. The program is administered by Advanced Energy, an independent nonprofit in Raleigh, NC who works with nearly 60 renewable energy producers across the state. (NC GreenPower)

### **Overview of alternative rate structures**

States throughout the country have undertaken additional measures to expand alternative energy within their borders. One option already in place in more than twenty states, and currently being considered by the North Carolina General Assembly, is a renewable portfolio standard (RPS).(LaCapra Associates LLC et al, 2006) Though the specifics vary from state to state each one involves a target for renewable energy and, in some cases, energy efficiency that energy providers within the state must meet or exceed during a specified time period. (Nadel, 2006) This mechanism provides an incentive for the utilities to invest in alternative energy, namely a desire to avoid a penalty for non-compliance. Among the possible advantages of renewable and efficiency portfolio standards is the fact that the utilities have the freedom to choose how to meet the target which allows for innovation and can contribute to lower enforcement costs. Additionally, such a program can be implemented through the passage of a single state law without any need to change existing legislation. On the other hand, the utilities generally have little, if any, incentive to exceed the minimum standard set by the state though inclusion of a trading scheme could act to encourage utilities to exceed the target. (Nadel, 2006) Overall experience with renewable and efficiency portfolio standard in other states has been positive, in fact efforts are underway in Texas to increase the existing standard because utilities in the state are currently exceeding the targets. (Nadel, 2006)

A second technique employed in some states to address the disincentives of the traditional rate-of return-structures is to separate profits from sales by fixing utility revenues rather than customer rates. (Alliance to Save Energy, 2006) Commonly referred to as decoupling, this practice

eliminates the possibility that utilities can increase profits by selling more electricity and instead focuses attention on finding the least-cost way to satisfy the customers need for energy services such as lighting and refrigeration. (Carter, 2001) Decoupling profits from sales can be accomplished in a variety of ways, each addressing the unique characteristics of an individual utility and region, though all act to align utility interests with the public interest in improved energy efficiency. (Carter, 2001) This approach was first implemented in 1982 by the California Public Utilities Commission and at least 5 other states have since implemented decoupling, if only on a limited basis, and several other states are currently considering this approach. (Kushler et al, 2006; Carter, 2001) A wide variety of industry stakeholders support decoupling, including consumer advocates, environmental groups and trade association such as the American Gas Association. (Kushler et al, 2006) In addition to promoting investment in energy efficiency these regulations simplify the regulatory process by eliminating contention over the sales forecasts that currently dominate most discussion in rate cases. (Carter, 2001) Noting a surge in interest in decoupling The American Council for an Energy Efficient Economy (ACEEE) released a report that concluded there was insufficient experience with decoupling nationwide to begin to assess results. (Kushler et al, 2006)

This same ACEEE report examines a third policy option, performance incentives, which have been implemented in at least seven states. This policy, as with the others, can take different forms but all provide a direct financial incentive for utility companies to meet a clearly defined performance goal in energy efficiency; essentially they allow the utilities to earn a profit from their energy efficiency activities. Among the ways this can be accomplished is to provide utilities a rate of return on energy efficiency investments equal to that earned on other capital investments or to provide utilities with a financial reward for meeting certain targets. It is important to design the policy so that the desired outcome, usually a given amount of demand reduction, can reasonably be achieved through actions of the utility companies and not unduly influenced by some extraneous factor such as the weather. Performance incentives can be designed to meet specific objectives, such as targeting low-income home owners, but the objectives and rewards should be simple, transparent and well defined in order to avoid possible conflicts and confusion. (Kushler et al, 2006)

And, finally, some states are experimenting with time-of-use pricing schemes. These price structures provide customers with a price signal similar to that experienced by the utilities; customers pay a lower price of electricity during periods of low demand, like the middle of the night, compared to times of high demand, like summer afternoons, when the cost to the utility is of

supplying power is high. Experience suggests that these rate structures spread electricity usage throughout the day and slow demand growth during peak times. (Summit Blue Consulting, 2006) These measures can help improve energy efficiency and increase conservation among end users but are thought to be most useful in reducing the need for the construction of new power plants by spreading out electricity usage so that current resources can better meet demand.

### **The need for public education on this issue**

Electricity rate reform is a politically difficult issue especially here in North Carolina where our electricity rates are among the lowest in the country. In order for such changes to be implemented the state legislatures will need to change existing laws and, thus, support of their constituents will be an important ally as powerful business interests, specifically the electric utilities, will likely oppose such efforts.

Interest among environmental organizations in tackling electricity rate reform is fueled, in part, by the overwhelming attendance at recent public hearings of the NC Utilities Commission regarding dockets E-100 Sub 103 and E-7 Sub 790. Hundreds of individuals attended these hearings with many arguing that the state would be better served by an expansion of energy efficiency initiatives and development of renewable energy technologies (together referred to as clean electricity).

Few North Carolinians, including some that testified at the hearings, are aware that various state policies currently act to discourage energy efficiency initiatives and the use of renewable energy in the state. For example, the technique used to determine what utilities can charge for the electricity they sell and the rules that determine what utilities will pay for electricity added to their system both have aspects which discourage clean electricity. Awareness of these problems with the current system needs to be expanded if efforts to change the system are to be successful.

Given the importance of public education on this issue and the lack of existing program to meet this need, a sample outline and all the relevant materials for such a program follows. The program is designed as a 4-hour educational workshop which, as with all environmental education, is “aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems and motivated to work toward their solution.” (Stapp et al, 1969) The workshop is interactive and involves more discussion and small group activities than lectures. It begins with an activity that reviews how electricity gets to peoples homes and continues with a discussion of how electricity is generated and a comparison of

different electricity fuels. An explanation of the current electricity rate structure in North Carolina follows, along with an overview of different ways states have structured their electricity rates in an effort to expand the role of alternative energy. A mock election allows the participants to select the rate structure they think North Carolina should use in the future and information for how they can get involved with efforts to change the rates structures is then shared. An outline and all relevant materials can be found on the following pages and a CD that includes this report and the workshop materials is available for those wishing to implement the program.

## Works cited

Alliance to Save Energy. (2006, December). Energy Efficiency Policies for the Utility Sector. Retrieved April 14, 2007, from [http://www.ase.org/section/\\_audience/policymakers/policyfacts](http://www.ase.org/section/_audience/policymakers/policyfacts).

Carter, Sheryl. (2001, December). Breaking the consumption habit: ratemaking for efficient resource decisions. *The Electricity Journal*, 14(10) pp 66-74. Retrieved April 13, 2007, from <http://www.nrdc.org/air/energy/abreaking.asp>.

Energy Information Association. (2007, March). State Electricity Profiles: 2005 Edition. (DOE/EIA- 0348) Retrieved April 14, 2007, from [http://www.eia.doe.gov/cneaf/electricity/st\\_profiles/e\\_profiles\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/st_profiles/e_profiles_sum.html).

Energy Information Administration (EIA). (2005, March). North Carolina Electricity Profile: 2005 Edition. Retrieved April 22, 2007, from [http://www.eia.doe.gov/cneaf/electricity/st\\_profiles/north\\_carolina.html](http://www.eia.doe.gov/cneaf/electricity/st_profiles/north_carolina.html).

Energy Information Administration. (2007, February). Annual Energy Outlook 2007 with Projections to 2030. pp 8,9 (DOE/EIA- 0383 (2007)) Retrieved April 13, 2007, from [http://www.eia.doe.gov/oiaf/aeo/pdf/0383\(2007\).pdf](http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2007).pdf).

Environmental Defense. The Basics of Global Warming. Retrieved on April 22, 2007, from <http://www.fightglobalwarming.com/page.cfm?tagID=273>.

Environmental Defense, North Carolina Sustainable Energy Association, et al. (2007). The Power to Choose: North Carolina's Clean-Energy Future. Retrieved April 22, 2007, from [http://www.environmentaldefense.org/documents/5971\\_NCCleanEnergyFuture.pdf](http://www.environmentaldefense.org/documents/5971_NCCleanEnergyFuture.pdf).

Kushler, Martin, York, Dan, & Witte, Patti. (2006, October). Aligning Utility Interests with Energy Efficiency Objectives: A Review of Recent Efforts at Decoupling and Performance Initiatives. (ACEEE report # U061). Retrieved on April 13, 2007, from <http://aceee.org/pubs/u061.pdf>.

La Capra Associates, Inc., GDS Associates, Inc., Sustainable Energy Advantage, LLC. (2006, December). Analysis of a renewable portfolio standard for the state of North Carolina. Retrieved April 13, 2007, from <http://www.ncuc.commerce.state.nc.us/rps/NC%20RPS%20Report%2012-06.pdf>.

Murawski, John. (2007, February 24). Power plants face a setback. *The News & Observer*. Retrieved on April 13, 2007, from <http://www.newsobserver.com/114/story/545424.html>.

Nadel, Steven. (2006, February). Energy Efficiency Resource Standards: Experience and Recommendations. (ACEEE report E063). Retrieved April 14, 2007, from <http://aceee.org/pubs/e063.pdf>.

Nadel, Steven, Zhirong, Yang & Yingyi, Shi. Integrated Resources Planning and Demand-Side Management Manual for China and Other Developing Countries. (1995) (ACEEE report # I953) Retrieved April 14, 2007, from <http://www.aceee.org/pubs/i953.htm>.

NC GreenPower. (2003, July 28). NC GreenPower available now: first step toward October Kickoff. Retrieved April 14, 2007, from [http://www.ncgreenpower.org/media/releases/press\\_release1.html](http://www.ncgreenpower.org/media/releases/press_release1.html).

NC GreenPower. (unknown) Retrieved April 14, 2007, from <http://www.ncgreenpower.org/about/producers.html>.

North Carolina General Statutes 62-2 (3), 62-2(3a) and 62-2(5). Retrieved April 14, 2007, from <http://www.ncga.state.nc.us/gascripts/Statutes/StatutesTOC.pl?Chapter=0062>.

Office of the Governor. (2007, February 19). Gov. Easley calls on North Carolina to blaze new trail to prosperity. Retrieved on April 13, 2007, from [http://www.governor.state.nc.us/News\\_FullStory.asp](http://www.governor.state.nc.us/News_FullStory.asp).

Redefining Progress. (2004, October). Smarter, Cleaner Stronger in North Carolina: Secure Jobs, a Clean Environment and Less Foreign Oil. Retrieved April 23, 2007, from [http://www.rprogress.org/bluegreen/SmartCleanStrong\\_NC.pdf](http://www.rprogress.org/bluegreen/SmartCleanStrong_NC.pdf).

Stapp, William et al. (1969). The Concept of Environmental Education. *The Journal of Environmental Education*, 1:1 p30-31.

Schneider, Conrad G. (2004, June). Dirty Air, Dirty Power: Mortality and Health Damage Due to Air Pollution from Power Plants. p 14. Retrieved April 22, 2007, from [http://www.catf.us/publications/reports/Dirty\\_Air\\_Dirty\\_Power.pdf](http://www.catf.us/publications/reports/Dirty_Air_Dirty_Power.pdf).

Summit Blue Consulting. (2006, August 1). Evaluation of the 2005 Energy-Smart Pricing Plan: Final Report. Retrieved on April 23, 2007, from <http://www.energycooperative.org/pdf/ESPP-Evaluation-Final-Report-2005.pdf>.

US Census Bureau. (2004). State Interim Population Projections by Age and Sex: 2004-2030. Table 1. Retrieved April 13, 2007, from <http://www.census.gov/population/www/projections/projectionsagesex.html>.

U.S. Department of Energy (US DOE). (2005, September 12). Glossary of Energy Related Terms. Retrieved on April 23, 2007, from [http://www.eere.energy.gov/consumer/information\\_resources/index.cfm](http://www.eere.energy.gov/consumer/information_resources/index.cfm).

U.S. Department of Energy (US DOE), U.S. Environmental Protection Agency (US EPA), National Action Plan for Energy Efficiency Leadership Group. (2006, July) National Action Plan for Energy Efficiency: Executive Summary. Retrieved on April 23, 2007, from [http://www.epa.gov/cleanenergy/pdf/napee/napee\\_exsum.pdf](http://www.epa.gov/cleanenergy/pdf/napee/napee_exsum.pdf).

U.S. Environmental Protection Agency (US EPA). (2007, February 3). What is Acid Rain? Retrieved on April 22, 2007, from <http://www.epa.gov/acidrain/what/index.html>.

## **Part II. Workshop Outline and Materials**

## **Activity 1: Pre-assessment**

***Overview:** To ensure that the workshop is geared at a level appropriate to the audience it is helpful for the presenter to have an understanding of what the participants already know on the topic. Additionally, this activity can be paired with the post-assessment activity to help the make clear to participants what they learned during the workshop.*

### **Doing the activity:**

1. Before the participants arrive place a ½ page pre-assessment worksheet and a pen or pencil on the table in front of each chair.
2. As participants arrive ask them to complete the short worksheet and bring it to the presenter when finished. This can be communicated verbally and/or by posting a written request it in the front of the room.
3. As the worksheets are turned in, the presenter can quickly look them over to assess the previous knowledge of the participants. To maintain anonymity but still allow people to quickly collect their sheet at the end of the session encourage the participants to write a number or symbol of some sort at the top of the page so they will be able to quickly identify their sheet.
4. Save the worksheets so they can be redistributed for the post-assessment activity at the end of the workshop.

### **Activity 1, Pre- assessment**

#### **Objective:**

To provide the presenter with an understanding of the participant's previous knowledge about electricity

#### **Materials**

- short questionnaire  
(a sample is available on the following page and accompanying computer disk)

#### **Time consideration:**

0-5 minutes

## Pre-workshop questionnaire

As you wait for the workshop to begin please take a moment to answer the following questions. When finished, bring the paper to the presenter's table. It is not necessary to write your name, though it is helpful to make a mark of some sort which will help you identify your sheet later.

**1. Please circle any words which you are not comfortable using in a sentence:**

fossil fuel

renewable energy

energy efficiency

transmission lines

power grid

**2. What happens when you plug something into an outlet that allows it to start working?**

**3. Write down as many sources of electricity as you can think of in less than 30 seconds.**

**4. Who determines how much you pay for electricity? What factors do they consider when setting the price you will pay for electricity?**

---

## Pre-workshop questionnaire

As you wait for the workshop to begin please take a moment to answer the following questions. When finished, bring the paper to the presenter's table. It is not necessary to write your name, though it is helpful to make a mark of some sort which will help you identify your sheet later.

**1. Please circle any words which you are not comfortable using in a sentence:**

fossil fuel

renewable energy

energy efficiency

transmission lines

power grid

**2. What happens when you plug something into an outlet that allows it to start working?**

**3. Write down as many sources of electricity as you can think of in less than 30 seconds.**

**4. Who determines how much you pay for electricity? What factors do they consider when setting the price you will pay for electricity?**

## **Activity 2: Introductions and agenda**

*Overview: Since this workshop involves a lot of small group work it is helpful for participants and the presenter to be familiar with everyone's name. And, having people name ways that they use electricity will help remind everyone of the important role electricity plays in their daily lives and will provide examples that can be referred to throughout the workshop.*

### **Doing the activity:**

1. The presenter should begin the workshop by introducing him or herself and providing a little information about their background and how they came to be leading this workshop. Perhaps, also mention one or two ways you use electricity.
2. Explain that we will go around the room so that each person can introduce themselves. Ask that everyone say their name, one or two ways in which they use electricity (encourage creativity) and, if they'd like, a little bit about themselves and why they are here today.
3. After each participant has had a chance to speak, explain the agenda for the day. Ask the group if they have any questions or if there is something missing that they would like to have included in the agenda. It is up to the discretion of the presenter whether or not to alter the agenda.

### **Activity 2, Introductions and Agenda**

**Objective:** To bring the group together, learn names, examine the importance of electricity on one's daily life and let everyone know what to expect from the workshop.

#### **Materials:**

- Agenda that can be prominently displayed in the room (samples are available on the following page and accompanying computer disk)

#### **Time consideration:**

10-15 minutes

### sample agenda 1 (detailed)

- Introductions and agenda (15 minutes)
- How electricity gets to our homes (15 – 35 minutes, depending on optional activity 3)
- Overview of electricity fuels (40 minutes)
- Break (15 minutes)
- More on electricity fuels (10 minutes)
- Advantages of a alternative fuels (10 minutes)
- Barriers to non-traditional fuels in NC (15 minutes)
- Alternatives to NC electricity rate structure (30 minutes)
- Break (10 minutes)
- What would you do? (10 minutes)
- What can you do? (20 minutes)
- Wrap up and conclusion (15 minutes)

### sample agenda 2 (vague)

- Introductions and agenda (15 minutes)
- Overview of electricity distribution and generation (65-75 minutes)
- Break (15 minutes)
- Comparison of electricity fuels (20 minutes)
- Setting electricity rates (45 minutes)
- Break (10 minutes)
- Looking ahead (30 minutes)
- Wrap up and conclusion (15 minutes)

## **Activity 3: Overview of electricity distribution and generation**

***Overview:** Like the air we breathe, most Americans take electricity for granted; once an appliance is plugged in to the outlet few people wonder if it will work when they need it and most adults don't even notice the power lines beside them as they drive down the road. It is important that everyone have a basic knowledge of electricity generation and distribution before the group can have a substantive discussion of whether or not changes to the current system are advisable. This activity allows the presenter to ensure that everyone has at least a minimum understanding of the important points.*

**Background:** Electricity is the movement of electrons from one atom to another and a generator is a device that converts mechanical energy into electrical energy. In most electrical power plants the flow of electrons is initiated by the movement of a magnet near a coil of wire. This movement is generally because a turbine spins a shaft which powers the generator.

In many power plants a fuel is burned in order to heat water and create steam. The steam flows through a turbine which is connected to a generator, consisting of wires and a magnet, which initiates the flow of electrons through an electrical circuit. In a hydroelectric plant flowing water turns the turbine and wind can also be used to turn the turbine. (Activity 5 explores the various fuels commonly used to power a turbine.)

The flow of electrons initiated by the generator has energy and, therefore, can do work such as lighting a light bulb and running a computer or other electronic appliance. In order for an appliance to harness the energy of the electrons there must be an electrical

### **Overview of electricity distribution and generation**

**Objective:** To ensure that all participants have a basic knowledge of electricity generation and distribution.

#### **Materials:**

- PowerPoint, or similar visual tool to enhance a verbal presentation (a sample presentation is available on accompanying computer disk)

#### **Time consideration:**

10-15 minutes

#### **Suggested references:**

[www.eia.doe.gov/kids/energyfacts/sources/electricity.html#Generation](http://www.eia.doe.gov/kids/energyfacts/sources/electricity.html#Generation)

<http://science.howstuffworks.com/electricity.htm>

circuit which includes a source of electricity (the power plant), a load (the appliance) and two wires that carry electricity between the source and the load.

Electricity often travels long distances from the power plant where it is generated to the residential, commercial or industrial site where it is used. An extensive network of power lines and electricity substations makes up the countries electric grid. Unfortunately no aspect of the grid can store electricity so it must be generated right when it is needed and used in a timely manner, which can be a challenge for the utility companies given that demand for electricity changes by the second.

**Doing the activity:**

1. This activity is dominated by a presentation from the workshop presenter; a sample presentation is included with this report. It is up to the discretion of the presenter how involved the participants are in the presentation, though a straight lecture is discouraged. If time permits activity 4, on the following page, can be interjected into the presentation.

## **Activity 4: What goes on behind the electrical outlet? (optional)**

*Overview: If time permits this activity can be included as part of Activity 3, as it is a quick and easy way to get people comfortable working in small groups. This exercise helps remind everyone that our appliances rely on electricity generated in power plants many miles away and that there is a vast infrastructure in place to bring electricity to the places where we live, work and play. If time is limited the information can simply be included in the presentation of the previous activity.*

**Background:** Electricity often travels long distances from the power plant where it is generated to the residential, commercial or industrial site where it is used. It is typically generated and used at a low voltage but can be moved long distances along a power line most efficiently at a high voltage.

A transformer is an electrical device that can increase or decrease the voltage on a power line. Transformers are generally situated in a substation beside a power plant where the voltage is increased for travel along transmission lines. Another substation, typically near a populated area, houses a transformer that decreases the voltage. From this second substation the electricity travels along distribution lines through populated areas. A third transformer that further steps down the voltage will be situated just outside the home or business where the electricity is to be used. Throughout this process the electricity travels along wires which connect the electrical outlet in the walls of buildings to the power plant.

### **Activity 4, optional, What goes on behind the electrical outlet?**

**Objective:** To familiarize participants with how electricity gets from the power plant to the their homes

#### **Materials**

- 7 laminated pictures that illustrate different aspects of the power grid.

(available on following pages and accompanying computer disk)

#### **Time consideration:**

15-20 minutes

#### **Suggested references:**

[www.science.howstuffworks.com/power.htm](http://www.science.howstuffworks.com/power.htm)

<http://www.eia.doe.gov/kids/energyfacts/sources/electricity.html#Generation>

*Continued on next page*

**Doing the Activity:**

1. Divide the group into smaller groups of 2-5 people based on where they are sitting. Give each group a complete set of the 7 picture cards on the following pages.
2. Explain that the pictures represent different aspects of the electricity grid and that together they are to arrange the picture cards in chronological order on the table. Announce that the groups will have about 5-7 minutes to work through this before we go over it as a big group
3. While the groups are working the presenter should walk around the room to see how work is progressing and to answer questions, but it is not necessary to correct errors at this time.
4. Once all, or most groups, have finished arranging the pictures stop the small group discussion and go over the proper order of the picture cards as a large group. This can be done by having one group come up and display what they think is the proper order. Or the presenter can ask for individuals to come up one at a time and display the picture card that they think is next in the proper order of the power grid. If individuals or groups are in disagreement allow each a moment to explain their reasoning and see if the group can come to an agreement. If necessary the presenter should intercede and clarify any confusion.
5. The presenter should take a moment to name and describe the purpose of the items represented in each picture. This can be done while group is working through the process or after the large group has completed arranging the pictures in chronological order. If the group is struggling to complete the task it will probably be most helpful to explain as you go.

*The following 3 pages include graphics for use in this activity. They are arranged in chronological order: power plant, electricity substation, transmission lines, electricity substation, distribution lines, transformer drum and electrical outlet.*

**Activity 4, optional,  
What goes on behind the  
electrical outlet?**

*continued...*

**Suggested references:**

[http://en.wikipedia.org/wiki/Electric\\_power\\_transmission](http://en.wikipedia.org/wiki/Electric_power_transmission)

<http://en.wikipedia.org/wiki/Transformer>

[http://en.wikipedia.org/wiki/Electrical\\_substation](http://en.wikipedia.org/wiki/Electrical_substation)



**Progress Energy's Lee Plant is located on the Neuse River near Goldsboro N.C.**



**An electricity substation**



**Transmission lines**



**An electricity substation**



**Distribution lines**



**A transformer drum**



**An electrical outlet**

## **Activity 5: Overview of electricity fuels**

*Overview: This activity provides participants an opportunity to share what they already know about electricity fuels that are commonly used and potentially available in North Carolina.*

*Participants will move through the stations in an orderly fashion writing down what they know about the different fuels and reading over what others have written.*

**Background:** Electricity is a secondary source of energy, meaning we get it from the conversion of other sources of energy. Any number of different fuels can be used to generate electricity, including coal, natural gas, uranium, water, wind, biomass and the sun. (See to Activity 3 for more information on how electricity is generated.) Utility executives, including Jim Rogers the CEO of Duke Energy, and many others have begun to refer to energy efficiency as a “fuel” and we will treat it as one in this workshop.

Each fuel source has its own advantages and disadvantages. For example the combustion of fossil fuels such as coal, natural gas and petroleum in a power plant contributes to air pollution and associated health and environmental concerns while wind turbines are linked to bird mortalities. The list of suggested references provides a good place for those looking for details about the

### **Activity 5: Overview of electricity fuels**

#### **Objective:**

To allow participant the opportunity to share what they already know about various electricity fuels and to learn from each other.

#### **Materials:**

- 16 or more sheets of white, easel paper (27" x 34" or larger)
- 16 or more markers
- 3 different colors of post it notes (8 x 5" or larger) OR one color of large post it notes and 8+ sets of 3 different colored markers
- masking tape or push pins
- 8 easel pads or stands, optional

#### **Time consideration:**

40 min.

*Continued on next page*

different electricity fuels explored in this workshop.

**Doing the activity:**

- 1.** Before the workshop separate the materials into 8 stacks. Each stack should contain: at least 2 pages of easel paper, 3 or more markers, and 3 different colors of large post it notes or markers or 3 different colors. Label each stack with one of the following titles: coal, nuclear, hydropower, wind, solar, biomass, energy efficiency or conservation. (If preferred, make 7 stacks and group together energy efficiency and conservation.)
- 2.** Before the workshop spread the stacks throughout the room. The paper can be hanging from an easel pad, taped or tacked onto the walls, or laid on a desk. Be careful not interfere with seating for participants and, if possible, hide the titles until it is time for the activity.
- 3.** Upon completing the presentation about electricity distribution and generation let the group know it is time for them to share what they know about different electricity fuels. Call their attention to the materials spread throughout the room and explain that they will have time to write down what they know about some of the different fuels for electricity generation.
- 4.** Explain that the participants will start at one station and move around the room in a clockwise manner until each person visits all 8 stations. Everyone will have about 5 minutes at a station to write down, and read over, information about each fuel before switching to the next station. Although they will move around the room as a group they should work individually and leave the markers and post it notes behind when they switch.
- 5.** Explain that each bit of information will be written on its own post it note and then stuck to the appropriate piece of easel paper. The three different colors of post it notes, or markers, will be used to indicate whether an individual thinks the information is an advantage, a disadvantage, or neither an advantage or disadvantage of the fuel source. Make a key and display it where it can easily be

seen in order to help people remember what each color means. The key can be prepared by simply writing the abbreviations 'adv', 'disadv', and neutral on a separate color of post it note or with a different color marker, depending on the material provided. This key can be prepared before the workshop or while explaining the activity.

**6.** Additional easel paper is available at each station if space runs out on the 1<sup>st</sup> page. One can add information to something already written by writing on another post it note and sticking it to the existing note. One can rewrite a piece of information if they would classify it differently than the previous writer. If someone disagrees with or questions something that is written they should write a small question mark in the corner of the post it note. If one has no new information to contribute then that person can spend the time arranging the post it notes so duplicate or similar information is grouped together.

**7.** After explaining the activity clarify any questions.

**8.** When ready to begin ask the group to spread out so that there is an even number of people at each of the 8 stations. Make sure there are sufficient markers and stacks of post it notes at each station.

**9.** Begin the activity. The presenter is responsible for watching the time and announcing when it is time to move to the next station, remind everyone to leave the markers and post it notes behind when they switch. Allow approximately 3-5 minutes at each station and keep in mind that people will likely need more time at first and less time towards the end when lots of information has already been written.

**10.** Once everyone has visited each station allow another 5-10 minutes for people to walk around and revisit the stations at their own pace.

**11.** The next activity will begin with a brief group discussion of the information that is written so that, if appropriate, questions can be clarified and additional information can be added.

## **Activity 6: Wrap up of electricity fuels**

*Overview: Here is an opportunity to correct or clarify any erroneous information provided by the participants and to mention any important details not written. During this time the participants can also discuss their overall impression of the different electricity fuels available in North Carolina.*

**Background:** see write-up for activity 5.

### **Doing the activity:**

1. Display the individual pages of easel paper so they can easily be seen from throughout the room. At the very least make sure none are laid down on a table and, if possible, bring them all together in one corner or along a single wall.
2. Gather everyone together for a group discussion. If appropriate summarize the information provided for each fuel, be sure to correct or clarify statements that include a question mark and add important pieces of information that were overlooked by the group.
3. After each fuel has been discussed in brief, invite participants to share some general thoughts. Encourage them to note the colored paper or markers to identify which fuels seem to have more advantages than disadvantages. Spend a moment grouping together the different fuels into categories such as renewable and non-renewable, polluting and non-polluting, greenhouse gas emitting and non-greenhouse gas emitting...(be sure to define each category).

### **Activity 6: Wrap up of electricity fuels**

#### **Objective:**

To summarize information about the different electricity fuels.

#### **Materials:**

- easel paper and post it notes that participants wrote on during previous activity

#### **Time consideration:**

25-30 minutes

#### **Suggested references:**

See activity 5

## Activity 7: Advantages of and barriers to alternative fuels in

### North Carolina

*Overview: After quickly reviewing the advantages to employing alternative fuels in North Carolina the presenter will explain one reason that these techniques are currently underutilized in North Carolina.*

**Background: (more detailed information can be found in the accompanying report.)** As concerns over how to meet a growing demand for energy continue to mount, renewable energy and energy efficiency are increasingly identified as part of the solution. The advantages of alternative energy include, but are not limited to: minimal emission of air pollutants, including global warming pollutants; diversification of generating portfolio; protection against price volatility and/or increasing fuel costs; local (in-state) economic development and, in some cases, lower costs per kilowatt hour.

Still, alternative technologies are not readily adopted by utility companies and experts identify current rate making structures as one barrier to their expansion. In North Carolina, and many regulated states, current policies encourage utility companies to build more power plants and sell more electricity since these behaviors will increase profits while efforts to improve energy efficiency will actually decrease company profits.

#### **Doing the activity:**

1. This activity is dominated by a presentation from the workshop presenter; a sample presentation is included with this report. It is

#### **Activity 7: Advantages of and barriers to alternative fuels in North Carolina**

##### **Objective:**

To help explain why alternative fuels are not commonly employed in NC.

##### **Materials:**

- PowerPoint, or similar visual tool to enhance a verbal presentation  
(a sample presentation is available on accompanying computer disk)

##### **Time consideration:**

15-20 minutes

##### **Suggested references:**

- <http://www.ncuc.commerce.state.nc.us/rps/NC%20RPS%20Report%2012-06.pdf>

*Continued on next page*

up to the discretion of the presenter how involved the participants are in the presentation, though a straight lecture is discouraged.

**Note:** Discussion of the advantages of alternative fuels may be included in the previous activity, depending on the written information and comments of the participants, but it will still be valuable to summarize the point at the beginning of the presentation.

**Activity 7: Advantages of  
and barriers to alternative  
fuels in North Carolina**

**Suggested references:**

•<http://www.ncuc.commerce.state.nc.us/rps/NC%20RPS%20Report%2012-06.pdf>

•[http://www.rprogress.org/bluegreen/SmartCleanStrong\\_NC.pdf](http://www.rprogress.org/bluegreen/SmartCleanStrong_NC.pdf)

•<http://www.nrdc.org/air/energy/abreaking.asp>

•<http://aceee.org/pubs/u061.pdf>

## **Activity 8: Alternatives to NC's electricity rates structure**

*Overview: Regulation regarding electricity rates varies by state.*

*Over the last 30 years some states have introduced rate reforms in an effort to encourage alternative forms of energy. The participants will work in small groups to become “experts” on one rate structure and will prepare a short presentation to the others about their specific rate structure.*

**Background:** (more detailed information can be found in accompanying report and in the documents that follow and are meant to be shared with participants) States throughout the country have recognized that their electricity rate structures discourage the development of alternative energy and some have made changes to address this concern. One policy currently used in more than 20 states is commonly referred to as a Renewable Portfolio Standard (RPS); though the specifics vary from state to state each one involves a target for renewable energy, and in some cases energy efficiency, that all energy providers in the state must meet or exceed during a specified time period. Another option commonly referred to as decoupling, fixes utility revenue rather than customer rates so that utility profits are no longer tied to electricity sales. A third approach, commonly referred to as performance incentives,

### **Activity 8: Alternatives to NC's electricity rate structure**

#### **Objective:**

To introduce participants to the rate structures other states are using to help promote alternative energy.

#### **Materials:**

- documents that summarize the different alternative rate structure to be discussed
- easel paper
- markers
- tape

#### **Time consideration:**

50 minutes

#### **Suggested references:**

- [www.dsireusa.org](http://www.dsireusa.org)
- [www.nrdc.org/air/energy/abreakin.g.asp](http://www.nrdc.org/air/energy/abreakin.g.asp)
- <http://aceee.org/pubs/u061.pdf>

*Continued on next page*

provide a direct financial incentive for utility companies to invest in energy efficiency, perhaps by allowing them to earn a profit from their energy efficiency activities similar to that which earn on other capital investments. And, finally, some states are doing away with a flat rate for electricity and introducing time-of-use pricing, charging customers higher prices at high demand times, like summer afternoons, to encourage energy efficiency and spread electricity use throughout the day.

**Doing the activity:**

1. Before the workshop begins print out descriptions of different rate structures, the following pages provide an example. Be sure to make more than enough copies for each small group to have a complete set and more if you think individuals will want to take the information home. Make one copy of each rate structure description on colored paper and use white paper for additional copies.
2. Before the workshop organize the copies so that each small group will have a description of all the alternative rate structures to be discussed, one of which is printed on colored paper. You may want to provide each group an additional printout or two of the rate structure they will be presenting. Also, provide each group with a sheet of easel paper and some markers.
3. Divide the group into as many small groups as you have alternative rate structures to discuss. Provide each small group with a set of rate structure descriptions, a sheet of easel paper and markers.
4. Explain that each group has about 15 minutes to prepare a 2-3 minute presentation about the rate structure described on colored paper and that they can use the easel paper, markers and any other

**Activity 8: Alternatives to NC's electricity rate structure**

**Suggested references:**

- [www.ase.org/section/\\_audience/policymakers/policyfacts](http://www.ase.org/section/_audience/policymakers/policyfacts)
- <http://aceee.org/pubs/e063.pdf>
- [www.energysmartpricing.org](http://www.energysmartpricing.org)
- [http://www.eia.doe.gov/cneaf/electricity/eu\\_comprice/eu\\_comprice\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/eu_comprice/eu_comprice_sum.html)

available materials to aid in the presentation. The other descriptions are available for them to compare with if they have time after preparing their presentation, though it is not required that they read or discuss the other rate structure at this time.

5. During the 15 minutes the groups are preparing the presentation the presenter should move around the room and be available to answer any questions.

6. After time is up have the small groups make their presentation one at a time. Questions can be addressed as you go or held until after all the groups present.

7. After all the groups present open the floor for discussion, during this time the presenter can provide additional information and/or clarify and confusion.

*The following 10 pages are handouts that could be used in this activity.*

**Instructions:** Prepare a brief summary, two to three minutes in length, of the alternative rate structure described below. You are encouraged to use the easel paper, markers provided, and any other materials available in the room, to prepare a visual aid for your presentation.

## **Portfolio Standards**

(source: Database of State Incentives for Renewables & Efficiency, [www.dsireusa.org/glossary/glossary.cfm#benefit](http://www.dsireusa.org/glossary/glossary.cfm#benefit))

Renewables Portfolio Standards (RPS) require that a certain percentage of a utility's overall or new generating capacity or energy sales must be derived from renewable resources, i.e., 1% of electric sales must be from renewable energy in the year 200x. Portfolio Standards most commonly refer to electric sales measured in megawatt-hours (MWh), as opposed to electric capacity measured in megawatts (MW). The term "set asides" is frequently used to refer to programs where a utility is required to include a certain amount of renewables capacity in new installations.

(Source: RFF report *How Can Renewable Portfolio Standards Lower Electricity Prices?* <http://www.rff.org/rff/Documents/RFF-DP-06-20-REV.pdf>)

One of the most frequently advanced policies for supporting renewable energy sources in electricity generation is the renewable portfolio standard (RPS). Also known as renewable obligations, green certificates, and the like, these market share requirements require either producers or users to derive a certain percentage of their electricity from renewable sources. Currently, nearly half of the U.S. states and the District of Columbia have established an RPS or a state-mandated target for renewables.<sup>1</sup> Several other countries—including Australia, Austria, Belgium, Brazil, Czech Republic, Denmark, Finland, Italy, Japan, the Netherlands, South Korea, Sweden, and the United Kingdom—have planned or established their own programs.

(Source: RFF report *Cost-Effectiveness of Renewable Electricity Policies* <http://www.rff.org/Documents/RFF-DP-05-01.pdf>)

The second policy we analyze, a portfolio standard, is observed at the state level in the United States and in many European countries. Since the mid-1990s, 16 states have imposed renewable generation requirements on electricity retailers or generators within their borders.<sup>2</sup> Typically referred to as RPSs, these requirements set a minimum level or percentage of electricity sales that must come from renewable generation by a particular date. In several states, including Connecticut, Nevada, New Jersey, New Mexico, Texas, and Wisconsin, the implementing RPS law or regulation also allows for trading of renewable energy credits to meet this requirement. Thus, an electricity retailer can meet its renewable obligation by generating renewable energy itself and keeping the associated credits, purchasing renewable energy bundled with credits from others, or purchasing renewable energy credits sold separately. In New Mexico and Nevada, solar generators receive more than one credit per kilowatt-hour produced, providing them with an additional incentive above other renewables.

In the European Union, a similar policy took shape under the Renewables Directive in October 2001, which required member states to adopt national targets consistent with reaching the overall E.U. target that 12% of total energy and 22% of all electricity come from renewables by 2010.<sup>3</sup> Several countries, including the United Kingdom, Sweden, Belgium, and Italy, have implemented tradable certificates to achieve their national goals (Energy Research Centre of the Netherlands 2004). The European Union is also studying the feasibility, costs, and benefits of implementing a community-wide trading program (ESD 2001, Quené 2002). Australia adopted an RPS for wholesale electricity suppliers beginning in 2001.<sup>4</sup> Japan also has an RPS that includes a price cap of 11 yen/kWh on the price of renewable credits (Keiko 2003).

(Source: ACEEE's report titled *Energy Efficiency Resource Standards: Experience and Recommendations*, <http://aceee.org/pubs/e063.pdf>)

An Energy Efficiency Resource Standard (EERS) is a simple, market-based mechanism to encourage more efficient generation, transmission, and use of electricity and natural gas. An EERS consists of electric and/or gas energy savings targets for utilities, often with flexibility to achieve the target through a market-based trading system. All EERS's include end-user energy saving improvements that are aided and documented by utilities or other program operators. Sometimes distribution system efficiency improvements and combined heat and power (CHP) systems and other high-efficiency distributed generation systems are included as well. EERS's are typically implemented at the state level but can also be implemented over smaller or wider areas. With trading, a utility that saves more than its target can sell savings credits to utilities that fall short of their savings targets. Trading would also permit the market to find the lowest-cost savings. However, unlike other resources such as renewable energy and coal, energy-saving opportunities are distributed throughout the 50 states; studies on many states have found cost-effective opportunities to reduce energy use by 20% or more...

EERS-like laws are now in operation in several states and countries. Texas's electricity restructuring law created a requirement for electric utilities to offset 10% of their demand growth through end-use energy efficiency. Utilities in Texas have had no difficulty meeting their targets and are currently exceeding them. Hawaii and Nevada recently expanded their renewable portfolio standards to include energy efficiency....

Because EERS annual requirements are cumulative, savings would steadily mount. If an EERS calls for 0.75% savings per year, after a two-year ramp-in period, by 2020 annual electricity and natural gas use in the covered region would be reduced by nearly 10%....

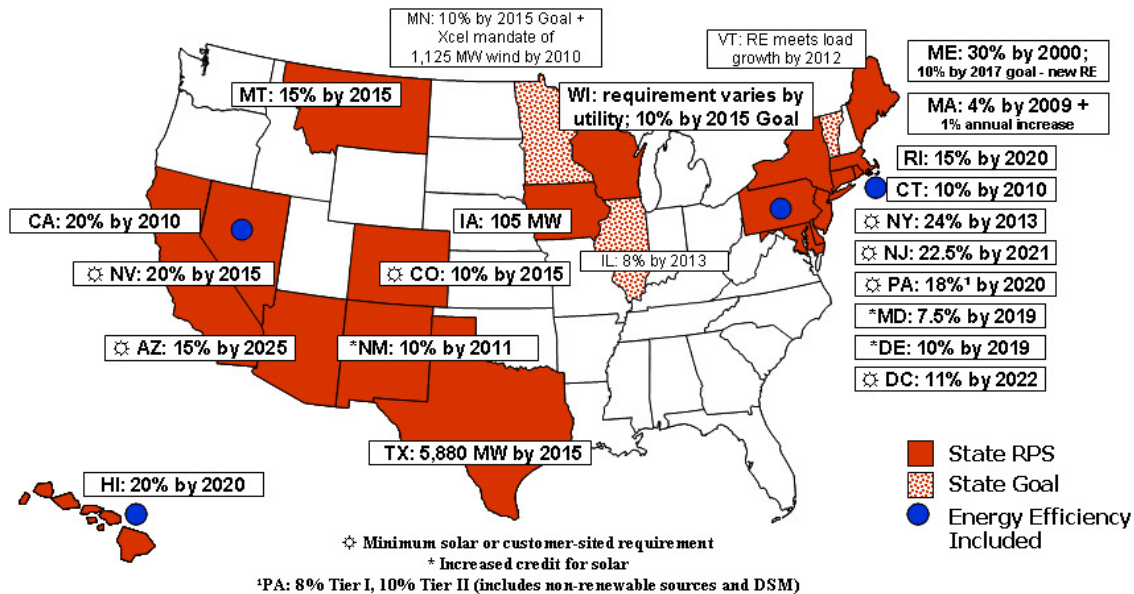
(source: *Analysis of a Renewable Portfolio Standard for the State of North Carolina* prepared by La Capra Associates for the North Carolina Utilities Commission)

A Renewable Portfolio Standard (RPS) is a policy tool that sets a requirement for retail sellers of electricity to provide a minimum portion of their electricity portfolio from renewable resources. The RPS requirements are typically denoted as a percentage of electricity sold to retail customers and are achieved by phased-in increases in the target percentage over time. Some RPS requirements include existing renewable generation, and others focus primarily on new (additional) generation. The standards are applied to companies selling electricity to retail customers (often referred to as load

serving entities (LSEs)), which may include investor-owned utilities (IOUs) and public utilities (municipals and cooperatives), as well as any competitive retail suppliers (if applicable). While a Federal RPS has been considered by Congress, to date, all enacted RPSs have been adopted at the state or local levels. As a result, the resources that are eligible for each RPS vary from state to state, reflecting each state's access to economically available resources and other economic, environmental and political considerations established through various combinations of legislative, regulatory and stakeholder processes. Over twenty states and Washington, D.C. have now passed an RPS of some form (see Figure ES-1). Four of these states – Connecticut, Hawaii, Nevada, and Pennsylvania – have included energy efficiency<sup>4</sup> or demand-side management (DSM)<sup>5</sup> measures as qualifying resources, either to meet an RPS target in conjunction with other renewable energy or to meet a target created for a separate tier or class of resources as part of an RPS.

### States with Renewable Portfolio Standards

Source: Database of State Incentives for Renewables & Efficiency (updated 11.2006)



**Instructions:** Prepare a brief summary, two to three minutes in length, of the alternative rate structure described below. You are encouraged to use the easel paper, markers provided, and any other materials available in the room, to prepare a visual aid for your presentation.

## Decoupling

(Source: Alliance to Save Energy's Energy Efficiency in the Utility Sector Fact Sheet, [www.ase.org/section/\\_audience/policymakers/policyfacts](http://www.ase.org/section/_audience/policymakers/policyfacts))

Under traditional regulatory rate structures, utility revenues are proportional to sales of electricity and natural gas, even though many utility costs are fixed. Thus utility profits may be hurt by energy efficiency programs even if the utility is paid for the program costs. This “throughput incentive” is a significant barrier to effective utility energy-efficiency programs. The National Association of Regulatory Utility Commissioners (NARUC) and others have supported new rate structures under which profits are “decoupled” from sales by fixing utility revenues rather than by fixing customer rates, thus aligning utility interests with the public interest in energy efficiency. Performance incentives for successful utility energy-efficiency programs also reward utilities for efficiency measures that save their customers money.

(Source: NRDC's article in The Electricity Journal, [www.nrdc.org/air/energy/abreaking.asp](http://www.nrdc.org/air/energy/abreaking.asp))

### **Breaking the Consumption Habit: Ratemaking for Efficient Resource Decisions**

By Sheryl Carter

All ratemaking provides utilities with incentives or disincentives to behave in a certain manner. Ideally, utilities should be rewarded based on how well they meet their customers' energy service needs. However, most current rate design instead places the focus on commodity sales, tying a distribution company's recovery of fixed costs directly to its commodity sales.

In order to motivate utilities to consider all the options when planning and making resource decisions on how to meet their customers' needs, the sales-revenue link in current rate design must be broken. Breaking that link between the utility's commodity sales and revenues, removes both the incentive to increase electricity sales and the disincentive to run effective energy efficiency programs or invest in other activities that may reduce load. Decision-making then refocuses on making least-cost investments to deliver reliable energy services to customers even when such investments reduce throughput. The result is a better alignment of shareholder and customer interests to provide for more economically and environmentally efficient resource decisions.

As an added benefit, breaking the sales-revenue link streamlines the regulatory process for rate adjustments. Contention over sales forecasts consumes extensive time in every rate case. If the sales-revenue link is broken, these forecasts carry no economic weight, so the incentive to game forecasts of electricity sales is removed and rate cases become less adversarial.

Many works have addressed the different forms that alternatives to the traditional rate design mechanism can take. These alternatives, variously known as decoupling, revenue indexing, revenue cap or revenue-per-customer mechanism, or statistical recoupling, range from the simple to the complicated -- allowing the design to take into account the unique characteristics of different utilities or regions.

Rate designs that break the sales-revenue link are not new, nor are they merely theoretical. These mechanisms have been in operation in some form since the California Public Utilities Commission (CPUC) adopted an electric rate adjustment mechanism (ERAM) in 1982. While California has the most extensive experience, Oregon, Washington, New York and Maine have also adopted some form of revenue cap mechanism over the last two decades.

Reliance on decoupling mechanisms declined substantially in the mid-to late 1990s. This was due in large part -- at least in California -- to uncertainties related to and the structure imposed by the restructuring transition. The CPUC, however, never abandoned its policy of breaking the sales-revenue linkage (see discussion below), and California's legislature mandated reinstatement of the policy in April 2001.

**Instructions:** Prepare a brief summary, two to three minutes in length, of the alternative rate structure described below. You are encouraged to use the easel paper, markers provided, and any other materials available in the room, to prepare a visual aid for your presentation.

## **Real-Time Pricing**

### **New way to cut electric bills kicks in today**

From Chicago Sun Times on January 11, 2007 BY [MARY WISNIEWSKI](#) Business Reporter

ComEd customers willing to wait until night to wash clothes might be able to save on their electric bills through a new "real-time" pricing program that opens today.

Customers who join will pay the hourly market-based electric rate, instead of the flat rate set by a power auction last fall. The auction rate plus a new delivery rate is increasing bills 24 percent this year.

#### *Sign-up starts today*

ComEd customers interested in the real-time program can call (866) 928-8776 or go to [www.energysmartpricing.org](http://www.energysmartpricing.org) starting today for more information and to request sign-up materials, according to Sharon Hillman, vice president of resource adequacy and environmental programs at ComEd.

By knowing when prices are high, a customer can decide not to use as much power during high-cost times of day, such as hot summer afternoons. Customers will be notified of the next day's hourly prices.

#### *10% savings*

ComEd customers on a pilot version of the program saved an average of 10 percent, reduced their power use and cut stress on the electric grid, according to the utility.

#### *Cheaper at night*

The program will require a new electric meter, which will cost participants \$2.25 a month. ComEd expects that 110,000 customers will join the program over four years.

Hillman cautioned that the program is not for everyone. Customers could end up paying more for electricity if they don't change their usage patterns. Customers who will benefit are those who are willing to shift when they run major appliances such as clothes dryers and are willing to turn down air-conditioners in the afternoon, Hillman noted.

# Pilot program gives consumers more control over electric bill By Paul Meincke

January 8, 2007 - ComEd customers are reeling from a double digit jump this year in the cost of electricity. But some smart consumers are banding together to cut their cost for power. During the debate over increased electricity rates in Illinois, the utilities have promoted how their customers can conserve electricity use and hold down their costs. It's a message similar to those we always hear when a heat wave rolls around.

A lot of people do conserve. But a pilot program underway for four years has allowed a select group of residential customers to have some control through real time pricing of the electricity they use. Now that pilot program is expanding.

"Our electrical bills have dropped to about half of what we used to pay," said Judi Kinch.

Judi Kinch is a geologist who works out of her apartment home on the Northwest Side. For the last four years, she and her husband have been part of a pilot program that sends out periodic email alerts -- typically during heat waves -- on when electricity costs will be high.

"In the evenings, usually before high electrical prices, I'll get an e-mail telling me which hours the electricity will be more than 20-cents per kilowatt hour the next day," said Kinch.

Judi, her husband and daughter can then tailor their electricity use -- put off using the dishwasher, or dial down the room air conditioner.

What utilizes charge their customers for electricity varies hour by hour based on supply and demand. This pilot program allows 1,100 customers involved in it to actually see what they are paying for electricity, so it adds greater incentive to those calls to "please conserve" during high use times.

"It makes a big difference to see the numbers because it puts in a dollar form what kind of money you're spending using electricity," Kinch said.

The pilot program run by Community Energy Cooperative is going to expand. Last month the Illinois General Assembly voted to increase it to 110,000 ComEd customers who will be equipped with so-called smart meters and a system that will alert them in timely fashion to specific energy prices.

Judi Kinch applauds that. While the electricity bills in her apartment are quite modest, they have been cut in half, and her family has saved money.

"If you're in a household that uses more electricity or has central air, you're gonna save a lot of money," said Kinch.

There are still some details to be worked out in this new expanded pilot program. ComEd has hired a third party -- called ComVerge -- to run it.

The Community Energy Cooperative has run the pilot since its inception in 2003. If you have questions on how it works, you can check out their web site at [energycooperative.org](http://energycooperative.org).

(Source: Community Energy Cooperatives Energy-Smart Pricing Plan 2005 Reference Guide)

Under this rate, called Rate RHEP-Residential Hourly Energy Pricing (Experimental) (Rate RHEP), your electricity cost will vary with market prices. This means you'll benefit from low market prices during most hours of the day and most times of the year. ESPP is currently your only opportunity to have access to hourly, market-based energy prices. Once enrolled, you will receive a new electricity meter. The Cooperative will then act on your behalf to transfer you onto Rate RHEP with ComEd.

ComEd will calculate your energy usage hour by hour and use the corresponding market-based hourly Rate RHEP prices of electricity to compile your monthly cost. The Cooperative will make it easy to find out what the hourly price of electricity is. The Cooperative will also notify you, in advance, any time the market-based hourly prices rise above 10 cents per kilowatt-hour (kWh), allowing you time to adjust your usage.

In addition, the Cooperative will provide a Price Protection Cap against the unlikely event of prices rising abnormally. If the market-based hourly prices ever exceed 50 cents per kWh, you will receive a rebate, directly from the Cooperative, for the amount that you were billed by ComEd at a market-based hourly price over the 50 cents per kWh limit...

The main difference between your current rate and Rate RHEP, the rate you will have under ESPP, is how the cost of electricity is calculated. You currently pay for the generation and delivery of your energy with a single cost per kilowatt-hour on a monthly consumption basis. Each month, ComEd reads your meter to see how many kilowatt-hours you have used since the last meter reading. During the four summer months, you pay 8.275 cents for each kWh. During the other months, you pay 8.275 cents per kWh for the first 400 kilowatt-hours and 6.208 cents per kWh for all remaining kilowatt-hours (an annual average of 7.781 cents per kWh).

With ESPP, you will pay the cost of electricity hour to hour and you will pay for the delivery of your energy via a separate charge, identified as the Access Charge. There will be no change in the method of calculating the monthly customer charge, taxes, franchise fees and other items.

## Examples of Real-Time Price Schedules in different seasons

### Day-Ahead Prices in Dollars/KWH

prices refreshed by 4:30 PM daily

Prices subject to change pending final MISO review.

Date	Hour	Total Price (cents)
9/2/2006	01	2.013
9/2/2006	02	2.013
9/2/2006	03	2.002
9/2/2006	04	1.936
9/2/2006	05	1.936
9/2/2006	06	1.903
9/2/2006	07	2.684
9/2/2006	08	2.706
9/2/2006	09	2.782
9/2/2006	10	2.867
9/2/2006	11	3.337
9/2/2006	12	3.810
9/2/2006	13	4.170
9/2/2006	14	4.595
9/2/2006	15	4.943
9/2/2006	16	5.036
9/2/2006	17	5.094
9/2/2006	18	4.913
9/2/2006	19	4.517
9/2/2006	20	4.267
9/2/2006	21	4.179
9/2/2006	22	4.102
9/2/2006	23	3.047
9/2/2006	24	2.695

### Day-Ahead Prices in Dollars/KWH

prices refreshed by 4:30 PM daily

Prices subject to change pending final MISO review.

Date	Hour	Total Price (cents)
3/2/2007	01	2.844
3/2/2007	02	2.434
3/2/2007	03	2.309
3/2/2007	04	2.393
3/2/2007	05	3.058
3/2/2007	06	5.030
3/2/2007	07	6.544
3/2/2007	08	6.270
3/2/2007	09	6.270
3/2/2007	10	6.059
3/2/2007	11	5.525
3/2/2007	12	5.100
3/2/2007	13	4.754
3/2/2007	14	3.945
3/2/2007	15	3.514
3/2/2007	16	3.572
3/2/2007	17	3.728
3/2/2007	18	5.980
3/2/2007	19	7.057
3/2/2007	20	6.162
3/2/2007	21	5.148
3/2/2007	22	4.169
3/2/2007	23	3.780
3/2/2007	24	0000

**Instructions:** Prepare a brief summary, two to three minutes in length, of the alternative rate structure described below. You are encouraged to use the easel paper, markers provided, and any other materials available in the room, to prepare a visual aid for your presentation.

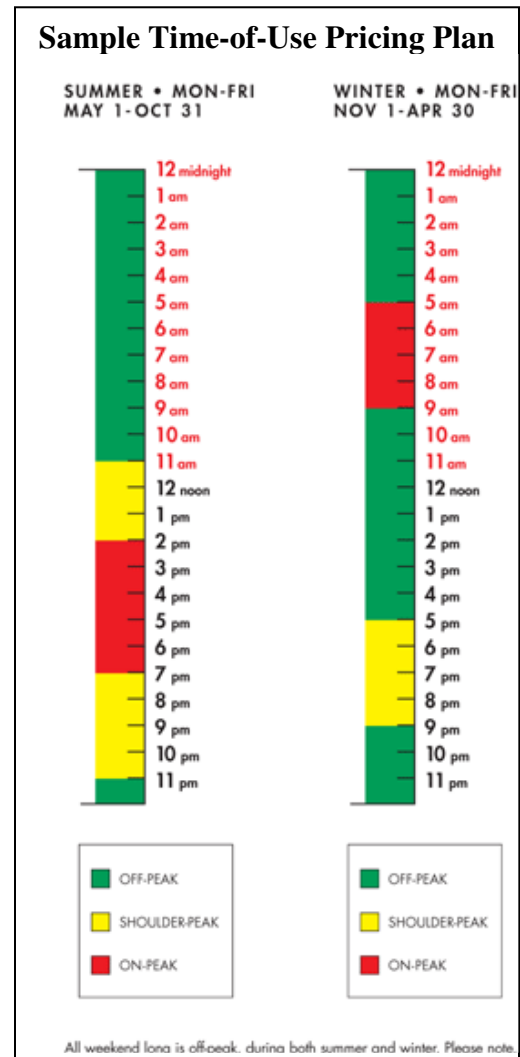
## Time of Use pricing

(Source: Regulatory Assistance Project)  
 Time-of-use (TOU) and/or real time rates give customers a price signal that encourages efficient use (to the degree that the rates reflect all costs of production, including external ones). There are limitations, however, as the cost of providing TOU signals to customers who do not already have demand meters can overwhelm the system savings expected from voluntary customer response. In addition, absent automated systems that monitor prices and adjust consumption, the relatively small potential savings for (especially) residential and small commercial customers means that these customers are unlikely to consistently respond to price changes unless they are large and sudden. Combining energy efficiency program offerings with inverted block rates and seasonal rates (where costs justify them) is a highly synergistic strategy and a reasonable proxy for TOU rates. Seasonally differentiated rates capture the cost of service differences between summer and winter seasons. Many states experience markedly higher demand due to use of air conditioning in the summer months. A higher seasonal summer rate reflects the higher costs of serving customers in the summer months. By delivering this price signal to customers, seasonal rates help to drive investment towards higher-efficiency air conditioning, with marked environmental gains.

(Source: Salt River Project Agricultural Improvement and Power District

<http://www.srpnet.com/prices/business/tou.aspx>)

The key to saving money on SRP's business Time-of-Use Price Plan is to shift usage from the higher-priced on-peak hours to the lower-priced off-peak and shoulder hours. You may already be doing some of this, and with some additional adjustments, switching to this price plan could maximize your energy savings.



**Time-of-Use Pricing Plan Raises Concerns** from NW Energy Coalition Report Vol 20:4 p6  
By Mark Glyde

Puget Sound Energy (PSE) this month proposed putting about 420,000 of its 920,000 residential customers on **time-of-use pricing**, a rate structure intended to encourage customers to shift their energy use away from peak hours when wholesale electricity prices are highest.

Reducing peak energy can save utilities and customers money by reducing dependence on high-priced peak power and offers environmental benefits. Because the energy system is geared toward serving peak demand, a lasting reduction in peak consumption region or west coast wide would mean fewer power plants would be needed.

Under the plan PSE this summer would charge customers more for electricity than the utility's current flat rate on weekdays between 6AM and 9PM and on Saturdays, and less from 9PM to 6AM weekdays and on Sundays and holidays. The plan calls for customers to pay PSE's current flat rate on weekdays between 10 PM and 5PM during winter months.

Although many consumer and environmental advocates support time-of-use pricing, they are concerned that PSE's plan may result in higher bills and want the program to begin on a voluntary basis. They fear the savings customers will receive off-peak won't make up for the higher rate they will pay during on-peak hours and the result will be a higher monthly bill.

"It's really hard to tell if this will benefit customers at all," said Simon ffitth, public-power counsel for the Washington Attorney General's Office in an April 9 *Seattle Times* news report.

The price plan could be particularly problematic for low-income consumers, and households with seniors and young children who tend to be home more often during the middle of the day than the average customer. PSE argues off-peak savings from constantly-running big household energy users like refrigerators would help balance the additional cost of on-peak consumption.

***Time-of-use prices could affect the timing of electricity usage*** from the Energy Information Administration report *Electricity prices in a competitive environment (1997, August)*  
[http://www.eia.doe.gov/cneaf/electricity/eu\\_comprice/eu\\_comprice\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/eu_comprice/eu_comprice_sum.html)

Because electricity cannot be stored, as its demand rises and falls by season or during the portions of a day, additional generating plants in reserve must be immediately brought on line ("dispatched") to serve increases in demand. As a result, the costs of electricity production—and thus the marginal cost and competitive price—rise and fall with changes in the demand for power, as generating plants are dispatched or taken off line. Competitive prices that vary with demand may lead to changes in consumer electricity usage patterns. **Time-of-use prices** give consumers an incentive to reduce usage during high demand ("peak") periods and increase usage during low demand ("off-peak") periods. It is uncertain what effects time-of-use prices will have on demand patterns. Therefore, several estimates of short-term consumer responsiveness to changes in price are used in this analysis to examine the effects of time-of-use prices.

## **Activity 9: What would you do?**

*Overview: After discussing the different types of rate structures let the participant pretend to be policy makers and vote for the rate structure, or combination of rate structures, that they think is best for North Carolina.*

### **Doing the activity:**

1. Before the workshop prepare a ballot that lists the different rate structures discussed in the previous activity and also includes the possibility to vote for no change. Make enough copies for each participant to have two, in case a run off is needed. Also, prepare a ballot box where the participants can anonymously drop the ballot after they have filled it out.
2. Distribute the ballots, one to each participant and allow them a few moments to fill out the ballot and bring it to the ballot box in the front of the room.
3. Tally the responses; this can be done orally while the group watches or while allowing the participant a brief break.
4. If one structure gets more than 50% of the vote then announce it the winner. If none of the options get more than 50% of the votes that distribute more ballots but ask that participants only vote for one of the top 2 choices from the first vote.
5. Before voting again you may want to ask for a volunteer to “campaign” for each of the remaining choices.
6. If necessary tally the responses 2<sup>nd</sup> round responses and announce the winner.
7. Open the floor for discussion.

### **Activity 9: What would you do ?**

#### **Objective:**

To encourage participant to decide which rate structure option is best for North Carolina.

#### **Materials:**

- multiple copies of a ballot listing alternative rate structures discussed in previous activity (a sample ballot is available on following pages and accompanying computer disk)
- a small box with a slit cut in the top

#### **Time Consideration:**

10 minutes

## **Activity 10: What can you do?**

*Overview: In addition to providing people with information, an important component of any environmental education program is to provide participants with tools to help solve the problem. This activity allows participants to share information about what they are already doing and to learn about other opportunities.*

### **Doing the activity:**

1. There are three different things that should be prepared before the workshop. First of all, pull together contact information for groups that are working on rate reform and related issues, this can be shared with the group on a power point slide or in a handout. In addition to organizations working in NC one may also want to include organizations that are advocating for changes at the national level, including the Alliance to Save Energy and the American Council for an Energy-Efficient Economy.

Please also prepare sample text for a letter, email and/or phone message that participants could use to contact their representatives in Raleigh and Washington, DC in order to communicate their desire to expand alternative energy in North Carolina. If possible print up postcards with a note for legislators that participants can sign during the workshop and leave with you to be mailed.

And, finally, bring along contact information for the state and national legislators that represent the participants (this information is available at the website of the North Carolina General Assembly and state Board of Elections). There is no need to print a copy of this for everyone, just bring 2-4 copies that the participants can reference while at the workshop.

### **Activity 10: What can you do?**

#### **Objective:**

To provide participants with information that will help them to take action on this issue.

#### **Materials:**

- easel, easel paper and marker
- list of contact information for organizations working on energy policy
- sample text for a letter/email or phone call go state legislators
- list with contact information for state legislatures

#### **Time Consideration:**

10-15 minutes

2. This activity can continue straight out of the last activity. As discussion of the “election” results wanes, point out that though the participants are unlikely to ever get the chance to vote like this there are still actions they can take to affect change in the way electricity rates are set in North Carolina.
3. Ask participants to name things that they can do, or are already doing, to help increase the use of alternative energy in North Carolina. As the group brainstorms, have someone write down the suggestions on the easel paper in the front of the room.
- 5 When appropriate the presenter should share the list of contact information for relevant organizations to those who are interested and let them know that they can look up the contact information for their state and local representatives on lists at the front of the room.
4. As the discussion dies down the presenter can interject and add additional opportunities that have not yet been mentioned by the participants. If available, distribute the postcards while the group is still sitting in their seats. Make clear that no one is required to sign a postcard but they are welcome to sign one and leave it behind when they leave or take it home to mail themselves.

## **Activity 11: Post-Assessment & Wrap up**

*Overview: Before the session ends it is helpful take time to review what was discussed and allow the participants to ask any last questions.*

### **Doing the activity:**

- 1.** Have the participants come to the front of the room and collect the pre-assessment workshop they filled out at the beginning of the workshop.
- 2.** After they have had a chance to look them over either ask the participants to tell you if there is any question they are unsure how to answer or, go through the questions one at a time and review the answers as a group.
- 3.** Then ask the group if there are any other questions they have or issues they would like to discuss before the session ends.
- 4.** After 1 minute or so passes with no additional questions or comments from the group thank them all for coming and let them know you will be around for a while and available to talk individually or in smaller groups if desired. If appropriate share your contact information or the contact information of someone who has agreed to be available to answer additional questions.

### **Activity 11, Post-assessment and wrap up**

**Objective:** To provide the participants a chance to clarify any remaining questions.

#### **Materials**

- participant's completed pre-assessment worksheets

#### **Time Consideration:**

10-20 minutes