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The politics of renewable energy policies: The case of feed-in tariffs in Ontario, Canada

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HIGHLIGHTS

▸ Analyses of renewable energy policies need to include political considerations.
▸ Governments need to manage opposition to renewable energy during implementation.
▸ Governments should aim to minimize asymmetric information when pricing renewables.
▸ Governments must balance policy stability with adaptive management.

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ABSTRACT

Designing and implementing a renewable energy policy involves political decisions and actors. Yet most research on renewable energy policies comparatively evaluates instruments from an economic or technical perspective. This paper presents a case study of Ontario's feed-in tariff policies between 1997 and 2012 to analyze how the political process affects renewable energy policy design and implementation. Ontario's policy, although initially successful, has met with increasing resistance over time. The case reveals key political tensions that arise during implementation. First, high-level support for a policy does not necessarily translate into widespread public support, particularly for local deployment. Second, the government often struggles under asymmetric information during price setting, which may weaken the policy's legitimacy with the public due to higher costs. Third, there is an unacknowledged tension that governments must navigate between policy stability, to spur investment, and adaptive policymaking, to improve policy design. Fourth, when multiple jurisdictions pursue the same policies simultaneously, international political conflict over jobs and innovation may occur. These implementation tensions result from political choices during policy design and present underappreciated challenges to transforming the electricity system. Governments need to critically recognize the political dimension of renewable energy policies to secure sustained political support.

1. Introduction

Addressing climate change will require the electricity system to transition towards zero emissions over this century (Hoffert et al., 1998; Caldeira et al., 2003; Lackner and Sachs, 2005). Without a carbon price sufficient to internalize carbon-intensive electricity generation's externalities, renewable energy technologies will require other forms of government support to accelerate their deployment. While governments have adopted a range of policies aimed at increasing investments in renewable energy, policy experts consistently characterize feed-in tariff (FIT) policies as the most effective instrument to support large-scale, rapid renewable energy deployment (Mitchell et al., 2006; Lipp, 2007; Mendonça, 2007; Butler and Neuhoff, 2008; European Commission, 2008; Fouquet and Johansson, 2008; Mendonça et al., 2009). By 2008, the majority of global solar photovoltaic and wind deployment was attributed to FIT policies (Deutsche Bank, 2010).

Although they vary in their design and implementation, a FIT typically has three components: (1) a standard purchasing price per unit of electricity supplied (¢/kW h); (2) a requirement that the electric utility buy all available electricity; and (3) a long-term contract at the given price for 15–20 years. In essence, a FIT aims to create stable incentives for new investment in renewable technology. In practice, FITs have been effective, reducing the costs per kW h delivered because they reduce regulatory and financial risk (Mitchell et al., 2006; Lipp, 2007; Butler and Neuhoff, 2008). With some exceptions, however, the political ramifications of different FIT policy designs have not been explored, particularly during

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implementation (Jacobsson and Lauber, 2006; Laird and Stefes, 2009). This paper uses a detailed case study of provincial-level FIT policies in Ontario, Canada between 1997 and 2012, to investigate political support for and opposition to FITs. Drawing on supplementary evidence from other cases, I propose conclusions about the political dimensions of renewable energy policies. These findings may be relevant for other ambitious renewable energy support mechanisms, including renewable portfolio standards (RPS), auctions and tax incentives.

The Ontario case reminds us that building a renewable energy policy coalition is not the same as building local support for implementing renewable energy projects. The factors that account for initial success in renewable energy policymaking may not be sufficient to propel the policy through a difficult and politicized implementation period. Instead, policymakers navigate opposing and often contradictory pressures when crafting ambitious renewable energy policies. Since renewable energy policies must remain politically viable over long periods, given the scale of the electricity transformation necessary to address climate change, policy analysts must consider both the politics of policy enactment and the politics of policy implementation when evaluating and changing policies.

2. Evaluating renewable energy support mechanisms

Renewable energy policy mechanisms include quantity-based instruments, such as the RPS used widely in the United States, and price-based mechanisms, including FITs and auctions. Existing studies comparatively evaluate these mechanisms on their effectiveness in deploying technology, minimizing economic costs and crafting a stable investment environment that attracts capital (Meyer, 2003; Wiser et al., 2005).

There is considerable debate on the role that governments should take in supporting renewable energy technologies as well as on the choice of policy instruments to increase renewables' share of the electricity supply mix (Mitchell, 2008). Debate stems from different perspectives on innovation (Grübler et al., 1999). Experience curves suggest that as cumulative production of a technology increases costs should decline (Arrow, 1962; Neuhoff, 2005). Yet it is unclear whether governments should allocate funding for energy innovation to technology-push mechanisms, through knowledge creation and research and development (R&D), or to demand-pull mechanisms, through market creation via subsidies or guaranteed markets (Jaffe et al., 2005; Nemet, 2006, 2009). Technology-push advocates see investment in R&D as a first priority, particularly for high cost technologies including solar PV (Frondel et al., 2008). Others see demand-pull mechanisms, including FITs, that focus on market creation, production increases and removal of deployment barriers, as key to innovation (Loiter and Norberg-Bohm, 1999; Menanteau et al., 2003).

Within the context of this debate, FITs are demand-pull mechanisms where the government attempts to create a market for renewable technologies. By 2011, FITs were enacted in 87 jurisdictions, either at the national or sub-national level (REN21, 2011). As FIT policies have grown in prominence, researchers have examined whether FITs set prices efficiently (Lesser and Su, 2008) and whether FITs are more economically efficient than other policies (Butler and Neuhoff, 2008; Wong et al., 2010). Overall, it is unresolved whether FITs are an efficient means of increasing renewable energy deployment or whether other mechanisms would allow for the same quantity of energy development at a lower cost.

There are several reasons why FITs are seen as effective policies. First, FITs are able to quickly deploy significant capacity, as they remove barriers to renewable energy projects (Owen, 2006; Auer et al., 2009). Second, FITs are often justified from an innovation perspective. FITs may be particularly important for technologies that remain costly compared to conventional sources or exist in niche markets (Batlle et al., 2011). Without government intervention to deploy these technologies and bring costs down in the process, the transition to a low-carbon economy may be too slow (Fouquet, 2010). Once innovation occurs through learning by doing, the FIT should, in theory, decline over time (Haas et al., 2004). Third, FITs provide stability and investor certainty, ideally reducing the risk premium and the volatility in energy prices (Mitchell et al., 2006; Lipp, 2007; Butler and Neuhoff, 2008; Couture and Gagnon, 2010). Fourth, FITs allow for diverse participation across society, since individual prices and contracts do not have to be negotiated (Jacobsson and Lauber, 2006). This policy feature allows small-scale and community-based projects in load centers, increasing distributed generation capacity. Politically, if citizens are able to benefit from the policy, they may be more likely to support it (Wilson, 1980).

However, there are also clear drawbacks associated with using FIT policies, many of which are political. First, governments have historically struggled with subsides for energy technologies, with prominent examples including the Synthetic Fuels Corporation and the Public Utility Regulatory Policies Act (Cudahy, 1995; Lesser and Su, 2008). Policymaking is difficult, particularly when interest groups lobby for specific policy designs and price schedules. Early FITs seemed to set the price too low, leading to an increase in the tariff over time, rather than the decrease we would expect under innovation (International Energy Agency, 2008). This may occur because governments promoting a new policy are interested in seeing short-term success, and therefore favor an initially higher price (Stokes and Lee, 2012). Second, there is increasing evidence of political risk associated with FIT policies. Cost escalation can undermine public support for the policies (Frondel et al., 2008; Couture et al., 2010). In addition, FITs have a transparent cost structure opening them up to criticisms compared to other more opaque energy subsidies, for example those that come through tax breaks. While international support for renewable energy was $88 billion in 2011, fossil fuel subsidies were nearly 6 times at large, at $523 billion (International Energy Agency (IEA), 2012). As this suggests, FIT policies are typically small compared to other energy subsidies, however they are highly visible and may be disproportionately targeted.

Although there are a variety of motivations for implementing FITs and other renewable energy support policies (Rabe, 2004; Lyon and Yin, 2010), little research explores how a feed-in tariff policy develops over time through policy coalitions (Jacobsson and Bergek, 2004; Michaelowa, 2005; Jacobsson and Lauber, 2006; Hogan, 2008; Laird and Stefes, 2009; Dewald and Truffer, 2012). Yet, it is precisely through the negotiation process between policy actors, including policy coalitions, the state and regulators, that the ultimate structure of renewable energy mechanisms develops. In turn, the structure of a FIT policy determines its effectiveness in enabling renewable energy deployment (Haas et al., 2004; Lipp, 2007; Couture and Gagnon, 2010), as well as its cost and political acceptance. Should governments price based on marginal sites or the best resource sites? If prices are set based on the highest resource sites then the scarcity in the market is driven by competition for locations rather than for contracts (Butler and Neuhoff, 2008). Should the government use cost-based or value-based pricing? Ultimately, these are political as well as economic decisions; there are winners and losers associated with each approach. Understanding how a FIT policy is formed through political contestation and how the policy changes during implementation is critical to addressing questions of renewable energy policy effectiveness.

Table 1
Ontario's wind and solar energy price schedule 2006–2012.

	2006—RESOP	2009—FIT	2010—FIT mid-policy alteration	2012—FIT review
Wind any size	11	13.5 (19—offshore)	13.5 (offshore program postponed)	11.5
Solar PV ≤ 10 kW	42	80.2	80.2 (rooftop) 64.2 (ground mounted)	54.9 (rooftop) 44.5 (ground mounted)
Rooftop > 10– ≤ 250 kW	42	71.3	71.3	54.8 (≤ 100 kW)
Rooftop > 250– ≤ 500 kW	42	63.5	63.5	53.9 (> 100 kW to ≤ 500 kW
Rooftop > 500 kW	42	53.9	53.9	48.7
Ground mounted > 10 kW– ≤ 10 MW	42	44.3	44.3	38.8 (> 10 kW to ≤ 500 kW) 35.0(> 500 kW to ≤ 5 MW) 34.7 (> 5 MW)
Hydroelectric ≤ 50 MW	11	12.2–13.1	12.2–3.1	12.2–3.1
Bioenergy (biomass, biogas and landfill gas)	11	10.3–19.5	10.3–19.5	10.3–19.5

*All prices are in cents per kW h (¢/kW h) in Canadian dollars.

3. A renewable energy policy case study: Ontario's feed-in tariff policy

In 2004, Ontario's provincial government set an ambitious goal to phase out all coal-fired electricity by 2007. Faced with growing energy demand and aging infrastructure, the government aimed to increase the share of renewable energy in the supply mix.[1] Since the late 1990s, the Ontario government has experimented with a variety of approaches to increasing renewable energy. As the largest province in Canada, with a population of 13 million, Ontario had an installed generation capacity of 34,500 MW in 2011. The system was dominated by nuclear (11,500 MW), hydro-electric (8000 MW) and oil and gas (9500 MW) generation. Coal, later scheduled to be phased out by 2014, accounted for 4500 MW. Over the past decade, renewables (excluding hydro-power) have grown to approximately 2500 MW of capacity. As is the case with many power systems, Ontario is currently under-taking significant infrastructure renewal; investments today will shape the electricity system's evolution over the next 50 years. This transition created an opportunity for renewables to replace existing energy infrastructure and for the system to be decarbonized.

After several years of policy experimentation, Ontario enacted a feed-in tariff program in 2009 as part of its *Green Energy and Green Economy Act* (GEGEA), the first, large-scale FIT in North America (see Table 1 for the price schedule). This program offered enhanced support for wind, solar PV, bioenergy and hydropower. By November 2010, the government had signaled it aimed to increase its renewable energy capacity to 13% by 2030, excluding hydropower, aiming for 10,700 MW from wind, solar, and bioenergy by 2018 (Ontario Power Authority, 2011). Given current development rates, this target will be reached by 2015 (see Fig. 2).

This article analyzes the political dynamics of renewable energy policy, using Ontario as a representative case. Representative cases are well-suited to within-case analysis, as they help uncover the causal mechanisms and processes that may characterize the larger case population (Yin, 2009). Ontario's policy employs several typical FIT elements: set prices, multiple technologies and long term contracts. Its design is similar to FIT policies passed in Germany, Spain, the United States, China and other countries. It is also a large program, making it comparable to national-level FIT policy experiments in other jurisdictions. By examining Ontario's renewable energy policies over more than 10 years, this paper is also a longitudinal case aiming to understand how renewable energy policies' political dynamics change over time. While this is a study of FITs specifically, its findings may also be pertinent to the design and implementation of other large-scale renewable energy policies, including RPSs, auctions and tax incentives.

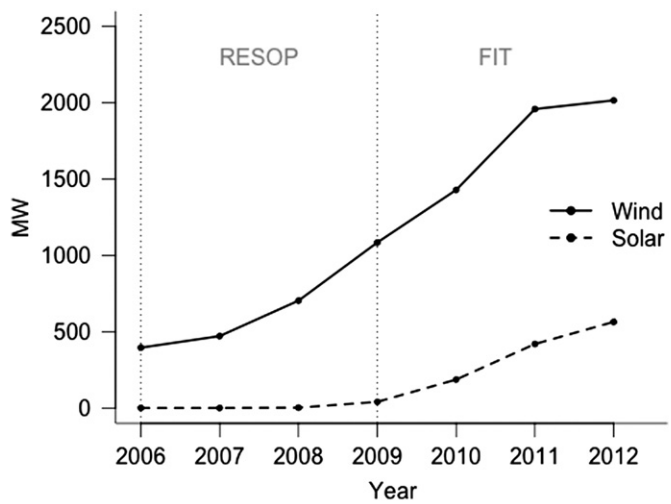

Fig. 1. Total renewable energy capacity under operation (2012 figures are only until June 30th 2012).

Ontario represents the largest policy experiment to date within North America to decarbonize an electricity system (see Figs. 1 and 2 for the scale of the program). According to one group of scholars, "Not since the US Congress passed [the Public Utility Regulatory Policy Act] in 1978 has a single policy had the potential for such wide-ranging influence on energy policy [in North America] as Ontario's Green Energy Act" (Mendonça et al., 2009, p. 91). This paper presents Ontario policies in four periods, moving from policy design to implementation. The research was conducted through interviews with 18 policy actors and through reviewing committee records, policy documents, laws and regulations. Moving an ambitious renewable energy policy from a formative period to full-scale implementation has significant political ramifications.

3.1. Period I. Market liberalization, auctions and the genesis of community power

Although there were earlier efforts to increase renewable energy in Ontario, renewables began to be seriously discussed after the electricity system's deregulation in the late 1990s (Swift and Stewart, 2004). In 1998, the provincial government passed *The Energy Competition Act* with the intention to privatize the publicly owned utility, Ontario Hydro. In 1999 the state-owned power generation monopoly was broken up into several different

[1] Under the Canadian Constitution, provinces largely have jurisdiction over natural resources, energy and electricity policy.

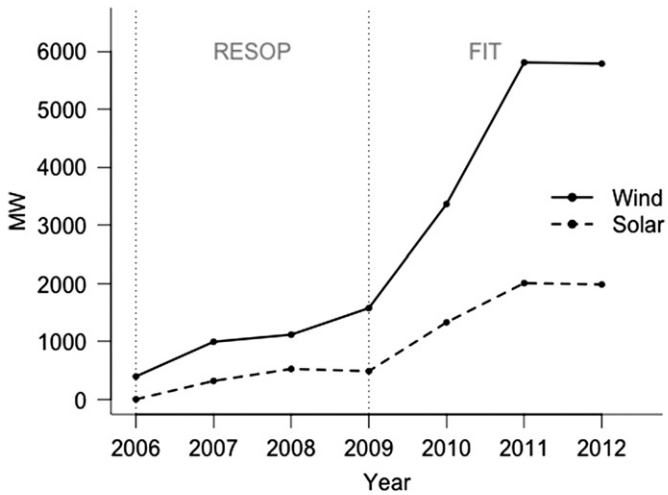

Fig. 2. Total renewable energy capacity under contract (2012 figures are only until June 30th 2012).

companies, including Ontario Power Generation (OPG). OPG was given the generation assets, which currently accounted for approximately 70% of the province's generation capacity in 2011. Although the intention was for OPG to become a smaller, private company, it remains the largest market player and is publicly owned (Swift and Stewart, 2004). For these reasons, market liberalization is incomplete in Ontario, with OPG remaining a dominant, public utility.

In 2003, the Liberal party ran successfully on a platform committing to phase out coal power plants and increase renewables to 5% of the total capacity by 2007, all while reducing electricity consumption and nearly meeting Canada's Kyoto Protocol GHG reduction targets (Ontario Liberal Party, 2003; Rowlands, 2007). The commitment to phase out coal, unique in North America, was a critical decision that reoriented the policy landscape. It also coincided with a massive infrastructure renewal within the electricity sector, since Ontario had not reinvested in its electricity supply mix for several decades (Freeman, 1996; Rowlands, 2007). In 2004, the Liberal government began a series of legal reforms to the energy sector, establishing the Ontario Power Authority (OPA) through the *Electricity Restructuring Act*. The OPA was created to support long-term planning and procurement, including transitioning the grid away from coal electricity by 2012, and towards greater emphasis on renewables (Winfield et al., 2010). Initially, the government decided to procure new capacity through a request for proposals (RfPs), believing an auction mechanism would prove both efficient and effective. Although the auction results initially looked favorable, cost changes and thin margins during bidding created delays for many approved projects (Rowlands, 2007). Further, only wind energy and hydropower contracts were offered and only large-scale developers could participate.

At the same time, a renewable energy coalition was beginning to form. The Ontario Sustainable Energy Association (OSEA) was founded in 1999, and aimed to reform renewables procurement to allow for community participation. In a few years, OSEA became the organization at the core of the coalition advancing renewable energy policy in the province. OSEA's organizational mission was to serve community power groups broadly defined, including homeowners, farmers, cooperatives and First Nations. At the time, its membership included renewable energy NGOs and the farmer's association. The association began with outreach to potential members, government advocacy work and capacity building through publications and workshops. It set ambitious goals: to build 500 MW of locally-owned community power by 2012 and to have 100% of Ontario's capacity as renewable energy by 2025 (OSEA, 2011). In line with these goals, the organization began a campaign for a set aside of 500 MW of auction capacity specifically for community power. Later, in 2004, OSEA began campaigning for "advanced renewable tariffs," a version of a feed-in tariff with variable rates based on the technology and project size. OSEA changed its position because FITs served its interests more closely, supporting broad participation through small-scale, community power. Since the group was aiming to develop community-scale power, its interests were quite different from traditional renewable energy associations, whose members are international corporations typically aiming to build large projects. For these groups, the existing auction system seemed sufficient. Given the tight timeframe for the coal phase-out, the renewable energy coalition OSEA led pushed to fill the gap through the use of feed-in tariffs.

3.2. Period II: The renewable energy standard offer program (RESOP)

The problems that arose under the RfP process caused the government to look for alternative ways to meet its coal phase-out timeline and encourage investment in renewables. Through building relationships with the Minister of Energy and her staff, OSEA's advocacy for "advanced renewable tariffs," began to have traction; the Ontario Liberal Party put the policy on the agenda at their annual policy development conference in November 2004, endorsing the idea. In December 2004, the Ministry of Energy awarded OSEA a contract to write a policy document that outlined policy designs for small-scale renewable energy projects. In July 2005, the government released OSEA's report, "Powering Ontario Communities: Proposed Policy for Projects up to 10 MW" (Gipe et al., 2005).

Invoking the European experience, the report argued that a community power model would deploy more renewable energy more quickly. The report proposed a "standard offer contract" policy (another term for a feed-in tariff) with 20-year contracts, procurement from a variety of renewable sources, an uncapped program, pricing to provide adequate returns at moderate resources sites, and a revolving community power innovation fund to support initial projects. Long-term contracts were meant to provide stability, lower the barriers to entry for small producers and reduce transaction costs, allowing for broad participation. Procurement from a number of technologies was a response to the RfP process; OSEA wanted to ensure that a variety of renewable technologies would be pursued, allowing for broader participation. Ensuring the program was uncapped would allow for explosive growth, as was seen in Germany and Spain under their feed-in tariff policies (Lauber and Mez, 2004; del Rio Gonzalez, 2008).

In 2006, the first FIT policy in Ontario, the Renewable Energy Standard Offer Program (RESOP) was passed through a Directive from the Minister of Energy. The policy was largely in the form OSEA recommended in its report, including 20-year contracts to both community power and traditional energy developers. Initially, the province established a guaranteed price for wind, hydroelectric and biomass at 11 ¢/kW h, and solar PV at 42 ¢/kW h for new generation. The OPA set the RESOP tariff prices based on its calculation of value to the consumer. For example, with 11 ¢/kW h for wind, the price was the sum of average bids from the RFP system (8.6 cents), the value of distributed generation benefits (1.2 cents), and compensation for limiting the size of projects to 10 MW, thereby, reducing the potential economies of scale compared with larger projects (1.2 cents) (Ontario Power Authority, 2008).

Renewable energy advocates quickly contested this value-based approach to FIT pricing (Gipe, 2007). The coalition argued that the price was too low and should be based on cost rather than value, allowing developers a reasonable rate of return. A cost-based approach sets the FIT price schedule based on the cost of deploying a specific technology, with more expensive technologies paying a higher price per kW h generated. The coalition argued a cost-based approach would better drive investment and would allow for community-based ownership. The schedule, they argued, should also be based on the size of the system to encourage distributed generation. The coalition also advocated grandfathering existing contracts, to avoid penalizing early adopters (Gipe, 2007). These arguments neglected the possibility that cost reductions might occur through technological innovation and market expansion. In addition, the coalition did not acknowledge that existing contracts were moving forward because they were already financially viable at this lower price schedule.

At this point, the influence of the renewable energy coalition was clear. During this period, renewable energy advocates reinforced their relationship with the farmers association through grassroots engagement. As the coalition grew, it expanded its policy proposals. In their policy document, OSEA articulated a vision for renewable energy that included both community-scale and large-scale, industrial projects. Renewable energy industry groups were less interested in promoting the FIT policy, in part because the previous auction system had worked well given their business model. OSEA's openness to large-scale projects limited criticism and added potential allies for the coalition. Ideologically, this approach also grew out of a belief that renewables should replace conventional generation as quickly as possible and at scale. Without large-scale, industrial projects, renewable energy would never overtake convention generation fast enough. In these ways, the coalition neutralized criticism, built grassroots political support and expanded its membership. Indeed, a similarly inclusive strategy was pursued in Germany in the late 1990s to reduce opposition from large-utilities (Laird and Stefes, 2009).

3.3. Period III. The Green Energy and Green Economy Act

When the RESOP program was implemented in 2006, members of the renewable energy coalition became dissatisfied with delays in project approvals and the price offered for small-scale solar energy. As a result, the coalition sought to enact a larger, improved FIT policy modeled after Germany's program. The coalition widened its membership to include politically influential groups, including Environmental Defense Canada. Environmental Defense also partnered with the United Steelworkers (USW) union in 2008, forming the "Blue Green Alliance" modeled after the U.S. alliance between labor and environmentalists. In addition, OSEA built a relationship with First Nations, groups of Aboriginal peoples, supporting the founding of the First Nations Energy Alliance. Together, these groups formed the "Green Energy Act Alliance" a broad coalition composed of renewable energy NGOs, environmental NGOs, farmers, First Nations, consultants, and, indirectly, organized labor. The inclusion of labor, farmers and First Nations brought the coalition renewed credibility, as these were traditionally influential political groups in the province (Jacek, 1997). The Alliance at this point was well organized and had gained resources and broadened its membership. The organizations in the coalition learned from the earlier policies, and developed significant capacity to advocate for a larger renewables program through relationships with government decision makers and alliances with key stakeholders.

This lobbying effort occurred while the province was losing manufacturing jobs during the 2008 recession. Politicians and advocates alike saw a FIT program as an economic development and industrial policy mechanism, potentially allowing Ontario to become a North American manufacturing center for renewable technologies. In this way, a policy window opened for FIT reform. Although the coalition expected a long campaign for a new policy, in light of the recession, the Minister of Energy & Infrastructure moved quickly to draft and introduce a bill. In 2009 the government proposed another round of changes to the *Electricity Act*, overturning the RESOP program entirely with the proposed *Green Energy and Green Economy Act* (GEGEA).

There was little opposition to the government's reforms because Ontario's electricity liberalization structure maintained the main electricity generation company as a provincial-owned utility. In Canada, while Crown Corporations are arms-length from government, they have tended to avoid taking public stances on policy issues. The fact that the main utility remained publicly owned blocked criticism of the new FIT policy. As a result, resistance to the FIT policy was minor while it was being proposed. This dynamic is unusual; typically, incumbent utilities are opposed to institutional transformations that undermine their market share (Jacobsson and Bergek, 2004). For example, in Nova Scotia during discussions on their FIT proposal, the incumbent private utility spoke out against the policy (Adams et al., 2011). Still, as in Germany during the 1990 debate on their FIT, it is possible that the utility, OPG, underestimated the potential impact of the FIT program (Laird and Stefes, 2009).

The GEGEA passed on May 14 2009. As its name implies, the GEGEA had two fundamental goals: to reduce environmental externalities from the existing energy supply mix and to create an opportunity for Ontario to become the North American leader in clean energy jobs. In this way, the policy responded to both the Premier's coal phase-out goal and the economic recession. The FIT mechanism was chosen because of its potential to drive the growth of an industry, which the RESOP and RfP process, with their relatively smaller scale and lack of stability, would not. Importantly, the policy had support from a broad-based political coalition.

The expanded FIT program included contracts for wind, solar PV, biomass, biogas, landfill gas and waterpower (Yatchew and Baziliauskas, 2011). Like the RESOP program, contracts were signed for 20 years, with hydro-power contracts for 40 years. There was also a price for each generation technology, based on the scale of the project, as the renewable energy coalition had proposed. The program was further subdivided into microFIT (less than 10 kW) and FIT (more than 10 kW), to accommodate smaller scale projects by homeowners and small businesses, as per OSEA's interests.

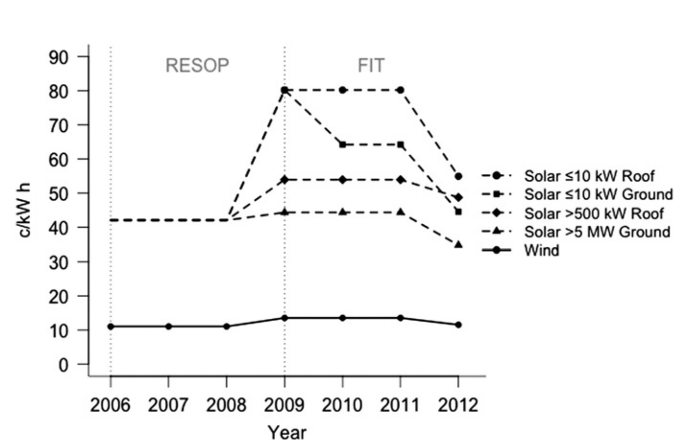

Fig. 3. Solar PV and wind FIT price schedule by year.

Unlike the RESOP, the price schedule for the FIT was constructed based on the cost of generating electricity from each source and a rate of return (10–12%) as estimated by the OPA (see Table 1 and Fig. 3). Thus, rates in the new FIT program were substantially higher (13.5 ¢/kW h wind; 44–80 ¢/kW h PV) and at the levels quoted in the 2007 OSEA report (Gipe, 2007). These higher rates led to significant renewable deployment, particularly among farmers. In addition, the program did not limit wind projects to 10 MW, and therefore many large-scale wind projects were proposed (Yatchew and Baziliauskas, 2011). By April 2012, the program had offered contracts for 4600 MW of renewable power, with almost 50,000 microFIT applications received, representing 450 MW (see Figs. 1 and 2).

Since job creation was a central political aim of the new law, the GEGEA required system components to be procured from within the province. These domestic content rules were set through the OPA, rather than in the law itself. The percentage of goods and services required depended on the date the project was implemented, to allow time for a renewable energy industry to grow within the province. For wind, 25% of the content had to be domestic before January 1 2012 increasing to 50% thereafter; for solar PV, the share grew from 40–50% to 60% over the same period. These provisions attempted to incentivize manufacturers to relocate to the province, and grew out of the USW union's proposals, which argued that if renewables were to be promoted, their components should be made in the province to create jobs.

3.4. Period IV. FIT implementation

The *Green Energy and Green Economy Act* removed many barriers to entry, including grid connection problems and lack of cooperation by local distribution companies. The government created a Renewable Energy Facilitation Office to work with project proponents to speed FIT contract approval and grid connection. Further, the Act removed municipal jurisdiction, making it mandatory to connect feed-in tariff contracted projects ("take or pay") into the local distribution system. Essentially, this regulatory change limited a municipality's ability to block projects locally. In addition, the program allowed projects to connect directly to the transmission system, with grid expansion paid for by ratepayers rather than project proponents (Yatchew and Baziliauskas, 2011).[2] Overall, addressing these non-economic barriers was critical to speeding up project deployment.

However, not everyone was pleased with the speed of the FIT implementation. As siting barriers were lessened and implementation accelerated in rural areas, concerned citizens began protesting against wind turbines. Wind Concerns Ontario (WCO),[3] an umbrella, grassroots coalition comprised of citizens against industrial wind turbines, became active in the province during this period with over 50 local chapters. This group directly challenged the accelerated approval processes for wind generation, transmission lines and other infrastructure, arguing it is "tearing apart the very fabric of rural Ontario" (Wind Concerns Ontario, 2011). WCO argued that streamlining the permitting process, so that local opposition groups were less able to delay projects, was undemocratic. Organized across communities online, including links with groups in the United States and Europe, this group trained citizens to keep diaries of their experience with nearby wind turbines and to register complaints formally with the government. They also collected donations for court cases and actively participated in online and in person debates about wind energy. The website claimed it had over 3 million visitors between 2009 and 2012.[4] This opposition became so strong that the Ontario Federation of Agriculture (OFA), a long time supporter of wind energy and the FIT policy, spoke out publically against the policy in early 2012. The OFA called for a moratorium on any new wind development and tabled a critical report during the crucial two-year policy review. The OFA's vocal criticism of the FIT, after years of support, was a surprising development that fractured the renewable energy coalition active since the late 1990s.

Apart from siting concerns, many groups and individuals started to argue the FIT price schedule, particularly for solar PV, was too generous and would overly burden paying consumers. Electricity rates were increasing in the province, with a substantial portion attributable to the ratepayer-funded FIT program. The government attempted to address these concerns through an Ontario Clean Energy Benefit, introduced in late 2010, which provided a 10% reduction on electricity bills from 2011 to 2015. This moved some of the burden of the program away from ratepayers towards general government revenues. The government estimated this benefit would cost $1.1 billion CAD in 2011 alone (Government of Ontario, 2012), likely costing around $5 billion over the five years. In short, it is an expensive way to address concerns.

In addition, the decision to include domestic content requirements was publicly rebuked beginning in 2010 through a Japan- and later European Union-led World Trade Organization (WTO) compliant, including the United States and 11 other countries. Given the strong interest in multiple jurisdictions to create jobs through an expanded renewable energy industry, Ontario's provincial content requirements were portrayed as protectionist. The compliant alleged that Ontario was subsidizing renewable energy equipment produced in Ontario and contravening the General Agreement on Tariffs and Trade (GATT). The ruling issued in late 2012 found that Ontario was contravening the GATT but not subsidizing renewable energy, given that there is no a competitive market for electricity. Canada had 60 days to appeal, however, it is unclear whether the Canadian federal government will cooperate with Ontario. If the appeal fails or if it is not launched, Ontario could face sanctions if it does not negotiate with the other parties. The outcome further suggests that independent actions to foster renewable energy within countries may be limited by international trade rules.

As problems with the program were made apparent, the government began to actively manage the FIT policy during implementation. In 2009, during the first year of the revised FIT policy, the OPA abruptly announced it would drop the ground-mounted solar tariff for small systems from 80.2 to 58.8 ¢/kW h. This price decline occurred because the OPA saw an abnormal demand for the program with 16,000 applications in the first 10 months, of which 85% were for ground-mounted solar. The volume of applications suggested developers building ground-mounted systems would receive larger than intended profit margins. As the province's auditor general later suggested, these projects would receive a 23% after tax return on equity rather than the 11% the program was supposed to provide (Auditor General of Ontario (AGO), 2011).

While the OPA held a comment period, it opened after the change was proposed, likely because the regulator wanted to avoid a rush on applications. At the end of the comment period,

[2] When there is insufficient transmission capacity, the OPA conducts an Economic Connection Test to decide whether the project should go forward.

[3] This group broke apart and changed its name from Wind Concerns Ontario to Ontario Wind Resistance in late 2011, likely because of internal disagreements. Wind Concerns Ontario still operates as a parallel organization with different leadership.

[4] This number is from the Ontario Wind Resistance website, which was formerly the Wind Concerns Ontario website between 2009 and the end of 2011.

the OPA settled on a higher, compromise price of 64.2 ¢/kW h and existing ground-mounted applications still proceeded at 80.2 ¢/kW h, in order to ensure investors retained confidence in the program. This decision brought criticism. The pro-renewables coalition felt the change was made too swiftly, before the formal, two-year review date and without adequate consultation. Yet, if the government had waited the additional 18 months until the scheduled program review to change the prices, many more contracts would have been signed at the higher price. For critics, even the fact that existing contracts would continue at the higher price for their 20-year lifetime was cast as a large, additional cost to the ratepayer. There was already a five-month delay in the price cut, when 11,000 applications were received, which the Auditor General's report suggests cost $950 million (Auditor General of Ontario (AGO), 2011).

In a second case of Ontario's FIT rules changing mid-program, the Ministry of the Environment announced a moratorium on all offshore wind projects in February 2011, citing environmental concerns. The Ministry's argued that offshore wind in freshwater environments were early in development, with no active projects in North America. The government stated it would monitor projects and scientific results in other jurisdictions before proceeding. Existing contracts for planned developments were cancelled, leading to significant criticism from project proponents. The government had already placed a moratorium on offshore wind projects from 2006 to 2008 for environmental reasons, but the Premier had eventually endorsed offshore wind, lifting the ban. Many advocates saw the decision as a political move, rather than an objective decision based on expert opinion.

In the 2012 policy review, the Ontario government attempt to address growing contestation over wind and solar siting in rural communities. Existing documents has stipulated wind energy project setbacks. However, the new directive stipulated specific setbacks of at least 20 m for ground-mounted solar PV projects greater than 10 kW in rural areas. These new rules, however, did not apply to existing contracts. In addition, the new rules created specific carve outs of 100 MW for community-scale and aboriginal projects.

Although the government has attempted to manage the program actively, often changes have amplified criticisms from both supportive and opponent coalitions. Clearly, the government's initial goals to expand investment in renewable energy, create jobs and phase out coal have proven more difficult than expected. Rather than raising economic and technical questions, the policy increasingly raises political questions that are often overlooked in renewable energy design.

4. The politics of renewable energy policies

Enacting and implementing an ambitious renewable energy policy is a politically difficult task. To understand renewables policy, we need political analyses alongside economic and technological analyses. Feed-in tariffs, including those in Canada, the United States, Germany, Spain, China and India, demonstrate political tensions at work in deploying renewable energy policies that aim to transform and decarbonize the electricity system. This representative case demonstrates four political dimensions to renewable energy policies. First, high-level political consensus on instrument design does not necessarily translate into grassroots support for renewable energy infrastructure during implementation. Second, information asymmetries between the government and private actors when pricing renewables are common, with political ramifications for policy acceptance. Third, there is a tension between maintaining policy stability, to ensure investor confidence, and adaptively managing the policy when new information is made apparent. Fourth, when multiple jurisdictions pursue the same policies simultaneously, international political conflict over jobs and innovation may occur. While this case focuses on FITs, these findings apply more broadly to renewable energy policies and suggest a need to consider political dynamics during both enactment and implementation periods when designing renewable energy policies.

4.1. Building coalition support versus fostering support for individual renewable energy projects

The Ontario FIT case demonstrates that a coalition's support for renewable energy during policymaking does not necessarily translate into broad scale acceptance during implementation. There was little opposition to the proposed feed-in tariff in 2006 or in 2009 when a large and diverse coalition supported the policy's expansion. Few groups provided testimony against the proposed policy. Yet, as the program was implemented, opposition grew.

First, many groups argued that the solar PV price was too high. Renewable energy costs are higher than conventional energy sources, particularly in the absence of a price on carbon. While we can expect innovation to bring wind and solar PV costs down over time, deploying existing technologies is expensive. Further, if the government does not set the price schedule effectively through accurate forecasts and fair profits, these costs will be unnecessarily high. As the Ontario Auditor General's report argued, the expanded FIT contracts cost $4.4 billion more than counterfactual costs under the earlier RESOP price schedule (AGO, 2011). Even the OFA, a long-time coalition member, tabled a position paper that criticized the FIT policy harshly, stating profit margins should decrease from 11% to 7.5% and that prices should be capped at the projected cost of electricity imports in 6 years (Ontario Federation of Agriculture, 2011). This dynamic is also seen in Germany, where there is increasing criticism of FIT rates being too high relative to the cost of solar PV panels (Frondel et al., 2012).

Second, anti-wind groups increased as the government signed 5500 MW of wind contracts. Although it is unlikely that these groups will be able to prevent wind project construction, given the changes made to local distribution discretion after the GEGEA, it is noteworthy that wind is quite unpopular in rural areas. Increasing decentralized electricity production implies both increased transmission, to bring energy to load centers, as well as significant land use expansion (MacKay, 2009). Renewable energy technologies' land-use impacts are not negligible and have entered the Ontario debate at several points: limits on the class of agricultural land where solar power can be ground-mounted, the moratorium on offshore wind and difficulties with acceptance of wind developments in rural areas.

With the transformation of the electricity system towards renewable energy sources, more land will be required to harvest energy. As a result, rural communities will likely bear the brunt of impacts from industrial scale renewable power and their concerns have to be navigated. Engaging rural communities through economic development and consultation is essential. In the Ontario case, the government often heeded this reality, placing limits on high quality agricultural land, and setting rules for noise and mandatory setbacks. Farmers in this case were initially appeased but the broader communities' concerns over potential windmill health and safety eventually undermined their support. For this reason, the government must continue to be responsive, focusing on communication and public outreach to promote and explain renewable energy policy and its relative risks compared to other energy sources. Social acceptance of renewable energy implementation is increasingly seen as a large barrier to renewable energy expansion (Wustenhagen et al., 2007). Governments cannot wait for problems to arise; they need to be actively communicating and consulting with communities. In Germany, the government chose to reduce the wind FIT rates and exclude development in low-resource sites (Laird and Stefes, 2009); these changes helped to reduce opposition to the FIT policy. Changes to the policy in 2012 to prioritize community-owned projects may similarly help to allay wind energy concerns in Ontario. To date, only 3% of the solar capacity and 11% of the wind capacity have come from community projects, including in aboriginal communities.

Apart from siting concerns, governments and policy advocates should be thinking about how costs and benefits are perceived by ratepayers and the public. Lack of opposition to FITs during the policy design phase is common as the subsidy per kW h is small enough and diluted amongst so many electricity consumers that the cost is minimal to any specific company or individual (Michaelowa, 2005). However, opposition may grow over time. With FIT policies, the cost structure is transparent, making comparisons to conventional generation quite simple, if wrong-headed. Although subsidies to other energy sources are no doubt significant, they are often in the form of tax breaks or insurance guarantees, which may be less easy to compare. For this reason, it may be easier for opponents to attack renewable energy subsidies than nuclear or fossil fuel subsidies because they are highly visible. The fact that the program costs are often spread across society may mitigate this effect slightly. However, the public may still perceive renewable energy as contributing to electricity rate increases more than is actually occurring, as was the case in Ontario, because the costs are transparent and easily comparable against standard electricity rates.

Governments should think about how they communicate renewable energy costs. They may also seek to have those benefiting from the program support the policy through public information campaigns. Politically, the question may boil down to whether political supporters are able to mobilize and communicate more effectively than political opponents. While FITs have the potential for path dependence through reinforcing coalitions, political science reminds us that grieved parties can also challenge the institutional status quo to upend policies when opportunities arise (Thelen, 2004; Laird and Stefes, 2009; Kingdon, 2011).

4.2. *The politics of asymmetric information*

Renewable energy policies, including FITs, require the government to structure a market for renewable energy. In a quota system, such as the U.S.'s state-level RPS policies, the government sets the quantity and the market sets the price. In a price-based system, such as a FIT, the government sets a price and the quantity follows, as market actors develop projects. While auctions may be one way to reveal the price, the information may still prove insufficient. In the United Kingdom, auctions for renewable energy capacity resulted in higher average costs, as many low-cost bids were never built (Mitchell et al., 2006). In China, the average bid was eventually used after many problems proceeding with the lowest cost bids (Lewis, 2009). In the Ontario case, changes in steel prices delayed many wind projects (Rowlands, 2007). Setting prices based on earlier programs can also prove difficult. The local utility in Gainesville, Florida had difficulty setting a FIT price using information from historic policies, and found there was a high variance in developers' costs, likely due to an immature market (Stokes and Lee, 2012). Together, these challenges are often referred to as an asymmetric information problem, well characterized in the economics literature.

What is less well appreciated, however, is the political ramifications of asymmetric information for renewable energy policies. For example, while FIT design principles suggests prices should decline over time, since cost reductions through innovation and learning should be occurring (International Energy Agency, 2008), this may not occur in practice. Often, FIT price schedules *increase* rather than decrease over time. As Table 1 and Fig. 3 illustrate, in Ontario the solar PV FIT doubled between 2006 and 2009, while significant institutional and technical learning was occurring. During this period, the international price for solar PV declined significantly (Frondel et al., 2008). Between early 2009 and late 2010 alone the solar PV costs in Ontario declined by at least 25% (Yatchew and Baziliauskas, 2011). Similarly, in Germany, the FIT price for solar PV set in the 1990s nearly doubled in the 2000s (Lauber and Mez, 2004). While some upward price adjustments may be necessary to ensure renewables are built, FITs must also balance deployment speed with a perceived fair price for consumers. The public needs to think that the FIT price is reasonable, both in terms of the price schedule and in terms of the return to investors. In Ontario, the FIT will result in a potential increase in annual electricity costs of $2.5 billion and electricity bill increases of about 25% from 2009 levels in 2014 (AGO, 2011). Without sustained public support for these policies, renewable energy policies may suffer from erratic support or politicization during elections.

The electricity system's structure can greatly aid or hamper the government's efforts to set a fair price that balances incentives for investment with consumer protection and that ensures political stability. Incumbent utilities have often proven hostile to new policies, speaking out against renewable energy support mechanisms. This was the case in Colorado in the early 2000s and in Nova Scotia's recent participatory energy planning process (Rabe, 2007; Adams et al., 2011). In contrast, Ontario witnessed little contestation during policymaking because the main utility was publicly owned and because the coalition had a strong relationship with the government. This analysis suggests that the price given in coalition policy documents was consistently reflected in the eventual price schedule until 2012. The result was overly generous returns for early developers and widespread criticism of the program (Pirnia et al., 2011).

While political opponents may seem a barrier to renewable energy policy, encouraging an active political debate over rules and prices may actually help the government cope with informational asymmetries. When advocates make specific policy proposals they have an interest in securing the highest price possible. This is true not only for private corporations, but also for renewable energy advocates interested in community-scale projects that may have higher unit costs because of their small scale. Ensuring the government has access to a range of views on renewable energy costs and values during policymaking may help to reduce asymmetric information. For example, the government could solicit many cost estimates before the program or require cost documentation with projects. This may increase policy stability, since large price corrections or policy reversals will be less likely given pricing that consistently reflects a fair rate of return. If a policy is not seen as legitimate or fair, elections can overturn ambitious renewable energy programs. Political polarization on renewable energy should be avoided, since all parties need to work towards decarbonization if climate targets are going to be met.

4.3. *Adaptive versus stable policy during implementation*

Apart from setting a fair price, renewable energy programs may need to adapt and change their prices and rules during implementation. Renewable energy policies are consistently discussed with reference to policy stability as an essential design element to spur investment (Del Rio Gonzalez, 2008). In theory, this stability lowers the cost of capital and the risk premium (Lipp, 2007; Couture and Gagnon, 2010). Yet, stability also has political ramifications, particularly when the government is operating under asymmetric information. Instead, the government may need to make policy adaptively, using each period as an opportunity for learning and iteration. To decarbonize the energy system effectively, renewable energy policies must navigate this tension between stable policy and adaptive policy.

On the one hand, FIT policies must remain stable to allow projects with significant lead-time to develop, pass approvals and be built. Once operational, these projects will take years before they are profitable, hence the requirement for long-term contracts. If investors perceive that the government will change the policy, financing will likely dry up. For these reasons, governments need to ensure the policy is stable enough that investors remain confident that contracts will be honored. When contracts are cancelled after the fact, as was the case in Ontario with one offshore wind project, or modified, as was the case in Spain, the entire program can lose credibility.

However, given the challenges outlined in the preceding section in setting the price and rules for a FIT policy, maintaining a static policy may potentially bolster opposition and undermine support for the policy. For this reason, the government must be open to adaptive management during implementation, adjusting the policy over time as new information becomes available and ensuring that the price schedule remains fair for both project proponents and electricity ratepayers. If the price is high and the program is stable, the policy may be abandoned entirely due to eroding political support; if the price is low and the program unstable, investment might suffer. Navigating this tension is difficult.

Despite FIT policies' central aim to provide investor stability, the Ontario case shows that changes during implementation often occur as governments respond to new information. The rapid change in the solar PV price less than a year into the program illustrates the challenge in a government setting the price for renewable technology, given political pressure, asymmetric information and rapid innovation. Despite the government's previous experience with auctions, large data gaps remained leading to improper pricing for solar PV and a significant correction in the price mid-program and during the two-year policy review. Adjustments to FITs are common, and stability is difficult to achieve.

Renewable energy policies may also need to be designed with greater adaptation built in. Assessing the price at one period in time and then setting a static, two-year price is problematic for technologies with rapidly declining prices where learning may be occurring such as for solar PV (Fri, 2003; Frondel et al., 2008). The market for solar and wind technology is global, and for this reason, policies will need to adapt to global shifts in price. Although stability is constantly heralded in the literature, adaptation needs to be equally considered, or else political support for renewable energy policies may erode faster than decarbonization can occur. Germany's recent changes to their FIT policy provide one option for increasing FIT policies' adaptive capacity. After a record-breaking installation year in 2011, with deployment concentrated right before the tariff decline, Germany changed their degression schedule to be a function of quantity deployed. This "breathing cap" means that the FIT price will change dynamically with deployment demand. Policy designs that facilitate automatic adaptation when deployment is abnormally high may help to limit costs and thereby increase the program's stability.

4.4. Multi-scale political conflict over job creation and innovation

International economics and politics also shape domestic renewable energy politics. Renewable energy policies are often proposed with explicit goals for job creation and industrial development (Rabe, 2007; Lyon and Yin, 2010). This is particularly the case with FIT policies, since their potential for exponential growth in deployment can spur an industry. However, capturing jobs locally is not a given. FITs are expensive policies and governments may want to ensure that job creation happens within the jurisdiction, rather than outside of it. This dynamic results in political conflict between jurisdictions competing for the renewable energy economy.

The Ontario case demonstrates one strategy for capturing a high proportion of jobs locally: requiring procurement from within the jurisdiction. This approach is not unique to Ontario—China, Spain, and Brazil have also included domestic content requirements in their renewable energy policies (Lewis and Wiser, 2007). Yet this approach to job creation raises significant international concerns due to existing trade agreements, generating tensions between political actors across scales. This policy approach is unlikely to foster an innovative, internationally competitive renewable energy industry.

Internationally, the domestic content requirements in Ontario brought harsh reactions. The EU, Japan, the US and other countries challenged the Ontario policy through the WTO, arguing that renewable policies based on trade protectionism should not be tolerated. Ontario, through its federal representatives, lost this case and is now determining its next steps. One possibility is that domestic content requirements will be removed.

Regardless of the WTO outcome, job creation may not occur in Ontario to the degree anticipated. While FITs are often promoted as an industrial and economic development policy, many jurisdictions are simultaneously pursuing this approach. Each place seeks FIT policies to develop an industry that can export technology, leading to long-term manufacturing jobs. However, not every jurisdiction will become a clean energy exporter—early actors may be winners but not everyone can be an early actor. Creating false expectations for job creation, through overpromising may make renewable energy policies vulnerable to political attacks. While innovation in renewable energy technologies is valuable, it is difficult for one jurisdiction to capture the benefits from innovation, since the knowledge from innovation is a global public good (Barrett, 2009). This dynamic suggests that demand-pull mechanisms at national and subnational levels may run into challenges if they over promise jobs that do not arrive and if trade rulings become costly.

Technology-push mechanisms at the international level, while difficult to coordinate, may help to overcome some of this political contestation across jurisdictions through trade law (Golombek and Hoel, 2011). However, the exact details of this technology-centered approach would determine its effectiveness (De Coninck et al., 2008). A combination of demand-pull mechanisms, including FITs, and technology-push policies would likely bring the most innovation at the lowest cost, providing global benefits (Nemet and Baker, 2009). In short, multi-scale political and economic linkages can undermine the political legitimacy necessary to sustain the long-term success of a renewable energy policy.

5. Conclusion

In Ontario, Canada the renewable energy coalition's success during the FIT policymaking period paradoxically contributed to weakening political support over time. When the FIT was being reformed, the coalition promoted higher prices, reduced barriers for grid connection and local content requirements. Each one of these changes strengthened the policy and simultaneously resulted in direct challenges to the program. First, the higher prices brought criticism that the program would be too costly for consumers. When the program was revised in 2012, it reopened with a 200 MW capacity cap on small projects. Second, reducing the barriers to deployment brought the ire of anti-wind activists, largely in rural communities, who felt their concerns were being circumvented by an expedited process. These two changes eventually caused a key coalition member, the Ontario Federation of Agriculture, to defect. Third, several countries contested the local content requirements through the WTO, portraying them as protectionist, with some success. As the coalition tried to extend the reach of the FIT policy they ran up against consumers' willingness to pay, resistance from rural communities and global trade challenges. More broadly, this case signals that ambitious renewable energy policies are likely to meet stiff challenges during implementation.

The issues arising in Ontario are not unique. Similar controversies are unfolding in Germany and Spain, where FIT contract costs are increasingly questioned, particularly in light of the recent financial crisis. In Germany, one estimate puts the cumulative costs for the solar PV FIT from 2000 to 2011 at €100 billion (Frondel et al., 2012). Indeed, the Ontario experience parallels the political conflicts in Germany during the late 1990s, where a growing coalition was able to learn and reinforce policies overtime while simultaneously catalyzing increasing opposition (Laird and Stefes, 2009). In Spain, 21% of the electricity bill came from renewable energy projects in 2010 (Batlle et al., 2011). With increasing public backlash based on costs, in January 2012 Spain suspended the FITs entirely for all new renewable energy projects. In China, strong government support for renewables, including through local content requirements, has sparked similar trade conflicts concerning solar PV (Hart and Gordon, 2012).

Together, these challenges emphasize that ambitious renewable energy policies require political support beyond the policy design phase and well into implementation. With FIT policies, implementation represents a critical period for political support: as the policy expands in scope, and deployment begins to grow exponentially, the potential for opposition to emerge increases. Electricity became a key issue in the 2011 Ontario election, with the incumbent Liberal government losing its majority by one seat; while this cannot be causally attributed to the FIT policy, negative coverage of the FIT during the election was pronounced. Given growing critiques by other political parties and defections by key coalition members, Ontario's expanded FIT policy is increasingly vulnerable.

Feed-in tariff policies may be more politically acceptable if regular and short price adjustment intervals are built in, or if prices decline with increasing capacity (Foxon and Pearson, 2007). When setting the price, governments should actively seek multiple sources of information. FITs that are set too rigidly, without opportunities for adaptive policy management, are likely to come under attack. Indeed, there is a growing, unacknowledged tension between adaptive management of renewable energy policies, as governments attempt to contain the overall cost and acceptability of the policy, and investor stability, a constantly heralded critical factor for policy effectiveness.

Given the potential for growing opposition, governments and renewable energy coalitions must refine policies over time to address opposition groups' concerns. For example, they should fund and prioritize community supported and community owned power projects. Indeed, there is greater emphasis on community owned power in the revised Ontario FIT with 10% of the capacity set aside for community power. Governments should also require project proponents to consult with communities early and actively, using mediators where necessary to bring to community on board. If governments and advocacy coalitions remain blind to critiques of renewable energy policy, they will not adequately respond to concerns from opponent groups. This was seen in the Ontario case, where the supportive coalition consistently overlooked criticisms that higher FIT prices would cost money and may not have been necessary, given the robust deployment under the lower-priced RESOP policy. Economic efficiency principles suggest consumers should not have to pay more money than necessary for renewable energy; if they do, opposition will mount. Finally, governments should pursue collaborative efforts across jurisdictions, to bring down component costs ideally before deployment. Apart from avoiding trade disagreements, this may also reduce the cost of renewable energy and speed deployment, supporting much-needed decarbonization.

Governments that ignore criticisms may risk losing renewable energy policies altogether, which is of particular concern given the urgency of decarbonizing the electricity system and addressing climate change. Implementation is as critical as initial support for a renewable energy policy, and the political dimensions of any proposed policy cannot be ignored.

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References

Adams, M., Wheeler, D., Woolston, G., 2011. A participatory approach to sustainable energy strategy development in a carbon-intensive jurisdiction: the case of Nova Scotia. Energy Policy 39 (5), 2550–2559.

Arrow, K.J., 1962. The economic implications of learning by doing. The Review of Economic Studies 29 (3), 155–173.

Auditor General of Ontario (AGO), 2011. 3.03 Electricity Sector—Renewable Energy Initiatives. 2011 Annual Report of the Office of the Auditor General of Ontario 87–120.

Auer, H., Resch, G., Haas, R., Held, A., Ragwitz, M., 2009. Regulatory instruments to deliver the full potential of renewable energy sources efficiently. European Review of Energy Markets 3 (2), 91–124.

Barrett, S., 2009. The coming climate-technology revolution. Journal of Economic Perspectives 23 (2), 53–75.

Batlle, C., Pérez-Arriaga, I.J., Zambrano-Barragán, P., 2011. Regulatory design for RES-E support mechanisms: learning curves, market structure, and burden-sharing. Energy Policy 41, 212–220.

Butler, L., Neuhoff, K., 2008. Comparison of feed-in tariff, quota and auction mechanisms to support wind power development. Renewable Energy 33, 1854–1867.

Caldeira, K., Jain, A.K., Hoffert, M.I., 2003. Climate sensitivity uncertainty and the need for energy without CO_2 emission. Science (New York, N.Y.) 299 (5615), 2052–2054.

Couture, T., Gagnon, Y., 2010. An analysis of feed-in tariff remuneration models: implications for renewable energy investment. Energy Policy 38 (2), 955–965.

Couture, T.D., Cory, K., Kreycik, C., Williams, E., 2010. A Policymaker's Guide to Feed-in Tariff Policy Design.

Cudahy, R.D., 1995. PURPA: the intersection of competition and regulatory policy. Energy Law Journal 16 (2), 419–439.

De Coninck, H., Fischer, C., Newell, R.G., Ueno, T., 2008. International technology-oriented agreements to address climate change. Energy Policy 36 (1), 335–356.

Del Rio Gonzalez, P., 2008. Ten years of renewable electricity policies in Spain: an analysis of successive feed-in tariff reforms. Energy Policy 36 (8), 2917–2929.

Deutsche Bank, 2010. Global Energy Transfer Feed-in Tariffs for Developing Countries.

Dewald, U., Truffer, B., 2012. The local sources of market formation: explaining regional growth differentials in German Photovoltaic Markets. European Planning Studies 20 (3), 397–420.

European Commission, 2008. The Support of Electricity from Renewable Energy Sources.

Fouquet, D., Johansson, T., 2008. European renewable energy policy at crossroads—Focus on electricity support mechanisms. Energy Policy 36 (11), 4079–4092.

Fouquet, R., 2010. The slow search for solutions: lessons from historical energy transitions by sector and service. Energy Policy 38 (11), 6586–6596.
Foxon, T.J., Pearson, P.J.G., 2007. Towards improved policy processes for promoting innovation in renewable electricity technologies in the UK. Energy Policy 35 (3), 1539–1550.
Freeman, N.B., 1996. The Politics of Power: Ontario Hydro and Its Government, 1906-95. University of Toronto Press.
Fri, R.W., 2003. The role of knowledge: technological innovation in the energy system. The Energy Journal 24 (4), 51–74.
Frondel, M., Ritter, N., Schmidt, C., 2008. Germany's solar cell promotion: dark clouds on the horizon. Energy Policy 36 (11), 4198–4204.
Frondel, M., Schmidt, C.M., Vance, C., 2012. Germany's Solar Cell Promotion: An Unfolding Disaster. Ruhr Economic Papers #353.
Gipe, P., 2007. Renewables Without Limits.
Gipe, P., Doncaster, D., MacLeod, D., 2005. Powering Ontario Communities: Proposed Policy for Projects up to 10 MW, Policy.
Golombek, R., Hoel, M., 2011. International cooperation on climate-friendly technologies. Environmental and Resource Economics 49 (4), 473–490.
Government of Ontario, 2012. Ontario Introduces Electricity Cost Relief. November 18, 2010. [WWW Document]. URL 〈http://news.ontario.ca/mof/en/2010/11/ontario-introduces-electricity-cost-relief.html〉.
Grübler, A., Nakicenovic, N., Victor, D.G., 1999. Dynamics of energy technologies and global change. Energy Policy 27 (5), 247–280.
Haas, R., Eichhammer, W., Huber, C., Langniss, O., Lorenzoni, A., Madlener, R., Menanteau, P., Morthorst, P.-E., Martins, A., Oniszk, A., Schleich, J., Smith, A., Vass, Z., Verbruggen, A., 2004. How to promote renewable energy systems successfully and effectively. Energy Policy 32 (6), 833–839.
Hart, M., Gordon, K., 2012. Five myths and realities about U.S.-China solar trade competition. Center for American Progress, 1–7.
Hoffert, M.I., Caldeira, K., Jain, A.K., Haites, E.F., Harvey, L.D.D., Potter, S.D., Schlesinger, M.E., Schneider, S.H., Watts, R.G., Wigley, T.M.L., Wuebbles, D.J., 1998. Energy implications of future stabilization of atmospheric CO2 content. Nature 395 (6705), 881–884.
Hogan, M.T., 2008. Running in Place: Renewable Portfolio Standards and Climate Change. Unpublished Masters Thesis, Massachusetts Institute of Technology1–213.
International Energy Agency, 2008. Deploying renewables: Principles for Effective Policies.
International Energy Agency (IEA), 2012. World Energy Outlook 2012. OECD/IEA, Paris.
Jacek, H., 1997. The new world of interest-group politics in Ontario. In: White, G. (Ed.), The Government and Politics of Ontario. University of Toronto Press, pp. 307–327.
Jacobsson, S., Bergek, A., 2004. Transforming the energy sector: the evolution of technological systems in renewable energy technology. Industrial and Corporate Change 13 (5), 815–849.
Jacobsson, S., Lauber, V., 2006. The politics and policy of energy system transformation—explaining the German diffusion of renewable energy technology. Energy Policy 34 (3), 256–276.
Jaffe, A.B., Newell, R.G., Stavins, R.N., 2005. A tale of two market failures: technology and environmental policy. Ecological Economics 54 (2-3), 164–174.
Kingdon, J.W., 2011. Agendas, Alternatives, and Public Policies, second ed. Little Brown and Co, Boston.
Lackner, K.S., Sachs, J., 2005. A robust strategy for sustainable energy. Brookings Papers on Economic Activity 2005 (2), 215–284.
Laird, F.N., Stefes, C., 2009. The diverging paths of German and United States policies for renewable energy: sources of difference. Energy Policy 37 (7), 2619–2629.
Lauber, V., Mez, L., 2004. Three decades of renewable electricity policies in Germany. Energy & Environment 15 (4), 599–623.
Lesser, J.A., Su, X., 2008. Design of an economically efficient feed-in tariff structure for renewable energy development. Energy Policy 36 (3), 981–990.
Lewis, J., 2009. Can green sunrise industries lead the drive into recovery? The case of the wind power industry in China and India. United Nations Industrial Development Organization.
Lewis, J.I., Wiser, R.H., 2007. Fostering a renewable energy technology industry: an international comparison of wind industry policy support mechanisms. Energy Policy 35 (3), 1844–1857.
Lipp, J., 2007. Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom. Energy Policy 35 (11), 5481–5495.
Loiter, J., Norberg-Bohm, V., 1999. Technology policy and renewable energy: public roles in the development of new energy technologies. Energy Policy 27 (2), 85–97.
Lyon, T.P., Yin, H., 2010. Why do states adopt renewable Portfolio standards? An empirical investigation. The Energy Journal 31 (3), 133.
MacKay, D., 2009. Sustainable energy—without the hot air. Usman Institute of Technology.
Menanteau, P., Finon, D., Lamy, M.-L., 2003. Prices versus quantities: choosing policies for promoting the development of renewable energy. Energy Policy 31 (8), 799–812.
Mendonça, M., 2007. Feed-in Tariffs—Accelerating the Deployment of Renewable Energy. Earthscan.
Mendonça, M., Jacobs, D., Sovacool, B., 2009. Powering the Green Economy: The Feed-in Tariff Handbook. Earthscan.
Meyer, N., 2003. European schemes for promoting renewables in liberalised markets. Energy Policy 31 (7), 665–676.
Michaelowa, A., 2005. The German wind energy lobby: how to promote costly technological change successfully. European Environment 15 (3), 192–199.
Mitchell, C., 2008. The Political Economy of Sustainable Energy. Palgrave Macmillan, New York.
Mitchell, C., Bauknecht, D., Connor, P.M., 2006. Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany. Energy Policy 34 (3), 297–305.
Nemet, G.F., 2006. Beyond the learning curve: factors influencing cost reductions in photovoltaics. Energy Policy 34 (17), 3218–3232.
Nemet, G.F., 2009. Demand-pull, technology-push, and government-led incentives for non-incremental technical change. Research Policy 38 (5), 700–709.
Nemet, G.F., Baker, E., 2009. Demand subsidies versus R & D: comparing the uncertain impacts of policy on a pre-commercial low-carbon energy technology. The Energy Journal 30 (4), 49–80.
Neuhoff, K., 2005. Large-scale deployment of renewables for electricity generation. Oxford Review of Economic Policy 21 (1), 88–110.
Ontario Federation of Agriculture, 2011. The Green Energy Feed in Tariff Review: Recommendations of the Ontario Federal of Agriculture.
Ontario Liberal Party, 2003. Growing Strong Communities.
Ontario Power Authority, 2008. Presentation to the smart grid Forum. Distributed Energy, 1–30.
Ontario Power Authority, 2011. Ontario's Long-Term Energy Plan.
OSEA, 2011. OSEA: About Us [WWW Document]. URL 〈http://www.ontario-sea.org/Page.asp?PageID=751&SiteNodeID=205&BL_ExpandID=50〉.
Owen, A., 2006. Renewable energy: externality costs as market barriers. Energy Policy 34 (5), 632–642.
Pirnia, M., Nathwani, J., Fuller, D., 2011. Ontario feed-in-tariffs: system planning implications and impacts on social welfare. The Electricity Journal 24 (8), 18–28.
Rabe, B.G., 2004. Statehouse and Greenhouse: The Emerging Politics of American Climate Change Policy. Brookings Institution Press.
Rabe, B.G., 2007. Race to the top: the expanding role of U.S. State renewable Portfolio standards. Sustainable Development Law & Policy 7 (3), 10–16.
REN21, 2011. Renewables 2011: Global Status Report.
Rowlands, I.H., 2007. The development of renewable electricity policy in the province of Ontario: the influence of ideas and timing. Policy Studies 24 (3), 185–208.
Stokes, L., Lee, H., 2012. Gainesville Regional Utilities' Feed-in Tariff. Harvard Kennedy School Case Program.
Swift, J., Stewart, K., 2004. Hydro: The Decline and Fall of Ontario's Electric Empire. Between the Lines.
Thelen, K., 2004. How Institutions Evolve: The Political Economy of Skills in Germany. Cambridge University Press, Britain, the United States, and Japan.
Wilson, J.Q., 1980. The Politics of Regulation, in: The Politics of Regulation. Basic Books, New York, pp. 357–394.
Wind Concerns Ontario, 2011. About Us [WWW Document]. URL 〈http://wind concernsontario.wordpress.com/who-are-we/〉.
Winfield, M., Gibson, R.B., Markvart, T., Gaudreau, K., Taylor, J., 2010. Implications of sustainability assessment for electricity system design: the case of the Ontario Power Authority's integrated power system plan. Energy Policy 38 (8), 4115–4126.
Wiser, R., Porter, K., Grace, R., 2005. Evaluating experience with renewables Portfolio standards in the United States. Mitigation and Adaptation Strategies for Global Change 10 (2), 237–263.
Wong, S., Bhattacharya, K., Fuller, J.D., 2010. Long-term effects of feed-In tariffs and carbon taxes on distribution systems. IEEE Transactions on Power Systems 25 (3), 1241–1253.
Wustenhagen, R., Wolsink, M., Burer, M., 2007. Social acceptance of renewable energy innovation: an introduction to the concept. Energy Policy 35 (5), 2683–2691.
Yatchew, A., Baziliauskas, A., 2011. Ontario feed-in-tariff programs. Energy Policy 39 (7), 3885–3893.
Yin, R.K., 2009. Case Study Research: Design and Methods. Sage Publications.