National Rural Electric Cooperative Association
Response to the U.S. Senate Committee on Energy and Natural Resources
White Paper on a Clean Energy Standard

The National Rural Electric Cooperative Association (NRECA) represents 912 electric cooperatives that serve 42 million consumers across the nation. NRECA believes that a federally-mandated, one-size-fits-all Clean Energy Standard (CES) policy will not translate into developing the most effective, thriving, or dynamic use and application of the inherent resources that are available to different segments of this country and will produce disparate rate impacts. However, if Congress develops a CES, and since a CES would fundamentally impact the electric utility industry, the standard should reflect several components included in our responses to all of the questions.

A small electric utility exemption should be included in a CES. The definition of a small utility was developed in 1974, and needs to be updated to reflect 37 years of changes in the industry.

The definition of clean energy should be much broader than one focusing solely on those resources and technologies that reduce greenhouse gas (GHG) emissions. A CES should reflect other policy considerations such as recognizing whether a resource is cost-effective, encouraging diverse regional participation, and protecting against the inclination to pick "winners" and "losers".

Not only should the resources be expressly listed, but the list should be expansive: existing as well as new resources and technologies should be included. Energy efficiency on the demand side and supply side should be included, and the amounts applicable to satisfy a CES should not be limited.

The timing of the standard's requirements should be matched to realistic assessments of year and percentage targets and what is possible given restrictions on technology, finance, manufacturing capability, and infrastructure. Given objective realities in the electric utility industry, meeting a goal of 80% clean energy by 2035 would create major challenges in all of these areas.

All existing and new clean energy resources and technologies should qualify for credits. While partial credits should not be allowed, more than one credit should be provided to entities that invest in advancements in technologies through research, development, and demonstration. The banking and borrowing of credits are important strategies that should be included in a CES.

While a broad array of technologies is necessary to help deal with regional and electric utility differences, it is not enough: including a cost cap on consumer electricity prices is critical. Once the consumer cost cap trigger is reached, the requirement to satisfy the CES for the following compliance year should be waived. In addition to a cost cap, appropriate off-ramps for situations such as Force Majeure, failure to build needed transmission capacity, and existing transmission constraints should be included. Finally, costs should be kept under control through a low Alternative Compliance Payment (ACP).

- *Should there be a threshold for inclusion or should all electric utilities be subject to the standards set by a CES?*

Yes, there should be a small utility threshold under a CES. The 4 million megawatt hour exemption in past legislation is based on a Small Business Administration regulation from 1974 and needs to be updated. This mandate will significantly impact the affordability of power for small systems.

- *On what basis should qualifying "clean energy" resources be defined? Should the definition of "clean energy" account only for the greenhouse gas emissions of electric generation, or should other environmental issues be accounted for (e.g. particulate matter from biomass combustion, spent fuel from nuclear power, or land use changes for solar panels or wind, etc.)?*

This question is a bit like asking for the definition of "art." There is no clear answer because there is no completely benign form of energy.

NRECA believes that a federally-mandated, one-size-fits-all CES policy will not translate into developing the most effective, thriving, or dynamic use and application of the inherent resources that are available to different segments of this country and will produce disparate rate impacts. However as part of a general clean energy standard discussion, the definition of "clean energy" should be much broader than one that focuses solely on those resources that reduce greenhouse gas (GHG) emissions. While the reduction of GHG emissions is an important component, other policy considerations such as determining the cost-effectiveness of a resource; ensuring significant participation by <u>all</u> of the country's regions; and avoiding the choice of determining resource "winners" and "losers" should also be fundamental considerations in determining the parameters of a clean energy definition. We must keep in mind that in determining what qualifies as "clean energy," we are determining what is <u>not</u> considered clean energy.

- *Should the standard's requirements be keyed to the year 2035 or some other timeframe?*

The timing of the standard's requirements should be matched to realistic assessments of achievable targets, the scope of what is included in the definition of clean energy, and what is possible given restrictions on technology, finance, manufacturing capability, and infrastructure (e.g. transmission, gas pipelines, possible pipelines needed for CCS carbon distribution, etc.). Given objective realities in the electric utility industry, meeting a goal of 80% "clean energy" as defined in President Obama's proposal by 2035 would create major challenges in all of these areas.

In its Prism 2.0 analysis of what is technically feasible to dramatically reduce the carbon output from the electric utility sector, the Energy Power Research Institute (EPRI) forecasts a diverse generation mix including a large expansion of renewable and nuclear generation, the availability from 2020 onward of deployable CCS technology, and aggressive energy efficiency and price signal measures to depress demand growth. EPRI does not foresee the availability of a significant expansion of new nuclear power or viable CCS fossil fuel generation until after 2020. These two technologies are critical because it would be virtually impossible to meet an ambitious goal like 80% in 2035 with just renewables, efficiency, and natural gas that is not considered fully clean. With this in mind, to be technically feasible a CES must be paired with government support to do everything possible (R&D, regulatory streamlining, finance guarantees, etc.) to expedite the deployment of nuclear generation and CCS technology.

Even increasing today's share of non-hydro renewable generation from 3% to 10% would be impossible without massive increases in transmission lines that would be very costly and difficult, especially in the chopped up regulatory and legal environment for transmission. For all generation types, finance will be a huge question. Currently, the utility industry has a capitalization of $1.2 trillion. The costs of transforming the generation mix to meet a CES will likely require double that amount, before even accounting for transmission and other costs. These hurdles would remain and be only somewhat eased even if the final goal is pushed back beyond 2035. The complexities of these challenges is the reason why a CES mandate is not an appropriate avenue for establishing a national energy policy.

- *How valuable would clean energy credits have to be in order to facilitate the deployment of individual qualified technologies?*

If Congress adopts a clean energy standard, utilities will build or buy sufficient clean energy resources to meet their statutory obligation. If the incremental cost of building or buying clean energy resources exceeds the cost of the Alternative Compliance Payment (ACP), then some of the obligation will be met through ACP purchases.

The price of clean energy credits will not be administratively set at a level required to facilitate deployment of clean energy resources, but will be established by supply and demand in the market for clean energy resources. The price will reflect the cost differential between traditional resources and the cost of the marginal clean energy resource that has to be built in order to meet the clean energy standard, capped at approximately the ACP.

If higher deployment levels permit clean energy manufacturers and developers to bring down the cost of clean energy resources, then the differential will drop and the price of clean energy credits will come down accordingly. If, however, higher deployment levels drive developers further up the price curve (for example, requiring wind developers to build turbines in less windy spots or further from good transmission as the best locations become saturated) then the differential will increase and the price of clean energy credits will go up accordingly.

Unless different prices are established for clean energy credits from different clean energy resources, the value of clean energy credits is unlikely to affect the level of investment in the most expensive clean energy resources. A single-price clean energy credit will bring down the price of all clean energy resources by the same absolute amount, but will not reduce the disparity in cost between different resources so the most attractive resources without a clean energy credit will remain the most attractive resources with the credit. In fact, the credit will bring down the cost for the least expensive resources by the greatest percentage, perhaps making them even more attractive to investors as compared to the more expensive clean energy resources.

In any event, there are limits on the extent to which higher prices for clean energy credits can impact investment decisions. There are some limitations on clean energy investment that are not driven directly by price. For example, penetration levels may be limited by manufacturing capacity. There is only one manufacturer in the world that can produce nuclear containment vessels. It will take years for that capacity to expand significantly. Penetration levels will be limited by restrictions on installation capacity. There are only so many qualified solar installers, nuclear-rated welders, and large cranes for raising wind turbines and it will take time to expand that capacity as well. A high clean energy credit may encourage some manufacturers to consider expanding their capacity, but it will not be able to overcome shortages in manufacturing capacity during the near or medium term.

Penetration levels will also be limited by the ability to integrate the new resources into the grid. Several studies performed by the National Renewable Energy Laboratories and others have confirmed that 30% wind penetration levels, for example, would require the construction of approximately $100 billion in new transmission capacity. In fact, according to Navigant, a 5% penetration level in the Eastern Interconnect would require nearly as much transmission capacity as a 25% penetration level. To plan, site, and build that much transmission would require a minimum of 16 years and could take much longer if significant public policy barriers are not addressed or if the public objects to the massive expansion of the transmission grid. As Texas has seen, high levels of interest in wind cannot increase the total number of MWH of wind beyond a certain point until the transmission infrastructure is in place to deliver it to load.

Furthermore, a study performed by ICF International for the INGAA Foundation explains that it would require an investment of another $2 billion and $15 billion to construct the gas transportation and storage infrastructure that would be required to support 33 GW of new gas generation capacity that would be required to firm up another 88 GW of wind generation (less than required for a 10% wind penetration). A high clean energy credit may encourage some to invest in infrastructure expansion, but it will not be able to overcome infrastructure shortages during the near or medium term.

Finally, penetration levels will be limited by policy makers' willingness to address some very difficult issues. For example, the growth of clean energy will be limited by the industry's ability to build the transmission infrastructure required to move power from wind, nuclear, or other large clean energy resources to load. It will be extraordinarily difficult for the industry to build that transmission unless policy makers are willing to address the tough questions of how that transmission is going to be planned and sited and how the costs of that transmission will be allocated. Those decisions will have significant financial implications for consumers in different parts of the country and there will be winners and losers however those issues are addressed.

Similarly, policy makers will have to decide how much cost they are willing to impose on consumers to support their clean energy policies. While an extraordinarily high price for clean energy credits may encourage high levels of investments in clean energy resources, those prices may not be politically sustainable. Spain, Germany, and other European countries that adopted feed-in tariffs to encourage renewable energy development – which guaranteed developers of renewable resources long-term profits on their investments – have found that those subsidies were "too" successful and imposed an unsustainably high burden on rate payers and tax payers in those countries. Similarly, several states in the US have had to reconsider the goals in their renewable portfolio standards because the cost of compliance was politically unacceptable.

- *How might a CES alter the current dispatch order of existing generation (such as natural gas-fired power plants), which has been driven by minimization of consumer costs, historically?*

It will be difficult to continue with an economic dispatch of generation resources in a world with a CES that is narrowly defined to preclude certain energy resources. However, the details of how the current dispatch may be reordered will be related to how the CES is designed. In a perfect world, it might seem that CES dispatch requirements could be met by simply decreasing output from non-CES compliant resources, and increasing the output from CES qualified resources. Unfortunately, it is not a perfect world even in the electric industry. The existing system is what it is, and we must approach a CES-type dispatch recognizing the legacy system limitations and the realities they represent. Also, it is important to note that some resources are not "dispatchable" absent major advances in battery storage technology. For example, Mother Nature determines when the wind blows and when the sun shines.

Background

As the question implies, the power system dispatch today is economically driven, i.e., the generators with the lowest operating (i.e., marginal) costs (capital costs don't directly figure into the dispatch equation) are dispatched first, and then the next lowest cost generator and so on as needed to serve load at any given level and point in time. Environmental factors are considered, but usually through an adjustment in the affected resource's marginal costs. In today's terminology, that economic dispatch order translates into "baseload generation" (units with the lowest marginal costs but least flexibility - usually nuclear and coal) dispatched first and at the highest output levels; then "intermediate generation" (the next cheapest units to operate but with some operating flexibility - some coal and gas resources) dispatched next at levels varying with load, and then "peaking generators" (usually the most expensive to operate but with the most flexibility - mostly gas "peaking" units) that usually operate on only a few of the highest peak load days of the year or for a few high peak hours of a particular day. Hydro resources are unique because they have very low marginal costs and are highly flexible in their operating characteristics, but have limited energy available. Some areas have very high capacity levels of hydro resources such as with BPA where hydro can be baseload generation. In most areas, however, hydropower is very limited. In these areas, hydro output is usually scheduled as available throughout an operating day to take advantage of its unique operating flexibility and to maximize its reliability and economic value to the system. This can be done to displace expensive peaking power, to follow changing load levels or to provide other ancillary services that help maintain system reliability, depending on how much hydro-power energy is available at any given time.

Resources that are even more difficult to schedule/dispatch because they are more variable (meaning their output levels vary somewhat unpredictably) in nature, such as wind and solar, are also treated differently in the typical dispatch lineup today. While the marginal cost of these types of resources is also usually low or zero, they have very limited flexibility and don't fit well in a dispatch schedule because:

- their availability at any given point in time is very hard to predict;
- the capacity output levels for these units is very hard to control; and
- they usually represent a small fraction of resource capacity available on most systems.

Thus, the energy output from these resources is usually accepted on as available/produced basis (referred to as "must run" resources), offsetting energy that would have been produced by other operating and usually more expensive (intermediate or peaking usually) resources to the extent necessary/possible and with minimal impact on the overall planned daily dispatch lineup. This is especially true in market regions with substantial levels of wind resources, where wind is almost always bid with a zero or negative price, and is taken into the system as it is produced. This allows the wind energy to be utilized in the market as it is produced, and compensated as a "price taker," meaning it will be paid the prevailing market price at the time of its production.

Because of this "must run" status for wind, it presents several economic and reliability challenges as its penetration levels increase. Since it operates with essentially a zero marginal cost, wind energy tends to drive down the overall cost of energy in the spot market below the level required for many generating resources (especially peaking units) to recover their fixed or capacity costs. Most of these units are needed on the system for their operating flexibility and contributions to reliability, but will receive fewer opportunities to be compensated in the markets due to increasing production from wind or other clean resources that may further drive down market prices in order to meet the clean energy standard. This presents a bit of a conundrum, as the variability nature of wind makes its capacity value low, while at the same time creating an increasing need for additional flexible capacity resources on the system to help compensate for that variability. Also, wind output levels tend to be greatest at night when load levels are usually low. Due to the lack of flexibility on most existing baseload generation, many of these units must remain online overnight to be available for morning load pickup. This means wind output must sometimes be curtailed in order to maintain reliability. This issue will become increasingly problematic as utilities try to meet clean energy requirements that may also create reliability issues.

As has been fairly well publicized, expanding wind and other clean resources present several challenges from the transmission perspective. They are often located far from load centers and the level of transmission congestion on the grid is already high. Dispatch algorithms must take into account the deliverability of resources and cannot plan reliably to dispatch resources if congestion could prevent them from reaching the loads that need them—even where those resources need to be dispatched for utilities to meet clean energy requirements. The system may need to dispatch units uneconomically in order to permit flows around congestion in a manner that maximizes the availability of clean energy resources notwithstanding the added costs it imposes on consumers or the added complexity it imposes on unit operations.

Therefore, it will be difficult to continue with an economic dispatch in a world with a CES. However, the details of how the dispatch will be impacted will obviously be related to how the CES is designed. For example, if the CES is designed with its primary objective to provide a set amount of energy from "clean resources," that would have to be factored into the dispatch equation, considering all of the resources' limitations and variability, transmission constraints, fuel costs, reliability requirements, etc. Depending on all of the types of resources available to a particular system, some possible impacts on the dispatch order by category could include:

- For baseload resources, if the system includes nuclear generation, its dispatch should not be directly impacted by a CES due to its low marginal costs and assuming it is classified as “clean.” If baseload resources include both coal and gas capacity, then gas would likely move ahead of coal production in dispatch order and substantially reduce or even eliminate baseload coal completely on some systems, depending on the price of gas and the assumption that gas is “cleaner” than coal. Also, if nuclear expansion becomes more feasible, then new nuclear (through up-rates or other) would help displace baseload coal even more quickly. If the system has no nuclear resources, then the question of whether a CES could be met with coal continuing operation as baseload capacity within CES limits will be difficult to determine on a general basis, remembering that system reliability must be maintained at all load levels.

- For intermediate generators, it is very likely that gas generation would quickly displace any coal capacity in dispatch merit order and maybe even completely if reliability requirements can be met without coal, and gas prices remain acceptable. These intermediate gas resources will be needed for the foreseeable future to provide the ongoing flexibility needed for reliability. Unless there are technology advances that allow some other type of CES-based resource to ultimately provide this flexibility, a CES must consider this issue.
- For peaking resources, gas is likely to remain the resource of choice due to the inherent low capital costs, fairly low marginal costs (at least at current gas prices) and the ability to install gas capacity quickly and in many different capacity increments to serve changing load levels.
- For renewable/intermittent resources, increasing amounts of this resource presents several operating/reliability challenges, as discussed above, that makes it difficult to determine the effect on overall dispatch order. The system flexibility currently provided by gas and coal units is needed even more to maintain reliability in a system with large and expanding amounts of renewable resources, and may limit the ability to meet CES requirements for some time. In addition, with wind output typically being highest at night, it will be a challenge to eliminate the non-CES resources until there is significant progress made in the areas of energy storage that helps wind be more “dispatchable” to better follow load.

Therefore, the dispatch order for a system under a CES may be very similar to today, at least in transition. Depending on the particular system considered, it could look something like nuclear first (if an option), then gas or coal (depending on the factors discussed above), then maybe (if still needed to serve load) some other coal, then others. Until renewable resources become more manageable, it is unlikely they could displace all the traditional resources (i.e., coal, gas) that are depended on to serve base load and match varying load requirements during the day. The energy from those CES resources will be utilized when available and reliable, changing the overall dispatch merit order slowly as the system evolves in a reliable way to a CES environment.

- *What is the expected electricity generation mix for a target of 80 percent clean energy by 2035, under the President's proposal or an alternative construct?*

In the end, meeting an 80% target while maintaining electric reliability and affordability will require a very wide portfolio of generation technologies as well as robust efficiency efforts at both the utility and end-user levels. Unless all of these are available within the time frame of a CES, it will be virtually impossible to meet an 80% goal. The Obama CES 80% proposal by 2035 requires a major restructuring of the entire electricity system in only 24 years assuming this is put in place by the end of 2011. The dramatic reduction in current fossil fuel generation and the subsequent requirements for new infrastructure to support the allowable electricity technologies in the Obama proposal will be extremely costly and create potential threats to electricity reliability.

<u>Background</u>

Renewables will play a major role in any clean energy plan, but they face challenges. These challenges are especially acute in the case of wind and solar. Absent major advances in energy storage, the intermittent nature of these resources will require firming backup, mainly from natural gas generation. Building transmission facilities to connect the wind resources of the Midwest and the solar resources of the Southwest to major population and demand centers also presents a major challenge that cannot be tackled unless the current patchwork of transmission permitting and regulation is streamlined to overcome NIMBY opposition and connect these resources to the grid. Other renewable technologies like biomass, landfill gas, geothermal, and heat recovery generation offer baseload capacity factors, but these technologies face locational and/or fuel constraints that prevent them from being deployed on a very large scale. It must be remembered that while non-hydro renewable generation technologies have enjoyed rapid growth in recent years, they still account for only about 3% of US generation. A more consistent and long term package of financial incentives will also be needed to continue renewable resource growth trends because renewable generation is still generally more expensive and less reliable than traditional sources of power.

Currently, nearly half of US electricity comes from coal fired power plants, providing vital baseload generation that keeps the entire electric grid stable. Furthermore, much of this capacity comes from older plants whose capital costs (except for more recent environmental upgrades) are already largely retired, making them the lowest-cost generation option in many regions. Meeting any clean energy standard, especially one requiring steady progress from year one, would necessitate the retirement of much of the existing coal fleet and its replacement by combined cycle natural gas (CCNG) plants, new nuclear plants, or fossil fuel plants with carbon capture and sequestration technology (CCS). The huge costs of retiring inexpensive generation and replacing it with new plants would create huge costs for utilities that would ultimately be borne by consumers and businesses. In the near term, CCNG plants are the only large-scale baseload generating option available, but since CCNG plants are only considered partially clean under the President's proposal, many of these new plants built in the early years of a CES program would need to be retired early to meet an 80% goal in 2035, creating significant additional costs. These challenges could be mitigated by retrofitting existing coal and gas plants with CCS technology, but at this point the technology is in a relatively early stage of development and current thinking is that it will be rare that any CCS equipment will be added as retrofits to current coal based generation plants. Government promotion of CCS RD&D and regulatory streamlining for its deployment are vital if this technology is to be available within the 2035 timeframe.

Nuclear power is already a proven technology providing one-fifth of total US electricity needs, but as with renewable resources and CCS, it will require a robust Federal commitment to promote the deployment of new nuclear plants. Besides regulatory support to cut down on the time needed to plan and build new plants, the government must be involved with new plant construction either through loan guarantees because the capital costs of these plants would otherwise be prohibitive to all but the largest utilities. The government can also assist in reviewing current and proposed designs to incorporate lessons learned from the recent earthquake/tsunami in Japan. If anything takes nuclear generation out of the mix, it will be impossible to meet a CES such as the one the President has proposed.

At the end of the day, any generation mix must also maintain the overriding imperative of maintaining reliable and affordable electric power. It must also be recognized that the mix will vary significantly by region based on starting points and resource availability. Any CES mandate would necessitate a major shift from the EIA baseline, which currently has the generation mix rising to only about 42.5% "clean" compared to 40% today under the White House's definitions. While it is possible to foresee some flexibility, for instance, with the role of natural gas, EPRI's Prism 2.0 model makes it clear that diversity is the key to achieving a low carbon generation mix.

Again, if one or more of these resources are not available, it is difficult to see how an ambitious target of 80% can be met. Furthermore, even assuming that all these hurdles are cleared, the costs of just constructing new generation to meet an 80% CES by 2035 would be substantial before even accounting for increased fuel costs, the cost of retiring fossil generation, and of building the transmission facilities necessary to accommodate renewable resources.

- *Could different crediting and requirements than those proposed by the President be more effective in deploying clean technologies?*

All existing and new clean technologies should qualify for credits. Clean technologies should include environmentally-favorable generation and efficiency investments.

There should be only one exception for treating all clean energy the same. In order to encourage advancements in technologies through research, development, and demonstration, utilities should get extra credits for any investment in RD&D. A RD&D project is defined as any project that has a legitimate research component that is recognized by the research community and submitted to DOE.

- *What are the anticipated effects on state and regional electricity prices of a CES structured according to the President's proposal? What are the anticipated net economic effects by region?*

It is important to note that the US is currently heading into an electric generation building cycle, so an increase in electric prices is already anticipated. A CES structured according to the President's proposal would put increasing cost pressure on electric prices. First, meeting a 80% CES would necessitate the rapid retirement of much of today's coal capacity, currently the low-cost generation option for much of the nation because these plants are older with much of their original capital costs retired and coal has (traditionally) been a comparatively inexpensive fuel due to abundant domestic supplies. Costs will be especially high if the interim targets are not matched to technological advances in CCS technologies that will allow much of this coal capacity to stay online.

Secondly, a CES will by design lead to the construction of new generation with a focus on low and zero emissions. While the use of natural gas already looks likely to grow rapidly, meeting an 80% goal will also require a rapid build-out of renewable resources (with associated transmission and firming backup), nuclear power plants whose estimated up-front capital costs have escalated, and CCS technology that currently does not commercially exist.

A CES would affect different regions in different ways. Those regions already containing significant carbon free generation (hydro and nuclear) are at a significantly better starting point than those regions that are largely reliant on coal generation, which would face huge technical and financial barriers just to catch up with the "cleaner" regions. Furthermore, not all regions in the country are equally endowed with renewable resources, or the infrastructure needed for significant new natural gas generation. Again, a very wide portfolio of technologies is necessary to allow significant carbon reductions in all regions, but the costs of retiring fossil fuel generation and building suitable low and no carbon generation will fall unevenly across regions.

- *Would other CES formulations or alternative policy proposals to meet a comparable level of clean energy deployment have better regional or net economic outcomes?*

Meeting any CES goals will require robust Federal involvement to subsidize more expensive or unproven technologies, guarantee the huge financing requirements for nuclear and CCS deployment, and ease permitting processes for efficiency improvements, new generation and transmission. As for improving regional outcomes, any CES plan should take regional variations into account when setting goals and in creating the widest possible range of low and no carbon technology options and carbon intensity reducing efficiency improvements. While a 40% clean baseline is the national average, any plan must recognize that significant variations do exist. Any policy should not create winners and losers based on decisions that were often made as long as 50 years ago based on completely different imperatives.

While a broad array of technologies is necessary to help deal with regional and utility differences, it is not enough. A utility level cost cap on consumer electricity prices is critical. The industry is already facing huge costs to upgrade an aging infrastructure and a growing demand for electricity. A CES adds still another layer of costs. There are a number of ways to address this problem. One of the most clean, direct and simple strategies to address this problem is to establish a consumer cost cap.

- *How might various price levels for the ACP affect the deployment of clean energy technologies?*

We do not support establishing different ACPs for different energy technologies because it is only choosing winners and losers at the federal level. Policy makers will have to decide how much cost they are willing to impose on consumers to support their clean energy policies. While an extraordinarily high price ACP may encourage high levels of investments in clean energy resources, the costs consumers incur for those resources may not be politically sustainable. Spain, Germany, and other European countries that adopted feed-in tariffs to encourage renewable energy development – which guaranteed developers of renewable resources long-term profits on their investments – have found that those subsidies were "too" successful and imposed an unsustainably high burden on rate payers and tax payers in those countries. Similarly, several states in the US have had to reconsider the goals in their renewable portfolio standards because the cost of compliance was politically unacceptable.

For illustrative purposes, assuming that Congress is not concerned about consumer electricity cost caps, the ACP will act as a cap on the price that utilities will be willing to pay for clean energy credits to comply with the clean energy standard.

Higher ACPs, may therefore lead to the development of more clean energy resources, as the market will support development of resources further up the supply cost curve, for example wind farms located in areas with less wind or located further from transmission.

Unless different ACPs are established for different clean energy resources, however, the level of the ACP is unlikely to affect the level of investment in the most expensive clean energy resources. Neither the clean energy standard nor the ACP will reduce the disparity in cost between different resources so the most attractive resources today will remain the most attractive resources under the clean energy standard unless there are significant technological advancements for high-cost alternatives, or the clean energy requirement is so expansive and the ACP is so high as to overcome the substantial price disparities between different clean energy resources. For a clean energy standard to encourage the development of large quantities of rooftop solar energy, for example, the ACP would have to be set at over 30 cents/kWh and the targets would have to be so high as to drive utilities to develop every clean energy resource that costs less than that.

In any event, there are limits on the extent to which higher prices for clean energy credit can impact investment decisions. There are some limitations on clean energy investment that are not driven directly by price. For example, penetration levels may be limited by manufacturing capacity. There is only one manufacturer in the world that can produce nuclear containment vessels. It will take years for that capacity to expand significantly. Penetration levels will be limited by restrictions on installation capacity. There are only so many qualified solar installers, nuclear-rated welders, and large cranes for raising wind turbines and it will take time to expand that capacity as well. A high ACP may encourage some manufacturers to consider expanding

their capacity, but will not be able to overcome shortages in manufacturing capacity during the near or medium term.

Penetration levels will also be limited by the ability to integrate the new resources into the grid. Several studies performed by the National Renewable Energy Laboratories and others have confirmed that 30% wind penetration levels, for example, would require the construction of approximately $100 billion in new transmission capacity. In fact, according to Navigant, a 5% penetration level in the Eastern Interconnect would require nearly as much transmission capacity as a 25% penetration level. To plan, site, and build that much transmission would require a minimum of 16 years and could take much longer if significant public policy barriers are not addressed or if the public objects to the massive expansion of the transmission grid. As Texas has seen, high levels of interest in wind cannot increase the total number of MWH of wind beyond a certain point until the transmission infrastructure is in place to deliver it to load.

Furthermore, a study performed by ICF International for the INGAA Foundation explains that it would require an investment of another $2 billion and $15 billion to construct the gas transportation and storage infrastructure that would be required to support 33 GW of new gas generation capacity that would be required to firm up another 88 GW of wind generation (less than required for a 10% wind penetration). A high ACP may encourage some to invest in infrastructure expansion, but will not be able to overcome infrastructure shortages during the near or medium term.

Finally, penetration levels will be limited by policy makers' willingness to address some very difficult issues. For example, the growth of clean energy will be limited by the industry's ability to build the transmission infrastructure required to move power from wind, nuclear, or other large clean energy resources to load. It will be extraordinarily difficult for the industry to build that transmission unless policy makers are willing to address the tough questions of how that transmission is going to be planned and sited and how the costs of that transmission will be allocated. Those decisions will have significant financial implications for consumers in different parts of the country and there will be winners and losers however those issues are addressed.

- *What options are available to mitigate regional disparities and contain costs of the policy?*

While a broad array of technologies is necessary to help deal with regional and utility differences, it is not enough. A utility level cost cap on consumer electricity prices is critical. The industry is already facing huge costs to upgrade an aging infrastructure and a growing demand for electricity. A CES adds still another layer of costs. There are a number of ways to address this problem. One of the most clean, direct and simple strategies to address this problem is to establish a consumer cost cap. A robust banking and borrowing system for clean energy credits would also increase flexibility for utilities in regions where clean energy resources are more constrained.

In addition, we believe that a low Alternative Compliance Payment (ACP) is the most effective and administrable form of a cost cap. Clearly, the lower the ACP, the less consumers would be impacted by costs associated with a clean energy mandate.

- *What are the possible uses for potential ACP revenues? Should such revenues be used to support compliance with the standard's requirements? Should all or a portion of the collected ACP revenues go back to the state from which they were collected? Should ACP revenues be used to mitigate any increased electricity costs to the consumer that may be associated with the CES?*

No ACP should be paid to any federal or state government. The funds should be segregated at the electric utility level, and the electric utility should spend the funds on eligible technologies. This will help address regional differences.

- *Should cost containment measures and other consumer price protections be included in a CES?*

Yes.

While a broad array of technologies is necessary to help deal with regional and utility differences, it is not enough. A utility level cost cap on consumer electricity prices is critical. The industry is already facing huge costs to upgrade an aging infrastructure and a growing demand for electricity. A CES adds still another layer of costs. There are a number of ways to address this problem. One of the most clean, direct and simple strategies to address this problem is to establish a consumer cost cap trigger.

In addition, we believe that a low Alternative Compliance Payment (ACP) is the most effective and administrable form of a cost cap. Clearly, the lower the ACP, the less consumers would be impacted by costs associated with a clean energy mandate.

- *How much new transmission will be needed to meet a CES along the lines of the President's proposal and how should those transmission costs be allocated?*

In order to "ensure price certainty for consumers and industry, minimize regional disparities and the cost of such a policy, and contain cost overall" the true cost and benefits of each clean energy technology must be well understood---much as it is for well established conventional power generation technologies such as coal, natural gas and nuclear. As the introduction to question 5 properly recognizes, there is often significant regional variability to the availability of many CE resources, particularly renewable CE technologies. Onshore wind generation, for instance, is highly concentrated in the nation's heartland, so much so that for wind generation to play an important part in achieving the President's goals, electricity generated by wind must be transmitted from those areas to the nation's load centers.

The size of the investment in just the high voltage transmission lines needed to accomplish a 25-30% penetration of wind energy has been studied by the National Renewable Energy Laboratory (NREL) for both the Eastern and Western Electricity Interconnections, and according to these federal studies the cost is very high---some $100 billion dollars for the high voltage transmission portion alone. These studies show the need to build some 15,000-20,000-plus miles of such transmission to move the wind power from where it is to where the electrical energy produced will be used. A formidable siting, construction and investment task, indeed given the cost and frequent regulatory and public opposition to the construction of major transmission lines.

If wind generation is to provide some 25% of the President's goal – approximately 1,000Twhr, the Electric Power Research Institute (EPRI) has estimated the cost at approximately $650 billion dollars for some 175,000 wind turbines, not including the cost of firming the intermittent wind generation with rapid start natural gas fired combustion turbines or some other technology. If you assume the National Renewable Energy Laboratory (NREL) studies of high voltage transmission needs are approximately correct, and noting that the corresponding lower voltage system components necessary to coordinate reliably with the high voltage system have not yet been studied, the principal questions of achieving this level of clean wind generation become; 1) can we site, build and operate the high voltage transmission needed in time to meet the Presidents challenge---estimated by Navigant Consulting at 16 years minimum, and 2) who pays for the $100 billion plus investment in transmission needed, i.e., how will those costs, and the costs imposed on the underneath lower voltage transmission, be identified and allocated.

Cooperatives believe that the cost allocation for high voltage transmission facilities needed to support renewable energy generation should take into consideration specific and measurable economic and reliability benefits of those entities paying such costs. In addition, cooperatives believe that high voltage transmission should not be restricted to renewable resources only, and should encourage all forms of economic and cost-affordable generation for cooperative members and the public at large.

- *Are there any technological impediments to the addition of significantly increased renewable electricity generation into the electrical grid?*

If the technology question is do wind generators work, the obvious answer is yes. If the question is can the grid handle one or a hundred or even a thousand wind generators, the answer is yes. However if the question is what we believe it is---can utilities cost-effectively and reliably integrate sufficient wind generators to supply 25-30% of the nations electric energy needs---175, 000 or more wind generators, we believe the answer is no one knows yet.

Having said that, it should be noted at the outset that many electric cooperative service areas are in the "Saudi Arabian" portions of America's wind heartland. Thus it is not surprising that these electric cooperatives have contracted for and/or built, own and operate more than 2700 megawatts of wind generation. Simply put, these cooperatives believe that wind is a significant resource for electric cooperatives and their rural consumers, and by signing contracts for and investing in wind generation they are learning as they go on how to operate wind reliably and effectively, and its true costs and benefits. In fact, Minnkota Power Cooperative uses wind power to supply more than 30% of its customers' electricity needs.

We know at this point that even the best wind studies done to-date have not looked at important electric grid operating issues (e.g. voltage control and stability), or have made heroic assumptions about what the grid will look like in 20 years (e.g. consolidated balancing areas and massive investments in high voltage transmission), or leave open many very important questions that the industry itself cannot yet answer (e.g. cost/reliability/environmental impact of cycling the existing conventional generation fleet). We believe that no one knows all that policy makers, investors and consumers need to know to make rational decisions about how much variable generation to require or to build to ensure the resulting cost to consumers and the economy is appropriate.

In an effort to understand these issues better, NRECA, with the support of DOE, led an industry-wide meeting of electric system operators and planners from around the nation in order to both define what is unknown and to develop research priorities to obtain the missing data on the cost and the best methods to integrate variable resources into the electric grid. The specific categories of unknowns, not necessarily in order of priority, include issues related to: short term stability reliability; dispatchable generation flexibility; appropriate level of reserves and ancillary services; the impact of rapid cycling on cost, life and the environmental foot print of existing dispatchable generation; the tools for grid operators and planners for variable generation, and, the all-in cost and value of variable generation.

It is NRECA's opinion that these issues must be fully understood prior to investing hundreds and hundreds of billions of dollars in variable resources that, if done incorrectly, could dramatically escalate cost and degrade reliability. Cooperatives are investing in and operating wind generation to better understand these issues. Of course technological advancements that allow cost-effective storage could turn intermittent resources into dispatchable resources helping to resolve the above issues.

- *What are the costs associated with replacing or retrofitting certain assets within the existing generation fleet in order to meet a CES?*

The costs for all generating technologies have been rising rapidly over the last several years. Though the recession caused a dip in prices, recovery is expected to restore the paradigm of rising costs due to increasing international competition for materials and capital goods. Many major producers of electric equipment have shifted their focus towards rapidly growing markets in developing countries, especially China and India, where electricity demand is growing much faster than in the United States. Unlike developing countries where all of the investments finance the construction of new plants, a CES that is problematic will result in stranded investments and additional costs for electric utilities to replace those investments.

Combined cycle natural gas plants are, in general, the most affordable and proven technology providing the benefit of high (baseload) capacity factors and lower capital costs, though historically natural gas prices have been both higher and more volatile than coal. While US natural gas resources have grown rapidly in recent years, due to new drilling methods, a large scale shift towards natural gas in the utility sector (and possibly in transportation) would naturally lead to higher fuel prices.

While renewable resource generation, such as wind and solar, enjoy the benefit of no or lower fuel costs, they face high up-front capital costs and often incorporate low and intermittent capacity factors, requiring backup firming generation (most often natural gas) to ensure reliability. Since no new nuclear plants have been constructed in the United States in decades, capacity costs are more uncertain, but estimates have been growing quickly and would be a financing challenge for even the largest utilities without robust Federal guarantees, subsidies, or direct construction.

Carbon capture and sequestration technology costs are even more speculative, but would place a very large premium over conventional fossil generation costs while reducing capacity factors by 10-40% because much of a plant's output will be used on site to run a CCS system. Finally, it must be remembered that much of this generation will be replacing existing coal plants which sit at the bottom of the dispatch curve of reliable baseload generation resources because low fuel costs and low capital costs (their original capital costs have been largely retired). Current thinking is that it will be rare that any CCS will be added as retrofits to current coal based generation plants, but the cost of retiring these plants and replacing them with newly-financed generation will be very high.

- *What level of asset retirements from within the existing generation fleet are anticipated as a result of a CES?*

The level of asset retirements that could be anticipated from a CES largely depends on the structure and definition of the CES. Specifically, an end goal and date with mandatory interim requirements would likely result in a higher percentage of earlier unit retirements than would be expected without interim milestones. The specific CES definition and whether the definition is ratcheted downward over time, however, would largely dictate the overall level of asset retirements.

- *To what extent does a CES contribute to the overall climate change policy of the United States, and would enactment of a CES warrant changes to other, relevant statutes?*

As previously mentioned in our response to question 5, the CES definition and whether a CES is ratcheted over time would significantly determine its effects on maintaining existing generation. The more stringent a CES and the more directed at mitigating GHG emissions the more it would affect climate policy.

Any CES along the lines of the President's proposal would result in emissions reductions, and in this light changes to the Clean Air Act (CAA) are certainly warranted to foster efficiency improvements in generation that would result in such reductions. EPA could, but has not yet done so, change its current interpretation of the CAA new source review (NSR) provision on "routine maintenance" that would allow generating unit components to be replaced with ones having more modern engineering designs that would result in significant increases in generating unit efficiencies, thereby reducing air emissions including CO_2. Any utility incorporating such modern replacements in today's regulatory environment faces likely enforcement action from the agency. With EPA's continued failure to make this sensible interpretive change to its NSR policy, a statutory amendment would be warranted.

In a broader context, a CES geared towards economic reductions and constructed in an appropriate manner could serve as a substitute mandate for many existing CAA provisions directed towards generation of electricity that result in very costly applications across the utility sector. In fact, a well thought out CES may justify eliminating the many existing clumsy regulations that address the same emissions as the CES.

- *What are the specific challenges facing individual technologies such as nuclear, natural gas, CCS, on- and offshore wind, solar, efficiency, biomass, and others?*

Coal – This resource is the most abundant natural resource in the U.S. Currently 47% of the nation's electricity is derived from coal; for rural electric cooperatives, it is 65%. Coal derived electricity is the lowest cost electricity other than hydro and is used for the many base loaded U.S. power plants. Abundant fuel with low cost energy should not be overlooked when trying to meet future energy needs. Coal fired power plants meet all current emission regulations, but do emit more CO_2 than natural gas, nuclear and renewable generation. The nation has spent years and invested billions of dollars in reducing stack emissions, including CO_2.

DOE has provided a loan guarantee to FutureGen for a near zero carbon emission power plant that will capture and store CO_2 in deep underground saline water reservoirs. DOE has also provided funding to investigate different types of CO_2 underground storage in 9 different regions of the US.

A highly efficient, advanced design pulverized coal power plant with carbon capture and storage should be able to meet the criteria for a CES . The added equipment necessary to meet this standard will add considerably to the initial cost as well as the operating cost. EIA estimates are that such a plant will cost about 60% more than one without CO_2 capture, will be 40% less efficient and the operating cost will more than double.

The nation has a large existing fleet of coal fired units. Many will shut down rather than spend the large amount of dollars necessary to meet near and long term air regulations. Including CCS as a CES-eligible technology may contribute to additional coal fired units being constructed in the future. However, the biggest barriers at the moment are the added cost and lower efficiencies as well as storage liabilities that are part of the CCS technology. It is expected that natural gas fired units will be utilized to pick up the slack as the smaller, older coal units are shut down.

Natural Gas – The efficiency of gas turbines and combined cycle power plants has greatly increased over the past 10 years. These units represent the lowest capital cost of fossil fuel projects and can be ordered and installed in much less time than coal or nuclear units. Gas turbines are used primarily for meeting peak loads, while combined cycle units can meet base or intermediate loads.

For decades, the major concern with using these technologies has been the volatile cost of natural gas. In the 1970's, the fear of natural gas shortages led the government to pass the Fuel Use Act which stated that no new gas units could be installed, and that existing units would have to be shut down in the future. Since electric cooperatives were building electricity generation in that period, our industry was prohibited from building natural gas plants, and electric cooperatives were forced to build coal-fired generation.

Finding more natural gas led to the cancelling of that law. Natural gas prices continued to fluctuate, at times being as low as $3 per million Btu and going as high as $13 per million Btu. When natural gas prices are as high as $13, gas units run only when emergencies arise, and not on a daily basis.

New drilling technology has seemed to open the US to the ability to recover additional quantities of natural gas, although that is being challenged in some areas as being environmentally harmful. With today's cost of gas (varying between $3 and $4), a natural gas fired combined cycle unit is the cheapest form of new generation, averaging about 5 cents/kWh. A combined cycle unit with carbon capture and storage would raise the cost about 40%. Including gas fired units in the CES would definitely help this technology.

<u>Nuclear</u> – There are currently 104 nuclear power plants operating in the US and two others under construction. There are 4 new units with on-site construction awaiting a combined construction-operating permit. (Note the construction is limited to site work and not nuclear reactor construction, which will not occur until there is a license). There are as many as 20 other nuclear units that are in some phase of review for future construction.

In addition, there is a lot of interest in the new small modular reactor designs. One large electric utility is working with a manufacturer to submit a construction permit request by 2012. The newer, more advanced reactors are inherently safer than those using an older design: having fewer moving parts, depending on gravity and natural circulation rather than pumps and valves. The smaller units would be built in factories and shipped to the site for installation; the reactor being underground for added safety.

Construction time is lengthy, and licensing time is added on top of this, so regulatory approval streamlining is important to reduce the time needed to build new plants. The government can also assist in reviewing current and proposed designs to incorporate lessons learned from the recent earthquake/tsunami in Japan. If anything takes nuclear generation out of the mix, it will be impossible to meet a CES such as the President has proposed.

<u>Renewables</u> – Renewables are a sustainable resource, and an increasing part of our nation's energy mix. Renewables can be utilized when available and cost-effective, but there are certain drawbacks. Most renewables, such as wind and solar, are not dispatchable. That is, they are good sources of energy when the wind is blowing or the sun is shining. Wind and solar have low capacity factors limiting the amount of energy generated, and the resources may not be available when needed, such as during system peaks. For example, on a hot summer day with all of the air conditioners turned on and a grid system peaking, there is usually no wind, and hence no wind generation.

Renewable energy is also not low cost energy. On shore wind costs about 30% more than combined cycle unit and 20% higher than a coal unit excluding the significant cost of ancillary services needed to firm the resource. Off shore wind, while more available, is even more expensive. One form of renewable electricity that is base loaded and can compete economically with coal is biomass. However, fuel supplies are limited and there are concerns over the future price of this fuel.

<u>Efficiency</u> – This activity should certainly be included as a clean energy resource under a CES. While some may argue whether it is a fuel, no one can argue the virtue of saving energy through more efficient use. More efficient homes and appliances should result in less needed generation and hence fewer environmental impacts. There are studies, however, which have shown that in spite of more efficient appliances and homes, residential use of electricity

continues to increase because consumers have more appliances. Nevertheless, efficiency should be encouraged for both the utilities and the customers.

DOE energy appliance efficiency standards have resulted in much more efficiency by the users. There are many programs rewarding customers for increasing efficiencies in their homes and businesses. Up front investment costs are the most significant barriers to additional consumer-based efficiency. To help overcome this, we proposed the Rural Energy Savings Program Act (RESPA) in the 111th Congress, which would promote investments and improvements in energy efficiency by providing rural electric cooperatives access to low-interest loans through USDA's Rural Utilities Service. There are barriers, however, to increasing efficiencies for coal generators, such as EPA's New Source Review, that must be addressed.

- *Will the enactment of a CES be sufficient for each technology to overcome its individual challenges?*

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- *Should there be an examination of energy-connected permitting?*

Currently, a fractured unaligned federal, state and local permitting process for such things as siting and for environmental purposes is increasing costs to getting critical new electricity infrastructure built. Meeting a CES will require that this problem be addressed by legislation to force regulations into alignment. The schedule of CES retail requirements should account for the time it will take to align the permitting process. For example, the misalignment for transmission needing to cross BLM and federal forestry lands can take nearly a decade to resolve as evidenced by the current problems in western states.

An "off ramp" that can be administered and that does not raise retail utility costs must be part of the process to address cases where permitting delays for prudent projects have not allowed retail utilities to meet their CES requirements. In these cases, utilities must have relief in both the CES percentage requirements and be allowed to document the amount of the alternative minimum paymnt that would be owed, and utilities must be permitted to use those resources to make prudent clean energy investments in the future instead of paying the tax to the government.

Implementation of a CES would necessitate streamlining or altering the environmental regulatory permitting process whether or not the CES addresses the emissions or pollutants addressed by the required permits. The rationale for permit examination and consideration of changes would be two-fold. First, a CES by definition is clean and addressing the same emission or pollutant in a separate permitting process would be redundant, time consuming and costly. Second, existing permitting requirements could include conflicting policies with a CES, making compliance with both difficult.

As an example of the latter, we cite the problems associated with the Clean Air Act (CAA) permitting program under the new source review (NSR) provisions. Should a CES require a physical or operational change at an existing facility to meet its requirements, such as a new pollution control device or a component part replacement with a more efficient one, the likelihood that the change would trigger concerns of an NSR violation would be high. On the one hand, the courts have determined that installations of pollution control devices are not exempt from NSR review. We point out here that such devices decrease the overall facility efficiency thereby increasing greenhouse gas emissions, so an NSR trigger is quite possible. Making the situation worse, EPA interprets facility component parts replacements as potential NSR "major modifications," and not NSR exempt "routine maintenance," again raising NSR concerns and effective barriers to an effective CES. These examples point to the necessity of reviewing the existing permit requirements with an emphasis towards updating and streamlining them to achieve a workable CES.

Whether permitting a generating unit that underwent a "major modification" or a new unit under the CAA NSR program, the process itself is time consuming and uncertain. The inclusion and determination of best available control technology (BACT) in NSR permitting adds considerable uncertainty and cost to the NSR process and should be eliminated for any emissions that is addressed by the CES.

- *Are there specific supporting policy options that should be considered for coal, nuclear, natural gas, renewable energy, and efficiency?*

In the 111th Congress, we proposed the Rural Energy Savings Program Act (RESPA), which would promote investments and improvements in energy efficiency by providing rural electric cooperatives access to low-interest loans through USDA's Rural Utilities Service.

Any CES must include policy options to promote the viability of carbon capture and storage (CCS). Presently, CCS is not a commercialized technology today but must be a viable option in the near to mid-term under a CES mandate. To effectuate this effort, federal policy must address the two major obstacles. CCS must be technology demonstrated and commercially capable, where now it is not. Second, legal liability obstacles that thwart viable commercial implementation must be overcome.

At least five to ten full scale CCS projects must be completed and in operation for at least five years for CCS to be considered commercialized. This simply will not happen without additional federal financial support through both appropriations and tax incentives, in a manner equitable for electric generators, shareholder-owned electric utilities, not-for-profit utilities and other industries that could advance CCS deployment.

To facilitate full scale demonstrations within a reasonable period of time, expedited processes to complete National Environmental Policy Act (NEPA) reviews and to acquire necessary permits must be developed. Additionally, for CCS to become a realistic option to achieving a CES goal, both demonstration and commercialization phases must incorporate liability and stewardship regimes in which the federal government will assume a partnership role with CCS project owners and operators related to the disposition of captured carbon.

Legal liability should be addressed under a simple and clear regime, rather than multiple liability regimes arising from various state and federal statutes and common law. Federal liability regimes such as the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the burdensome hazardous waste regulatory structure of the Resource Conservation and Recovery Act (RCRA) should not apply to the various stages of CCS.

CERCLA applies joint, strict, several, and retroactive liability for releases of hazardous materials. RCRA's regulatory program applies to treatment, storage, and disposal of hazardous wastes. Neither CERCLA's liability scheme for hazardous materials, nor RCRA's waste regulatory regime, is appropriate to regulate or impose liability with respect to CO_2 and CCS. CO_2 is a ubiquitous, high-volume emission with low potential for toxicity. There is no need to regulate CCS under CERCLA or RCRA provisions.

As discussed in several other answers to white paper questions, significant energy efficiency gains are available through replacing numerous coal-fired generating unit components with more modern and better designed ones. EPA's current policies, however, under the Clean Air Act (CAA) new source review (NSR) program prevent the effective consideration of many of these technical options because these types of replacements are considered "major modifications" and thus NSR violations. Efficiency gains estimated to over five percent for the coal-fired fleet, with a corresponding reduction in air emissions, could be effectuated if EPA would change this policy that is not dictated by the CAA statute. Absent this policy change by the agency, the CAA could be amended to override EPA NSR policy interpretation.