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Frequently Asked Questions about Green Energy in Ontario

Ontario has taken the laudable step of closing down its entire fleet of coal-fired power plants – a move supported across partisan lines. This, however, is but one of the many changes that is coming to Ontario's electricity system. Meanwhile:

- Almost one-half of the entire province's power plants are scheduled to be retired or rebuilt within the next 10 years.
- The entire fleet of nuclear generating stations need major refurbishment or will be retired before 2020.
- Over 50 per cent of the exisiting transmission infrastructure is over 50 years old and requires major investments, just to keep the lights on.
- With the Green Energy Act, Ontario has introduced Canada's first comprehensive legislation that encourages individuals, communities and companies to develop and own renewable energy projects.

The reality is that big decisions need to be made now about how to re-build and expand our electricity system in Ontario, decisions that have real implications for the future. Any of the choices that we make will have consquences and each comes with their own price tag. However, doing nothing is simply not an option.

This backgrounder is intended to provide some perspective on frequently asked questions regarding renewable energy options for Ontario.

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Behind the Switch; Pricing Ontario's Electricity Options
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1. Why are electricity prices rising in Ontario?

Ontario's electricity grid needs work and re-building it costs money.

For years, underinvestment in Ontario's electricity system led to aging infrastructure, poor reliability and continued dependence on polluting energy sources, such as coal. As a result of this under-investment, Ontario's electricity rates have been kept artificially low.

A lot of investment is required to modernize Ontario's electricity system.

Investments are required to keep the lights on and clean up the sources of Ontario's electricity. In the short term, prices are poised to rise because you simply cannot build something in 2011 and expect it to cost the same as what was built in the 1970s and '80s (or in some cases the '60s!).

Ontario's power plants are old and getting older by the day. As much as 43 per cent of Ontario's electricity facilities will need to be rebuilt or retired in the next 10 years.[1] The entire fleet of nuclear plants will reach the end of their lives in that time. All of Ontario's coal plants will be closed by 2014. Over 50 per cent of the overhead transmission lines in Ontario are more than 50 years old.[2] The most recent Long Term Energy Plan from the Ontario Power Authority projected nine billion dollars of investment would be needed over the next 20 years to renew Ontario's transmission system.[3]

New investment is needed in Ontario, regardless of whether that new investment pays for power from new and refurbished nuclear plants, for more fossil fuels or a shift to modern sources of clean energy

Ontario is not alone. Electricity prices are rising across the country because their systems – which were built around the same time as ours – are aging as well. Between 2002 and 2010, rates in Nova Scotia rose 37 per cent. Rates in Saskatchewan rose 36 per cent over the same time period. BC Hydro is expected to

[1] Ontario Power Authority, *Ontario's Long-term Energy Plan* (2010), 9, http://www.powerauthority.on.ca/long-term-energy-plan

[2] The Pembina Institute, *Behind the Switch: Pricing Ontario's Electricity Options* (2011), 27, http://www.pembina.org/pub/2238

[3] Ontario Power Authority, *Ontario's Long-term Energy Plan* (2010), 55, http://www.powerauthority.on.ca/long-term-energy-plan

increase rates by 8 per cent in 2012, followed by a 3.9 per cent increase in 2013 and another 3.9 per cent increase in 2014. In Alberta, rates are forecast to rise 50 per cent from 2010 to 2016. Across the country, the expense of new capital projects and infrastructure upgrades are driving prices up.

2. What would happen to electricity prices if Ontario cancels the Green Energy Act?

Prices would continue to rise anyway. With or without renewable power, Ontario's electricity prices are poised to keep increasing. The reasons are complicated, but in short many of the expenses in Ontario are inevitable, including grid upgrades and rebuilding new types of supplies. With or without renewables, you still need to get electricity from another source, even if you keep renewables from playing a bigger role in the mix. What ever source you use will have a cost.

Any new electricity plant in Ontario – renewable or otherwise – faces the same challenge: it is being built today, and not in 1970 or 1980. While wind energy contracted under Ontario's Green Energy Act is 13.5 cents per kilowatt-hour (¢/kWh)[4], the average price for new natural gas prices has been around 11 ¢/kWh[5] – we can't know exactly what the cost is since such contracts are confidential. However, while the price of natural gas is forecast by everyone from the Canadian National Energy Board to the United States Department of Energy[6] to increase over the next 20 years, the price of renewables will continue to decrease.

It's also important to remember that the price we pay for electricity is a mix of all the generators on the grid, plus transmission, plus distribution, plus administration costs and taxes. So while wind and other renewables do cost a little more today than building another new alternative, renewables are only a part of the overall mix of what shows up in your electricity bill. The prices for renewables are fixed for a long-term and, because they have no fuel cost, they are an effective hedge against fossil-fuel price volatility. However, the good news is that, as the percentage of renewables increases, these prices will continue to drop.

A recent study from the Pembina Institute modeled these complex interactions and found that cancelling the Green Energy Act would likely result in a slightly slower price increase – about the price of a cup of coffee and a donut per month for a typical household. In the long-term, however, investments made in renewables today

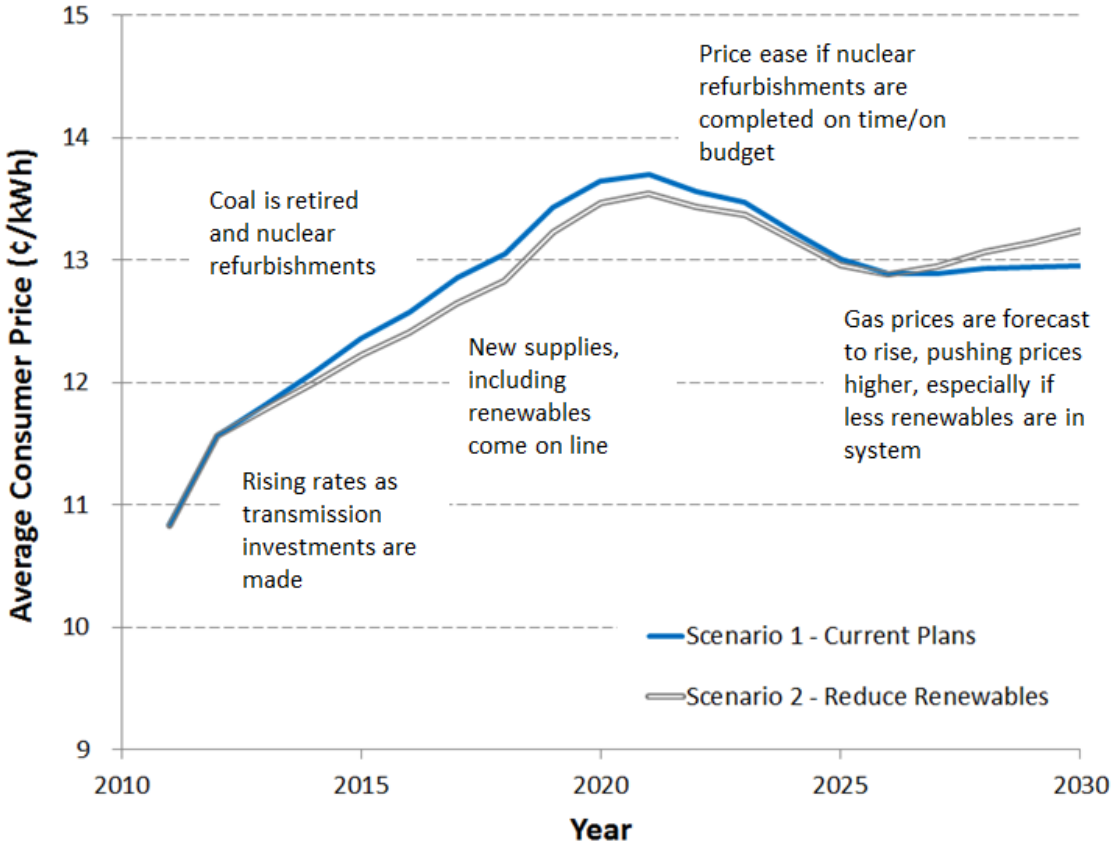
[4] Ontario Power Authority, "FIT Price Schedule" (June 3, 2011), http://fit.powerauthority.on.ca/fit-price-schedule

[5] In OPA's 2009 Generation Procurement Cost Disclosure, they report that the all-in costs of combined-cycle natural gas contracts fall in a range of 8.2 – 14.2 cents per kWh (within a 95 per cent confidence interval). Ontario Power Authority, "Generation Procurement Cost Disclosure" (2009) http://www.powerauthority.ca/understanding-electricity-prices/generation-procurement-cost-disclosure

[6] U.S. Energy Information Administration, *Annual Energy Outlook 2011,* DOE/EIA-0383(2011), http://www.eia.gov/forecasts/aeo/pdf/0383(2011).pdf

are likely to act as a price hedge leading to a cost savings as the price of gas and other technologies are expected to increase.[7]

The graph below illustrates relative cost over time of Ontario's electricity system with and without the green energy act. Without the GEA, renewables would need to be replaced with natural gas-fired power.



Source: Weis, T. and Partington, PJ (2011) *Behind the Switch: Pricing Ontario's Electricity Options*, published by The Pembina Institute, available online: www.pembina.org/pub/2238.

[7] The Pembina Institute, *Behind the Switch: Pricing Ontario's Electricity Options* (2011), http://www.pembina.org/pub/2238

3. How does the cost of purchasing new power from renewable sources like wind and solar compare to the cost of purchasing power from other, more conventional sources?

Renewables are more affordable than new nuclear and cost slightly more than natural gas does at today's prices, that is, as long as you leave out the environmental costs.

Electricity prices are complex, especially in Ontario, which makes it difficult to compare prices from one source directly to another. One important reminder is that the cost of building new sources of electricity is going to be more expensive than continuing to buy power from old sources that were built and paid off years ago. As old and polluting power plants reach the end of their lives, Ontario has no choice but to start investing in new generation, so it only makes sense to compare prices for new wind or solar power infrastructure with the prices for new natural gas, hydro or nuclear plants.

The Green Energy Act's current feed-in-tariff (FIT) rate for wind is 13.5 ¢/kWh over a 20-year contract.[8] For comparison, recent contracts for new small hydro plants in Quebec and British Columbia have come in around 12 ¢/kWh[9] and new natural-gas-fired electricity in Ontario have averaged more than 11 ¢/kWh.[10]

Natural gas prices are currently the lowest they've been in many years, in part due to the advent of hydraulic fracturing (or "fracking") that has unlocked abundant shale gas reserves, as well as reduced demand due to the recession. Gas prices are predicted to steadily rise even if we don't start putting a price on pollution. If there is a price on pollution, the price of the gas that is imported to Ontario to run these plants will increase even further.

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[8] Ontario Power Authority, "FIT Price Schedule" (June 3, 2011), http://fit.powerauthority.on.ca/fit-price-schedule

[9] BC Hydro announces first group of successful projects in Clean Call May 2010 www.bchydro.com/news/articles/press_releases/2010/bch_announces_first_group_of_successful_projects_in_clean_call.html

[10] In OPA's 2009 Generation Procurement Cost Disclosure, they report that the all-in costs of combined-cycle natural gas contracts fall in a range of 8.2 – 14.2 cents per kWh (within a 95 per cent confidence interval). Ontario Power Authority, "Generation Procurement Cost Disclosure" (2009) http://www.powerauthority.ca/understanding-electricity-prices/generation-procurement-cost-disclosure

New nuclear cost estimates range from 15 ¢/kWh from agencies such as Moody's Investment Services and Standard and Poor's,[11] to between 17- 34 ¢/kWh from agencies such as the California Energy Commission[12]. (These estimates assume nuclear plants will be built on budget; however, in practice, nuclear projects in Ontario have turned out to be an average of 2.5 times more expensive than their original cost estimates).

Feed-in tariff rates for wind and solar will decline over time in Ontario as they have for FIT programs all over the world. Since their inception in Europe, FITs have been specifically designed to pay a price to clean energy sources that allow them to be built for a modest profit. As more and more equipment is installed, the cost for new renewable technology decreases and the rates paid can be reduced, sometimes quite dramatically. For solar energy, these programs have consistently been lowering the price paid to encourage innovation. FIT programs have driven the cost of wind down 33 per cent between 1998 and 2008 and the cost of solar energy down 50 per cent in the last five years alone.[13]

Germany, which has had a FIT program for over a decade and has over 370,000 people working in the renewable energy industry,[14] recently extended its FIT program and, at the same time, reduced its FIT rates again this year for solar to reflect the decrease in the cost of the technology. Onshore wind rates, however, have remained stable since wind is close to competitive with other new technologies in Germany. Ontario's FIT has a mandatory two-year review that is currently scheduled to begin in late 2011.

Another big advantage of renewable electricity generation is that it does not require a fuel to be purchased or disposed of, nor does it produce greenhouse gas (GHG) emissions or other local air pollutants. Fossil fuels impose costs on the economy in the form of health and environmental damage, but so far the price of fossil-fuel-fired electricity does not reflect these costs. Coal-fired electricity in Ontario is estimated to

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[11] Mark Cooper, The Economics of Nuclear Reactors: Renaissance or Relapse, 2009, p. 48, http://www.vermontlaw.edu/Documents/Cooper%20Report%20on%20Nuclear%20Economics%20FINAL%5B1%5D.pdf

[12] 2010 Comparative Costs of California Central Station Electricity Generation, (2010) CEC-200-2009-07SF, available online at : www.energy.ca.gov/2009publications/CEC-200-2009-017/CEC-200-2009-017-SF.pdf

[13] REN 21, *Renewables 2010 Global Status Report* (2010), http://www.ren21.net/Portals/97/documents/GSR/REN21_GSR_2010_full_revised%20Sept2010.pdf

[14] *German Ministry for the Environment, Nature Conservation and Nuclear Safety,* http://www.bmu.de/files/english/pdf/application/pdf/ee_beschaeftigung_2010_en_bf.pdf

cost three billion dollars in additional health care costs and $371million in environmental damages annually.[15] That works out to an extra 12.7 ¢/kWh on top of the regular price of coal-fire-generated electricity.[16] Natural gas is cleaner than coal but still emits GHG emissions and other air pollutants.

[15] DSS Management Consultants Inc. and RWDI Air Inc. *Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation* (2005) http://www.mei.gov.on.ca/en/pdf/electricity/coal_cost_benefit_analysis_april2005.pdf

[16] Sustainable Prosperity, *Ontario's Feed-in-Tariff for Renewable Energy: Lessons from Europe* (2010), http://www.sustainableprosperity.ca/article292

4. How can we afford to pay wind producers 13.5 ¢/kWh and solar producers 44.3 – 80.2 ¢/kWh when the average price for electricity in ON is 3.67 ¢/kWh?

Simply put, the spot-market price for electricity is not the best basis for comparison. The best way to compare the affordability of new sources of renewable power is to compare feed-in-tariff rates to the prices in contracts for other kinds of power, such as natural gas, nuclear or hydro. Sometimes we see comparisons of FIT rates to the average spot-market price for electricity, which so far this year is about 3.26 ¢/kWh.[17] This price as a point of comparison is misleading for several reasons.

First, most of Ontario's electricity producers (including nuclear plants and most of the hydro and gas plants) all have long-term contracts that are outside of the spot market.

Second, Ontario has a surplus of electricity for a few years because demand has been falling. This will change soon. All of the nuclear plants will need refurbishing starting as early as 2013.[18] Ontario needs to start building new plants now, even though the current price is low, because soon huge amounts of electricity generation will be unavailable to Ontario and prices will increase dramatically without new supply.

Finally, the average spot-market price is not the whole story. For solar, the current FIT rates are 44.3–71.3 ¢/kWh for solar power;[19] microFIT rates for homeowners and small businesses are 64.2 – 80.2 ¢/kWh.[20] While that is much higher than for wind, hydro, nuclear or natural gas contracts, solar power generates power at times of peak demand. During periods of peak demand, prices can be substantially higher than the average.

For example, on a hot and sunny July day this past summer, the hourly market price reached as high as 49.29 ¢/kWh due to high demand.[21] However, even this is a

[17] Independent Electricity System Operator, "Weekly Market Report" (August 31 – September 6, 2011) http://ieso.ca/imoweb/pubs/marketReports/weekly/20110906.pdf

[18] Ontario Power Authority, *Ontario's Long-term Energy Plan* (2010), http://www.powerauthority.on.ca/long-term-energy-plan

[19] Ontario Power Authority, "FIT Price Schedule" (June 3, 2011), http://fit.powerauthority.on.ca/fit-price-schedule

[20] Ontario Power Authority, "microFIT Price Schedule" (August 13, 2010) http://microfit.powerauthority.on.ca/pdf/microFIT-Program-price-schedule.pdf

[21] Independent Electricity System Operator, "Weekly Market Report" (July 21-27, 2011) http://www.ieso.ca/imoweb/pubs/marketReports/weekly/20110726.pdf

pretty low price compared to where electricity prices have been; once nuclear reactors start to come offline in the next few years, prices during these peak times will increase substantially.

Solar prices should be considered in the context of how much it would cost to meet power demands at peak times otherwise, including peak-demand market prices, peak import prices and the cost of building and contracting new infrastructure to be on standby for daily peak periods. The good news for solar power in Ontario is that the electricity system demand peaks in this province when it is hot and sunny.

5. Ontario sometimes has more electricity than it needs and must sell it off at below-market prices. So why is Ontario building more generation capacity?

Current oversupply is a small and temporary problem. Occasionally at night, when demand is low, Ontario generates more electricity than it can use. This is largely because nuclear generators (which generate close to 50 per cent of Ontario's electricity) cannot easily be ramped up or down in response to demand. So, occasionally Ontario actually pays consumers to use power. This might seem perverse but it is cheaper to pay someone to take the power rather than to try to stop and restart a nuclear power plant for the few hours when oversupply is occurring.

Ontario's demand for electricity has been dropping for several years as part of the restructuring of its economy and efforts to use electricity more efficiently. When demand dips below the level of supply generated by sources that cannot be easily switched off, it becomes more affordable to export the electricity even at a loss.

This situation of occasional oversupply will not last long. The problem will begin to correct itself as Ontario's coal plants are phased out and nuclear units are removed from service starting in 2015, for refurbishment. With so much generation capacity going offline, Ontario will need new sources of electricity. Building electricity infrastructure takes time and Ontario is building up its clean electricity capacity in order to be able to keep the lights on in the next few years when its dirty coal plants are retired and its nuclear fleet reaches the end of its design life.

6. Why are we "subsidizing" renewable energy? If renewables make sense, should they not be able to compete in the marketplace on their own merits?

Renewables are competing with traditional electrical generation that has been historically heavily subsidized. For example, the federal government has provided $20 billion in total historic subsidies to nuclear power.[22] These subsidies are ongoing, including $651 million paid in 2009 alone for operations research and to cover cost overruns.[23] The federal government also covers most of the nuclear energy industry's liabilities; it will pick up the tab for any cost exceeding $75 million dollars in the event of a nuclear accident. (The Fukushima accident is projected to have cost at least $2.84 billion, while the Chernobyl concrete "sarcophagus" is excepted to have a $2.2 billion price tag).

In addition, the Ontario taxpayer subsidizes polluting sources of electricity generation through the health care system. The government of Ontario estimates that shutting down coal will reduce health care costs by three billion dollars annually.[24] Burning fossil fuels, be it coal or natural gas, is also in effect subsidized by virtue of there being no cost to release GHG emissions into the atmosphere.

In comparison, federal subsidies for renewable electricity between 2002 and 2020 will total $1.8 billion,[25] less than 10 per cent of what nuclear has received.

The FIT mechanism in Ontario is not a subsidy in the sense of a tax-payer funded program to artificially reduce costs. Rather, a FIT is simply paying the current costs required to build clean energy in an open and transparent way. Feed-in-tariff mechanisms have been shown to lower prices by developing a market and letting industry bring costs down rather than using tax-payer dollars to bridge any gaps. Given the existing market distortions the FIT is in many ways an effort to level the playing field.

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[22] Tom Adams, *Federal Government Subsidies to Atomic Energy of Canada Limited*, Energy Probe, January 11, 2006, http://energyprobe.files.wordpress.com/2011/03/aeclsubsidies.pdf

[23] Tyler Hamilton, "Atomic 'challenges' prompt Ottawa to shell out another $200 million," *The Toronto Star,* November 6, 2009, http://www.thestar.com/news/canada/article/722050--atomic-challenges-prompt-ottawa-to-shell-out-another-200-million

[24] Government of Ontario, "Shutting Down Coal," http://www.ontario.ca/en/initiatives/progressreport2011/ONT05_039158.html

[25] Combining the Wind Power Production Incentive and the ecoENERGY for Renewable Power Programs from Natural Resources Canada.

Ontario's support for renewable energy is also directed at developing local clean energy manufacturing capacity. As a result, the government has arranged for a $110 million incentive payment offered to Samsung tied to establishing four manufacturing plants in the province. This deal is expected to result in seven billion dollars of investment in Ontario as well as manufacturing plants in Tillsonburg, Windsor, Toronto and one additional community. Some of Ontario's biggest manufacturers exist in the province as a result of foreign investment, including Toyota, Honda, Ford and General Motors. Renewable energy is a booming industry globally, attracting over $400 billion of investment in 2010, and Ontario is positioning itself to become an important regional center of renewable energy technical know-how.

7. Who benefits from the prices paid for renewable energy?

The rates for renewables in Ontario not only result in cleaner air but are also tied to bringing jobs and investment to Ontario. Ontario has put in place local content requirements to ensure that the rates being paid for renewable electricity result in jobs and economic development and diversification in the province.

According to a recent study conducted by ClearSky Advisors for the Canadian Solar Industry Association, as of 2011 solar energy in Ontario had generated two billion dollars of private sector investment and 8,200 jobs. ClearSky estimates that solar energy adds $1.42 to the average household electricity bill: a monthly increase of 1.1 per cent. Between 2008 and 2018, they project that solar energy will generate $12.9 billion in investment and create 74,000 jobs in Ontario. They estimate that in 2018, solar energy will be responsible for an increase of $4.91 on the average household electricity bill, a monthly increase of only three per cent.[26]

ClearSky Advisors also completed a study for the Canadian Wind Energy Association on the projected economic impacts of wind energy in Ontario for 2011 - 2018. They estimate that wind power will generate 80,328 person-years of employment and attract $16.4 billion of private investments of which $8.5 billion will be invested locally in Ontario. They expect that the projects installed between 2011 and 2018 will contribute more than $1.1 billion of revenue to Ontario municipalities and landowners in the form of taxes and lease payments over the projects' 20-year lifespan. They estimate that roughly 75 per cent of the jobs will be pre-connection (e.g., construction and manufacturing) and 25 per cent of the jobs will be post-connection (e.g. operations and maintenance).[27]

The vast majority of natural gas used in Ontario is purchased from outside of the province. While investments in wind and solar have guaranteed requirements for Ontario content, a further reliance on natural gas will result in money leaving the province to pay for and transport gas from all over North America.

[26] ClearSky Advisors Inc. *Economic Impacts of the Solar PV Sector in Ontario 2008-2018* (2011), http://www.cansia.ca/sites/default/files/economic_impacts_of_solar.pdf

[27] ClearSky Advisors Inc. *Economic Impacts of the Wind Energy Sector in Ontario 2011-2018* (2011), http://www.canwea.ca/pdf/economic_impacts_wind_energy_ontario2011-2018.pdf

8. Why not build more natural gas plants instead of new renewable energy capacity?

Natural gas comes with its own risks – both economic and environmental. Ontario has built a significant number of natural gas plants in recent years, many of which will greatly help the province phase out coal completely. However, in the longer-term, investments in renewable energy will provide a hedge against price fluctuations in natural gas, which have seen prices as high as triple that of current prices in the past five years.

Natural gas prices are currently low but more reliance on natural gas would make Ontario more vulnerable to volatile gas price hikes. Natural gas prices are projected to rise and may rise more steeply if environmental and health concerns about shale gas extraction results in limits on supply or higher production costs. Shale gas is projected to make up nearly 30 per cent of Ontario's natural gas supply by 2020.[28] But shale gas extraction raises considerable environmental concerns, including the risk of contaminating freshwater. Several jurisdictions, such as Quebec[29] and New York,[30] have issued temporary moratoriums on shale gas activities pending further study. Since shale gas is expected to account for the bulk of new natural gas production, any moves by governments to restrict shale gas production could have a significant impact on gas supply and prices.

Finding appropriate sites to build new gas plants may also be challenging, given the recent local opposition to proposed developments in Oakville and Mississauga. Based on past electricity plans, new plants may be likely in Kitchener-Waterloo, the southwest Greater Toronto Area (GTA), and two other locations: one in the GTA and one that has yet to be determined.[31]

Natural gas is less polluting than coal but it still generates GHG emissions and air pollution. In Ontario, more reliance on natural gas could mean as much as three million more tonnes of GHGs, over 260 tonnes of nitrogen oxides, 21 tonnes of

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[28] ICF International, *2010 Natural Gas Market Review* (August 20, 2010) Prepared for the Ontario Energy Board, p. 7, http://www.oeb.gov.on.ca/OEB/_Documents/EB-2010-0199/ICF_Market_Report_20100820.pdf

[29] Rhéal Séguin, "Charest dodges shale-gas bullet with de facto moratorium" *The Globe and Mail*, Mar. 09, 2011, http://www.theglobeandmail.com/news/politics/charest-dodges-shale-gas-bullet-with-de-facto-moratorium/article1936123/

[30] Dan Wiessner, "NY Assembly Extends Fracking Ban for Another Year," *Reuters*, June 6, 2011. http://www.reuters.com/article/2011/06/06/us-newyork-fracking-idUSTRE7556RR20110606.

[31] The Pembina Institute, *Behind the Switch: Pricing Ontario's Electricity Options* (2011), 38, http://www.pembina.org/pub/2238

sulphur oxide and 75 tonnes of volatile organic compounds.[32]

[32] The Pembina Institute, *Behind the Switch: Pricing Ontario's Electricity Options* (2011), vi, http://www.pembina.org/pub/2238

9. Wind power only works when the wind is blowing. How can we replace a reliable source of power like coal, with a variable source of power like wind?

Greater amounts of different types of energy from variable renewable sources does require planning, but it can be done, *and it is being done* all over the world. Wind, solar and run-of-river hydro are all variable sources of electricity: they produce more power when it is windy, sunny, or during times of high water flow. In small amounts, the variability of wind, solar and run-of-river sources is dwarfed by the normal variability of system demand caused by customers turning appliances on and off. When variable renewables make up a greater portion of the electricity supply, integration becomes more challenging. The Utility Wind Integration Group was formed in North America to focus specifically on integrating large amounts of wind energy into traditional electricity systems.[33]

How much variable-output electricity a grid can handle varies depending on what else is on the grid and how well that grid is connected. Denmark, for example, generates over one-fifth of its electricity from the wind alone and has since the year 2000, which is more than what Ontario is planning for even by 2020. Denmark has a well-connected grid and ready access to large hydro systems and studies have found that their grid can likely accommodate a lot more wind. In fact their electricity mix could be up to 63 per cent variable output without any power storage systems.[34] Germany and Japan are planning to phase out nuclear power altogether and will use renewables to do so.

General Electric (GE) completed a study for Ontario in 2006 and found that 5,000 Megawatts (MW) of wind could be accommodated with minimal impact to the operating system in Ontario. Currently, approximately 1,300 MW of wind is in operation in Ontario and another 600 MW is expected to be operating by the end of 2012. The same GE study concluded that up to 10,000 MW could be added in Ontario with some minor changes to the existing operating framework, and this was before much of the new natural gas plants were built, which have fast responses times and can help to balance the overall system.[35]

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[33] Utility Wind Integration Group web site, http://www.uwig.org

[34] International Energy Agency, *Harnessing Variable Renewables: A Guide to the Balancing Challenge* (2011), http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2403

[35] GE Energy, *Ontario Wind Integration Study* (prepared for Ontario Power Authority, Independent Electricity System Operator and Canadian Wind Energy Association, 2006), http://www.ieso.ca/imoweb/pubs/marketreports/OPA-Report-200610-1.pdf

With practice and changes to the operating framework, electricity system operators in other jurisdictions have found that they can integrate more variable supply than they originally thought possible. Ontario's independent electric system operator is already taking steps to incorporate additional variable generation including improved resource forecasting, ensuring that systems over five MW that are embedded in the distribution system are visible to the operator, and improving its ability to dispatch renewables.[36] Managing variability will require some new thinking and grid management but it is not insurmountable. Germany is now covering its entire peak period using electricity generated from solar panels and Denmark's electricity system operator, who once thought they could not handle more than 500 MW of wind, have now integrated more than 3,000 MW since the early 2000s.

[36] Independent Electricity System Operator, "Renewable Integration," http://www.ieso.ca/imoweb/consult/consult_se91.asp

10. I've heard that the world leader, Germany, is backing away from feed-in-tariffs and renewable energy to prevent further harm to their economy. Is that true?

No, not at all. If anything, support for renewable energy in Germany and elsewhere is strengthening.

From 2000 to 2011, Germany increased the proportion of electricity coming from renewable sources from five per cent to 20 per cent. Their previous target of 30 per cent renewable electricity by 2020 has been updated to reflect expectations that Germany's grid will reach 38 per cent renewable sources by 2020. Germany's long-term goal is 80 per cent renewable electricity by 2050[37] and the country has decided to phase out nuclear entirely by 2022. Siemens, a major global electrical manufacturer announced in September 2011 that it is getting out of nuclear altogether, claiming that "Germany's shift towards renewable energies is the project of the century."[38]

This growth has continued despite the global recession. In 2009, in the aftermath of the global financial crisis, the renewable energy industry in Germany invested €17.7 billion. In 2010, German farmers planned to invest €3.5 billion towards renewable energy, accounting for 59 per cent of their overall investments.[39] The industry continues to be a growing source of jobs with about 370,000 people employed in the renewable energy sector in 2010, roughly eight per cent more than in 2009, and more than double its 2004 numbers.[40] Between 2005 and 2020, the renewable energy industry aims to invest a total of €200 billion in new generation and by 2020, the industry is expected to employ 500,000 people.[41]

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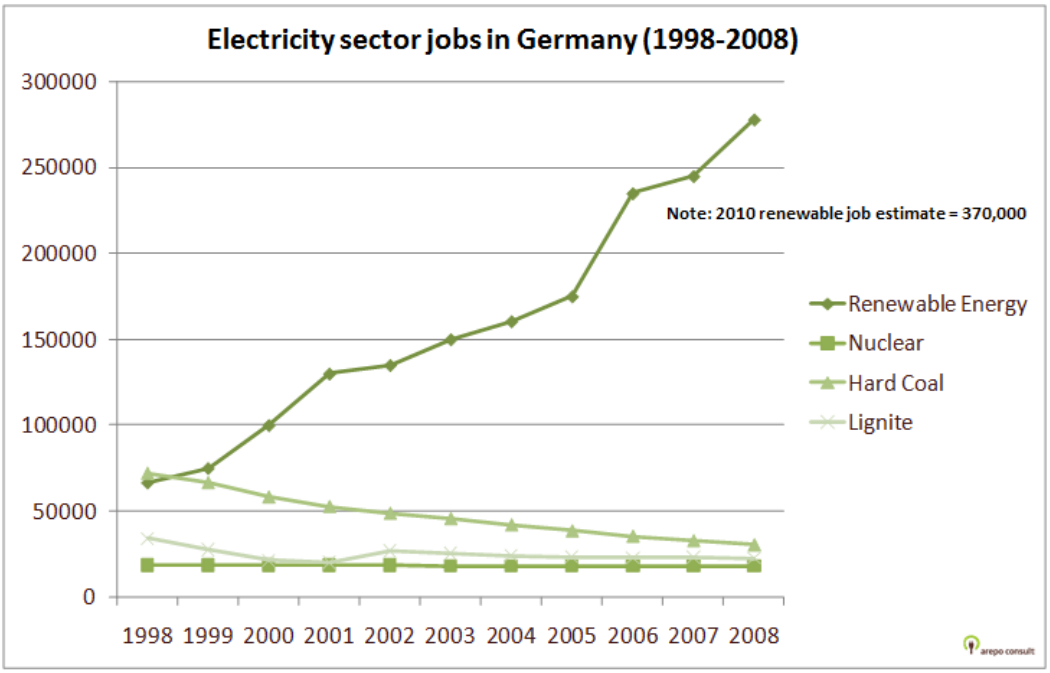
[37] German Federal Ministry of the Environment, Nature Conservation, and Nuclear Safety, "National Renewable Energy Action Plan," 2010, http://www.bmu.de/english/renewable_energy/downloads/doc/46291.php

[38] Spiegel online: *Siemens to Exit Nuclear Energy Business*, available online at: http://www.spiegel.de/international/business/0,1518,787020,00.html

[39] Deutscher Bauernverband, "Landwirte wollen mehr in erneuerbare Energien investieren," Press release, November 12, 2009, http://www.agrarheute.com/landwirte-erneuerbare-energien-investieren

[40] German Federal Ministry of the Environment, Nature Conservation, and Nuclear Safety, "Gross employment from renewable energy in Germany in 2010," March 2011, http://www.bmu.de/english/renewable_energy/downloads/doc/47242.php

[41] Germany's Renewable Energy Agency Information Platform, http://www.unendlich-viel-energie.de/en/economy/current-facts-and-figures.html



Source: BMU 2010, FH Wiesbaden 2008

Renewable energy in Germany also continues to enjoy broad public support. A 2010 poll conducted by the Forsa Institute found that 78 per cent of the populace named renewables as their favourite source of energy. Renewables are vastly more popular than nuclear at six per cent, and natural gas at nine per cent. Seventy-eight per cent said that it was very, or even extremely, important to expand renewable energy, while only one per cent said that it was not at all important.[42]

You may have heard that Germany is reducing the amount that it pays producers for renewable energy. This is true in part, and is a feature of the design of the feed-in-tariff program. Every two years, the program reviews FIT rates and reduces most rates by a set percentage. These reduction in rates reflect the declining cost of renewable technology and is intended to encourage improved production efficiency. For example, the cost of solar energy has dropped by 50 per cent in the last five years alone.[43] The success of Germany's FIT program is credited worldwide for the rapid decrease in the cost of solar energy.

[42] Forsa, 2/2010: "Erneuerbare Energien" 2009, http://www.unendlich-viel-energie.de/fileadmin/content/Panorama/Meinungen/Forsa-Umfrage_Akzeptanz_2010/FORSA-Akzeptanz%20EE_Einauswertung%20Bundeslaender.pdf

[43] REN 21, *Renewables 2010 Global Status Report* (2010), http://www.ren21.net/Portals/97/documents/GSR/REN21_GSR_2010_full_revised%20Sept2010.pdf

Germany is often touted as the model for the use of FITs to spur renewable energy development, but several other European countries such as France, Italy, Switzerland, the United Kingdom and the Czech Republic have similar programs. In the United States, Hawaii, California and Vermont also have versions of FITprograms, as does Nova Scotia here in Canada.

For more information:
Harvesting clean energy on Ontario farms: A transatlantic comparison:
http://www.pembina.org/pub/2230

Glossary

Distribution system
The poles, wires, transformers, insulators, disconnects, breakers, fuses and other associated equipment that deliver electric energy from the local substation to individual consumers.

Note: Typically, the distribution system is defined as electrical lines and associated equipment where the operating voltage is less than 50 kilovolts.

Feed-in-tariff (FIT)
A feed-in-tariff is simply a guaranteed price (tariff) set for anyone who wants to "feed" renewable energy into the electricity system. The tariff is set in order to make a variety of clean energy sources economic, encouraging diverse technologies and broad opportunities for individuals to participate.

Grid
The network of transmission or distribution lines used to move a commodity from its source to consumers.

Kilowatt (kW)
Unit of power of any form of energy, that is, a measure of the rate of doing work or instantaneous rate of energy use

Note: 1 kW is equal to 1,000 watts. A 100-watt light bulb uses 100 watts when it is illuminated.

Kilowatt-hour (kWh)
Unit of energy of any form, that is, a measure of how much energy is used over time

Note: 1 kWh is equal to 1,000 watt-hours. This is the basic unit for measuring electric energy. A 100-watt light bulb that is illuminated for 10 hours uses 1 kilowatt-hour of energy (10 hours x 100 watt-hours = 1 kWh).

Megawatt (MW)
Unit of power of any form of energy

Note:1 MW is equal to 1,000 kilowatts or 1 million watts. 1 MW of electrical power can light up 10,000 of 100 W light bulbs.

Megawatt-hour (MWh)
Unit of energy of any form

Note: 1 MWh is equal to 1,000 kilowatt-hours or 1 million watt-hours.

Off-peak
Electricity supplied during periods of low system consumption.

OPA
The Ontario Power Authority is an independent, non-profit corporation who reports to Ontario's Ministry of Energy. The OPA is responsible for assessing the long-term adequacy of electricity resources, forecasting future demand and the potential for conservation and renewable energy, preparing an integrated system plan for conservation, generation, transmission, procuring new supply, transmission and demand management either by competition or by contract, when necessary, and achieving the targets set by government for conservation and renewable energy.

Peak demand
The greatest demand placed on an electric system in a given year.

Power
Rate of energy flow.

Note: The standard unit of measure is a joule per second, which is encapsulated in the term watt (W).

Surplus Baseload

A situation that occurs when electricity production from baseload facilities exceeds provincial electricity demand.

Transmission
Transfer of high-voltage electric power from generating plants to customer loads or distribution systems at a distance ranging from nearby to hundreds of kilometres.

Watt (W)
Unit of power of any form of energy.

Note: 1 W is equal to a flow of one joule of energy per second.