A BETTER WAY: VOLUNTARY AGREEMENTS TO MOVE MARKETS AND ACCELERATE SAVINGS

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Abstract:

Conventional energy efficiency regulatory models struggle to keep pace with high-tech consumer and commercial equipment categories that are continuously changing. Devices with rapid innovation cycles or that can be modified in the field by software updates are challenging for regulators accustomed to stable products whose features and designs can be predicted years in advance. One-size-fits-all approaches inherent in conventional regulation can struggle to accommodate innovation and evolving consumer behavior. However, regulators may not be satisfied relying only on market efficiency trends and incentive programs to secure savings.

An effective third approach has arisen in response to this challenge: the voluntary agreement. While voluntary programs have long been employed around the world for discrete initiatives such as labeling, another class of voluntary programs has emerged in recent years with the broader objective of providing a complete substitute for energy regulation of a particular device category. Prior studies have broadly evaluated the efficacy of this policy tool, but this paper attempts to generate additional insight through a more specific review of lessons learned from two of these comprehensive voluntary programs implemented in North America for set-top boxes and broadband network equipment.

Voluntary programs can be more effective than regulation because they afford both government and industry more flexible opportunities to achieve energy savings. Voluntary commitments can start more quickly than government procedures would allow and include elements that a government lacks authority to adopt, such as modification of deployed devices. In return, voluntary programs give industry more flexibility to test innovative new products or features without securing advance regulatory waivers.

Voluntary programs can feature more agile enforcement. For example, immediately following a year in which one party to a voluntary agreement missed its commitment, the company downloaded energy-saving software to older models that offset the extra energy before a government enforcement proceeding could have even completed fact-finding. A regulator would have lacked the authority to compel such a creative and effective remedy.

To be credible, voluntary agreements can include transparent procedures, public reporting, independent verification testing and auditing, and direct participation of representatives of government or energy-efficiency advocates.

Still, voluntary programs face their own challenges. Free riders can undermine the effectiveness of a program while giving themselves a competitive advantage. Small companies may struggle to meet the administrative, testing, and financial commitments of a voluntary program. Voluntary programs lack the power to compel production of evidence or cessation of distribution that can be useful in assuring effective enforcement. The paper explores how voluntary programs can effectively address these limitations.

The Emergence of Voluntary Energy-Efficiency Agreements in North America

Introduction

In 2011, the Natural Resources Defense Council (NRDC) published a study urging regulators to address the increasing energy consumed by “set-top boxes” used to deliver pay-TV video services in the United States.[1] Set-top boxes had been around for decades, but their number was on the rise due to technological changes that often required devices for each television, and their average power had increased due to the growing popularity of recording capability, which at that time typically employed constantly spinning hard disks. Within months, the U.S. Department of Energy (DOE) opened a

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rulemaking proceeding to consider the possible adoption of mandatory energy standards for set-top boxes.[2]

DOE's Appliance and Equipment Standards Program employs minimum energy conservation standards for more than sixty categories of appliances and equipment, which it estimates collectively save American consumers tens of billions of U.S. dollars per year. The agency at first approached set-top boxes the same as it has the other equipment it regulates: it sought to document the then-existing features of set-top boxes so that it could try to estimate the energy that would be used by devices with those same features five, ten and even decades into the future.

This long time horizon reflects the slow, deliberate pace of the agency's processes, which must satisfy the many requirements under the Administrative Procedure Act in the United States. Under U.S. law, federal appliance efficiency regulations cannot become effective until five years after adoption,[1] and changes to or waivers from regulations to accommodate new features and innovations that emerge after that five-year period typically require more than a year to complete even after the moving party has undertaken all of the necessary steps to initiate such a proceeding. The legal and procedural requirements inherent in a government process can cause regulatory proceedings to move slowly in order to gather data, afford due process to stakeholders, and resolve disputes through contested litigation. These steps include public notice; the opportunity for any interested party to be heard often in public meetings or public written comment cycles that must be scheduled well in advance; the opportunity for parties to reply to the input of others; and the opportunity to contest initial agency findings with the agency and then final agency findings through appeals. Each of these steps requires significant time. The pace can be further stretched by the fact that decision-makers and their staffs often start a proceeding with little or no expertise with the specific product in question and even less access to inside industry information that could give them insight into the potential future designs of such products or the trajectory of the industries that build them. Moreover, these regulators may be replaced in the middle of a process due to a political election or to a change in personnel, with the resulting transition further extending the timeline or altering its direction.

This regulatory pace may have been effective in the earlier days of energy regulation. Regulations were typically focused on relatively stable product categories that changed only slowly, and what change did occur was often foreseeable years in advance, such as a larger size or a bigger battery. But set-top boxes posed new challenges for DOE. Unlike twentieth century refrigerators or dishwashers, the design, features, and even the purpose of set-top boxes had changed repeatedly and radically decade by decade, and sometimes year by year. Moreover, the pace of change in the video market and video technology was expected to accelerate even more dramatically in the 2010s and beyond. This history of the evolution of set-top boxes and the video market is described next to provide more context for the decision faced by DOE on how to address the energy efficiency of this fast-changing product.

A Brief History of Cable Boxes

Cable television began in the United States in the late 1940s, conceived by local television salesmen who wanted to make their TVs useable or more attractive to consumers who lived out of reach of viewable reception of the TV broadcast stations. For years after the birth of cable, many televisions were not "cable ready" – they could not ingest the multiple channels received from a cable company and display them on different TV channels, but instead had to have each of the analog cable channel signals converted so that it could be displayed on a single VHF channel, typically channel 3 or 4. Over the years, TVs were redesigned to be cable ready, but by then other purposes for cable boxes had emerged. Boxes were used to descramble and tune premium analog cable channels. Later, advanced analog cable boxes were used to support downloaded on-screen displays, rudimentary remote controls, and parental controls. As pay-TV providers migrated to digital service, set-top boxes were then needed to convert digital service so that it could be displayed on analog TVs. Consumers now increasingly own digital TVs, but today most digital cable and satellite programming is encrypted, and set-top boxes perform decryption so that the service can be accessed by authorized subscribers. Set-top boxes later

[1] 42 U.S.C. § 6295(l)(2) ("Any new or amended standard for [previously undesignated] covered products … shall not apply to products manufactured within five years after the publication of a final rule establishing such standard.").

evolved to provide new services and functions for consumers, such as support for program guides; pay-per-view and on-demand services; on-screen caller ID integration with telephone services; weather, shopping, sports and other interactive applications; and hard disks for recording of programs. The initial implementation of the recording feature was particularly energy intensive, and it was that feature that brought new attention from energy-efficiency advocates.

Not only has set-top box equipment changed rapidly but the underlying market has as well. In the 1980s, most consumers only had one choice (the incumbent cable operator) for video service beyond the over-the-air broadcast stations. Competition from satellite providers and telephone companies emerged in the next decade, and by the time of the DOE proceeding it was already apparent that Internet-delivered services such as Netflix and Amazon would radically transform the marketplace by giving most consumers abundant choices.

The traditional regulatory path would have involved DOE attempting to set feature-by-feature energy standards for five years into the future that could last a couple of decades beyond. While DOE dutifully asked for public comment on the expected characteristics and market for set-top boxes into the 2020s and beyond, no one at that time could predict with certainty whether cable set-top boxes would actually still be made by then, or, even if they were, what services they would deliver, what technologies they would use, or how they would be used by consumers. The reality was that set-top boxes were changing faster than ever and would likely be very different five years later, let alone in a quarter-century. If regulations fixed the amount of energy that a set-top box could use based upon the set-top boxes of the present, set-top boxes of the future might not be able to employ innovative new features or support new services that required more energy to support the added functionality.

The stage was set for U.S. regulators and the energy-efficiency advocate NGOs that had urged them to action to consider, for the first time, a third-way alternative to replace regulation of an appliance category: the Voluntary Agreement.

The Emergence of Voluntary Agreements for Set-Top Boxes

The United States has experience with voluntary energy efficiency-focused programs. The ENERGY STAR program, initiated in 1992 and operated by the U.S. Environmental Protection Agency, has been highly successful at driving efficiency in many product and equipment categories through specifications targeting the most energy-efficient products in the market. Still, these programs did not comprehensively or immediately address the overall market through broadly applicable minimum specifications.

Comprehensive energy efficiency programs for set-top boxes had started to emerge elsewhere. In 2009, the leading pay-TV providers in Australia worked with the Australian government to establish the Voluntary Code for Improving the Energy Efficiency of Conditional-Access Set Top Boxes. The Australian agreement aimed to "voluntarily minimise the overall energy consumption (kWh) used by CSTBs [complex set-top boxes] without limiting or impeding the functionality and user convenience of CSTBs."[2]

That same year, the European Commission's Ecodesign Directive recognized that voluntary programs can "allow[] for flexible and appropriate adaptations to technological options and market sensitivities." It accordingly instructed its regulators that "[p]riority should be given to … self-regulation by the industry where such action is likely to deliver the policy objectives faster or in a less costly manner than mandatory requirements."[3] Set-top box manufacturers were one of the early industries to embrace this approach, recognizing that the alternative of regulation was likely to stifle innovation and the development of new features and services. Leading manufacturers and service providers engaged extensively with European Commission staff to set the overall expectations for a voluntary program, and then the industry parties developed specific targets and rules that would satisfy those expectations and incorporated them into the European Union Complex Set-Top Box Voluntary Agreement. This

[2] The Australian set-top box agreement is no longer in operation. A primary service provider now maintains an internal program to assure energy objectives are met.

agreement became effective in 2010, and it was approved in 2012 by European Commission as an alternative to mandatory requirements.[3]

The leading pay-TV service providers in the United States took note of these developments in Australia and Europe and in late 2012 developed their own voluntary agreement that covered more than 90% of pay-TV customers in the United States. DOE continued to move forward with its proceeding well into 2013, but ultimately, DOE recognized the impossibility of predicting all of the technological and business changes that would have occurred with this fast-changing equipment and market by the time its rules could have come into force five years later. Companies were developing new features every year, and would have had to petition DOE repeatedly to adopt or amend allowances and then wait for DOE approval before they could make the feature available to consumers. That result would have delayed or even derailed the introduction of new features to consumers and upgrades to service provider networks. Lengthy waits for waivers would have deprived innovators of first-mover advantages in a competitive market. Industry argued that these barriers to innovation would violate a directive of U.S. law to avoid "any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard,"[4] and the Obama Administration's directive to federal agencies to "promote innovation."[5]

At the same time, DOE had a legal duty to pursue energy efficiency in appliances and understandably did not want to rely on a voluntary program without assurance that it would produce real energy savings in a transparent and credible manner. Industry representatives met with the DOE to show that the new Voluntary Agreement included multiple levels of transparency and verification that enable trust and reliance by policymakers. These measures, discussed in more detail below, include an annual public independent audit report, third-party verification testing using a consistent test method approved by a standards body, and public disclosures.

While these discussions were ongoing, the key breakthrough occurred in 2013 when the agreement was joined by two well-respected, independent energy-efficiency advocacy organizations: the Natural Resources Defense Council (NRDC) and the American Council for an Energy-Efficient Economy (ACEEE).[6] Under a revised Voluntary Agreement, these two "energy-efficiency advocates" would participate fully in the Voluntary Agreement's Steering Committee, help set even more rigorous energy savings levels that would become effective in 2017, and sit on the review panel that would approve remedial plans of any party that missed its commitments under the agreement.

With these advocates on board to play an active, watchdog role in the Voluntary Agreement, and in light of the agreement's other measures that assured reliability, DOE decided that it was ready to close its rulemaking proceeding on set-top boxes and endorse the Voluntary Agreement. President Obama's Secretary of Energy, Ernest Moniz, issued a press statement announcing that the "energy efficiency standards [embodied in the Voluntary Agreement] reflect a collaborative approach among the Energy Department, the pay-TV industry and energy efficiency groups – building on more than three decades of common-sense efficiency standards that are saving American families and businesses hundreds of billions of dollars."[4] The Secretary added that the "set-top box efficiency standards will save families money by saving energy, while delivering high quality appliances for consumers that keep pace with technological innovation."[4] United States Senator Dianne Feinstein praised the agreement as "a big win for nearly every American" because DOE standards could not have produced as much savings as quickly.[4]

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[3] Report from the Commission to the European Parliament and the Council on the voluntary ecodesign scheme for complex set-top boxes, COM/2012/0684 (22 November 2012) at 6 (finding that "this voluntary ecodesign scheme will achieve the policy objectives more quickly and at lesser expense than mandatory requirements.").

[4] 42 U.S.C. § 6295 (o)(2)(B)(IV).

[5] Improving Regulation and Regulatory Review, Executive Order 13563, 76 Fed. Reg. 3821 (Jan. 21, 2011) ("In developing regulatory actions and identifying appropriate approaches, each agency shall … seek to identify, as appropriate, means to achieve regulatory goals that are designed to promote innovation.").

[6] The current signatories of the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes are service providers AT&T/DIRECTV, Altice, CenturyLink, Charter, Comcast, Cox, DISH Networks, Frontier, and Verizon, and manufacturers ARRIS and Technicolor. Trade associations NCTA – The Internet & Television Association (NCTA) and the Consumer Technology Association (CTA), as well as CableLabs, also play leading roles in the program.

After the initial success of the set-top box agreement in the U.S., the voluntary agreement concept continued to spread. In 2015, many of these same parties, along with major retail manufacturers, launched a second Voluntary Agreement in the United States to improve the energy efficiency of residential broadband equipment such as modems, routers, and Wi-Fi extenders, collectively known as "small network equipment" (SNE).[7] In 2016, the leading set-top box manufacturers and providers of pay-TV service in Canada entered into the Canadian Energy Efficiency Voluntary Agreement for Set-Top Boxes (CEEVA). CEEVA incorporated many of the same energy standards and procedures as the U.S. agreement, but the role of the energy-efficiency advocate in Canada has instead been performed by the federal regulator, Natural Resources Canada (NRCan), which is similar to the European and Australian approaches.

In early 2018, the signatories of each of the U.S. programs extended the term of the agreements for an additional four years through the end of 2021, and committed to a new schedule of even more rigorous energy levels for each agreement that will apply to new purchases and sales beginning in 2020. U.S. Secretary of Energy Rick Perry announced that "DOE supports the commitment from industry to improve energy efficiency, and looks forward to the renewal of this voluntary agreement with our private sector partners," adding that "voluntary industry standards such as this are an effective alternative to government regulation."[5]

The voluntary agreement approach now has a significant presence in North America. This paper will next examine the terms of the agreements to evaluate their effectiveness as an alternative to traditional energy regulation.

Keys to Credibility and Success: Rigor, Flexibility, Verification, Transparency and Enforcement

The parties to the set-top box agreements in both the U.S. and Canada and the SNE agreement in the U.S. each committed that 90% of the devices they purchase (or, for SNE manufacturers, that they sell at retail) meet an energy allowance that is calculated based upon the features of the device.[8] The agreements recognize that more robust and feature-rich devices should be allowed to use more energy so that consumers are not deprived of new capabilities and better performance, but the parties strive to set efficient but achievable allowances for each of these features. The allowances have periodically been adjusted with more rigor, with an effective date typically three years out, to push the signatories and their vendors to develop models that are even more efficient in the future. For example, the U.S. set-top box agreement's Tier 2 allowances became effective in 2017, a third tier will take effect in 2020, and the parties committed to begin discussing a Tier 4 late this year that would presumably be considered for effectiveness around 2023.

Flexibility for New Features and Services

An implementation period of at least two years is typically necessary so that new commitments can be harmonized with the development and production cycles for new models and their components. Of course, setting energy allowances this far in advance is fraught with the same predictive problems that the U.S. regulator DOE faced in trying to set regulations that would take effect five years later. The North American voluntary agreements introduced an innovative, crucial additional procedure that permits parties to deploy new features and types of equipment without advance permission. Under traditional energy efficiency regulation, if a company wants to develop and launch a device with a new energy-using feature for which no allowance exists, it has to petition the regulator, disclose the feature, and request a new allowance or exemption. The filing of a public petition not only slows the availability of the feature for consumers for months or even years, but the company's element of surprise relative to competitors and the benefits of being first to market a new feature are lost. By contrast, the North

[7] The signatories of the Voluntary Agreement for Ongoing Improvements in the Energy Efficiency of Small Network Equipment are service providers AT&T, Altice, CenturyLink, Charter, Comcast, Cox, Frontier, and Verizon; and manufacturers Actiontec, ARRIS, NETGEAR, Technicolor, and Ubee Interactive. Like the set-top box agreement, trade associations NCTA and CTA, as well as CableLabs, also play leading roles in the program.

[8] The 90% commitment, instead of 100% compliance that would typically be required by regulation, is intended to give breathing room for small trials of new non-compliant devices (the first generation of a new prototype is often less energy efficient than subsequent production runs) or the disposition of older models that lasted in inventory longer than expected.

American voluntary agreements permit a party to launch the new feature without advance permission and self-declare a new proposed allowance that will remain in effect for a maximum of six months until the parties are able to develop and approve an appropriate allowance.

This "new features" process is essential to fostering innovation in technology and business models in rapidly changing industries. It also avoids depriving innovators of first-mover advantages in a competitive market. For example, in 2015, DISH Networks was able to launch the nation's first 4K-capable pay-TV set-top box using the new features process, without any regulatory delay and without disclosing the planned launch of this product in advance to its competitors. The parties (including the energy-efficiency advocates) then convened a technical working group to establish a 4K allowance going forward.

The agility and flexibility of the new features process is even more important for SNE because of the rapid pace of hardware and feature evolution. A DOE regulation drafted more than five years prior would have focused on a world in which consumers typically hard-wired a single desktop computer to a modem delivering 1.5 Mbps of Internet speed. That rule would have become effective in a world in which consumers wirelessly connect dozens of laptops, tablets, game consoles, alarm and home monitoring systems and other devices over much faster Wi-Fi speeds that need to be robust throughout the home. By contrast, the new features process has enabled the SNE voluntary agreement to keep pace with rapid innovation. As a result, the energy efficiency of small network equipment has improved even as features and performance radically increased.

While this process may potentially allow some devices temporarily to exceed the energy level ultimately set for a new feature, the energy associated with these new product launches is typically small in their first year, and the manufacturers must in any event adapt quickly to the permanent allowance set by the parties for the next year. It is reasonable for public policy to favor the rapid rollout of new features and services even if it can necessitate a temporary exception to energy efficiency requirements.

Assuring Rigor through Transparency and Engagement

Another recent study observed that voluntary agreements may be the most effective realistic approach for fast-changing product categories but contended that such agreements typically "target for a modest, and certainly not a maximum energy performance improvement" and that "[n]on-industry stakeholders generally consider that [voluntary agreements] deliver less results than a regulatory approach would have done, if that had been practical and feasible."[6] But just as regulation can vary in rigor and effectiveness, so too can voluntary programs. One voluntary program might only adopt modest targets that would have been achieved in any event, while another could implement robust and creative measures that save energy beyond simple lowering of nominal usage allowances, which may include commitments that a regulator would have lacked the capacity or authority to impose. Ultimately, what makes an energy-efficiency program most effective is not whether it is voluntary or regulatory, or whether it reduces maximum energy allowances by at least a certain percentage; it is whether it actually improves overall energy efficiency in the market. The probability of that success can be improved by government and NGO collaboration and engagement with industry to press for rigorous but also realistic terms in a voluntary agreement. In addition, effectiveness and rigor are promoted by transparency that is sufficient to enable evaluation and reliance by regulators.

While these programs are often described as "voluntary" agreements, they should not be misunderstood as government abdication to regulatory indifference. Government agencies can and do actively engage with industry in the development, implementation and monitoring of these agreements, a practice that has been described as "co-regulation" in which government sets certain expectations but leaves the implementation details to private parties, with the implied threat of new regulatory mandates if government expectations are not met.[7] The participation of energy-efficiency advocates in the U.S. and the federal government in Canada helps to assure that the commitment levels and new feature allowances represent real energy savings and do not simply reflect efficiencies that industry would have

achieved in any event under business-as-usual practices.[9] In the absence of such energy-efficiency advocates, regulators should apply careful scrutiny to the process used by a voluntary agreement to assure the sufficiency and rigor of its energy commitments. In addition, where the regulator is not directly engaged in a voluntary agreement, it may wish to request recurring updates and maintain a credible threat of new regulation if commitments are not met or if the parties fail to update commitments to embody the best new available technologies for improving energy efficiency.

At the same time, if a regulator not only co-regulates by participating in a voluntary program but also continues to adopt or enforce additional regulation that is out of step with that collaborative effort, the perceived benefit to industry of remaining engaged in a demanding voluntary program may diminish. One of the key attractions to industry of a voluntary agreement is the replacement of traditional regulation and relief from the corresponding strains that such regulation can place on innovation. For example, after the European Commission's network standby regulation did not exempt set-top boxes despite its prior certification of the European set-top box voluntary agreement, the parties subsequently had greater difficulty in retaining and recruiting industry participants.[10] Of course, industry parties must ensure that a voluntary program actually and clearly satisfies regulatory and public objectives if they wish to avoid traditional regulations.

Regulators can more effectively monitor voluntary programs if they are sufficiently transparent. The North American agreements include multiple levels of transparency and verification that enable public trust and reliance. A key element of the voluntary agreement program is oversight by an independent auditor. Each signatory party reports the energy usage and the number of purchases/sales of each model each year to this independent auditor (D+R International for all three existing North American agreements) which verifies and aggregates the information, verifies each party's compliance with its commitments, and prepares an annual report that is shared with regulators and posted on public websites.[11] The review process includes independent verification testing of select models in a third-party lab or under a supervised testing program with an accredited observer,[12] as well as audits of procurement data to verify signatory reports.

A potential area of weakness for a voluntary agreement is enforcement, since a non-governmental program cannot compel participation or enjoin or penalize a non-compliant party. Free riders can undermine the effectiveness of a program while giving themselves a competitive advantage that they would not enjoy under mandatory regulation. The energy-efficiency advocates have addressed this problem in the U.S. set-top box agreement by requiring that the agreement cover at least 85% of all pay-TV subscribers in the United States.[13] If any of the largest signatories or any significant number of the mid-sized providers dropped out, the agreement would fall below this threshold, which in turn would

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[9] A third-party report evaluating the rigor of the U.S. set-top box voluntary agreement stated that there was "a lack of information about technologies in development and in the product pipeline" at the time the agreement was negotiated, and that "[t]his information would have allowed for a more precise tailoring of requirements to the performance level of technologies in the market at the time the requirements would come into force."[6] But the agreement's terms provide the NGO energy-efficiency advocate parties with extensive access to confidential future business and technology plans through one-on-one meetings with the largest signatories and direct engagement with manufacturers and key suppliers. Most recently, the advocates in 2018 started an engagement with the industry parties and their component suppliers to focus long-term planning and development efforts that could support further improvements in energy efficiency in the early to mid-2020s.

[10] The concurrent regulation of set-top boxes in Europe by a voluntary agreement and the European Commission's standby power regulation appears to be unique in the world.[6]

[11] The website for the US agreements is www.energy-efficiency.us, and for Canada is http://www.energyefficiency-va.ca. Individual company data is kept confidential and the compliance rates of individual parties are not shared with their competitors or disclosed.

[12] Testing is performed under American National Standards Institute (ANSI) standards, which can also be updated far more rapidly than government-mandated test methods. The U.S. set-top box agreement initially conducted independent verification of devices in consumer homes. After four years of such testing in hundreds of homes, the parties determined that laboratory testing was equally effective and was less costly and disruptive to consumers.

[13] The European Commission similarly set a standard that self-regulatory programs cover at last 80% of "units placed on the Union market." Commission Recommendation (EU) 2016/2125 of 30 November 2016 on guidelines for self-regulation measures concluded by industry under Directive 2009/125/EC of the European Parliament and of the Council, at Section 3.3. Because market placement is done by the manufacturer or importer, the principal basis for market coverage of the European agreement is the manufacturer signatories, unlike the North American agreements, which have focused on coverage by service providers. See Blue Guide on the implementation of EU products rules 2016, Official Journal of the European Union, (26 July 2016), at Section 2.3.

jeopardize the entire project and invite regulation. Some other voluntary programs have been hampered by non-participation of key parties.

The impact of non-participation of small pay-TV service providers is also mitigated by the fact that many of these providers purchase equipment from the same manufacturers as the signatories. Even in industries where parties manufactured their own equipment, it is likely that many underlying components would have been made more efficient by pressures arising from the participating parties' need to comply with the commitments of a voluntary agreement. Voluntary agreements have the effect of improving the energy efficiency of equipment across an entire industry, even the devices associated with non-participating free-rider parties. This observation has been made in Canada, where one large service provider has declined to date to participate in the agreement, but the party's set-top boxes nonetheless appear to comply with the agreement's energy commitments.

Some academics have also noted that a voluntary program enjoys other advantages in promoting effective enforcement. Industry peer enforcers better understand the motivations and trajectory of industry participants.[8] The North American agreements have capitalized on this advantage and managed to make enforcement another area of strength. Each of these programs requires non-compliant parties to remediate extra energy usage caused by their non-compliance. Parties are required to provide early notice of expected non-compliance, even before a reporting year is completed, so that remediation can start sooner than it would under a traditional enforcement proceeding. Companies are afforded flexibility to develop creative remediation plans that fit with their business objectives, in contrast to rigid government enforcement actions that would likely focus on monetary penalties and injunctions against the further sale of a product. However, to ensure their adequacy, effectiveness and implementation, the plan itself and then completion of the plan must be approved by the energy-efficiency advocates in the United States or by NRCan in Canada. For example, in one instance, a company downloaded new energy-saving software to older models in the January following a year in which it missed its energy commitment, offsetting the extra energy before a government enforcement proceeding could have even completed its fact-finding. A regulator would have lacked the authority to compel such a creative and effective remedy.

Still, if a non-compliant party failed or refused to implement a remedial plan or dropped out of the agreement, the other parties to a voluntary program cannot penalize the company, force its compliance, or enjoin the distribution of an offending product. The voluntary program also lacks authority to require a party to produce evidence to the auditor or Steering Committee if the accuracy of its data is suspect. Regulators should be ready to step in when needed to address any breakdown of a voluntary program caused by a party's unremedied non-compliance.

Another challenge for voluntary programs is cost. While regulatory programs are typically financed by governments, the cost of voluntary programs (such as the cost of an auditor and third-party verification testing) is borne by industry. Most large companies have found these costs to be well worth the benefits of a voluntary agreement, and government also can benefit from shifting costs to the private sector. However, small companies and companies operating on tight margins or with lean staff may struggle to meet the administrative, testing, and financial commitments of a voluntary program. More than 85 percent of the U.S. and Canadian pay-TV and residential Internet access markets are served by a small number of large providers, which has enabled the agreements to provide effective national energy savings programs without requiring the participation of small providers. In a more decentralized or smaller market, larger or third parties could consider making resources or subsidies available to small participants to facilitate broader participation. Similar support for energy-efficiency advocates may also enable such parties to play more comprehensive, effective roles.

It is therefore vital that a voluntary program is configured to address the potential shortcomings of the approach, which may vary case to case depending upon the specifics of the product and the market. However, this paper is not the first to conclude that a voluntary agreement, properly structured, can "form a rapid and flexible response to environmental challenges from stakeholders who have gained particular experience in the field; stimulate a pro-active approach from industry and can offer cost-effective solutions for the faster achievement of environmental objectives."[7] This paper now returns to judge how well the U.S. set-top box agreement has managed these challenges to achieve energy efficiency objectives as a complete substitute for traditional government regulation.

MEASURING THE SUCCESS OF THE VOLUNTARY AGREEMENTS

Other papers have noted that it is difficult to measure the precise effectiveness of a voluntary agreement because the results of a counterfactual – either the absence of any program, or the existence of regulation instead – are unknown.[6] There are no available comparisons between a product that is regulated in one market by a voluntary agreement and in another by government regulation. Even if there were, voluntary or government regulation in any major market would influence those products even in countries without regulation because markets for many products such as set-top boxes are global. It is also difficult to determine to extent to which improvements in energy efficiency that occur after the effective date of a voluntary agreement would have occurred in any event, due, for example, to new products or innovations that were already in the pipeline at the time of the agreement.[6] These observations no doubt are valid, but all of these same uncertainties exist in measuring the effectiveness of regulation. Effectiveness should ultimately be measured by outcomes, whatever their actual cause.

By that standard, the North American voluntary agreements have succeeded. The year 2018 marked the five-year anniversary of the U.S. set-top box agreement, and five years is a meaningful yardstick because that is the waiting period before DOE regulations could have become effective. Before DOE's first generation of energy efficiency levels could have taken effect, the industry program was already on its second generation of energy allowances and had already adopted a third set to take effect in 2020. In 2018, 97.7 percent of U.S. service providers' set-top box purchases met these Tier 2 levels, and the new-unit average power usage of the most energy-intensive type of set-top box, the DVR (digital video recorder), had fallen by 48 percent since 2012. As a result, overall national set-top box energy consumption in the United States declined by nearly 40 percent since 2012, according to the independent auditor. In 2018 alone, consumption was 12.6 TWh less than would have been expected in the absence of the voluntary agreement, more power than is generated by four typical 500 megawatt coal-run power plants, saving consumers more than US$1.6 billion[14] and avoiding nearly 9 million metric tons of CO_2 emissions.[15] In 2019, after six years of the voluntary agreement, cumulative energy consumption in the U.S. has been reduced by an estimated 40.4 TWh, saving consumers approximately US$5.1 billion and avoiding 28.6 million metric tons of CO_2 emissions. These savings – verified by an independent auditor and all before a regulatory program could have even started – are even more impressive because they occurred even as the functions and features of the equipment increased.[16] Another independent report concluded that the agreement "allowed for requirements to be introduced much quicker and with more flexibility about where and when to achieve efficiency gains optimized for the business operations of a particular service provider than could have been achieved with a regulatory process."[6]

Another reason (other than speed) that a voluntary agreement can be more effective than regulation is because it can afford the parties more flexible opportunities to achieve energy savings. For example, while regulation could have capped the energy that could be used by a DVR set-top box, it could not have ordered pay-TV providers to reduce the number of DVRs used by consumers. By contrast, the U.S. set-top box agreement has reduced the number of DVRs by promoting "whole-home" solutions that enable a single DVR to record and play back recorded content on any TV in a house, and apps through which consumers can watch live and recorded content without any set-top box at all. As a result, U.S. providers purchased less than half as many new DVRs in 2018 as they did in 2014. The energy-efficiency advocates and service providers have also focused on the promotion of cloud-based services and Internet-delivered apps that enable customers to access video services without any operator-supplied set-top box at all, through Internet-connected devices such as smartphones, tablets, personal computers, select "smart" TVs, game consoles, and streaming devices such as Apple TV,

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[14] See [9]. D+R based its 2018 savings calculations on a national U.S. average energy cost of $0.1289 per kWh. See U.S. Energy Information Administration, Electric Power Monthly, available at https://www.eia.gov/outlooks/steo/report/electricity.cfm.

[15] See [9]. D+R's emission reduction estimates are based on the U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator, available at https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

[16] A calculation of savings from the SNE agreement is more complicated because of the pace of change in equipment features. The primary effect of the U.S. SNE agreement has not been an overall reduction in energy consumption but instead significant improvements in efficiency that have enabled support for mush faster home Internet speeds, stronger Wi-Fi signals in the home and support for many more Internet of Things and other connected devices, all without significant increases in overall energy usage. The agreement's second tier of energy allowances that will become effective in 2020 are on average 11% more efficient than the current agreement levels, which the independent auditor found had already improved the efficiency of small network equipment by nearly 20% compared to typical, previously deployed devices used by the parties. See [9].

Roku, Google Chromecast and Amazon Fire. Nearly all U.S. TV households have at least one of these devices,[8] and three-quarters can stream video to their televisions.[11] Regulation might be able to make set-top boxes more efficient, but only a collaborative, flexible program could displace set-top boxes altogether.

These opportunistic additional savings are encouraged by the Voluntary Agreement, which commits the industry parties to "explore approaches to further improve the energy efficiency of Set-Top Boxes in all power states", "set future targets to increase energy efficiencies in accordance with the usual product development cycles," and meet both as a group and also individually with the energy-efficiency advocates to explore strategies for additional efficiencies. The advocates actively participate in all Steering Committee meetings and have conducted numerous one-on-one meetings with individual company engineers and executives who are responsible for the design of future equipment. This unprecedented direct access (under non-disclosure agreements) into the realm of equipment design and company decision-making can potentially enable advocates to be more effective than they could through lobbying government for mandatory regulations.

FUTURE VOLUNTARY AGREEMENTS FOR A WIDER RANGE OF PRODUCTS

While most energy efficiency voluntary agreements to date have been focused on specific consumer technology categories that have always experienced rapid changes, the cycle of innovation for many more product categories – certainly in the world of electronics, but also beyond – is becoming faster than ever. More and more device types, from televisions to lighting to refrigerators, are now connected to the Internet and can incorporate more sophisticated computerized and sensor-enabled capabilities. These changes greatly expand opportunities to offer consumers additional functions such as interactive voice controls, and they enable device functionality to continue to evolve through software downloads even after the product is purchased and deployed in a consumer's home.

For this reason, regulators, advocates and industries may increasingly wish to explore the possibilities for additional voluntary energy efficiency programs for other categories of devices, including devices that have previously been regulated. The lessons from the North American set-top box and SNE voluntary agreements provide a roadmap of considerations to determine if a voluntary program can provide an effective, complete substitute for regulation. As noted, while the particular design of a voluntary agreement will depend upon the specifics of the product and the market, regulators or others considering the design of a voluntary agreement should carefully consider the following valuable elements:

- A respected, independent auditor with energy expertise;
- Public reporting;
- Periodic updates for regulators;
- A requirement that the agreement cover a specified portion of a market;
- Participation by government and/or NGO energy-efficiency advocates to set expectations, review the sufficiency of program commitments, and evaluate remediation of non-compliance; or, in the absence of direct engagement, an opportunity for government scrutiny of commitment standards and performance;
- A flexible process for considering energy associated with new features or services that does not hinder innovation, competition, and the rapid rollout of new features and services to consumers;
- A consensus standard test method that can assure consistent and repeatable results, preferably adopted by a private standards body that can rapidly adapt to changes in technology;
- A process and schedule for considering future updates to energy commitments;[11] and

- Subsidies or resources for small participants and energy-efficiency advocates to facilitate broader participation.

Traditional energy regulation has avoided billions of metric tons of carbon emissions and played a critical role in advancing the public interest. In many cases, those programs remain the right answer going forward. Nevertheless, legislators and regulators should ultimately prioritize and favor whatever solutions will be most effective. Increasingly, public-private collaborative efforts including voluntary agreements will be the superior approach in the 21st century for accomplishing shared objectives of promoting efficiency and protecting the environment while still fostering innovation in appliances and services for the benefit of consumers.

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