AN ILLUSTRATIVE FRAMEWORK FOR A CLEAN ENERGY STANDARD FOR THE POWER SECTOR

by

Center for Climate and Energy Solutions

CENTER FOR CLIMATE AND ENERGY SOLUTIONS

November 2011

This paper describes an illustrative framework for a federal clean energy standard (CES) for the electricity sector. A CES is a type of electricity portfolio standard. Electricity portfolio standards are flexible, market-based policies that typically set requirements for the percentage of electricity that must be supplied from qualified energy resources—requiring, for example, that by 2025, 25 percent of electricity sales must be met with electricity generated from renewable sources (e.g., wind, solar, geothermal). Thirty-one states and the District of Columbia have already enacted some type of electricity portfolio standard, and members of Congress have several times proposed federal electricity portfolio standards.[1]

A CES FRAMEWORK

The CES framework described in this paper is intended to illustrate how policymakers could balance the various objectives and interests associated with a federal CES, whether in the way described in this paper or in any number of other ways.

AN ILLUSTRATIVE CES FRAMEWORK

Table 1 below presents the key CES policy design questions and considerations that policymakers face in choosing relevant CES policy parameters, as well as an illustrative framework that addresses these design choices, and the rationales that explain the approach illustrated. The various policy design choices in the illustrative CES framework should be considered together as a whole, as they are interrelated.

In addition to the CES policy outlined in Table 1 below, Discussion of Select Issues Related to the CES Framework describes some key CES design issues as well as policies that can complement a federal CES to more effectively drive clean energy technology innovation and deployment.

Note that certain numeric values are bracketed. These bracketed values are suggestions and can be refined based on additional analysis or deliberation. In addition, for the “Eligible Clean Energy Resources” policy design parameter, the proposal includes two alternatives.

TABLE 1: Illustrative Federal CES Framework

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
CES Point of Regulation	Administrative complexity and burden Cost-effective incentives for clean energy deployment, energy efficiency, and GHG emission reduction Ease of crediting both supply-and demand-side compliance	CES is an electricity portfolio standard with a point of regulation at (compliance obligation on) electric utilities[2]	The electricity portfolio standard approach is already demonstrated in a majority of states and well known among federal policymakers in light of multiple federal renewable and clean energy standard bills. Putting the point of regulation on electricity generators, rather than on utilities, would ultimately leave certain generators with no compliance options but to buy credits or shut down.[3]

TABLE 1: Illustrative Federal CES Framework (continued)

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
CES Coverage	Administrative complexity and burden Dilution of the effective CES target by exempting certain utilities Fairness with respect to impacts on different electricity consumers Compliance options available to smaller utilities	All electric utilities regardless of size or ownership	The inherent compliance flexibility and cost-effectiveness of a market-based CES program and the inclusion of non-renewable energy sources and efficiency as compliance options mean that electric utilities of any size in any location have readily available compliance options. Exempting certain electric utilities based on size or ownership unfairly shifts the cost of achieving a national clean energy goal onto a subset of electricity consumers. Covering all electric utilities does increase the administrative complexity of a federal CES as a much larger number of entities must comply, but experience with similar programs indicates that this is manageable (see Appendix A.3 in "Clean Energy Standards: State and Federal Policy Options and Implications").[4]

TABLE 1: Illustrative Federal CES Framework (continued)

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
Eligible Clean Energy Resources (Option A – Technology-focused definition of "clean energy")	Direct and lifecycle air emissions from different technologies Trade-off between promoting near-term deployment of more cost-effective clean energy technologies and accelerating the deployment of less mature technologies Improving the environmental and public health profile of electricity generation based on multiple criteria Distribution of costs and benefits—e.g., the potential for wealth transfers and windfall profits	Full credits for renewables, as defined in Sec. 132 of the American Clean Energy Leadership Act of 2009 (S.1462) from the 111th Congress—e.g., with respect to crediting both existing and new renewables for the most part but only incremental hydropower, and with respect to the definition of biomass[5] New and incremental nuclear power Partial credits for fossil fuel use coupled with carbon capture and storage (CCS) as a function of net CO_2 emissions rate Partial credits for new and incremental natural gas generation that is below an emissions threshold of [800 lbs CO_2/MWh] with the total credits available for such natural gas generation in any given year limited in order to spur coal-to-gas fuel switching without disadvantaging other clean energy technologies. Where [800] lbs CO_2/MWh is roughly the emission rate of a new natural gas combined cycle (NGCC) plant.	CES provides at least some financial incentive for all new generation that can lower power-sector GHG emissions below the "business-as-usual" trajectory. Concerns about biomass and hydropower addressed by adopting definitions from 2009 Senate renewable electricity standard. Incentive for NGCC generation limited to supporting the displacement of older, less efficient coal generation that would not otherwise have occurred. No credits directly issued to non-incremental hydropower and nuclear generation to avoid rewarding activities that do not provide any additional clean energy generation.
Eligible Clean Energy Resources (Option B – Emissions-focused definition of "clean energy")		Credits available for all generation save for non-incremental generation from nuclear, hydropower, and fossil fueled units. Credits awarded based on the following formula for a generator with an emissions rate of X lbs CO_2/MWh: (Credits / MWh) = 1 – (X lbs CO_2/MWh)/([1,700] lbs CO_2/MWh) Where [1,700] lbs CO_2/MWh is roughly the emission rate of a new supercritical coal-fired power plant.	CES provides financial incentive for any new generator that can lower power-sector GHG emissions below the "business-as-usual" trajectory, and for some existing generators, and the financial incentive is proportional to the degree of CO_2-intensity reduction. A CO_2-intensity metric for eligibility and partial crediting puts all lower-carbon resources on a level playing field.

TABLE 1: Illustrative Federal CES Framework (continued)

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
Credits for Electricity Savings from Energy Efficiency	Energy efficiency is often the lowest-cost option for clean energy (counting avoided use, or "negawatts") Challenges in measuring and verifying electricity savings Trade-off between promoting cost-effective GHG emission reductions and accelerating the deployment of less mature technologies	Credits issued for demonstrated electricity savings from utility energy efficiency programs (i.e., customer end-use electricity savings), and industrial efficiency, including new combined heat and power systems. 1 MWh of electricity savings earns (1- (CES % requirement)) credits. Credits for electricity savings are neither tradable outside the state where the electricity savings occurred nor bankable. Credits for electricity savings can be used to meet up to [25%] of an electric utility's compliance obligation.	Energy efficiency is included in a CES in recognition of its status as a low-cost clean energy option. The ability to directly comply via electricity savings is limited owing to concerns over measurement and verification and the policy goal of spurring new clean energy technology deployment. Demonstrated electricity savings earn less than 1 credit per MWh in order to correctly account for the differential impact of electricity savings versus non-emitting generation.
Base Quantity of Electricity Sales	Minimization of regional disparities	The base quantity of electricity sales to which the CES percentage requirement applies is equal to total annual electricity sales to end-use customers excluding non-incremental nuclear and hydropower generation.	Excluding existing nuclear and hydropower from the base quantity provides credit indirectly for these clean energy sources without risking windfall profits.

TABLE 1: Illustrative Federal CES Framework (continued)

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
Targets and Timetable	Increase in clean energy compared to "business as usual" Achievability and cost Minimization of regional disparities	Year / Total Clean Energy Goal / CES Requirement as % of base quantity 2013 / 43% / 11% 2015 / 47% / 15% 2020 / 55% / 28% 2025 / 63% / 41% 2030 / 72% / 52% 2035 / 80% / 64% The CES program administrator shall periodically (every [5] years) adjust future CES percentage requirements in light of any unanticipated reductions in generation from existing clean energy facilities to ensure that the total clean energy goals are met.	Clean energy targets are generally consistent with expected power-sector generation mix under recent proposals for comprehensive climate and energy legislation. Actual CES percentage requirement is a function of the total clean energy goal, the definition of the base quantity of electricity sales, and the treatment of existing clean energy facilities. Linear ramp up of CES targets is achievable in light of historical clean energy deployment rates and compliance flexibility from trading, banking/borrowing, and alternative compliance payment (ACP).
Banking and Borrowing	Compliance flexibility and cost containment Achievement of clean energy deployment beyond "business as usual" Risks associated with excessive credit borrowing	Unlimited banking Limited borrowing ([3] years into the future) with "interest" against future clean energy credit streams from facilities that are under construction.	Banking provides temporal compliance flexibility and lower compliance costs without sacrificing policy goals. Borrowing similarly provides compliance flexibility and improves cost-effectiveness but should be limited to avoid excessive borrowing that puts pressure on policymakers to forgive debts.

TABLE 1: Illustrative Federal CES Framework (continued)

POLICY DESIGN	CONSIDERATIONS	ILLUSTRATIVE CES FRAMEWORK	RATIONALE
Alternative Compliance Payment (ACP)	Trade-offs between cost containment and clean energy deployment and emission reductions	In lieu of clean energy credits, electric utilities can comply by making alternative compliance payments in an amount equal to [$35/MWh] in 2012 and rising at the rate of inflation plus [5%]. ACP revenues shall be made available to the states whose ratepayers provided them for use in furtherance of the goals of the CES—e.g., clean energy research, development, demonstration, and deployment – as well as offsetting electricity costs for ratepayers – e.g., energy intensive, trade exposed (EITE) industries and low-income households.	ACP that increases in real terms provides protection against excessive costs but allows credit prices to increase over time as the CES target becomes more ambitious. ACP revenues are used for the benefit of the states whose ratepayers paid them.
Treatment of Existing State Programs	States' ability to set state clean energy requirements States' ability to affect national clean energy requirements (i.e., additionality of state clean energy requirements) States' ability to define qualified clean energy under federal program Avoidance of "double-counting" of clean MWhs Administrative complexity and burden	Federal CES is a separate and distinct program from state electricity portfolio standards. Qualified clean energy facilities can earn both federal and state credits for meeting separate compliance obligations. Appropriate compliance credit granted to electric utilities for payments made to state programs (i.e., state RPS ACP payments and central procurement state RPSs (e.g., NY)).[6]	Federal CES does not preempt any state programs. Federal CES sets the goal and requirement for aggregate national clean energy generation, and Congress defines what counts as clean energy for the purposes of this goal. States retain authority to operate and implement their own programs that can change the share of national clean energy generation and associated benefits achieved within their own borders. Double-counting of MWhs toward compliance with the federal requirement is avoided.

DISCUSSION OF SELECT ISSUES RELATED TO THE CES FRAMEWORK

Certain CES policy design issues related to the CES framework above warrant particular mention, and these are explored in more detail in this section. Note that the issues below highlight the need for more sophisticated modeling analyses of potential CES policies to inform policymakers and other stakeholders about the implications of and trade-offs among various CES design options as they develop the details of a CES policy.[7]

QUANTIFYING BASE QUANTITY

The assumption underpinning the framework described in this paper is that, if a CES sets uniform percentage requirements for all electric utilities, policymakers should provide CECs only to qualified clean energy generation while excluding non-incremental nuclear and hydropower generation from the base quantity of electricity sales. This approach can minimize the risk of windfall profits, though for some technologies, it may risk encouraging the reduction of generation from existing clean energy facilities.

NATURAL GAS

Highly efficient natural gas combined cycle (NGCC) power plants emit much lower levels of air pollutants (including CO_2, the primary GHG) compared both to the average existing coal-fired power plant and even compared to new coal-fired power plants with modern pollution controls.[8] Moreover, developments over the past few years related to shale gas have led to the realization that the United States has a much larger supply of affordable domestic natural gas than previously thought.[9] As a result of these and other factors, natural gas is, absent new policies, projected by the U.S. Energy Information Administration (EIA) to dominate new electricity generating capacity additions in coming decades.[10]

While natural gas is a highly competitive choice for new electricity generating capacity required to meet electricity demand growth, there remains a significant opportunity to displace existing older, less efficient, and more highly polluting coal-fired generation with incremental natural gas-fired generation—a displacement unlikely to be fully realized under "business as usual" but one that a CES can facilitate by providing at least some credit to incremental natural gas-fired electricity generation. Incremental natural gas-fired generation could come from both new capacity additions and greater utilization of existing NGCC power plants.

In providing an incentive under a CES for displacing existing coal-fired generation with incremental natural gas-fired generation, policymakers may want to avoid an outcome in which a CES provides an incentive for natural gas at the expense of other lower-emitting energy technologies—e.g., renewables, nuclear power, and fossil fuel use coupled with CCS. Whether providing partial credit under a CES for incremental natural gas-fired generation leads to this outcome likely depends on the CES program's targets and the value of any alternative compliance payment (ACP). For example, providing credit for incremental natural gas-fired generation under a CES that has very modest targets and a low ACP value is more likely to create an incentive for natural gas-fired electricity generation at the expense of lower-emitting technologies.

Both "Eligible Clean Energy Resources" policy design parameter options in the CES framework would tie incentives for natural gas under a CES to the displacement of existing traditional coal-fired electricity generation. This approach, however, could benefit from additional analysis and deliberation – particularly regarding how best to implement it.

Other issues related to crediting natural gas under a CES are how the treatment of natural gas may affect CES cost impacts differently across utilities, states, and regions and how policymakers can provide incentives for new NGCC plants without creating competition between new and existing NGCC units.[11]

EQUITABLE IMPACTS

Since electricity prices already vary dramatically across utilities, states, and regions, electricity price impacts under a CES can vary across utilities, states, and regions. This variation results from factors such as the different levels of existing clean power generation, differences in renewable resource endowments, differences in wholesale power markets, and different retail electricity market structures (i.e., competitive vs. traditionally regulated). These factors and CES policy design choices can interact in complex and nuanced ways, so the best way to gauge the likely electricity price impacts of particular CES policy formulations is through sophisticated power sector modeling.

The CES framework in Table 1 is intended to provide for equitable electricity price impacts across utilities, states, and regions. Stakeholders, however, may reasonably have different points of view regarding what constitutes "equitable price impacts." For example, some might argue that roughly equal percentage changes in electricity rates across utilities, states, and regions are fair while others might support price changes of similar absolute magnitude (e.g., in cents per kilowatt-hour). Additionally, some might argue that it is only fair for utilities, states, and regions that currently have higher than average electricity prices because of a greater current reliance on cleaner energy sources to see smaller price increases under a national CES than utilities, states, and regions that enjoy lower than average electricity prices in part due to less investment in clean power generation.

COST CONTAINMENT

In designing a CES, policymakers will likely seek to balance the benefits associated with increasing clean power generation against the costs (e.g., electricity rate impacts) associated with transitioning to an electricity generation mix that relies more heavily on clean energy sources. In recent congressional electricity portfolio standards, one of the key provisions for cost containment has been the alternative compliance payment (ACP).[12]

A few points regarding the inclusion of and value chosen for an ACP warrant mention. First, congressional electricity portfolio standard proposals in the 111th Congress have included relatively low ACP values that remained constant in real terms (i.e., they increased only to keep pace with inflation).[13] However, putting the power sector on a clean energy trajectory that diverges more and more over time from "business as usual" is likely to require an ACP that may start off at a relatively low level but that increases in real terms over time.

Second, while an ACP acts as a price ceiling for the price of tradable clean energy credits, the relationship between credit prices and electricity rate impacts under a CES is not as straightforward as one might imagine. As such, policymakers should think carefully about what ACP value is truly appropriate for balancing benefits and costs under a CES.

Third, if policymakers want to use a CES to focus specifically on spurring the deployment of less commercially mature, very low-emitting technologies, policymakers might consider a CES formulation that has a high ACP value but a lower percentage target coupled with a narrower definition of clean energy. This formulation might satisfy the desire for cost containment while still providing a substantial financial incentive for less commercially mature clean energy technologies.

COMPLEMENTARY POLICIES

A policy—like a CES—that lowers the cost of clean electricity technologies relative to competing technologies can be the federal government's central, overarching policy for spurring widespread deployment of clean electricity technologies. However, combining a CES with technology-specific complementary policies like those summarized in Table 2 can help deploy clean energy technology more cost-effectively and advance a broader portfolio of clean energy technologies by addressing market failures, and market and institutional barriers that a CES alone cannot address.[1] 2 includes examples of existing policies and programs that could complement a CES. Policymakers could continue these policies and programs, expand them, or create new similar ones to complement a federal CES.

Given the limited options with a CES policy for addressing costs borne by particular households and businesses of concern to policymakers (e.g., low-income households and energy-intensive, trade-exposed [EITE] industries), policymakers might seek to ameliorate any negative cost impacts felt by such households and businesses via complementary policies outside of the CES. Tax credits to defray the cost of energy efficiency investments by EITE industries and additional funding for the Low Income Home Energy Assistance Program (LIHEAP), are examples of such complementary policies.

Table 2: Clean Power Complementary Policies

TYPE OF COMPLEMENTARY POLICY	DESCRIPTION	POLICY EXAMPLES
Clean Energy R&D	On their own, private firms tend to under-invest in clean energy R&D in light of the spillover benefits from such investments. The Federal government can directly fund clean energy R&D and provide incentives for private sector investment as well.	Advanced Research Projects Agency-Energy (ARPA-E) DOE Energy Innovation Hubs R&D tax credits
Demonstration and "First-Mover" Clean Energy Projects	First-of-a-kind demonstration projects and "first mover" clean energy projects provide real world cost and performance data, thus mitigating uncertainty and market risk for clean energy technologies. Such projects also move clean energy technologies along their "learning curve," thus making them more cost-competitive.	FutureGen 2.0 Loan Guarantee Program Targeted tax credits
Policies to Address Institutional and Regulatory Barriers	These issues vary among clean technologies and include, for example: transmission siting for wind and solar power, interconnection standards for distributed generation, uncertainty over long-term handling of spent nuclear fuel, and electric utility regulation that discourages electricity savings from energy efficiency programs.	Policies specific to institutional and regulatory barriers

Other C2ES Resources:

Clean Energy Standards: State and Federal Policy Options and Implications,[15] November 2011

For background information and additional resources on the concept of a CES, see: www.c2es.org/federal/policy-solutions/clean-energy-standards

ENDNOTES

1 “Renewable & Alternative Energy Portfolio Standards,” Center for Climate and Energy Solutions, last modified August 25, 2011, http://www.c2es.org/what_s_being_done/in_the_states/rps.cfm.

2 Here, as in congressional electricity portfolio standard proposals, the definition of “electricity utility” refers to any person, state agency, or federal agency, which sells electric energy (Public Utility Regulatory Policies Act of 1978, 16 U.S.C § 2602(4)).

3 Clean Energy Standards: State and Federal Policy Options and Im*plications, Section 8.5. This section discusses the point of regulation*.

4 Ibid, Appendix A.3.

5 American Clean Energy Leadership Act of 2009, S. 1462, 111th Congress, Sec. 132 (2009). Renewable energy is defined to mean electric energy generated at a facility (including distributed generation facility) from: solar, wind, geothermal and incremental geothermal, qualified incremental hydropower, marine and hydrokinetic renewable energy, ocean (including tidal, wave, current, and thermal), biomass (as defined by the Energy Policy Act of 2005, 42 U.S.C. § 15852(b)), landfill gas; and coal-mined methane, or qualified waste-to-energy sources or other innovative sources as determined through rulemaking.

6 In most states with RPS programs, utilities are required to provide their customers a certain percentage of electricity from renewable sources. New York’s RPS program uses a central procurement model, with New York State Energy Research and Development Authority (NYSERDA) as central procurement administrator. Under this model, utilities do not procure renewable electricity directly, but rather NYSERDA pays a production incentive to renewable electricity generators. In exchange for receiving the production incentive, the renewable generator transfers to NYSERDA all rights and/or claims to the RPS attributes associated with each MWh of renewable electricity generated, and guarantees delivery of the associated electricity to the customer.

7 “Clean Energy Standards,” Center for Climate and Energy Solutions, last accessed September 19, 2011, http://www.c2es.org/federal/policy-solutions/clean-energy-standards. Existing CES modeling results from such groups as the Bipartisan Policy Center and Resources for the Future are accessible on this webpage.

8 *Clean Energy Standards: State and Federal Policy Options and Implications*, Appendix A.3.

9 “What is shale gas and why is it important?,” United States Energy Information Administration’s (EIA), Energy in Brief, last modified August 4, 2011, http://www.eia.gov/energy_in_brief/about_shale_gas.cfm.

10 “Annual Energy Outlook 2011,” United States Energy Information Administration (EIA), last modified April 26, 2011, http://www.eia.gov/forecasts/aeo. In its AEO2011 Reference Case, EIA projects that natural gas will account for 60 percent of capacity additions for 2009-2035.

11 Meghan McGuinness, *The Administration’s Clean Energy Standard Proposal: An Initial Analysis*, Bipartisan Policy Center Staff Paper (Washington, DC: Bipartisan Policy Center, 2011), http://www.bipartisanpolicy.org/library/staff-paper/administration%E2%80%99s-clean-energy-standard-proposal-initial-analysis. Such competition between new and existing NGCC units has little to no benefit in terms of increasing clean energy generation, but as the Bipartisan Policy Center’s recent CES modeling suggests, it is a possible outcome if a CES policy is not carefully crafted to avoid it.

12 Electric utilities demonstrate compliance with CES requirements by submitting clean energy credits equivalent to the required level of clean energy generation. An ACP provision under a CES allows an electric utility to make payments to the CES program administrator of a specified value in lieu of submitting tradable credits. An ACP acts as a cap on the cost of compliance with a CES. Electric utilities will increase the amount of clean energy that they deliver in keeping with the CES requirement until the incremental cost of such energy exceeds the ACP value. Policymakers may set a fixed ACP, one that increases at the rate of inflation, or one that increase in real terms over time as the CES targets become more ambitious.

13 *Clean Energy Standards: State and Federal Policy Options and Implications*, Table 3 in Appendix A.3

14 Ibid, Appendix A.2. This appendix section provides a broad overview of many of these challenges.

15 Regulatory Assistance Project and the Center for Climate and Energy Solutions. Clean Energy Standards: State and Federal Policy Options and Implications, September 2011, http://www.c2es.org/publications/clean-energy-standards-state-and-federal-policy-options-and-implications, Appendix A.3.

C2ES CENTER FOR CLIMATE AND ENERGY SOLUTIONS

The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.

2101 WILSON BLVD. SUITE 550 ARLINGTON, VA 22201 703-516-4146 **C2ES.ORG**