e-brief

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ECONOMIC GROWTH AND INNOVATION

Zapped: The High Cost of Ontario's Renewable Electricity Subsidies

By

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- Ontario's *Green Energy and Green Economy Act* subsidizes producers of renewable electricity by paying them far more for their output than the prevailing market price of electricity. Wind power receives a fixed electricity price of 13.5 cents per kilowatt-hour, and solar receives even larger amounts;

- This subsidy will result in additional costs to the average Ontario household of $310 per year; ostensibly designed to reduce emissions and create jobs, Ontario's renewable electricity subsidy is an expensive way of meeting these goals;

- The drag of unnecessarily high electricity costs on the Ontario economy could be reduced if the province did not award any further subsidized contracts to renewable electricity generators.

Rising electricity costs are a matter of increasing concern for Ontario consumers and businesses and therefore the Ontario provincial government. In its most recent Long-Term Energy Plan (Ontario Ministry of Energy 2010) the government forecasts that in nominal terms, electricity costs for the typical household will rise from under $1,400 a year in 2010 to over $2,600 in 2022. Although there are many reasons for higher electricity costs, a major driver is Ontario's subsidy program for renewable electricity – particularly wind and solar – through the Ontario Power Authority's (OPA) Feed-In Tariff (FIT) program.[1]

We estimate that renewable subsidies will represent $310 per year in additional costs per household if existing policies are not revised. Ontario's policies do not provide cost-effective approaches to meeting the government's goals of creating jobs in the renewable energy technology sector or reducing greenhouse gases (GHGs). This *e-brief* argues that Ontario should phase out its costly subsidy program and not award further contracts in their current form.

1   Under a FIT, electricity producers have access to contracts that guarantee a defined price for every unit of electricity they produce for the electricity grid. While Ontario's FIT program pays a premium for renewable generation, a FIT that does not incorporate subsidies can be potentially useful for procuring electricity from any type of small-scale distributed generator (see Carr and Dachis forthcoming).

ESSENTIAL POLICY INTELLIGENCE

Table 1: Total Capacity and Expected Production and Costs from Ontario FIT Projects, as of May 13, 2011

	Average Feed-in Tariff Rate (cents/kWh)	Total Capacity Likely to be Built (MW)	Expected Actual Production (TWh)	Annual Payment to FIT Projects ($ million)	FIT Premium Relative to Natural Gas ($ million)
Wind	13.5	4,324	11.4	1,534	284
Solar	48.5	3,309	3.2	1,514	1,163
Hydro	13.0	320	1.7	218	34
Other	13.0	123	0.9	112	17
Total	**19.8**	**8,075**	**17.2**	**3,378**	**1,498**

Note: This includes large and small-scale FIT projects connected only to the distribution network, known as 'capacity allocation exempt' projects. However, this does not include the microFIT program. We calculate a weighted average price for solar producers where we assume that all 'capacity allocation exempt' FIT solar projects receive 71.3 cents per kWh and all other FIT solar projects receive 44.3 cents per kWh. Prices are in 2011 dollars because only a small fraction of FIT payments contract rates are indexed to inflation and will not escalate in the future.

Source: Authors' calculations from Ontario Power Authority (OPA), Independent Electricity System Operator (IESO).

Ontario's Renewable Electricity Subsidy Program

In 2009, Ontario introduced the *Green Energy and Green Economy Act*. One of the centerpieces of the legislation was the creation of a special tariff rate, the FIT, for producers of renewable electricity sources, which guarantees their prices for 20 years.[2] Most installed capacity and currently approved contracts under FIT, in Ontario, are for wind or solar projects, with smaller amounts of capacity provided by small-scale hydroelectric and other energy sources, such as biogas, landfill or biomass projects. The FIT program:

- guarantees land-based wind producers 13.5 cents per kilowatt-hour (kWh) and large ground-mounted solar power producers 44.3 cents per kWh;[3]
- will 'create' 50,000 jobs over six years, according to the Long-Term Energy Plan (2010);
- requires that 50 percent of the value of FIT-eligible wind projects (60 percent for solar) built after 2012 is sourced from Ontario.

As of May 13, 2011, there are 2,293 projects that have FIT contracts offered or executed, with 2,611 MW of installed capacity under development (Table 1), with another 6,302 projects with 11,079 megawatts (MW) of combined capacity in the application stage. Assuming proposed and in-development projects have the same approval and failure rates as they have had until now, we anticipate total future capacity of 8,075 MW from these projects.

However, most of these renewable energy projects operate only intermittently – the wind does not always blow nor does the sun always shine. The average operating capacity will be well below the installed capacity.[4] Based on average annual

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2   This FIT replaced the OPA's Renewable Energy Standard Offer Program that had been in place since 2007 and more closely reflected market prices.

3   Producers with rooftop solar panels receive higher rates, as high as 80.2 cents. The tariff rates in all calculations are the weighted average of the amounts that broad technology categories (wind, solar, hydro and other) are paid based on the distribution of sizes of currently approved projects.

4   The capacity factor of a generator is the amount of electricity it actually produced over some period of time divided by the amount it would have produced if it had operated at its design capacity for the entire period. The average operating capacity for a given period such as a day or year is therefore the design capacity multiplied by the capacity factor.

capacity of current similar electricity facilities[5] we expect annual production of FIT projects to be about 17 terawatt-hour (TWh)[6], or about 12 percent of 2010 total Ontario annual demand.

Cost to Electricity Consumers

Ultimately, costs of subsidizing electricity will be paid by electricity users through higher electricity bills or by provincial residents in general through higher taxes than otherwise. Comparing the average FIT rate to the cost of purchasing electricity from newly built natural gas generators – about 11 cents per kWh[7] – we find the expected annual excess cost of current and future FIT projects to be $1.5 billion.[8] This amounts to $310 per Ontario household, based on 4.8 million Ontario households.[9]

The $1.5 billion excess cost of renewable electricity could be reduced by two-thirds to $550 million if the province did not offer contracts for projects that are now in the pre-approval stage. Alternatively, costs could be reduced by offering incentives to current contract holders, who have yet to incur development costs, to not carry out their contracts. This could reduce the net cost to the province and potentially leave current FIT contract holders better off.

As the province becomes more reliant on intermittent electricity sources, it will need to i) build additional standby capacity or ii) purchase more power from outside the province when wind and solar power generators are not producing, which will further increase costs to consumers. Additionally, the costs of building transmission and distribution networks to new generating facilities are not included in our estimates, and may be substantial.

When FIT producers are operating, their output must be purchased at the rates specified in their contracts. Other, larger, electricity producers also have fixed price contracts (at cheaper rates) or normally run at all hours. In some cases, their output must be purchased too, irrespective of demand. FIT electricity generation may therefore cause or exacerbate surplus supply of electricity relative to demand, creating system management problems and higher costs than otherwise.

Greenhouse Gas Reduction

We estimate that the Ontario FIT program will offset approximately 8.4 megatonnes (MT) of GHG that would otherwise be produced by natural gas facilities, assuming that renewable intermittency leads to no increased emissions from standby generators. Natural gas will be the only GHG-emitting electricity source in Ontario after 2014 once Ontario shuts down its last remaining coal-fired electricity plant. The effective subsidy of GHG offset will be $177 per tonne (Table 2).[10]

Under a cap-and-trade system, which the Ontario government has committed to implementing, the total cap on emissions is already set.[11] A FIT would lead to no incremental economy-wide GHG emissions but would only transfer GHG reductions from the rest of the economy to the electricity sector (see Rivers 2010; and Fischer and Preonas 2010).

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5   We estimate effective capacity of FIT projects based on historical intermittency of similar projects in Ontario over the course of 2010. For wind, this is 30 percent, 60 percent for small-scale hydro, and we assume that other technologies produce 80 percent of the time, the average capacity factor of existing biomass facilities in Ontario. We use an 11 percent annual capacity factor for solar power, based on similar principles (Pelland and Abboud 2009).

6   A terawatt-hour is one million megawatt hours or one billion kWh.

7   This is in the mid-range of combined cycle natural gas procurements that the Ontario Power Authority has recently signed. See http://powerauthority.on.ca/understanding-electricity-prices/generation-procurement-cost-disclosure

8   This does not include the cost of an additional provincial agreement for 'economic development adders' worth $437 million (in net present value) over 20 years if a manufacturing consortium builds certain manufacturing facilities in Ontario by 2015 (Benzie and Hamilton 2010).

9   The provincial government recently instituted a 10 percent rebate to current electricity bills, the effect of which is to defer costs rather than eliminate them. These deferred costs become a liability for either taxpayers or electricity users resulting in some combination in the future of higher taxes, lower government spending on services or higher electricity prices.

10 The amount of GHGs offset would fall, and the cost per tonne would rise, if FIT projects offset lower emission nuclear or hydro power.

11 In a cap-and-trade system, there is an economy-wide cap on the amount of GHGs emitted.

Table 2: Cost per 'Green Job' Created and Tonne of GHG Offset Relative to Natural Gas Production

Total Premium Paid Over Natural Gas Electricity ($ million)	Premium Paid per 'Job Created' ($)	MT of GHG Offset Relative to Natural Gas	Premium Paid per Tonne of GHG Offset Relative to Natural Gas ($)
1,498	179,760	8.4	177

Source: Authors' calculations from OPA, Ontario Ministry of Energy, IESO, Natural Resources Canada (2010).

Note: We use emissions intensity estimates of 494.6 grams of GHG per kWh of electricity delivered from natural gas turbines. We assume renewable power results in no additional GHG emissions, such as through manufacturing or standby generation.

Further, subsidizing renewable electricity through a FIT leads to little incentive for cost reductions for renewable energy sources because generators have no price competition once they receive FIT contracts (Söderholm and Klaassen 2007). If the goal of policymakers is to encourage development of cost-competitive wind and solar technologies, traditional research and development credits or direct subsidies to the buyers of renewable electricity would be more effective means.

Job Creation

While job creation is a major goal of the FIT program, with 50,000 jobs projected over six years, those jobs would be heavily subsidized by electricity users paying premiums for renewable energy. Taking the province-wide cost estimates above, and the government's job creation estimates at face value, we estimate the subsidy to be $179,000 per job per year.[12]

These estimates of the number of jobs – in construction, manufacturing and spinoffs – do not take into account two countervailing effects. First, many of the people who would be employed by these projects would have had jobs anyway, meaning that jobs created from subsidies will have crowded out other jobs. Second, the higher electricity costs will raise business costs, resulting in fewer jobs than would otherwise have been created in the broader economy. The net number of jobs created therefore may be negative.

Furthermore, Ontario's FIT program is meeting international opposition. Japan has initiated a complaint against Canada at the World Trade Organization (WTO) – subsequently joined by the European Union and the United States – claiming that the program's requirement for domestic procurement constitutes a prohibited subsidy, which violates WTO rules. The Ontario government's current policies thus also raise the risk of a costly trade dispute.

Conclusions

Ontario's renewable electricity subsidy is a costly means of reducing domestic GHG emissions and creating jobs. These costs will be borne by Ontario electricity consumers and amount to $310 annually per household, with additional costs due to the intermittency of power from renewables and the transmission infrastructure investment needed. The Ontario government could reduce this cost by not continuing the program in its present form.

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12 In comparison, the German renewable electricity subsidy cost $273,000 per gross job created (Frondel et al., 2009).

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