Should the United States Create Trading Markets for Energy Efficiency?

by Noah M. Sachs

Noah Sachs is a Professor at the University of Richmond School of Law and Director of the law school's Robert R. Merhige Jr. Center for Environmental Studies. He writes frequently about climate change and energy efficiency.

For over 30 years, the United States has deployed an effective set of policies to promote energy efficiency, including appliance standards, information disclosure requirements, auto fuel economy standards, building codes, and tax rebates. From 1980 to 2014, the energy intensity of the U.S. economy (that is, the energy needed to produce one dollar of gross domestic product (GDP)) declined by about 50%—a remarkable success story.[1] Energy efficiency policies and technologies were responsible for a substantial portion of that decline.[2]

Climate and energy experts are now calling for the near-complete decarbonization of the U.S. economy by the middle of the century,[3] raising the question of whether the old policy tools to promote energy efficiency are up to the task.

Some analysts have suggested that the United States could achieve dramatic breakthroughs in energy efficiency by packaging energy savings into a tradable commodity called an energy savings certificate (ESCert). In this market-based approach to energy efficiency, companies would participate as buyers or sellers of ESCerts, just as companies now trade carbon dioxide emissions allowances, wetlands acreage, and fishing quotas. The goal of these markets is to incentivize companies to invest in energy-efficient equipment and practices that they might otherwise overlook, reducing U.S. greenhouse gas (GHG) emissions in the process.

Other countries have already embraced energy efficiency trading markets. In 2012, India launched a market involving energy-intensive industries such as steel, aluminum, and cement. When ESCert trading begins later this year in India, it will become the largest market-based environmental program in the developing world. France and Italy were pioneers in this new kind of environmental market, launching programs over a decade ago to improve residential and commercial energy efficiency.

ESCert trading has never caught on in the United States, but these markets nonetheless have an enthusiastic group of advocates. Energy policy analysts have called ESCert trading a "breakthrough plan"[4] that can "unlock energy saving potentials"[5] and serve as a "market-based and credible accounting instrument" to achieve climate change goals.[6] The thinking is simple: If we can put a price on energy savings and make it a tradable commodity, firms will innovate to find every available opportunity to save fuel and electricity.

This Comment examines whether the vision for energy efficiency markets matches the reality. It explains how energy efficiency markets work, examines the handful of energy efficiency markets that have been established to date, and explores the policy challenges inherent in commodifying energy efficiency and making it a tradable good.

Ultimately, I conclude that the high expectations for energy efficiency markets are unlikely to be met on the ground. The markets will likely play only a minor role in greening U.S. energy demand.[7] Programs in other countries have high transaction costs and encounter persistent problems involving energy-savings measurement, target-setting, governmental oversight, and ensuring the addi-

1. *See* Steven Nadel et al., American Council for Energy Efficient Econ., Energy Efficiency in the United States: 35 Years and Counting iv (2015) (estimating that energy efficiency improvements were responsible for about 60% of the decline in energy intensity and that structural shifts in the economy were responsible for the remainder of the decline).
2. *Id.*
3. *See, e.g.*, James Williams et al., Sustainable Dev. Solutions Network, Pathways to Deep Decarbonization in the United States Technical Report xii, xiv (2015), *available at* deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf.
4. Lisa Margonelli, *Toward an Energy Efficiency Trading System*, Wash. Post, Feb. 9, 2007, http://www.washingtonpost.com/wp dyn/content/article/2007/02/08/AR2007020801294.html.
5. EuroWhiteCert Project, White Certificates: Concept and Market Experiences 1 (undated), *available at* http://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/eurowhitecert_brochure.pdf.
6. Edward Vine & Jan Hamrin, *Energy Savings Certificates: A Market-Based Tool for Reducing Greenhouse Gas Emissions*, 36 Energy Pol'y 467, 474 (2008).
7. *See* Noah Sachs, *Greening Demand: Energy Consumption and U.S. Climate Policy*, 19 Duke Envtl. L. & Pol'y F. 295 (2009).

tionality of energy savings. The markets are complex and open to strategic gaming, making it difficult to ensure that claimed energy savings have actually occurred. There are also clear trade offs between high-quality verification of energy savings and keeping the operating costs of the markets low.

The importance of energy efficiency in climate change mitigation cannot be denied; energy efficiency is usually the cheapest strategy for reducing GHG emissions. But these new trading markets are a notoriously complicated means of spurring efficiency, and the United States would be better served by expanding well-established energy efficiency policy tools or energy taxes rather than creating new markets in ESCerts.

I. Creating Energy Efficiency Trading Markets

One preliminary question about these markets is why governments would create a new, complex market to incentivize companies to cut their energy consumption. After all, profit-motivated firms might be expected to find cost-effective energy-saving investments on their own.

Most energy economists believe that some policy intervention is necessary to promote energy efficiency because markets for electricity and fuel and markets for energy-efficient equipment are prone to market failures. The result is that firms and households do not adopt energy-efficient technologies and practices even when doing so would be profitable.[8] This sub-optimal investment has been dubbed the "energy efficiency paradox" or "energy efficiency gap,"[9] and it leads to an overconsumption of fossil fuels. The debate is about which mix of policy tools should be deployed to correct these market failures.

As a solution for bridging the energy efficiency gap, energy efficiency markets are a legal hybrid. First, they rely on a government mandate—an energy-savings target for an industry, a region, or individual firms. Second, they allow ESCert trading to provide the market participants with some flexibility as to how they reach the mandate.

The mandate at the heart of ESCert markets is a quantity-driven quota. While price-driven mechanisms such as a carbon tax have been shown to be ineffective in spurring many kinds of energy efficiency investments, the quantity-driven quota guarantees that the obligated firms will, in aggregate, achieve the desired energy-savings goal, such as an 8% reduction in energy consumption over five years. It should be noted, however, that like any tradable permit scheme, the markets rely on some firms *not* investing in energy-efficient equipment or practices. These "laggard" firms can instead purchase ESCerts on the market to fulfill their savings target. The overall impact of ESCert trading on the pace of clean technology innovation is therefore hard to predict. The programs are more likely to promote diffusion of existing technology rather than foster technology innovation.

The ESCerts themselves are government-issued, unique and traceable certificates—typically denominated in megawatt-hours or tons of oil equivalent[10]—that purport to certify that a firm has achieved a certain improvement in energy efficiency or a certain amount of energy savings. The programs can be structured either to promote energy efficiency (defined as energy used per unit of output of a firm) or to promote some specified level of energy savings. In the former case, energy consumption may continue to rise under these programs if overall output is rising.

In the trading market, companies that can surpass the energy efficiency or energy-savings target set by the government will become sellers of the ESCerts, while companies that fall short of their target are obligated to purchase ESCerts to make up their shortfall.

In this way, a "buyer" company can offset a portion of its own energy-savings mandate. For a "seller" company, the expectation is that the sale price of the credits will motivate them to invest in energy-efficient equipment or practices. For example, if a business investment in highly efficient refrigeration equipment has a nine-year payback period from the energy savings, the accompanying sale of ESCerts might allow the company to recoup the investment in six years, making the investment more financially attractive. Advocates believe that the added price signal from ESCerts will "change mindsets" by making business managers focus on energy efficiency opportunities in a way that they have not in the past.[11]

Within this broad outline of an ESCert trading program, there is tremendous variation in how the programs are structured. In Italy and France, which launched ESCert trading markets in 2005 and 2006, respectively, electric and gas utilities are the major players in the markets. These energy suppliers have to locate the energy savings not within their own facilities, but rather in residential and commercial buildings owned by their customers. Trading of EScerts (also called "white certificates" or "white tags" in

8. *See* Adam B. Jaffe & Robert N. Stavins, *The Energy Paradox and the Diffusion of Conservation Technology*, 16 Resource & Energy Econ. 91, 98-99 (1994); Stephen J. DeCanio, *Barriers Within Firms to Energy-Efficient Investments*, 21 Energy Pol'y 906, 908 (1993); International Energy Agency, Mind the Gap: Quantifying Principal-Agent Problems in Energy Efficiency 11 (2007).

9. Todd D. Gerarden et al., *An Assessment of the Energy-Efficiency Gap and Its Implications for Climate Change Policy* (National Bureau for Econ. Research, Working Paper No. 20905, 2015), *available at* http://www.nber.org/papers/w20905.pdf.

10. *See* Barry Friedman et al., National Renewable Energy Lab., Considerations for Emerging Markets for Energy Savings Certificates 6 (2008).

11. *See, e.g.*, Paolo Bertoldi & Sylvia Rezessy, Institute for Env't & Sustainability, Tradable Certificates for Energy Savings (White Certificates): Theory and Practice 35 (2006).

Europe) is an adjunct to traditional demand side management (DSM) programs in which utilities fund or undertake upgrades to save energy within their service areas. Typical eligible energy-savings projects in Europe include distributing compact fluorescent light bulbs to residential customers or upgrading home insulation.

India's new energy efficiency market, called Perform Achieve Trade (PAT), has a fundamentally different structure. Launched in 2012, PAT targets energy end-users in industry rather than energy suppliers. PAT covers eight energy-intensive industries: fertilizer, cement, pulp and paper, textiles, chlor-alkali, iron & steel, thermal power plants, and aluminum. India chose to deploy a market-based approach to energy efficiency because of some unique political and economic circumstances. India's total energy consumption is expected to skyrocket over the next few decades,[12] but per capita energy consumption remains low. Unwilling to accept a fixed cap on its GHG emissions, India has instead pledged in international climate change negotiations to lower the emissions intensity of its economy (the amount of GHG emissions per unit of GDP),[13] and this strategy depends heavily on becoming more efficient in energy use.

The PAT program focuses on reducing energy consumed per unit of output by a plant and therefore cannot guarantee any absolute level of energy savings. Under PAT, 478 individual industrial plants were obligated to achieve a target improvement in energy efficiency over a three-year period (2012-2015), and each plant had to achieve that improvement within its own fenceline or purchase ESCerts from better-performing firms. Rather than mandating a uniform improvement in efficiency for an industry (such as a 5% improvement over three years), India's Bureau of Energy Efficiency set a different improvement target for each plant, adding to the complexity of the program. In 2015, teams of auditors determined whether each plant surpassed its target or fell short, and the trading of ESCerts in India is expected to begin in mid-2016. Regardless of program structure, there are usually five key steps to establish and oversee an energy efficiency trading market:

1. Determine which entities will be obligated to achieve energy savings or improvements in efficiency.
2. Set the numeric energy savings or energy efficiency target that these entities must achieve within a program period (typically 3-5 years).
3. Verify whether the obligated entities have surpassed the target or fallen short.
4. Issue ESCerts to the firms that have surpassed their target, representing the energy saved by those firms.
5. Establish and oversee a trading exchange for the ESCerts, where sellers can be linked with buyers.

These steps may seem straightforward, but each step requires substantial governmental oversight and frequent interactions between policymakers and the regulated entities. Advocates of market approaches to environmental law often underestimate how much governmental involvement is needed to establish and oversee a credible marketplace. Market-based environmental policies still require detailed regulations to establish the terms of the property right to be traded and the conditions of trading, banking, borrowing, and other matters. Given this reality, energy efficiency markets should not be established on the cheap. ESCert trading necessitates exacting attention to energy-savings measurement and verification and requires careful tracking of the certificates. A competent bureaucracy and a network of credible auditors are essential for running the system.

Transaction costs are the primary barrier to expanding energy efficiency markets as a climate change mitigation tool. If ESCert trading is to make a significant dent in GHG emissions, countries would have to set aggressive targets, verify the energy savings alleged by firms, expand the number of players in the market, and potentially link ESCert markets with companion markets in renewable energy credits (RECs) or GHG emissions allowances. Economic theory suggests that the ESCert markets will operate most efficiently with the widest possible number of participants and a broad range of eligible projects and facilities. In theory, thousands of entities could participate in the markets.

For instance, if a household could document energy savings of 500 kilowatt hours per year, it might package that savings into an ESCert (with a third party certifying the savings) and then sell the ESCert to some other entity, such as a utility, that is obligated to achieve energy savings. Market participants might include utilities, energy service companies, cities, transportation providers, industrial or commercial firms, appliance manufacturers, individuals, or real estate developers. The transaction costs of expanding the markets in this way are substantial, however, and need to be carefully considered in program design.

II. Energy Efficiency Markets: Potential Applications in the United States

In the United States, the most likely purpose for an energy efficiency market would be as a mechanism for electric and gas utilities to comply with state Energy Efficiency Portfolio Standards (EEPS), also known as Energy Efficiency Resource Standards. Twenty-four states have adopted EEPS, which are government mandates for utilities to reduce energy consumption in their service areas, and the

12. *See* Nathalie Trudeau et al., International Energy Agency, Energy Transition for Industry: India and the Global Context 10 (2011), *available at* http://www.iea.org/publications/freepublications/publication/india_industry_transition_28feb11.pdf (reporting that India's energy consumption is expected to increase by a factor of 3.5 to 4.2 by 2050).
13. In the run-up to the Paris climate change conference, India committed to reduce the emissions intensity of its economy 33-35% below 2005 levels by 2030.

programs typically carry a fine or penalty for noncompliance.[14] In the electricity sector, EEPS range from Wisconsin's 0.77% savings per year to Massachusetts' 2.6% savings per year.[15]

Five states (Connecticut, Massachusetts, Michigan, Nevada, and Pennsylvania) have authorized various forms of market trading to comply with their EEPS, but of these five, trading is active only in Connecticut. The most likely explanation for the limited scope of ESCert trading is that EEPS in most states are not aggressive, representing small increments in energy savings beyond business as usual. As a result, utilities have been able to achieve their targets on their own initiative, without resorting to a trading mechanism.

Connecticut's legislature authorized ESCert trading in 2005 because of some unusual features of Connecticut's electricity market.[16] Connecticut's deregulated market has more than 30 independent electricity suppliers that are obligated to demonstrate a savings, through efficiency improvements, of 4% annually.[17] They can achieve this target through a broad array of eligible savings projects, including combined heat and power, load management, and demand response.[18] Because these suppliers have little experience in conducting these programs, however, they have instead bought ESCerts from Connecticut's two large electric distribution utilities, United Illuminating and Eversource. The utilities have funded the energy efficiency upgrades and have become the major sellers of ESCerts to the independent electricity suppliers.[19]

Could an energy efficiency market be established nationally, with interstate trading of certificates? Such a national market is highly unlikely to emerge any time soon. In 2009 and 2010, Democrats introduced several bills establishing a national EEPS, but these bills did not authorize any trading mechanism and none were enacted into law.[20]

We are unlikely to see national EEPS legislation coming out of the Republican-controlled U.S. Congress. Indeed, since 2009, the use of cap-and-trade systems to control carbon emissions has become anathema on the right, so Congress is unlikely to support a national program of trading in energy efficiency credits to achieve climate change goals. Nationwide ESCert markets would also encounter resistance from ratepayers, who would be reluctant to fund energy efficiency upgrades on facilities that might be located thousands of miles away. If energy efficiency markets are going to take root in the United States, it will likely happen at the state level, and ESCert trading would likely be restricted to intrastate trades.

States might look to existing REC markets as the most natural models for trading in energy efficiency credits. There is an important distinction between RECs and ESCerts, however, that make ESCert trading far more complicated: The renewable energy generation represented by RECs can be directly metered, whereas ESCerts purport to represent *non-use* of energy. For a company to assert that it has *not* used energy that it otherwise would have used, entitling it to a valuable credit, the purported energy savings must be compared against a hypothetical baseline energy consumption for that company. Consequently, ESCert trading relies far more on estimation and projection than other kinds of market-based environmental policies, and the transaction costs of an ESCert market are far higher than the transaction costs of an REC market. As two European analysts put it (understatedly), energy efficiency markets are "rather demanding with respect to design and operation of the system."[21]

III. Policy Challenges for Energy Efficiency Trading

There are four central challenges that policymakers would have to overcome to establish credible energy efficiency markets: measuring and verifying energy savings, ensuring additionality, setting environmentally meaningful program targets, and maintaining the system boundary. As I discuss below, the experience with other environmental markets does not provide much confidence that these challenges can be addressed at reasonable cost.

A. Measuring and Verifying Energy Savings

For energy efficiency markets to work effectively, regulators must be able to verify that claimed energy savings have actually taken place, or else market participants will be trading in bogus energy reductions. The existing ESCert trading markets have relied on two broad approaches for measurement and verification. The European ESCert trading markets rely principally on an ex ante, "deemed savings" approach.[22] Energy regulators simply "deem," or credit, a pre-specified amount of energy savings when electric and gas utilities implement energy-saving techniques for their residential and commercial customers.[23] This approach provides financial liquidity because the ESCerts

14. *See* Karen Palmer et al., Resources for the Future, Putting a Floor on Energy Savings: Comparing State Energy Efficiency Resource Standards (2012), *available at* http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-12-11.pdf.
15. *See* American Council for Energy Efficient Econ., State Energy Efficiency Resource Standards, (2015), *available at* http://aceee.org/sites/default/files/eers-04072015.pdf.
16. *See* Act of July 1, 2005, Conn. Pub. Acts No. 05-1, June Spec. Sess. (2005) (concerning energy independence).
17. *See* Vine & Hamrin, *supra* note 6, at 471.
18. *See* Friedman et al., *supra* note 10, at 28.
19. *See id.* at 31.
20. *See* Save American Energy Act, H.R. 889, 111th Cong. (2010) (sponsored by Rep. Edward Markey (D-Mass.)); Save American Energy Act, S.B. 548, 111th Cong. (2010) (sponsored by Sen. Charles Schumer (D-N.Y.)). Both bills set national goals of 15% electricity savings and 10% natural gas savings by 2020.
21. Nicola Labanca & Adriaan Perrels, *Editorial: Tradable White Certificates—A Promising but Tricky Policy Instrument*, 1 Energy Efficiency 233, 234 (2008); *see also* Vine & Hamrin, *supra* note 6, at 475 (concluding that the "most important issue" with tradable energy efficiency certificates "is the problem of transaction costs").
22. *See* Vine & Hamrin, *supra* note 6, at 469-71; Paolo Bertoldi & Silvia Rezessy, Joint Research Centre of European Comm'n, Energy Savings Obligations and Tradable White Certificates 22 (2009).
23. *See* Vine & Hamrin, *supra* note 6, at 471.

are earned upfront, and it reduces transaction costs because no auditor has to conduct field checks on an ex post basis to measure the actual energy savings. In France, for example, utilities can choose from a menu of over 100 projects listed in the regulations, with associated deemed energy savings for each.[24]

One disadvantage of the deemed-savings approach is that there is no field check to ensure that customers are actually using the energy-saving devices supplied by utilities. In addition, by incentivizing deployment of well-known, off-the-shelf energy efficiency upgrades, the deemed-savings approach appears to undercut one of the primary rationales for trading: that trading will link firms that have varying marginal costs of compliance. Firms are instead likely to have similar marginal costs of compliance if they are all selecting from the same standardized menu of efficiency upgrades. Moreover, the deemed-savings approach does little to encourage transformational improvements in the energy efficiency of products, equipment, or materials. It does nothing, for example, to encourage superior building or materials design.

The deemed-savings approach still necessitates complex energy and financial accounting because regulators must develop a credible reference case scenario. Assume, for example, that a utility offers rebates to homeowners to purchase super-efficient water heaters. Regulators would need to develop a reference case of energy consumption in which homeowners are instead relying on a mix of water heaters with varying efficiencies and life-spans. Once the data is compiled to determine that reference case, regulators can then estimate the likely energy savings from the rebate program for the purpose of awarding ESCerts.

An alternative to the ex ante, deemed-savings approach is the ex post approach used in India. Under the PAT program, regulators calculate the baseline energy efficiency of a particular plant (energy used per unit of output). They then assume that baseline will continue, set a target improvement in efficiency, and after three years, measure the new energy efficiency of the plant. This approach has the advantage of confirming energy efficiency improvements with real field data, but it presents substantial transaction costs: The changes in energy consumption per unit of production at each plant must be measured in the field, through ex post auditing at the end of each program period, and this is a substantial task for the 478 plants in the program. Moreover, the energy measurements at each plant are conducted by a network of third-party auditors,[25] raising the possibility of corruption in the program. In India, corruption in environmental law is a persistent problem.[26]

Indeed, one of the overlooked problems with energy efficiency markets in India and elsewhere is that the markets are ripe for fraud. Both the buyer and the seller of an ESCert have every incentive to look the other way regarding whether an ESCert represents real, verified energy savings. The seller has an incentive to inflate energy savings or energy efficiency gains to earn the certificates, and the buyer, which is using the certificates for compliance purposes, has little interest in the accuracy of the estimates used to generate the certificates. Only regulators themselves (or their third-party delegees) have a stake in maintaining the overall credibility of the market.

This same system of incentives also prevails in carbon offset markets such as the United Nations' Clean Development Mechanism (CDM). Launched in 2003, the CDM has been plagued with problems of inaccurate baseline estimation, carbon-accounting, and fraud, leading one author to conclude that the CDM "is a Rube Goldberg-esque scheme that is neither efficient nor self-regulating."[27] ESCert trading has many parallels with the CDM because in both markets, the credits are issued against a counterfactual baseline of energy consumption or carbon emissions, respectively, that must be projected over a number of years. Both markets offer only the illusion of environmental progress if the underlying carbon or energy-accounting is not done correctly.

B. *Ensuring Additionality*

Even if energy savings can be accurately measured, regulators must also ensure that the energy savings are additional; that is, that the savings are due to the program and would not have occurred anyway. As two American analysts have noted, "determining additionality is inherently problematic because it requires resolving a counterfactual question: what would have happened in the absence of the specific project?"[28]

Consider the hypothetical rebate program discussed above for super-efficient water heaters. If a gas utility could show that 10,000 customers applied for the rebate and installed the heaters, it should not be entitled to ESCerts representing the full extent of energy savings, because some portion of the customer base would have installed those heaters anyway, even without the incentive. This is just one example of the challenges of determining which changes in energy consumption in a utility's service area are due to utility DSM programs and which changes would likely have occurred anyway.

If U.S. states were to establish energy efficiency markets and then award ESCerts for non-additional energy savings, it would create two problems. First, it would provide

24. *See* Paolo Bertoldi et al., *Energy Supplier Obligations and White Certificate Schemes: Comparative Analysis of Experiences in the European Union*, 38 Energy Pol'y 1455, 1461 (2010).

25. *See* Rajesh Kumar & Arun Agarwala, *A Sustainable Energy Efficiency Solution in Power Plant by Implementation of Perform Achieve and Trade (PAT) Mechanism*, 2 Open J. Energy Efficiency 154, 158-59 (2013), *available at* http://dx.doi.org/10.4236/ojee.2013.24020.

26. *See* Michael Faure, *Bucking the Kuznets Curve*, 51 Va. J. Int'l L. 95, 99-100 (2010); Mahesh C. Mehta, *The Accountability Principle: Legal Solutions to Break Corruption's Impact on India's Environment*, 21 J. Envtl. L. & Litig. 141 (2006). [Editor's Note: For more information on India's efforts in the environmental justice field, see Navya Jannu, *India's National Green Tribunal: Human Rights and the Merits of an Environmental Court*, this issue at 46 ELR 10474.

27. Tyler McNish, *Carbon Offsets Are a Bridge Too Far in the Tradable Property Rights Revolution*, 36 Harv. Envtl. L. Rev. 387, 387 (2012).

28. Vine & Hamrin, *supra* note 6, at 472.

a windfall to the recipient firm, and second, it may actually undermine a state's environmental goals because that firm can sell the credit to another firm that has fallen short of its energy-savings target. Indeed, as several researchers have noted, adding a trading component to a state EEPS can eviscerate the EEPS if some utilities in the state are already surpassing the EEPS on a business-as-usual basis.[29] In this situation, where some utilities are already achieving more energy savings than the EEPS requires, the utilities will flood the market with their ESCerts, allowing the worst-performing utilities to buy cheap ESCerts rather than make fundamental changes to reduce energy consumption in their service areas.

There is no single method or mechanism to ensure additionality. Ensuring additionality requires exacting energy and financial accounting and attention to broader changes in energy markets that constitute the "baseline." To ensure additionality, regulators must avoid double-counting efficiency improvements created by other programs (such as tax breaks for installing efficient appliances or other equipment), and they also must ensure that the claimed energy savings are additional to background improvements in energy efficiency being experienced in particular industries or in the economy as a whole.

In the United States, additionality of energy savings would be difficult to track because there are multiple policies and incentives in place to encourage household, commercial, and industrial efficiency, including tax credits, product subsidies, government procurement requirements, efficient building codes, and research and development subsidies.[30] All of these policies affect the baseline against which the ESCert credit is being issued.

Other countries have not satisfactorily solved additionality problems in their energy efficiency markets. For example, Italian electric utilities have earned ESCerts for distributing compact fluorescent light (CFL) bulbs to their customers,[31] but many customers would have purchased CFLs on their own without utility assistance, as U.S. consumers have done.[32] India's PAT program appears to ignore the issue of additionality entirely. As long as a plant surpasses its energy efficiency target, the Bureau of Energy Efficiency will award it ESCerts, without regard to whether the plant would have surpassed that target anyway to save fuel, electricity, or other expenses.

C. Setting an Environmentally Meaningful Target

A third challenge with ESCert trading is setting the energy savings target. The transaction costs of establishing and overseeing these markets seem tolerable only if the underlying energy savings target is substantial, representing a steep gain over business-as-usual improvements in energy efficiency. With a substantial energy-savings target, it is more likely that firms will have varying marginal costs of compliance, a necessary condition for trading to lower the overall cost of achieving an energy-savings goal.

In the programs established to date, however, countries appear to have established lax savings targets. India, for example, required its industrial facilities to achieve, on average, a 5.8% improvement in energy efficiency over three years, but this closely tracked the business-as-usual improvements that the plants had been making on their own initiative over the prior decade.[33] In Europe, trading volumes in the ESCert markets have been low, suggesting that the participating utilities have been able to meet their savings targets on their own accord. The European Commission has concluded that "over-compliance has been observed in all the existing schemes in the EU, which . . . signals unimposing targets in comparison to economic saving potential."[34] A report on the Connecticut program found that Connecticut's mandatory EEPS was driving investments in energy efficiency in that state, not the trading component of the program.[35] Just as in the European programs, the report documented a massive oversupply of ESCerts in the Connecticut market.[36]

The lax target-setting in energy efficiency markets likely reflects the political environment in which ESCert trading is being proposed. Because ESCert trading is a relatively new policy tool, regulators likely proposed low targets to win the support of key stakeholders, with the hope that the energy-savings targets could be ramped up over time. But after many years of operation, most of the programs have failed to achieve scarcity in the ESCert marketplace.

It is possible, of course, for regulators to establish far more ambitious energy-savings targets, perhaps to meet increasingly ambitious pledges under the Paris Agreement between now and 2030. But it seems that lax targets in the existing ESCert programs are not an aberration. Rather, they reflect a larger trend of overallocation and insufficient stringency in many market-based policies in environmental law.

In cap-and-trade programs, for example, one scholar has documented a pattern of weak caps that require little change in behavior from regulated industries, drawing examples from the U.S. acid rain program, California's RECLAIM program, and the European Emissions Trading System (ETS).[37] Weak caps mean an absence of market scarcity and a correspondingly weak price signal for firms to change their behavior. Because of weak caps in the Euro-

29. *See* Joe Loper et al., Alliance to Save Energy, Deal or No Deal? Pros and Cons of Trading Under an Energy Efficiency Resource Standard 5-183, 5-190 (2008).
30. *See* Loper et al., *supra* note 29.
31. *See* Bertoldi & Resezzy, *supra* note 22, at 16.
32. *See* Joe Loper et al., Alliance to Save Energy, Scaling-Up Energy Efficiency Programs: The Measurement Challenge 12-14 (2010), *available at* http://www.ase.org/sites/ase.org/files/energy_measurement_challenge_0.pdf.
33. *See* Soumya P. Garnaik, Bureau of Energy Efficiency, Perform, Achieve and Trade (PAT), BEE Experience 5, *available at* www.iipnetwork.org/PAT-ppt_BEE%20Doc%209.pdf.
34. Bertoldi & Resezzy, *supra* note 22, at 49.
35. Joe Loper et al, Alliance to Save Energy, Energy Savings Credits: Are the Potential Benefits Being Realized? 6 (2010).
36. *Id.* at 20.
37. Leslie McAlister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 Colum. J. Envtl. L. 396, 398-410 (2009).

pean ETS, for example, allowance prices have remained below eight euros per ton of carbon dioxide for over three years,[38] far below expectations, and the ETS is now widely derided as "lifeless"[39] and "moribund."[40] Research suggests that the weak targets in many market-based environmental programs reflect the political economy of enacting the programs, where regulators can overcome opposition from regulated industries only by establishing targets that do not require substantial behavioral change.[41]

D. Defining the System Boundary

One final challenge with establishing trading markets for energy efficiency is defining the system boundary—the question of how regulators should define the geographic boundary of a participating firm, region, or facility.

In cap-and-trade programs for GHG emissions, sources may react to one jurisdiction's climate mitigation policies by relocating outside the geographic boundaries of regulation or subcontracting production outside those boundaries—the well-known problem of "carbon leakage."[42]

Energy efficiency markets are prone to a similar problem, which I call "energy-savings leakage." It is easy to see how this problem would arise with state EEPS policies if ESCerts were tradable across state lines. If State A has a lax energy-savings target that is easily surpassed by utilities, and those utilities are offering large amounts of ESCerts for sale, State B's more ambitious energy-savings goals could be undermined. Utilities in State B would choose not to expend resources on DSM programs to conserve energy if they could simply buy cheap cross-state ESCerts from State A. It is for this reason that state energy efficiency markets would likely need to restrict trades to in-state actors.

A different system boundary issue arises if a program targets energy savings from industry, as in India's PAT program. The concern is that firms could achieve improvements in energy efficiency, and earn valuable ESCerts, by outsourcing their energy-intensive operations to other firms that are not regulated in the market.[43] A textile plant, for example, could improve its energy efficiency profile simply by outsourcing its dyeing operation elsewhere. The plant would show the same annual output of textiles with far lower energy consumption, suggesting that it has improved its energy efficiency, even though in reality it has simply outsourced part of its operation.

Market enthusiasts are overlooking this important structural constraint on energy efficiency markets: It matters a great deal how regulators define the "facility" to be measured. If, as advocates suggest, thousands of entities could participate in a single market, the problem of defining the "facility" to be measured and monitored becomes intractable. What would it mean to claim that a certain industry, plant, or building has "achieved" energy savings compared to some baseline? How would regulators delineate the boundary of the facility to be measured? With dynamic economies, low-cost shipping, and an infinite ability for any facility to contract out operations, the accounting challenge is daunting.

IV. Conclusion

Improving energy efficiency is critical for reducing GHG emissions. On our current intensive path of energy use, global energy consumption is projected to rise nearly 40% by 2040,[44] and most of that energy will come from fossil fuels. Avoiding that dramatic rise in consumption will require both energy-efficient technology development and significant behavioral change.

Despite over a decade of theoretical work about ESCert trading and the existence of a few operating models, the extent to which ESCert trading is generating real environmental benefits remains unclear.[45] The United States should not rush to embrace market trading for energy efficiency when so many other policy tools to promote energy efficiency are working effectively. The core elements of U.S. energy efficiency policy should remain vehicle fuel economy standards, building codes, lighting and appliance standards, energy taxes, utility DSM policies, and information provision. In comparison to these tested policies, ESCert trading markets are complex—an "elaborate instrument"[46] that requires substantial government oversight—and the markets are hampered by persistent problems of measurement and verification. If governments remain reluctant to set energy-savings targets that are substantially more aggressive than business as usual, ESCert trading can be superfluous or even counterproductive.

Those interested in the potential of ESCert trading should closely watch India's new PAT program. Trading will begin later this year, and a second round of energy efficiency targets for industry will be unveiled as well. PAT deserves close scrutiny to see whether it can credibly slow the rate of growth in India's industrial energy consumption.

38. For historical trends in EU ETS allowance prices, see *Carbon Emissions Futures*, Investing.com, http://www.investing.com/commodities/carbon-emissions-streaming-chart.
39. Christian Oliver & Pilita Clark, *EU Plans to Revive Lifeless Carbon Market*, Fin. Times, Oct. 13, 2014, http://www.ft.com/intl/cms/s/0/23d2b622-4fce-11e4-a0a4-00144feab7de.html.
40. Carl Mortished, *EU Trading Market Collapses, Coal Cheap as Dirt*, Globe & Mail, Apr. 17, 2013, http://www.theglobeandmail.com/try-it-now/try-it-now-executive-insight/?contentRedirect=true&articleId=11311111&referrer=https%3A%2F%2Fwww.google.com.
41. *See* McAlister, *supra* note 37, at 426.
42. Julia Reinaud, International Energy Agency, Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry 3 (2008), *available at* https://www.iea.org/publications/freepublications/publication/Competitiveness_and_Carbon_Leakage.pdf (defining carbon leakage as "the ratio of emissions increase from a specific sector outside the country (as a result of a policy affecting that sector in the country) over the emission reductions in the sector").
43. India has adopted a "gate-to-gate" accounting concept that examines efficiency improvements within the physical perimeter of the plant. *See* Government of India, Bureau of Energy Efficiency, PAT Consultation Document 16-17 (2011).
44. *See* International Energy Agency, World Energy Outlook 2014: Executive Summary, *available at* http://www.iea.org/publications/freepublications/publication/WEO_2014_ES_English_WEB. pdf.
45. *See* Loper et al., *supra* note 35, at 34.
46. Labanca & Perrels, *supra* note 21, at 1.

The challenges of institutional design discussed in this Comment underscore that market-based trading policies are not a panacea for achieving environmental goals. Indeed, in the context of energy efficiency, if the programs are poorly designed, without adequate attention to verification and additionality, tradable permits can actually undermine environmental goals by allowing firms to use bogus credits to meet their energy-savings requirements. Given the need to reduce energy consumption, especially in the developed world, policy-makers should focus their attention on more promising energy efficiency policies.