Ontario's Energy Policy under the McGuinty Liberals:

Shifting Objectives, Changing Policies

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renewable energy sources, has limited the flexibility needed by the electricity sector to pursue the most cost-effective ways of achieving its emission reduction goals. This paper argues that a market-based instrument such as an emissions tax or emissions trading system would be a far more efficient way of achieving its targets. Furthermore, we do not find support for the additional justifications used to promote the FIT program, such as the claims of job creation and economic growth.

Before beginning the critical assessment of Ontario's decision to replace coal and introduce its FIT program, the next section will go through a brief overview of the GEA. The overview will look at the design of Ontario's FIT and compare it to its European counterparts. The third section will review the alternative policy options available to encourage the development of renewable energy. The critical assessment begins in the fourth section by analyzing Ontario's policy objectives. It starts with an analysis of Ontario's decision to replace coal followed by an analysis of its decision to increase renewable energy production via the FIT program. It finishes with an assessment of Ontario's third and most encompassing objective, reducing polluting emissions. The fourth section concludes.

II – Overview: Ontario's Green Energy Act (GEA) and the Feed-in Tariff (FIT) Program

Advocates of the GEA believe it is not only a major environmental policy initiative but that there will be many added benefits to the economy. According to the Ministry of Energy and Infrastructure (MEI), the introduction of the GEA will create some 50,000 jobs for Ontarians within the first three years (MEI, 2010). Its policy objectives are twofold, to increase energy conservation and promote renewable energy by ratepayers in the form of higher electricity costs (SP, 2010, p.7). The tariffs are set based on the cost of production plus a reasonable return for investors. Therefore, because the cost of production is not the same for all renewable energies, tariff prices are differentiated with respect to resources. For example, Ontario's FIT is currently offering a high of 80.2 Cents/KWh for rooftop solar PV under the Micro-FIT program, and a low of 10.3 Cents/KWh for energy produced by landfill gas under the regular FIT program (OPA Program Overview, 2010, p.14). Therefore, prices based on the cost of technology will tend to favor more infant technologies such as solar PV over the more advanced technologies such as wind or alternative forms of gas power, which have already experienced significant cost reductions. Furthermore, Ontario's FIT program has additional price incentives for projects that have certain levels of equity ownership by Aboriginal proponents (OPA Program Overview, 2010, p.8), and it also has specific domestic content requirements aimed at supporting the local renewable energy manufacturing industry. For example, they require a minimum domestic content of 25% for wind turbines, increasing to 50% after 2012, and 50% for solar panels, increasing to 60% after 2011 (SP, 2010, p.8). Now that the FIT program has launched, the OPA has stated they will monitor its progress and conduct policy reviews every couple years (OPA Program Overview, 2010, p.12).

Feed-in tariffs have been deployed in Europe for more than two decades and being the first of its kind in Canada, we can compare Ontario's very new FIT program with its more weathered European counterparts, namely Germany, Spain, France and Denmark. In most fundamental ways, Ontario's FIT structure closely mirrors that of Germany, Spain and France (SP, 2010). The most obvious distinctions are found when

Providing additional price incentives to install non-price competitive renewable energy technologies in areas that have demonstrated they provide insufficient resources to make a project profitable at the pre-set FIT amount would surely not pass any test of economic efficiency.

Another difference is that most European programs have fixed tariff degression rates. Reducing the tariff over time is based on the concept of the technological experience curve. The idea is that the costs associated with a technology will be reduced over time with experience. In application, a renewable energy developer would be given a FIT associated with the current cost of technology and they will receive it for the duration of the 20-year contract. In subsequent years, as costs of production will have reduced with experience, new developers will be offered slightly lower tariffs for their contract. In Germany, policy makers have estimated these rates of degression based on empirically derived progress ratios for the different technologies and therefore have pre-set yearly degression rates which reflect the cost reductions associated with technological advancements (Ragwitz and Huber, 2005, p.5). Currently, Ontario does not have such a degression mechanism, but has announced that it will conduct policy reviews every couple years (OPA Program Overview, 2010, p.12). If the Ontario government is intent on having a FIT program that attracts the greatest amount of renewable energy investment, then fixed yearly degression rates may be favorable as they provide greater investor certainty over policy reviews every couple years with uncertain outcomes.

III Alternative Policies to Encourage Renewable Energy

So far our discussion regarding the effectiveness of Ontario's Feed-in Tariff (FIT) has revolved around its ability to attract financing and deploy renewable energies into

(RPS). In either case, as utilities are required to purchase renewable energy, they will shop around among the available producers in attempts to meet their assigned quotas at the least cost. Producers on the other hand, will be looking to sell their renewable energy and hopefully enter into a long-term purchasing power agreement (PPA) with a utility company so as to provide the project and its investors with the greatest amount of certainty. Experience in the US has shown that a growing number of utilities are deciding to own renewable energies rather than enter into PPAs with third party producers (Cory et al. 2008, p.1).

With the quantity-based approach, regulators are required to monitor the amount of renewable energy being produced or bought by the utilities. A common practice to simplify this monitoring system has been for governments to create a green energy certificate market, where utilities can buy and sell their certificates in order to meet their renewable energy quotas. These green certificate markets will also hopefully reduce the overall program compliance costs (SP, 2010, p.6). In contrast to the price-based approach, the government now sets the quantity of renewable energy to be produced and lets the electricity market determine the price offered to renewable energy developers. Compared to the FIT, a RPS is generally seen as more efficient because they let the utilities determine how they are going to meet their quotas through a competitive bidding process. For this reason, RPS and quota mechanisms will tend to favour more developed renewable technologies that have already experienced significant cost reductions. In contrast, FIT programs with resource differentiated pricing will tend to favour more infant technologies such as solar PV, because the most expensive underdeveloped technologies will receive the greatest subsidies. Even though in theory RPS are more and emission trading systems. Both approaches consist of internalizing the negative costs associated with polluting emissions, thereby making renewable energies a more cost competitive alternative. Since the 1990's, carbon taxes have been implemented in the Scandinavian countries and in the Netherlands (Fischer and Preonas, 2010, p.4). More recently, British Columbia enacted its own emissions tax in May of 2008 (BC MOE, 2010). There are a number of examples of successful emission trading systems, also known as cap-and-trade programs, most notably the US Acid Rain Program, which capped the sulfur dioxide emissions of power plants. Also, the European Union Emissions Trading System (EU ETS) is the largest existing GHG trading program and it is currently in effect across 30 European nations (Fischer and Preonas, 2010, p.4).

IV Critical Assessment of Policy Objectives

Going back to 2003, long before the Green Energy Act (GEA) was introduced, the Ontario government's policy objective was to completely eliminate the use of coal from the province's electricity generation mix. With the introduction of the GEA and its Feed-in Tariff (FIT) program, policy makers have since outlined a number of additional objectives, specifically reducing greenhouse gasses (GHGs) and increasing renewable energy production. Before beginning the assessment of Ontario's new objectives, this section will begin with the critical assessment of the original objective, replacing Ontario's coal-fired electricity generation.

Replacing Coal

Historically, coal-fired electricity generation has been an extremely important source of energy for Ontario, not just because it is cheap, but also because it is highly reliable and flexible. The four remaining coal-fired plants, Nanticoke, Lambton, Atikokan shutdown, the IMO will need to rely on more expensive energy sources, and this will increase electricity prices in Ontario.

Since electricity is a necessary commodity, in the short-run, its demand is generally considered to be both price-inelastic and income inelastic. What this means is that as the price of electricity increases, demand will not significantly decrease, at least not in the short run. Similarly, when income falls, the demand for electricity will also fall but never equal in proportion to the change in income. Therefore, with increased electricity prices, this will increase the cost of living and lower household real-income for all Ontarian's. Moreover, as explained by McKitrick et al. (2005, p.23-25), the fall in household real income will be proportionately greater for low-income households as electricity costs would be a larger portion of their household expenses. For this reason, McKitrick et al. argue that when analyzing the social costs of energy production, it is important to consider not only the environmental and health effects of pollution, but also what would be the social consequence of a drop in disposable income for the poorest Ontario families, as coal is eliminated from the energy supply mix.

Although this may be true in the short run, elasticity of electricity demand is higher in the long run. This suggests that over time, if electricity prices increase, society can change its habits, pursue greater conservation and lower its overall demand for electricity. Furthermore, as any environmental energy policy will most likely result in higher electricity prices, they will all suffer from this same defect. Therefore, if Ontario is concerned about the negative social consequences of increased electricity prices, then they may wish to address these distributional concerns through ancillary policies. For example, in British Columbia, to help offset the cost of the carbon tax, low-income indicate that Ontario Power Generation's (OPG) five fossil fuelled plants accounted for only an estimated 15 per cent of the carbon dioxide equivalent emissions produced in Ontario in 2006 (Purchase, 2007, p.3)[1]. Air pollutants and GHGs are associated with all fossil fuels, not just coal. Furthermore, there are a huge number of power plants located just south of the border and they represent a major portion of Ontario's air pollution. By some estimates, 50% of the smog in southern Ontario comes from US sources (Purchase, 2007, p.3). Therefore it is reasonable to question why policy makers chose such a specific goal to only eliminate one fossil fuel, coal, and only in one application, the electricity sector. Moreover, unless more comprehensive environmental policies are put in place, simply shutting down Ontario's coal-fired electricity generating plants will have minimal effects on improving the province's air quality and reducing its GHG emissions.

Since coal has been such an important factor in Ontario's energy supply mix, and replacing it will not only increase electricity prices, but may have potentially long run negative impacts on the province's economic growth while conveying only moderate environmental benefits, then what are the valid reasons for its replacement? Although there are unquestionably negative impacts to the environment from the production of greenhouse gases and other pollutants, it is worth asking whether simply eliminating coal's use in energy production is the most cost-effective way to make substantial environmental improvements, and other than the advantage of its simplicity, what other benefits does it have over alternative policy measures? To gain insight, it may prove useful to understand where Ontario derived its policy objective of eliminating coal-fired electricity generation.

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[1] OPG's five fossil fueled plants include the four remaining coal-fired plants as well as the Lennox station which primarily uses oil and natural gas.

impacts due to air pollution were tabulated, the true cost of coal was $4.4 billion annually. The study concluded the lowest electricity cost scenario for Ontario would be to pursue a combination of refurbished nuclear and new natural gas generation, which would cost $2 billion annually. The all gas and stringent control scenarios were both about 30-45% greater than the costs of the nuclear/gas combination with average annual costs in the range of $2.6-$2.8 billion. The study had also estimated that an average total of about 660 premature deaths, 920 hospital admissions, 1090 emergency room visits and 331,00 minor illness cases could be avoided per year by switching from the base case to the nuclear/gas scenario. Although, even under the nuclear/gas combination scenario, it was still expected that a total of 5 premature deaths, 12 hospital admissions, 15 emergency room visits and 2500 minor illness cases per year would result (Ontario MOE, 2005, p.ii-iii). Therefore, based on this study, the Ontario government moved forward with its coal replacement initiative.

In 2006, with concerns over increasing electricity demand, it was announced that the closures would be delayed to sometime beyond 2009. Along with the displayed need for a more decisive plan, it was around this time when there appeared to be a transition in the government's purpose of eliminating coal-fired electricity generation. Although originally advocated over concerns about air quality and adverse health effects, the reduction of carbon dioxide emissions to combat climate change eventually became the main policy focus. As a result, the Ministry of Energy requested that the Ontario Power Authority (OPA) develop recommendations for Ontario's electricity future while achieving specific directives laid out by the Ministry (OPA, revised 2008). The directives given to the OPA were as follows:

role in the development of the IPSP. But since 2005 there have been a number of significant developments that are sufficient to warrant a policy revision. As per the Auditor General reports, costs of production for the Atomic Energy of Canada Limited (AECL), Canada's nuclear reactor builder, have been rising dramatically over the years and many projects are highly over budget and will require hundreds of millions of additional investment (AGC, 2007, p.1-4). For this reason, when the Ontario government was looking to make a deal for the construction of two new nuclear reactors at the Darlington site, they could not promise the billion dollar contract to Canada's AECL and had to open the biding process to the international market (Awillis, 2009). While the province was ready to invest billions into new nuclear power, when the bids came back, some reports suggest that even the most competitive offers were more than double the province's cost expectations (McCarthy and Howlett, 2009). Furthermore, when assessing the environmental benefits of replacing coal, it would be appropriate to assess the environmental damages and associated costs that result from increased nuclear power, an aspect the 2005 study did not evaluate. Future projects for dealing with nuclear waste have been reported in the billions of dollars. In 2009, one proposed solution was to bury the millions of bundles of spent nuclear fuel half a kilometer underground, at an estimated cost ranging between 16-24 billion dollars. (Paperny, 2009)

In terms of natural gas, the most recent discovery has been the massive reserves of "shale gas" trapped within dense sedimentary rock. This unconventional natural gas was for decades considered too costly to retrieve, but advances in drilling technologies known as "hydraulic fracturing" has transformed the economics of shale gas extraction. The volume of recoverable shale gas remains imprecise, but the National Energy Board a reasonable request as Ontario plans to invest millions into renewable energy subsidies over the next 20 years.

So why then did Ontario turn to renewable energies after not originally considering it as a significant alternative (Ontario MOE, 2005)? While the rising costs of nuclear power may have pushed the government to diversify its energy portfolio to alternate sources, another reason may have came from international influence. Amidst a global economic recession in 2009, governments around the world were encouraged to develop stimulus packages in response to their failing economies. For example, some notable programs in the US were the American Clean Energy and Security Act (ACESA) and the Clean Energy Jobs and American Power Act. As the titles suggest, their objectives would be to address growing environmental concerns while at the same time addressing concerns over the failing American economy by promising employment creation and increased energy security. Similar in this respect, on May 14th 2009, Ontario's Ministry of Energy and Infrastructure (MEI) introduced into legislation the Green Energy and Green Economy Act (GEA) and with it, Ontario's FIT program (MEI, 2010). In the next section, I will examine the justifications advanced in the public discourse regarding the validity of using a FIT program to directly encourage the development of renewable energies.

Increasing Renewable Energy Production

Replacing coal from Ontario's electricity generating supply mix may have been the province's original objective, but with respect to the Feed-in Tariff (FIT) program, the policy directive appears to be the rapid deployment of renewable energies. Policies directed specifically at the development of renewable energies have been typically government has promised that the Green Energy and Green Economy Act (GEA) along with its Feed-in Tariff (FIT) will create some 50,000 jobs for Ontarians within the first three years (MEI, 2010). But many economists have been unconvinced about such job creation claims. They argue that long-run national employment levels are instead driven by macroeconomic factors and policies. In reference to the standard theory of general equilibrium, shocks of any variety, including changes in regulation, may lead to short-term dislocations, but in the long term, provided markets are sufficiently flexible, the economy will adjust to the new circumstances, and then resources such as labour, will return to their long-run equilibrium. Therefore, much of the commentary on this subject mistakes the redistribution of economic activity for new economic activity. Many studies have focused on the number of jobs created in the renewable energy sector and have mistaken this to be a measure of net positive economic benefits, when in reality the gross and net employment benefits should be distinguished. For example, when Ontario reports 50,000 jobs will be created, this figure would reflect gross employment effects, since opposing impacts would be ignored. Aside from the direct crowding-out effects on conventional energy production, for example the closing of the four remaining coal plants, as well as the indirect negative impact on upstream sectors, supporting renewable energy technologies ultimately raises the price of electricity. The resulting drain of purchasing power and investment capital of private and industrial electricity consumers causes negative employment effects in other sectors (Frondel et al., 2008).

Becker and Shadbegian (2009) examined the economic performance of environmental product manufacturers (EPMs). Using data on EPMs from the 1995 Survey of Environmental Products and Services and comparing it to data from the

(2010) estimated the factors that increased the likelihood of a state adopting renewable portfolio standards (RPS) and what they found was that states with high unemployment were actually less likely to enact RPS policies. The authors determined that the best predictors of a state RPS were well-organized renewable energy interests and a Democratic state legislature. All together, the "green collar" jobs argument is weak, and counting jobs created or lost is a poor way to evaluate an environmental policy. Since economic theory suggests that a flexible economy can achieve full employment in the long run, then "job creation" is not really an issue. Rather, pointing the economy in the direction of its comparative advantage, and thereby maximizing incomes, would be a better policy objective.

Technological Market Failures

The theory of environmental policy suggests that because emitters of pollution possess different technologies, the costs of pollution abatement are minimized in an industry when all emitters pollute at the level where their marginal abatement costs are equalized at each point in time. But in reality, technologies change over time and because environmental policies are often evaluated over long periods, the dynamic technological effects can be significant in determining the optimal environmental policy. This is the argument advanced by Bramoullé and Olson (2004) who evaluated the optimal allocation of pollution abatement under learning by doing, a source of technological progress through which costs decline as firms gain experience utilizing a technology. It is often characterized by a learning curve in which each doubling of experience leads to a fixed percentage reduction in costs. Because different technologies will be at different stages of their learning curve - for example infant technologies like solar PV will have greater failure, other than the large price-based subsidies offered through Ontario's FIT program? As we will see in the next section, some studies suggest that the market-based measures of indirectly promoting renewable energy may provide sufficient market penetration to correct for leaning spillovers, while at the same time being more cost-effective.

Emission Reductions

Whether it has been to replace coal or advance the development of renewable energies, it can be argued that in either case, the intent behind the policy has been to reduce polluting emissions. But does Ontario's Feed-in Tariff (FIT) program do so at the least cost? As Fischer and Preonas (2010, p.11) point out, there exists a strong consensus in the economic literature that isolated renewable energy support policies, like a FIT, are effective at helping an economy meet renewable energy production targets while indirectly contributing to emission reductions. However, it is also agreed that specific market-based emission reduction policies, like an emissions tax or emissions trading system (ETS), are the most cost-effective ways to reduce emissions and, as was discussed earlier, they will indirectly promote the development of renewable energies. So if Ontario's primary goal in replacing coal-fired electricity generation and in the advancement of renewable energy production has been to ultimately reduce emissions, then as Fischer and Newell (2008, p.7) find, a single renewable energy support policy, whether it be price-based or quantity-based, will always be less cost-effective than a market-based cap-and-trade or emission pricing policy.

The reasoning is that the environmental costs associated with polluting emissions are not reflected in the price of electricity, and any policy to address these costs will result in higher electricity prices. Economic theory suggests that these costs can be electricity via Solar PV is among the most expensive emission abatement options available and from an economic perspective, it would be much more efficient if emissions were curbed through a market-based measure, in this instance an emission trading system, rather than directly subsidizing solar PV through a FIT.

In the US, many states have already adopted RPS, and now the federal government is proposing a comprehensive ETS. Similarly in Europe, many countries have implemented either FITs or RPS in attempts to meet renewable energy targets, while since 2005, Europe has had an ETS. Because of this, there are a growing number of studies looking at the consequences of overlapping policies. The outcome of these studies is equally important for Ontario because, with the introduction of its FIT program and the ever-growing environmental concerns, the likelihood in the next 20 years of either Canada or Ontario introducing an emissions tax or a cap-and-trade system is high. Many of these studies have found that, in the presence of a binding ETS, any additional renewable energy support policy, like a FIT, will not result in additional emission reductions. Although there may be some disagreement with this, nearly all studies do agree that additional renewable support policies will increase the overall compliance costs of the ETS (Fischer and Preonas, 2010). If instead a FIT were introduced in conjunction with an emissions tax, then reasoning would suggest that it would result in additional emission reductions. In this case the emission tax penalizes fossil fuel electricity generation relative to renewable electricity generation, and the FIT does likewise, such that the two policies build on one another (SP, 2010, p.11). But again, the overall compliance costs will still be greater; therefore, if the policy objective is specifically to reduce emissions, then a single market based measure will always be more and Jaccard (2006) found that market-based policies can provide enough support for renewable energy market penetration to fully realize all the potential cost-reductions that would result from learning-by-doing, and more importantly, they will do so at the least cost.

But if this is not the case, and a policy maker believes that some type of renewable energy support policy is required to correct for the technological market failure, they should not in any way believe that this type of policy can be used alone in addressing environmental issues. In Ontario's case, a FIT may well do its job at promoting renewable energies, but only once emissions are fully priced by a market-based measure will environmental policy objectives be achieved. As Fischer (2008, p.500) remarks in her analysis of overlapping environmental policies, "while mitigation policy must be the engine for reaching environmental goals, technology policy can help that engine run faster and more efficiently, but it only helps if the engine is running" (Fischer, 2008, p.500). This provides support for recommendations that Ontario should still consider introducing a carbon pricing policy even though it has already introduced a costly FIT program. For this reason, we will next be looking at what an appropriate carbon pricing policy would entail if Ontario were to meet future greenhouse gas reduction goals.

Even though the Ontario government has not committed to any specific emission reduction targets, Ontario consumers and business will inevitably be a large factor in Canada's emissions future. Through the "Turning the Corner" policy statement, the Canadian federal government has committed to deep long-term emission reduction targets for GHGs and air pollutants. For GHGs, these targets are 20% below 2006 levels to create the predictability required to attract new investment in innovation and technology.

Third, the NRTEE has suggested that an emissions price signal be the core element of any emission reduction policy framework. For the reasons we have previously discussed, a market based policy such as an emission trading system (ETS) or an emissions tax would be the most efficient and cost-effective way to achieve long-term pollution targets. The NRTEE also stresses the importance of complementary policies to force emission reductions from parts of the economy that do not respond to a price signal. They explain that because of market failures and other barriers that reduce the responsiveness of certain sectors to changes in emission costs, particularly in the transportation and building sectors and in some consumer markets of vehicles, houses and appliances, they suggest policies such as regulatory standards, subsidies and infrastructure investments should be used. For Ontario, policy makers should consider a carbon tax, as it would be more complementary to their FIT program. As we have seen, a greater number of studies suggest that a carbon tax in place with a FIT is more likely to result in additional emission reductions whereas there are doubts in the literature as to whether a FIT with an ETS will result in any additional emission reductions beyond what is already achieved by the emissions cap. Therefore if Canada or Ontario decides to introduce an ETS, provincial policy makers should review the need for the Ontario FIT and consider whether the subsidies should be reduced or eliminated all together. Unfortunately, even if the FIT program is eliminated after the introduction of an ETS, program costs will still remain above an efficient level for a long period of time, as FIT contracts are signed for a 20-year period.

specific renewable energy technologies. By doing this, they have severely limited the options available for the market players to choose the most cost-effective way to reduce emissions.

In terms of replacing coal, it is not only a cost-ineffective way of reducing emissions but it may also have adverse consequences for the growth rate of the provincial economy. Furthermore, with such a large number of coal plants south of the border and emissions from the transportation sector responsible for the lion's share of pollution, there is doubt whether a policy that simply addresses one fossil fuel (coal) in one application (electricity production) will have a significant impact in addressing the province's environmental concerns.

With the replacement of coal, Ontario will need to rely on more costly energy producing alternatives. With the introduction of the FIT program, the Ontario government has essentially decided that renewable energies would be largely responsible for filling this supply gap. Since a market-based approach would have been a more cost-effective way to reduce emissions, as energy suppliers would have had a greater number of options to choose from, such as relying on cheaper natural gas or investing in carbon abatement technology, we therefore evaluated the justifications used to explain why the Ontario government had instead decided to directly subsidize renewable energies via a feed-in tariff (FIT) program. One major selling point was the promise of job creation and economic development. In fact, the Ontario government has promised that some 50,000 "green" jobs will be created in the next three years. But the review of literature shows there is serious doubt among economists that renewable energy policies are so called job machines. The argument is that long-run national employment levels are driven by contributor to GHGs, if the government is serious about making environmental improvements and help mitigate the effects of climate change, then one suggestion may be to specialize and innovate in the area of low emission automobiles and automobile productions.

Probably the most persuasive justification for FITs reviewed has been that the deployment of renewable energies is essential to achieve the desired technological cost reductions resulting from market application and experience. Because the high cost of renewable technologies can act as a market barrier, there may be grounds for government subsidization to correct for the technological market failure. The literature suggests that if the increased application of renewable energies today lowers the costs at all future dates, then the optimal allocation of abatement depends on the marginal effect technological applications today has on future abatement costs. Therefore, it may be optimal to use a renewable technology with a high marginal cost of abatement today if the added experience results in sufficiently lower marginal costs in the future.

Most of the uncertainty in the literature is whether market penetration resulting from an emission pricing policy, can indirectly promote renewable energies enough to achieve the desired cost reductions. Alternatively the issue could be framed as to what extent should we subsidize renewable energy production to correct for knowledge-based spillover effects? In reality, this can be problematic to answer, because other than in theory, there is very little empirical evidence guiding policy aimed at correcting for this type of market failure. Some studies suggest that subsidizing R&D can adequately advance renewable energy technologies to achieve the desired cost reductions, but this only raises new issues with respect to cost-effectiveness. Would it not be more efficient

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