Frequently Asked Questions (FAQ) on Renewable Energy (Especially Wind and Solar Energy)

This document has been prepared to offer a consolidated list of the most common questions we have received about renewable energy, and to provide reference information for other clarifying resources where appropriate. The answers give below are at times particularly focused on the realities in Ontario, Canada, but most are generally applicable to the industry as a whole. We trust that you will find this useful. Should you have any further questions, suggestions, or resources for this document, please do not hesitate to email them to us at questions@mi-group.ca.

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QUESTIONS ON HEALTH / ECOLOGICAL ISSUES

Q1) Can wind turbines make people sick?

In 2011, the Ontario College of Family Physicians, the Registered Nurses Association of Ontario, the Asthma Society of Canada and the Ontario Lung Association sponsored an advertising campaign that voiced this message: "Ontario doctors, nurses and other health professionals support energy conservation combined with wind and solar power, to help us move away from coal."

Over 30 years of studies by protagonists and antagonists alike have failed to show scientific evidence that wind turbines are actually able to make people sick. Over 100,000 turbines are currently in operation throughout the world right now, mostly in Europe, many within a short walk of the owners' homes. Conversely, it is a well proven fact that burning coal causes the premature death of hundreds of Ontario residents, and debilitates those with asthma and other respiratory ailments. Similarly, there are multitudes of reports which conclusively demonstrate the dangers of nuclear energy, including a list of over 800 "incidents" such as Fukushima, Chernobyl, Three Mile Island, and many less well known, including incidents at Elliot Lake and Pickering in Ontario. A growing body of local and international studies has repeated proven that wind energy poses no meaningful health risk to humans, and indeed wind plays an important role in helping us move away from more dangerous alternatives like coal and nuclear.

For more information:

- http://www.health.gov.on.ca/en/common/ministry/publications/reports/wind_turbine/wind_turbine.aspx (Potential Health Impact of Wind Turbines, Chief Medical Officer of Health Report, May 2010)

- http://www.cape.ca/permalinked/capenews-summer2010-english.pdf (The Canadian Association of Physicians for the Environment demonstrating support for wind energy)
- http://tobacco.health.usyd.edu.au/assets/pdfs/WindHealthReviews.docx (17 reports on health)
- http://cleantechnica.com/2012/12/27/wind-turbine-syndrome-not/ (debunking Nissenbaum)
- http://canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/canwea-factsheet-health-v5.pdf
- http://www.guardian.co.uk/news/datablog/2011/mar/14/nuclear-power-plant-accidents-list-rank (Nuclear power plant accidents: listed and ranked since 1952)
- http://www.helencaldicott.com/resources/ (health effects of nuclear)

Q2) What is "Wind Turbine Syndrome"?

"Wind Turbine Syndrome", or "Wind Sickness" has been reported by some residents who live near wind energy projects in Ontario but who do not own shares in the projects, and may include symptoms such as loss of sleep, headaches, nausea, dizziness, anxiety, and further symptoms resulting from sleep loss (eg: reduced memory, difficulty concentrating, diminished spatial memory or ability to think critically and problem solve). These and other symptoms may multiply when third parties advise of their possibility (ie: the 'nocebo' effect), are typical of stress and anxiety related disorders which may be triggered by any number of unwanted experiences, and are common among people who feel that they have been disrespected or mistreated.

The reality is that there is no such thing as "Wind Turbine Syndrome", but there are many stress and anxiety disorders. Wind turbines do not make people sick, but badly managed projects and anti-wind activists can cause stress to the neighbours. Residents should be wary of placing too much confidence in the accusations raised by anti-wind activists, and developers should be expected to respect local residents and address their concerns during the course of a project. This is why the Ontario government has placed requirements on wind energy projects that they have a certain number of public meetings whereat they present information and gather public feedback prior to proceeding with construction.

Interestingly, people who own their own turbines or who own shares in a shared community project have never complained about stress or anxiety related symptoms such as these.

For more information:

- http://www.guardian.co.uk/environment/2013/mar/15/windfarm-sickness-spread-word-australia
- http://reneweconomy.com.au/2012/bad-day-in-court-for-anti-wind-campaigner-sarah-laurie
- http://helpguide.org/mental/stress_signs.htm
- http://www.medicinenet.com/stress/page3.htm#symptoms
- http://www.phac-aspc.gc.ca/publicat/miic-mmac/chap_4-eng.php
- http://ohfowp.blogspot.ca/2012/07/wind-turbine-syndrome-classic.html?utm_source=twitterfeed&utm_medium=twitter&m=1

Q3) Are wind turbines a threat to birds or bats?

Properly installed wind turbines are not a threat to birds, bats, or other avian life. For every 10,000 birds killed by human activities annually, less than 1 is caused by a wind turbine. By contrast, nearly 1,000 are caused by house cats, nearly 1,000 are caused by automobiles, and nearly 6,000 are caused by collisions with windows on buildings. That means that the living room window on your home is nearly 6,000 times more dangerous to a bird than a properly installed wind turbine.

To be fair, it is true that a poorly installed wind turbine can kill birds. That is why the Ministry of the Environment has strict guidelines about requiring bird migration and habitat studies, and why the wind industry in Canada has developed best practices over the past 30 years to minimize the likelihood that this will occur. The reports that are most commonly quoted as proof that wind turbines kill birds are typically done in reference to US based projects like Altamont Pass where turbines were installed in ways that are no longer permitted in Canada, and we have not experienced the same trouble here. The Wolfe Island project near Kingston has had an unfortunate history that has resulted in policy changes in Ontario to ensure similar mistakes are not repeated, and our policies continue to improve to better protect avian life. Every new project is safer than the last.

By contrast, birds are very vulnerable to habitat alteration caused by climate change, which affects entire flocks and species and poses a far greater risk than wind turbines. The 2004 study in Nature estimated that up to a quarter of all bird species could become extinct by 2054 due to global climate change. Wind turbines, when properly installed in ways that comply with both the law and the industry's best experience, are part of the solution to climate change, and are an indirect help to bird and wildlife protection.

For more information:

- http://canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/6_wildlife.pdf
- http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@renewable/documents/document/stdprod_071273.pdf and 289694.pdf
- http://mn.audubon.org/files/Audubon%20Minnesota/documents/06-01-10_bird-safe-building-guidelines.pdf
- http://www.birdsandbuildings.org/info.html
- http://nukefree.org/news/avianmortalityfromwindpower,fossil-fuel,andnuclearelectricity
- http://www.batsandwind.org/
- http://www.abcbirds.org/newsandreports/releases/120806.html
- http://www.waterkeeper.ca/2012/09/19/how-many-dead-fish-would-be-significant/ (Darlington fish casualties, for comparison)

Q4) How does climate change affect me?

Climate change is already causing more severe weather patterns in most climate zones around the globe, and is becoming increasingly severe with each passing season. Future expected impacts of climate change are often better described as "global wierding": hot regions will get hotter, some regions will get slightly colder, wet regions will get wetter, dry regions will get dryer, … and everywhere will see an increase in the severity and frequency of natural disasters. Climate refugees are already the largest percentage of refugees in the world. Future climate related disasters will include heat waves, floods, forest fires and hurricanes, and changing coastlines. The loss of human life is an inevitable and very disturbing reality. In the face of the prediction that most of the world's coastal cities will be submerged in a hundred year's time, all the concerns raised thus far about wind turbines pale by comparison. Wind energy is one of many forms of renewable energy, all of which are urgently needed if we are to do our part in the race against climate change.

For more information:

- http://www.ipcc.ch/
- http://srren.ipcc-wg3.de/report

Q5) Why is coal a problem?

Ontario's government has, for decades now, subsidized the use of coal and nuclear based electricity. The damage caused by coal alone costs our health system a reported $3 billion annually in Ontario. Burning coal killed 316 people last year in Ontario, according to The Ontario Clean Air Alliance, which also estimates that 440 people were admitted to hospital, 522 people sought help in the emergency ward, and 158,000 people were sickened with such ailments as asthma attacks. According to Ontario's Chief Medical Officer of Health, 9,000 people die prematurely each year in Ontario from smog, to which coal is a significant contributor. However, the Ontario government has recognized the need to reduce dependency on coal power generation and has closed several coal plants already, partly because of the Green Energy and Green Economy Act.

For more information:

- http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf (The Potential Health Impact of Wind Turbines by Chief Medical Officer of Health (CMOH) Report, May 2010)
- http://www.cleanairalliance.org/files/phaseout2011.pdf

Q6) I thought nuclear was safe? Why should I be concerned about health issues from nuclear or coal plants that are far from my home?

To be cliché, nuclear's back yard is much bigger than that of wind energy. Radiation from the Fukushima meltdowns has been reported all around the globe, and is causing crop and animal sicknesses on the US west coast. Chernobyl has caused over 200,000 deaths, and many millions of illnesses (cancers and otherwise), most from radiation related sicknesses in people that did not live close to the accident site (ie: many in Ukraine and Belarus, but also as far away as Germany, France, and even the UK). While a small group of people complain that noisy windmills are disrupting their sleep and giving them headaches (note that these complaints never come from people who actually own turbines), those living adjacent to the same water bodies as nuclear plants (even up to several hundred kilometers away) risk infertility, multiple forms of cancer, and radiation sickness, and those within even a few hundred kilometers of a gas or coal generator risk suffering from poisoned water, lung disease, and asthma. The tragic truth is that hundreds of people die every year in Ontario because of the coal and nuclear components of our energy system. Wind energy is not killing people. Replacing coal and nuclear with a mix of other sources, including wind energy, can actually save lives.

For more information:

- http://www.cleanairalliance.org/choices/coal.html
- https://www.oma.org/HealthPromotion/Smog/Pages/default.aspx
- http://en.wikipedia.org/wiki/Chernobyl_disaster_effects
- http://www.beyondnuclear.org/fact-sheets/
- http://www.porthopehistory.com/nucleargenocide/nucleargenocide_index.htm
- http://knownuclearwaste.ca/

QUESTIONS ON COST / MONEY

Q7) Why are electricity prices rising?

If the electricity grid were a car, then we could describe it this way: during the 50's, 60's and 70's, we were paying the lease on our brand new car. It worked well, needed little maintenance, and was seen as a reasonable expense. After we paid the lease off, we still had a relatively new car that was very inexpensive to own, and required little maintenance. But, like all cars, it eventually either needs maintenance or will need to be replaced, and we'll end up paying to fix it or to replace it. In Ontario we've put off properly maintaining this "car", and our electrical system is now going to be very expensive to fix. The most recent Liberal government began those fixes (that's part of why utility rates have increased in recent years), but previous governments of all stripes (Conservative and Liberal) had their share in neglecting the grid until it came to the relatively poor condition it's in now. No matter what we build or repair over the next decades, we will have new grid infrastructure worked into our electricity prices, and we will either pay for it on our utility bill as $/kWh, or it will be subsidized by the government, and we'll end up paying for it somehow through taxes.

It is rumored that the Green Energy Act is responsible for rising electricity bills. This is simply not true. The average Ontarian pays $0.13/kWh for their electricity, and most of the recent increases are due to upgrades for our aging transmission system, the largest portion of which is earmarked to help the privately managed Bruce Nuclear Plant (ie: our public tax dollars are paying to help this private corporation make more money off of us all). In fact, the Ontario Energy Board recently reported that only 6% of the increase in Ontario's average price of electricity is due to renewables: 45% is from nuclear, and the remainder is spread across gas/coal/large hydro and system improvements. Of the $0.13/kWh paid by the average consumer, $0.002 was enough to cover all the renewable energy currently connected to our grid system: only 1.5% of the bill! That includes wind, solar, and everything else, at only 1.5% of our electricity bill. Wind and solar are not causing our electricity rates to rise: nuclear rebuilds and transmission upgrades are.

For more information:

- http://www.ontarioenergyboard.ca/OEB/_Documents/MSP/MSP_Report_20120427.pdf
- http://www.eco.on.ca/blog/2011/03/22/the-true-cost-of-renewable-energy-and-conservation/

- http://www.pembina.org/pub/2238
- http://www.bridgepointgroupltd.com/database/rte/files/Renewable%20Energy%20Facts.pdf

Q8) Why do we sometimes pay the US to use our electricity?

Ontario's electricity system works like a big black box: energy is purchased from many different sellers (generators), is funneled through the black box, and is then sold to many different buyers (consumers). The black box in the middle is partly called the Ontario Power Authority (OPA), and is partly the Independent Electricity System Operator (IESO). The OPA has unique purchase agreements with each of the many generators, from nuclear plants to Niagara Falls to homes with solar panels on them. Many of these agreements are very different from each other, and have little to do with the rate that we actually pay for electricity: these purchases are all blended together into the OPA's budget, and the OPA pays for them quite separately from the way they sell the power to the rest of Ontario. Similarly, the OPA has agreements with each buyer: large companies like cement plants may connect to the grid directly and pay under certain rules, while Local municipal utility Distribution Companies (LDC's) connect to the grid and pay under different rules, and then the LDC's resell their electricity within their municipality to local consumers like small businesses and home owners. The OPA/IESO have a tough job: in the middle of all this confusion, their job is to make sure that there is always the right amount of electricity to keep the lights on and the factories running: neither too much electricity, nor too little. When we all get home from work and turn on our stoves to cook supper, the OPA/IESO buy more electricity to make sure our stoves will work. When we all go to bed and turn everything off for the night, the OPA/IESO buy less.

The problem with this system is that some of the companies that sell electricity to the OPA can't simply turn off, or turn down the amount that they sell. Nuclear companies are the biggest example of this, because you can't just turn off a nuclear reactor for the night (it takes several months to cool down and then ramp up again safely, and needs significant maintenance in between), and once it's on, it doesn't have an option to be turned up or down: it's simply on or off. Ontario as a province is using less electricity than we did in 2006, so we now regularly have nights where our nuclear plants are generating enough electricity that even after we have turned off everything else, there's still so much electricity being pumped into the grid that the nuclear plants are producing more than we need, and we have to get rid of the extra, or else that extra electricity will literally melt and burn things. In moments like these, when our supply exceeds our demand, the OPA pays other jurisdictions like the US to consume our electricity.

Some Ontarians blame this excess supply on wind energy, but the numbers show that wind energy doesn't tend to produce very much during the night: wind peaks when the temperature is changing (ie: sunrise and sunset, where changes in light create changes in air pressure which creates wind), so wind energy tends to be available when we need it most: in the morning peak before work and the evening peak during supper and laundry time. The times that we pay other jurisdictions to use our electricity are always in the middle of the night when we can't turn down our nuclear plants. And unfortunately these times happen much more often than we would like. All the stats are online at www.ieso.ca.

To solve this problem, we would need to decommission one of our nuclear plants (one would be enough, but nothing else, not even all of Ontario's wind supply, would suffice), and replace it with more flexible power that we can turn down at night. Refer to questions (Q28), (Q29), (Q30) and (Q39) below for more information on ways that we could use less nuclear and a larger mix of renewables and flexible (dispatchable) supply sources instead.

Q9) What is a "Feed-in Tariff" (FIT)?

A Feed-in Tariff (FIT) is a policy mechanism (an instrument of law) designed to encourage the adoption of renewable energy sources and to help accelerate the move toward grid parity (when renewable energy sources will have the same costs as traditional sources of electricity such as natural gas, coal, or nuclear).

FITs typically includes three key provisions:

- guaranteed grid access;
- long-term contracts for the electricity produced;

- purchase prices that are methodologically based on the cost of renewable energy generation and tend towards grid parity.

FITs are designed to help standardize the way electricity is purchased from generators before being distributed to consumers. Traditional energy markets have a number of creative subsidies and revenue offsets that enable market operators (like the Independent Electrical System Operator in Ontario) to sell electricity to consumers at artificially low rates, like the rates we have in Ontario. Renewable energy systems rarely have access to these subsidies, so they sell at true rates, rather than artificial rates, and the market is biased towards traditional energy sources (like coal, natural gas, and nuclear) which would otherwise be much more expensive. FITs are designed to level the playing field, and to give renewable energy sources like wind, solar, hydro and biomass/biogas, the opportunity to sell competitively. If sources like coal, natural gas, and nuclear were purchased through a FIT rather than being subsidized, they would likely have tariff rates between $0.15 and $0.45/kWh, not the $0.055 to $0.095/kWh that Ontarians expect.

Q10) Aren't FITs just another form of subsidy?

No. FITs do not subsidize the purchase or installation of the equipment used to produce renewably generated electricity, nor do FIT payments come from taxpayers. Subsidies are creative payment schemes used to offset or reduce the true of electricity, and are typically funded by tax payers rather than by electricity consumers (eg: certain corporate tax credits/exemptions and research tax credits for natural gas fracking), much like the way we pay for construction of coal/nuclear/gas plants, or the disposal of nuclear waste, separately from buying the electricity. Feed-in-Tariffs are an all-in nothing-hidden price for electricity as it is delivered: it's called a "tariff" because it doesn't get paid until the electricity is used. Other forms of electricity are heavily subsidized by many different collaborative funding mechanisms (some estimates top $3.5 Trillion/yr globally). Renewable energy that is purchased through a FIT contract has a fully disclosed price that is paid only on delivery: if no electricity is delivered, then they don't get paid, and regardless, they get no subsidies.

For more information:

- http://thinkprogress.org/climate/2012/08/29/766341/free-market-hypocrisy-why-do-we-hold-renewables-to-different-standards-than-fossil-fuels-and-nuclear/?mobile=wp
- http://www.commondreams.org/view/2013/03/29-4

Q11) Can a FIT contract be changed over time?

No. A FIT contract is just that – a contract. It is legally binding and cannot be changed without the consent of all parties who signed the contract. If you sign up for a PV contract and put solar panels on your roof, you will get what the contract says you will get until the contract expires in 20 years. The government can change what it offers to new applicants, but once a contract is issued, it is stable and will not change.

Q12) I hear that European countries are reducing the rates they're paying for renewable energy. Is it true, and does this mean renewable energy is phasing out?

Yes and No. Several European countries have had Feed-In Tariff (FIT) programs of their own for decades now, and those programs have been so successful that they have helped the local renewable energy industry to grow, and now renewable energy in those places is less expensive to install than it once was. The purpose of a FIT is to assist in increasing the volume of renewable energy deployed so that the cost of installation drops down towards parity, where renewable energy sources will be able to compete evenly with more traditional technologies. Old contracts will not have their rates changed, but new contracts will be offered less as the cost of renewable energy systems goes down. Eventually when the cost to produce renewable energy reaches parity, the FIT program will no longer be necessary. Ontario's FIT program was established with an automatic 2 year review period: it was launched in 2009 and planned from the beginning to see prices reduced at the close of 2011 and again in 2013 and bi-annually thereafter. Ontario has the advantage of not being first into this market, and has been able to accelerate our market development based on the lessons we have been able to learn from other jurisdictions around the world who have successfully implemented FIT systems of their

own: it is very likely that Ontario pricing will be able to be reduced more quickly than other jurisdictions have been able to do.

For more information:

- http://www.gwec.net/index.php?id=129 (showing ongoing increased installations in Germany even as Tariff rates are reduced)
- http://www.ren21.net/Portals/97/documents/GSR/GSR2011_Master18.pdf (Renewables 2011 Global Status Report by Renewable Energy Policy Network for the 21st century)

Q13) How does the Green Energy Act create local jobs?

Whatever energy we use, someone will get paid. Most of our electricity is generated by one of a few large companies, like Bruce Nuclear or Ontario Power Generation. Bruce Nuclear is a private firm, and the money that Ontarians pay to them goes to their shareholders. Ontario often needs to import power from our neighbor provinces and states, and in those cases Ontario tax dollars are paid to outside parties, and the money leaves Ontario.

Instead of paying for imported electricity or paying corporate shareholders, the Green Energy and Green Economy Act enables us to pay ordinary Ontario citizens to produce clean electricity for us, while creating thousands of skilled, local jobs. The money stays in Ontario, and after being used to pay Ontario people, it gets spent again in Ontario to buy groceries and other goods, and that same money typically gets spent and re-spent seven times before it leaves the province (for purchasing imported goods). This means that every $1 we spend buying electricity from an Ontarian actually creates $7 worth of in-province trade, and it stimulates the economy. Rather than giving the money away to big corporations or outside parties, we can spend it on ourselves, over and over again. That means that we can afford to pay slightly higher rates (up to 7 times higher) for the same electricity, if we pay it to Ontarians, and especially if those Ontarians are selling us electricity which they made with Ontario-made solar panels, or Ontario-made wind turbines.

An estimated 20,000 skilled, local jobs have already been created by the Green Energy and Green Economy Act. These jobs include Ontarians who are manufacturing things like solar panels and wind turbines, Ontarian contractors who are installing them, Ontarian consultants and safety inspectors who are supporting the process, and Ontarian land owners who sell us the electricity: all because every dollar we pay them for their electricity recycles itself over and over again in our economy, making more trade and making more jobs.

For more information:

- http://www.ieso.ca/Pages/Media/Imports-and-Exports.aspx
- http://www.pembina.org/pub/2178 (Reducing Pollution, Creating Jobs, March 2011)
- http://www.news.ontario.ca/mei/en/2011/07/green-energy-act-creates-20000-jobs.html
- http://www.mei.gov.on.ca/en/energy/gea/
- http://www.greenenergyact.ca/Storage/25/1722_PERI_ON_Green_Jobs_Report.pdf

Q14) I've heard that wind and solar jobs kill more jobs than they create (eg: Spain)?

This rumour was spread from an illegitimate study done in Spain, not supported by the Spanish government, funded ultimately by oil money, and has come to be known as the infamous "Spanish jobs study". The study included several faulty assumptions and weak data which it used to claim that for the amount of money invested by the Spanish government in wind and solar energy projects, that a certain number of jobs were created, and that a multiple of other jobs were displaced from other industries (eg: coal and nuclear jobs). There was no data to support these claims though, and the Spanish government went on public record saying that the study was unfounded and false. **The Spanish market has seen a substantial net increase in employment because of their renewable energy laws, and it is simply untrue to say otherwise.** The US government and several others have since disproven the study repeatedly, and reiterated that this study is false. Even still, this false study has been circulated widely in anti-wind and anti-solar lobby groups across North America, several of whom have received support funding from Exon and other equally questionable sources. Similarly false claims abound about Italy, which is now one of the top three European countries in the renewable energy industries, and has enjoyed steady net job growth. Still further claims (equally false)

have been misrepresenting Scotland's experience, and no doubt further reports will be announced in the coming years that repeat these unsupportable accusations about these and other unsuspecting nations: perhaps even ours.

Despite the recessionary economy, Ontario created more new jobs in June of 2011 than the rest of North America combined, and Ontario continues to lead in job creation.

In Ontario, every dollar invested in solar energy creates 12 times more jobs than nuclear and 15 times more jobs than natural gas or coal per unit of energy produced, and at 1/4th to 1/6th the cost of jobs created by nuclear, natural gas, or coal.

For more information:

- http://switchboard.nrdc.org/blogs/paltman/credit_for_trying_spanish_stud.html
- http://www.renewableenergyworld.com/rea/news/print/article/2011/02/how-much-does-a-solar-job-cost-in-ontario
- http://www.actionforrenewables.org/blog/archive/201103/employing-truth

Q15) How much are these new green jobs costing?

In Ontario, every dollar invested in solar energy creates 12 times more jobs than nuclear and 15 times more jobs than natural gas or coal per unit of energy produced, and at 1/4th to 1/6th the cost of jobs created by nuclear, natural gas, or coal. Solar is the most expensive technology among those supported by the Green Energy Act, and the other technologies offer strong job creation statistics as well.

Some Ontario agencies have copied the infamous and false "Spanish Jobs Study" (see Q14), and have alleged that these green energy jobs are costing Ontario as much as $170k/yr/job. This is completely false and is badly overstated. The total amount of money paid by the Ontario government for electricity from all sources of renewable energy combined in 2010 was approximately $270 million, which helped create nearly 20,000 jobs thus far. That works out to only $13.5k/job on average, which is far cheaper than what we pay for nuclear or natural gas jobs, and even compares well with infrastructure jobs. Not only that, but these are good jobs: manufacturing, consulting, and contracting positions, and all for a fraction of what the jobs contribute back to the economy: The income tax collected from these new jobs nearly pays for the jobs to be created, and from that point of view, these jobs are costing the government very little indeed, between $6k/job and $zero in the end.

For more information:

- http://www.renewableenergyworld.com/rea/news/print/article/2011/02/how-much-does-a-solar-job-cost-in-ontario
- http://rael.berkeley.edu/node/585
- http://www.eco.on.ca/blog/2011/03/22/the-true-cost-of-renewable-energy-and-conservation/
- http://www.news.ontario.ca/mei/en/2011/07/green-energy-act-creates-20000-jobs.html

Q16) How can we afford $0.80/kWh for solar?

$0.80/kWh may seem expensive, but it's important to know what else to compare it to. Consumers don't pay this price: it gets blended in with the other purchases that the Ontario Power Authority (OPA) makes before they charge us the net fees, and this $0.80/kWh price represents less than 0.001% of the bill, and all future solar projects will cost less as the prices continues to decline (already down to $0.549/kWh in 2012). Many Ontarians believe that we get nuclear electricity for $0.03 to $0.05/kWh, but this is not quite true. That may be what your local utility charges you for the electricity, but that's not what it actually costs. We also pay for the nuclear plants to be built, even when they will be owned by private corporations, and then we pay to buy electricity from them, and we pay for the waste to be managed, and we pay for insurance (ever increasing since Fukushima, since so many countries have declared that they are transitioning away from nuclear, and since large companies like Siemens and GE have stopped selling reactors). Nuclear electricity costs us more like $0.25 - $0.35/kWh right now, but that price is hidden and blended into the net price we pay, after several tax subsidies are applied from other budgets, making it very difficult to expose the true cost. The OPA pays different rates for different purchases on a regular basis, and many of those rates are governed by the "spot

market", or the hourly supply & demand market where the price varies up and down depending on how much electricity is available and on how many users want to consume it. Spot market prices are typically highest in the afternoon and early evening when the sun is shining brightest, so solar should never be compared with the cheapest electricity we buy, but should always be compared with the most expensive peak rates that the OPA pays instead: as much as $2.00/kWh as reported by Ernst & Young (see references below).

Next it's important to consider the actual economic impact of the price paid for solar, since we don't pay the rate directly (just like we don't pay by the kWh to build a nuclear plant or manage its waste: those fees are covered in other ways). The money spent buying solar energy gets paid to Ontario home owners, who spend the money on groceries and commodities, contributing to the local economy. The Ontario Sustainable Energy Association notes that these moneys tend to circulate a minimum of 7 times in the local economy before disappearing in tax levies or imports, so the money gets reused 7 times before disappearing, and the effective cost to the economy is reduced to 1/7th the ticket price. That means that $0.802/kWh for local Ontario solar electricity has a true effective cost to the economy of closer to $0.115/kWh, which is less than the $0.13/kWh already paid by the average Ontario consumer. Remember that we don't pay the ticket price: the OPA blends all the different ticket prices together, and we end up paying the effective price after several other subsidies and economic factors have been considered. Properly considered, because of the local economic stimulus benefit, solar is actually cheaper for the OPA than business as usual.

Perhaps best of all, the price of solar energy (and all other renewable forms of energy) is continually getting cheaper: Germany's equivalent to our FIT pricing has been able to be reduced to the point where new solar costs almost the same in Germany as new nuclear, and we're set to achieve the same thing within only another few years (it took Germany 30 years to do what we'll have done in only 4-6!).

And it needs to be said again: the money paid out by the FIT program goes to Ontario's farmers and home owners, not to foreign investors. This means that the money is used to buy made-in-Ontario energy systems, installed by Ontario contractors, and the final revenues go to Ontarians, who spend their earnings in Ontario: the net effect is that the same dollar gets spent several times over, and this stimulates the economy in very positive ways, so much that $0.802/kWh has a net effective cost more like $0.115/kWh as explained above. This would not be true if the program wasn't designed to buy electricity from Ontarians, but it is.

For more information:

- http://www.canrea.ca/site/2011/03/true-cost-of-peak-power-in-ontario-much-higher-than-solar-feed-in-tariff/
- http://canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/canwea-factsheet-pricing-v8.pdf (demonstrates that wind already costs the same as new natural gas)
- http://ieso.ca/imoweb/media/md_supply.asp (note that solar is too small to make the list)

Q17) Won't Nuclear always be cheaper than Solar?

No. Steven Chu, US Secretary of Energy (2011), and several reports from the International Panel on Climate Change (IPCC) have demonstrated that if we were to start building new nuclear plants today, then by the time we finish them (typically ~10 years later), solar energy will already cost less per kWh generated and sold: solar will have reached grid parity, and will be competing dollar for dollar with nuclear and other energy sources. That will be 2020 in America, or 2017 in the EU, or 2015 in China. The Nuclear Energy Agency recently (June 2012) quoted a cost of $5.86/W to construct new nuclear facilities in the Czech republic: that's the same cost Ontarians would pay for solar PV, and is more than double what we'd pay for new wind energy, and more recent nuclear projects (Finland and the UK) are reporting substantial increases in cost due to new insurance premiums and other technical precautions that have become standard since Fukushima.

Even today, a comparison of building renewable energy based generators or new nuclear reactors found that renewables would be significantly less expensive than new nuclear: $0.135/ kWh on average for renewables vs. $0.19 - $0.37/ kWh for new nuclear. Every nuclear project in Ontario's history has gone over schedule and over budget to an average of 250%, which is then paid by taxpayers. The nuclear industry also has hidden subsidies that support radioactive waste disposal and insurance. A Queen's University study found that insurance costs are at least $33 million per nuclear plant per year. Nuclear plants can't be built without heavy insurance, and especially since Fukushima, these costs are only going up. Ontarians are still paying for past

nuclear cost overruns too, and these costs continue to burden future nuclear projects: We have collectively made over $19 billion in payments on the former Ontario Hydro's "stranded debt" and still owe more than $14 billion more. The upgrades at the Bruce Nuclear Station have already burdened taxpayers $237.5 million in overrun costs, while also requiring major grid upgrades, which together are responsible for a significant portion of the recent electricity rate increases across the province. Nuclear has never been cheap, and is only getting more expensive. Solar and other renewables are continually getting cheaper.

For more information:

- http://www.ases.org/index.php?option=com_myblog&show=Nuclear-Power-Expensive-Uninsurable.html&Itemid=27
- http://energy.gov/articles/doe-pursues-sunshot-initiative-achieve-cost-competitive-solar-energy-2020 (US)
- http://srren.ipcc-wg3.de/ (IPCC report)
- http://www.euractiv.com/specialreport-solarpower/ipcc-author-solar-power-reach-grid-parity-eu-2017-interview-505060 (EU)
- http://www.businessgreen.com/bg/news/2102731/report-chinese-solar-power-reach-grid-parity-2015 (China)
- http://www.grist.org/solar-power/2011-10-11-solar-pv-rapidly-becoming-cheapest-option-generate-electricity
- http://www.wind-works.org/cms/index.php?id=93

Q18) Apples to apples, how much wind/solar would it take to replace nuclear, and at what cost?

Ontario purchases power from various different technologies in various different ways, and it would be much easier for the public to understand if we were to compare them all directly. The biggest difference in how we pay for the various power generation technologies is whether we pay for them up front, over time, or both.

Nuclear energy is purchased both up front and over time: we the public pay for the construction of new nuclear power plants up front through our taxes, and then we buy the electricity over time as we use it. The debt retirement charge we still see on our electrical bills is helping to pay off the loan the Province used to construct our last round of nuclear plants. The most recent nuclear quote in Ontario was $26 billion to construct a 2,400 MW plant (Darlington), which would generate approximately 18.9 TWh of electricity per year, or enough for ~2,000,000 homes (assuming 100% output and 90% availability, which is more than we've ever experienced in Ontario, but this is what the nuclear industry believes new reactors will be able to deliver). The price of nuclear energy after construction is the ongoing price it takes to operate and insure the nuclear plants: $0.06/kWh of electricity sold to the grid for existing plants, ~$0.16/kWh to ~$0.35/kWh for new plants yet to be built, or even higher according to some reports. There are other tax subsidies used to cover the management of nuclear waste, but that is separate, and is not clearly reflected in the price per kWh.

If we were to build wind turbines to generate the same amount of electricity as that nuclear project, then it would require 8,600 MW of turbines (which typically deliver at 28% of their rated capacity net over the year, and at 97+% availability: ~2,200 kWh/kW/yr in Ontario), at a net installation cost of $17.2 billion at today's rates, without any of the bulk savings that would be very likely for an order this large. Operations and maintenance (O&M) costs are what drive the ongoing price of electricity, and wind energy tends to cost 4% of purchase costs ongoing, or ~$0.036/kWh in this case. Compared to $0.06/kWh (for old nuclear, where new nuclear would cost more), this means that wind energy would save tax payers 34% of the initial installation cost, would save consumers a minimum of a further **$9.1 trillion** over the 20 year life of the turbines, and would further avoid the costs and liabilities of managing nuclear waste. This savings would more than pay for upgrades and replacements to extend the life of the turbines to match or exceed the life of the nuclear plant, compounding the savings into the perpetual future.

If we instead consider solar, then it would take ~16,500 MW of solar PV panels, running at an average of 15% efficiency and 98+% availability (generating an average of 1,150 kWh per kW installed per year in Ontario without any fancy tracking/concentrating hardware), with a net installation cost of $50-55 billion, and ongoing maintenance costs of ~$0.001/kWh for 35-40 years before the panels need to be replaced. It should

be noted that this would amount to a whole lot of solar panels, so the pricing would very likely be much less than what current industry trends reflect, but these numbers are conservatively based on current pricing. This means that solar (at today's prices, with no massive bulk discount) would cost approximately double the price of nuclear up front, and would then be nearly free for 35-40 years. Compared with $0.06/kWh (for past nuclear, much cheaper than what new nuclear would cost) and 18.9 TWh/yr, this represents a savings of **$38.4 trillion** to Ontario's electricity consumers over 35 years, which far exceeds the interest payments that would be made on the extra up-front installation cost for the solar panels. And that doesn't include the savings associated with avoiding nuclear waste.

All these assumptions are based on current industry data. This means that if we were to buy wind and solar energy the same way we buy nuclear energy, then it would be least expensive initially to buy wind, then nuclear, then solar. Both wind and solar would be much cheaper than nuclear to operate, both would have unlimited free fuel, and would have no radioactive waste to manage. The savings over time from wind and solar to electricity consumers is startling. This means that it would be financially responsible for the province to put solar panels on every house in Ontario, and to give wind turbines to every farmer who wants them, purchased and owned by the Province, and all at a much lower cost than nuclear energy.

And what if we don't want to pay the up-front cost for solar, or wind, or nuclear? Feed-in Tariffs (FITs) avoid up-front costs entirely, along with the associated debt repayments, and pay nothing until actual electricity is sold into the grid. FITs are a genius way to remove all liability from the public and place it all on the generator: the public pays nothing until electricity is delivered. Refer to other questions below for more detail about the advantages of FITs and of not paying up-front.

This explanation is based on a relatively unemotional and numbers-focused analysis. Ontario's electricity system is very expensive, and all major decisions therein tend to be made for political reasons, not just technical ones. That is perhaps why we don't purchase wind and solar the same way we purchase nuclear. Speaking strictly from the numbers, wind and solar are much better investments than nuclear.

For more information:

- http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php
- http://www.wind-energy-the-facts.org/en/part-3-economics-of-wind-power/chapter-1-cost-of-on-land-wind-power/operation-and-maintenance-costs-of-wind-generated-power.html
- http://www.sygration.com/gendata/today.html
- www.wind-works.org/cms/index.php?id=39... (Snapshot of Feed-in Tariffs around the World in 2011)
- http://www.wind-works.org/cms/index.php?id=497
- http://nextbigfuture.com/2013/07/china-sets-incentive-feed-in-tariff.html
- Refer to the other questions in this FAQ document, particularly (Q6), (Q7), (Q8) , (Q16) , (Q17) , (Q48) , and (Q39).

Q19) Does revenue from renewable energy stay local?

Yes, if the projects are owned by local community members or local businesses. Ontario has the highest level of community ownership of renewable energy in all of North America because of the Green Energy Act. That means that Ontario has more farmers and home owners who can generate their own electricity and sell it to the grid, than anywhere else in North America. Whether it's solar panels on a church, hospital or community centre, or windmills on the farm, revenue earned from renewable energy stays in the community.

Q20) Do wind turbines affect property value?

Talk on the street is very mixed in some communities, but actual studies have shown that wind turbines have either no effect or a slightly positive effect on property values. One study analyzed property values in a five-mile radius of wind farms across the US, including rural New York, and found that property values actually increased faster near wind farms 87% of the time compared to other nearby communities. Chatham-Kent and the Erie Shores municipalities in Ontario have experienced this same thing.

Anecdotal experience has shown that property values may decrease temporarily during the time between when a new wind farm has been announced and when the construction is complete, and that opportunist buyers may offer insultingly low purchase prices to homeowners who express frustration about a planned wind farm or highway or any other type of construction (ie: if you broadcast that you hate your location when trying to move, then unscrupulous buyers may try to exploit you with unfair purchase prices), but reports are showing clearly that real estate values stay strong and continue to grow after wind farms are built.

To answer this question properly for your area, you'll need to consider what the various factors are that affect property values, and ultimately most of those have to do with the purchaser: people's personal preferences may lead them to wish to avoid turbines, or to relocate closer to them. Both groups of people exist in Ontario. Properties which gain rent from local turbines will immediately see an increase in their value. Other local properties may appreciate less quickly.

For more information:

- http://www.mpac.on.ca/property_owners/how/assessment_guide.asp
- http://www.lakecountrywindenergy.com/facts-about-property-values
- http://ohfowp.blogspot.ca/2012/10/for-every-appraisal-there-is-equal-and.html (regarding the Lansink report)
- http://www.canwea.ca/pdf/talkwind/PropertyValuesConsultingReportFebruary42010.pdf (Wind Energy Study: Effect on Real Estate Values in the Municipality of Chatham-Kent, Ontario, Feb. 2010)
- http://this.org/magazine/2010/06/15/wind-power/ (discusses true origins of claims referenced to "international property consultant Savills")
- http://canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/canwea-factsheet-property-v6.pdf

QUESTIONS ON TECHNICAL ISSUES

Q21) How loud are wind turbines?

Noise can be measured with special meters: the noise from a commercial sized wind turbine at the nearest noise receptor (such as a house that is just outside the legally required setback distance from the turbine) will be no more than 38 dB. This volume is similar to a quiet library. 44 dB is like the sound of a bird chirping, 60 dB is the sound of a normal conversation, and nearby traffic can range from 50-100 dB. Commercial scale wind turbines are quiet: typically quieter than the wind.

For more information:

- http://www.deafness-and-hearingaids.net/2007/03/07/how-loud-is-too-loud-decibel-levels-of-common-sounds/
- http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf (May 2010)
- http://canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/7_visual_sound.pdf

Q22) When are sound/noise studies required?

The government of Ontario has established several setback requirements for wind turbines. If wind turbines are larger than 50kW rated, or are able to be louder than 102dBA, or if there are more than 5 turbines within 3km of any particular noise receptor (eg: a house), then the proposed turbines may be required to undergo a noise study which may affect the setback requirements for the project, or they may skip the noise study by increasing the setback requirements. Otherwise, the standard setback requirement of 550m from any receptor (eg: a house) applies to all receptors except those who have specifically granted permission for the turbine to be closer (eg: if you own your own turbine then you may give yourself permission to install the turbine closer than 550m to your house).

For more information:

- http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_090359_e.htm
- http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_088422.pdf

Q23) What is low frequency noise ("infrasound"), and is it a concern?

"Infrasound" is sound that has a frequency which is so low that you cannot hear it audibly with your ear. It is sometimes referred to simply as "low frequency noise", or incorrectly as "sub-sonic" noise, but the term "sub-sonic" more correctly refers to speed, not audible noise.

Infrasound is given off by vehicles moving along roads, by doors closing, by standing objects such as trees and buildings when wind blows past them, or by many types of animals (eg: whales calling through the ocean or elephants communicating across the plains), and by wind turbines. The levels of low frequency noise emitted by any of these (traffic, trees, animals, wind turbines) is measureable: wind turbines emit at a level similar to that given off by trees at similar distances, so wind turbines are no more dangerous than trees as an infrasound emitter. Most homes have trees and roads closer to them than the minimum wind turbine setback of 550m, and the infrasound generated in these closer proximities is stronger than you will ever experience from a wind turbine 550m away. Further still, infrasound is approved for use in therapeutic massage at levels that exceed those produced by typical wind turbines.

Concerns have been expressed in the past about some older style industrial machinery (picture big engines that rumble when they run) which used to make low-frequency noise. Employees working with heavy machinery that continually emits low-frequency noise may (over time) experience undesirable health impacts from the noise exposure, such as hearing loss for example. Wind turbines are essentially a generator that is forced to turn by the wind, and generators are essentially motors forced to run backwards: older wind turbine technology (~30 years ago) used older motor technology that in some select cases was later found to emit low-frequency noise. These cases were relatively rare, but have since been corrected regardless, and wind turbines have not been known to emit any significant levels of low-frequency noise for over a decade now. The only infra-sound that you will likely ever be exposed to in your lifetime is the same as that emitted by trees, traffic, animals, and doors closing near you. Many stereo amplifiers and surround-sound home theatre systems even emit low-frequency noise, and our kids call it "bass".

Infrasound from wind turbines is not a concern. If it was, then roads, trees and doors would be a health concern too.

For more information:

- http://acp.eugraph.com/elephetc/infra.html
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3179699/pdf/1476-069X-10-78.pdf
- http://www.canwea.ca/pdf/talkwind/Wind_Turbine_Sound_and_Health_Effects.pdf
- http://www.nrc-cnrc.gc.ca

Q24) Do wind turbines produce electrical noise?

No. Wind Turbines are essentially big industrial motors that run backwards (ie: using wind to spin the rotor to generate electricity rather than using electricity to spin the motor to move a machine), and they are very efficient. In order to be permitted to sell a wind turbine in Canada, turbine manufacturers are required to have their equipment meet certain CSA standards and be installed in a way that complies with our electrical safety codes. Modern wind turbine technology does not make noisy/unstable power, and if it did, it would never get approved by either the CSA or the Ontario Electrical Safety Authority.

Q25) Do wind turbines throw ice?

Under exactly the right conditions, it is possible for ice to form on turbine blades. However, like airplane wings need to be 'de-iced' to perform properly, turbine blades become inefficient when their aerodynamic shape is changed by a coating of ice, and they slow down and eventually stop. Wind turbine technology has evolved substantially over the past 30 years, and modern designs include several strategies to prevent ice buildup: some use heating elements in the blades, some use sensors to detect buildup and shut down the turbine, and others use blade materials that are specially designed to not receive water (ie: ice simply can't attach to the blade, so it can't build up).

In the rare circumstances where ice manages to form on a turbine, it is much more likely that the ice will simply fall off, just as it will fall off any large structure (eg: a building or cell phone tower). In case ice should fall off when melting, the globally accepted 'safe zone' around a turbine has a circular radius of 1.5 times the total height of the turbine (including blades) from its base. A recent study taken of hundreds of sites in Europe found very few fragments of ice of any size even inside that zone and only two small fragments beyond that. Statistically, you are more likely to be hit by lightning or by snow falling off your neighbour's roof. One report demonstrated that "If 15,000 persons pass the road close to the wind turbine per year there might be one accident in 300 years", and this report was deemed to be exceedingly conservative. Wind energy is one of the safest energy technologies, and enjoys an outstanding health & safety record. Well over 100,000 machines are installed around the world with over 35 years of operating experience that more than confirm this record. Consider the Exhibition Place Wind Turbine in downtown Toronto, which overshadows one of the busiest highways in the world, and has had zero ice issues in over 10 years now.

For more information:

- Report "*Risk Analysis of Ice Throw From Wind Turbines*", 2003, http://www.dewi.de, or http://www.mi-group.ca/files/boreas_vi_seifert_02.pdf

Q26) What is "stray voltage", and is it a concern?

"Stray Voltage" is the result of a poorly wired electrical system, and is one of many reasons why we have electrical codes (the Ontario Electrical Safety Code, Distribution System Code, and Transmission System Code). In Ontario, the law requires that any new project installed and connected to the electrical grid must first be installed using government approved equipment (eg: equipment certified by the Canadian Standards Association), designed by license professionals (eg: Professional Engineers), installed by licensed tradesmen (eg: licensed Electricians, Millwrights, etc), and inspected by licensed inspectors (eg: the Electrical Safety Authority). Wind turbines cannot be connected to the grid without meeting all of these requirements. Stray voltage is caused when an electrical device such as a motor, industrial control system, or wind turbine is connected to the grid improperly (more specifically, stray voltage occurs when electrical systems are not grounded properly), and in a way that violates the Electrical Safety Code and/or Distribution System Code.

To answer more succinctly, "stray voltage" is a concern, and we have laws in Ontario to prevent it. Wind turbines do not cause stray voltage: bad electrical workmanship does, and Ontario law requires that licensed government inspectors must approve every wind turbine installation before it may be turned on.

For more information:

- http://www.canwea.ca/pdf/talkwind/StrayVoltageFactSheet.pdf
- http://www.esasafe.com/corporate/corporate-documents/ontario-electrical-safety-code-(25th-edition/2012)
- http://www.ontarioenergyboard.ca/OEB/_Documents/Regulatory/Distribution_System_Code.pdf
- http://www.ontarioenergyboard.ca/OEB/_Documents/Regulatory/Transmission_System_Code.pdf
- http://en.wikipedia.org/wiki/Stray_voltage
- http://www.veridian.on.ca/strayvoltage.php

Q27) What is "EMF", and is it a concern?

EMF stands for "electro-magnetic field" or "electromotive force" (which are different, but deeply related things), and is essentially the hidden magnetic radiation all around us that emits from the sun, from home electronics, from cell phone towers, and from the alternator in your car engine. EMF is one of the fundamental building blocks of nature, like gravity, and is what holds atoms together in all living things. All electronic technologies work because of clever uses of EMF. The driver and front seat passenger sitting about 1.5m from the average car alternator receives more than 12 times greater exposure to EMF (from the vehicle alternator) than a home owner would receive from a 2MW wind turbine set back 550m. At large power stations, workers are regularly within 5-10 meters of electrical generators that are many hundreds of times more powerful than a 2 MW wind turbine at 550 meters from residential communities. The EMF emitted by the turbine in downtown Toronto is smaller at only 10' away than the EMF emitted by a household hair dryer. EMF is an important part of life, and the EMF emitted from wind turbines is nothing to be concerned about.

For more information:

- http://www.windrush-energy.com/update%20Jul%2024/Appendix%20D%20-%20Magnetic%20Field%20Survey/Magnetic%20Field%20Report.pdf (The Health Effects of Magnetic Fields Generated by Wind Turbines, Oct. 2004)

Q28) If we shut down conventional power plants in favour of wind plants, will there be brown-outs when the wind doesn't blow?

No. Even if we were to multiply five-fold the number of wind turbines installed in Ontario over the next three years, wind energy would still supply less than 20% of our electrical grid. 20-30% is what several international communities consider an ideal contribution by wind power, and the rest of our grid would be a mix of things like hydro (Niagara Falls), biomass, combined heat and power from natural gas or biogas, and to a lesser degree, things like solar. Some nations in Europe are working towards generating as much as 60% of their electricity from wind. Swings in wind power production can easily be managed just like the rest of the electrical system. The current method for managing swings in production or demand in Ontario is based on dispatchable power supplies like (1) coal, (2) hydro-electric plants which maintain reservoirs of water that can run through water turbines at any time to produce electricity (we can turn them on/ off in milliseconds), and (3) natural gas "peaker" plants that can top up power requirements upon demand. In less than a second, the province can already turn up the power we get from water, coal or gas to make up for lack of wind, and then turn it back down again when the wind picks up.

In addition, there are many types of energy storage that are inexpensive and are already successfully in use in Canada, such as water-pumping technology, where wind is used to power pumps which push water uphill into reservoirs or storage towers where it can then be used to power water turbines when the wind is not blowing. For future use, researchers are developing advanced battery and other technology that will allow for mass power storage which is much more efficient than any other type of mass power storage currently available. Turbines could charge the batteries on windy days for storage and use on calmer days. Wind already works very well today as part of a supply mix, and these future storage opportunities will make it work even better.

For more information:

- Refer to (Q29) below.

Q29) Doesn't wind require energy storage or gas make-up plants in order to work?

This question is basically the same as (Q28) above. The answer is "No", for at least two reasons. First, wind energy is intermittent, so it needs to be married to dispatchable power sources such as hydro (water) or biogas. Norway uses hydro power to complement wind generation with great success: we can do the same with our vast hydro sources (eg: Niagara Falls, Quebec, Manitoba, and more). Dispatchable power sources can be turned on/off in milliseconds, so that users will never experience a power shortage or overage.

Second, natural gas is just one form of dispatchable power, and just one form of gas supply. Biogas is another that is 98% the same as natural gas, and is much more preferable environmentally. Hydro power is another (and one that we have a lot of), and so is stored power, whether stored in capacitor banks, batteries, water-pumped into reservoirs, or any other method of storing electrical energy for future use.

Wind can't provide a full grid worth of electrical power on its own, but wind makes a very reliable supply that performs predictably with minimal maintenance, and its intermittency is easily managed by complimenting it with other dispatchable sources. Ontario has sufficient dispatchable supply to accommodate a relatively large mix of wind energy already, which far exceeds the amount of wind energy harvesting currently planned for installation here.

For more information:

- http://www.ontario-sea.org/Storage/27/1935_Renewable_is_Doable_Part_1_.pdf

- http://www.ontario-sea.org/Storage/27/1937_Renewable_is_Doable_Part_2.pdf
- http://www.worldfuturecouncil.org/fileadmin/user_upload/PDF/100__renewable_energy_for_citys-for_web.pdf (100% Renewable Energy - and Beyond – for Cities, World Future Council Foundation, Germany, March 2010)
- http://www.erec.org/fileadmin/erec_docs/Documents/Publications/ReThinking2050_full%20version_final.pdf (RE-Thinking 2050 a 100% Renewable Energy Vision for the European Union, EREC, April 2010)
- http://www.mei.gov.on.ca/en/energy/electricity/?page=nuclear-electricity-supply (Ontario's Future Electricity Supply Mix)
- http://canwea.ca/images/uploads/File/3_reliability.pdf

Q30) How much wind and solar are in Ontario right now?

Ontario's electricity supply mix varies from day to day, but is approximately 50% nuclear (~10,000 MW), 25% natural gas (~5,000 MW), 15% hydro (~3,000 MW), 2% coal (~350 MW), 1% wind (~200 MW), and 1% other renewables (landfill gas, biomass, solar, etc). Wind and solar energy make up a very small fraction of what's presently on our grid, even when generating at their full output.

For greater clarity, the "supply mix" really only refers to the generation that we're presently using in Ontario. Our grid has a heafty margin of backup equipment connected and ready at all times, and those numbers are a little different: 33% of what's connected to our grid is nuclear (~11,500MW), 29% is natural gas (~10,000 MW), 23% is hydro (~8,000 MW), 10% is coal (~3,500 MW), 4.4% is wind (~1,500 MW), and 0.4% is other renewables like landfill gas, biomass and solar (~200 MW).

For more information:

- http://www.ieso.ca/imoweb/media/md_supply.asp

Q31) Why do wind turbines seem to spend so much time idle?

A properly installed wind turbine in Ontario should generate electricity between 25 and 35% of the time. Wind tends to blow most during shifts in the amount of visible sunshine: sunlight brings heat which changes air pressure which creates wind. Wind turbines tend to idle in the middle of the day when the sun is steady or in the dead of the night when the air is still.

All forms of electricity power generation have what's called a "Capacity Factor", or a number that tells you how much of the time they should be generating electricity. Typical capacity factors for wind energy are between 25 and 35%, PV ranges between 10-20%, hydro is ~45%, nuclear varies between 60 – 80%, etc.

For more information:

- http://en.wikipedia.org/wiki/Capacity_factor
- http://media.cns-snc.ca/media/reliability/reliability.html#ONTCF
- http://www.ieso.ca/imoweb/siteshared/windtracker.asp

Q32) We can't control the weather: How reliable are wind and solar really?

This is precisely the reason that utility grids need to be planned. On their own, wind and solar energy could not power 100% of our electricity needs: Germany and Denmark will both shortly have >50% of their power from wind and solar, but the rest of their mix is provided by other complimentary sources. In Ontario, we would use dispatchable power (power that is easily turned on or off when needed) like hydro and natural gas to make-up the rest of our supply mix. That said, wind and solar combined are presently less than 5% of our supply, and will be for some time yet: more than 10 times more supply is available in dispatchable power here, so the intermittency of wind and solar are not a problem in Ontario, and won't be until we have much more wind and solar energy connected to our grid.

There are important differences between "reliability" and "intermittency": wind and solar energy systems are very reliable, but they are also intermittent. "Intermittent" means that they are not always available (eg:

when the sun isn't shining or the wind isn't blowing). Wind technology is based on simple motors that are used around the world in many industries very reliably, and wind turbines consistently have availability of over 97%: that means that they are more than 97% reliable, and will be working when the wind is blowing. Some of that last 3% is when the wind is blowing so strongly that the wind turbine must turn or throttle itself down in order to not be torn apart by the wind, so the machines themselves are very reliable (>97%). Solar energy is even more reliable: over 98% available. The maintenance logs for wind turbines and solar panels are relatively boring. That's a sign of reliability. For comparison, nuclear reactors are not intermittent at all (they generate very consistent and inflexible outputs, which is why they can't be used for dispatchable power the way that hydro and natural gas can), but they are sometimes unreliable: Ontario has approximately 14,000 MW of nuclear reactors presently, but only ~11,500 MW are in use, because the other 2,500 MW have been shut down for safety reasons (see the "Farlinger Report" in the 2nd and 3rd reference links below).

For more information:

- http://www.canwea.ca/wind-energy/index2_e.php
- http://www.ccnr.org/hydro_report.html (Ontario Hydro's 1997 report card)
- http://www.ontla.on.ca/web/committee-proceedings/committee_transcripts_details.do?locale=fr&Date=1997-10-06&ParlCommID=828&BillID=&Business=Hydro+Stakeholders&DocumentID=19049 (Minutes/Transcript of the presentation of the 1997 report card to the Ontario legislature)
- http://www.ccnr.org/index.html#dir (CCNR's complete directory of nuclear accidents and incidents)
- http://www.encyclopediecanadienne.ca/articles/macleans/ontario-hydro-meltdown
- http://www.cleanairalliance.org/node/962

Q33) Why do some wind turbines have red flashing lights?

NAV Canada and Transport Canada require that any structures above a certain height and within a certain distance of airfields or air traffic routes must have signal lights installed on the highest unmoving portion of their structure as a warning to local air traffic. This rule is the same for cell-phone towers, buildings, television and radio broadcast towers, wind turbines, and more. Each wind energy project is required to apply to both NAV Canada and Transport Canada to determine whether they need flashing signal lights, and the government decides when these lights are required: they are not universally required, and they may or may not be needed in any given project.

For more information:

- http://www.navcanada.ca/
- http://www.tc.gc.ca

Q34) What happens to turbines at the end of their life?

Turbines in Ontario are typically contracted to sell clean power to our grid for 20 years, and will likely last well beyond this. At the end of its useful life, what happens to the turbine will depend on who owns it: if the turbine is on rented land then the rental lease agreement will include terms that describe what happens to the turbine. If the turbine is owned by the same person who owns the land, then they may do with it as they wish: recycle it, refurbish it to extend its service life, or replace it with updated technology.

Q35) How do you replace shingles under PV?

Most modern PV systems are guaranteed to last at least 20 years, and experience has shown that many will still be generating >50% of their rated output after 40 years (ie: not "good as new", but still generating reliably), so it is certainly valid to consider what impact a PV project might have on your future ability to resurface your roof. In the ideal case, PV projects should only be installed on roofs that are rated to last another 20 years, such as young roofs that have been updated within the last 5 years, or more durable roofs that still have ~20 years left out of their expected service life. Standard residential roofs are rated to last between 20 and 50 years depending on the shingling products used, and commercial roofs have similarly broad ranges in lifespan, again depending on the surfacing products used. The PV itself will shield the roof from the sun's rays, and ultraviolet light from the sun is the chief agent that causes most roofing materials to degrade over time, so PV will typically extend the life of most roofs, especially asphalt shingles or modified

bitumen roofs. When the roof does eventually need to be replaced, the PV can be uninstalled with relative ease, and can simply be reinstalled once the roof has been resurfaced. Removing a PV project does not require approvals or permits the way that the initial installation does, so the system can simply be disconnected (ie: turned off at the inverter and all electrical disconnect switches), the panels unplugged from each other, and the system components (panels and racking) can be removed and stored/stacked out of the way. Once the roof has been resurfaced, the racking can be reinstalled, panels reconnected, and the entire system can be back up and running again in very little time: experienced contractors will be able to have the PV reconnected within no more than 2-3 days, especially with proper project planning. Larger roofs may require more time, but can often be managed in staged phases to ensure that only modest portions of the PV system are down at any given moment, and that they are brought back online promptly.

When considering a PV project, it is always prudent to ask the supplier for detailed instructions on how to disassemble the project for a future roof replacement, and then reassemble the project thereafter. We make a practice of requiring such instruction to be included in the system's Operations & Maintenance manual.

For more information:

- http://inspectapedia.com/roof/roofing.htm (a useful introductory resource on roofing concerns)

Q36) What about Fire Safety?

Proactive municipalities across Ontario are asking how they can help their fire fighters prepare properly to fight fires at buildings with PV systems on them. CSA and Electrical Safety standards ensure that PV and wind energy products are as safe as any other motor or wire attached to our electrical grid, but fire-fighters are wise to ask about PV panels and what hazards they present. In short, PV is a generator, and if it's sunny outside, then the panels will be creating electricity. The first thing fire-fighters should do when arriving at a building with PV on the roof is to turn off the PV by turning off the main disconnect switch at the meter, which should always be outside and near the front of the building, typically on a side wall. Fire fighters should maintain regular contact with the local electrical utility to ensure that they are kept informed about which buildings in the area have PV systems, and they may wish to work with the Municipal Council to explore appropriate ways of making the buildings identifiable from the street, for example with specific colour requirements for the civic address plates on the laneway, or similar ideas as suggested in the references below.

For more information:

- http://gov.ca.gov/docs/ec/CalFIRE_Solar_PV_guideline.pdf
- http://www.ul.com/global/eng/pages/offerings/industries/buildingmaterials/fire/fireservice/pvsystems/

QUESTIONS ABOUT CARBON FOOTPRINT

Q37) What is the lifecycle carbon impact of wind or solar?

"Lifecycle impact" is a term used to describe the full environmental impact, typically measured in carbon dioxide (CO_2) emissions, of the combined total impact of manufacturing, shipping, assembling/installing, operating, maintaining, and ultimately decommissioning something. For wind turbines this would involve assessing the impact of using steel and concrete, building and shipping towers, installing access roads, providing appropriate maintenance for the full life of the turbine, ultimately culminating in decommissioning. The most meaningful measure of a generator's environmental benefit is that of how much energy you get out of it for the emissions it creates, or what the total emissions are per unit of electricity generated (cumulatively from construction through decommissioning).

One carbon impact study by Benjamin K Sovacool found that fossil fueled power plants produce electricity with about 443-1050g equivalent CO_2 emissions per kWh generated, that nuclear power plants produce electricity with about 66g equivalent lifecycle emissions per kWh, and renewable power generators produce electricity with 9.5-38g CO_2 per kWh. Nuclear energy technologies are thus seven to sixteen times more effective than fossil fuel power plants on a per kWh basis at fighting climate change, and renewable electricity

technologies are "*two to seven times more effective than nuclear power plants*", or as much as 100 times more effective than other fossil fuel power plants.

Another way to consider the net lifecycle impact of power generators is a measurement called the "Energy Payback Ratio" (EPR), which measures how long it takes the generator (wind, nuclear, or other) to create enough energy to replace all the energy used to build it. The higher the number, the more times the generator pays for itself. Wind energy consistently outperforms all technologies except the latest in nuclear technology: older nuclear like that in service around the world today typically has an EPR of 16 to wind's 23, where theoretical new nuclear might achieve as much as 27. Coal and natural gas are ~10. Wind replaces itself much better than most other alternatives, and the only option that beats wind on the EPR index is the latest theoretical new nuclear, which is far more expensive than wind, and which has yet to be proven.

For more information:

- http://fti.neep.wisc.edu/FTI/POSTERS/sww_energy_ctr.pdf
- http://www.nirs.org/climate/background/sovacool_nuclear_ghg.pdf
- Refer to (Q17), (Q18)

Q38) Isn't nuclear "green" and carbon neutral?

Nothing is completely carbon neutral. Carbon emissions are created during the construction of power plants, during their operation, maintenance, eventual decommissioning, and during the process of mining fuel to supply them. Without considering the impacts of mining and fuel refining, coal based electricity generates as much as 1 tonne of CO2 emissions per 1,000 kWh of electricity produced. Natural gas emits roughly half that of coal, and both Nuclear and wind generate closer to 0.15%: 0.0015 tonnes per 1,000 kWh (1.5 tonne/TWh).

The real difference between carbon emissions is from the fuel that supplies these processes. Mining of coal, gas, or uranium are environmentally costly processes. Managing coal and nuclear wastes creates further emissions. Renewable energy like wind and solar have emission-free fuel and no waste.

Nuclear energy is a much lower carbon emitter than coal or natural gas, but mining and especially waste drag it down. Nuclear energy is ultimately based on a fossil fuel (uranium), and all fossil fuels are heavy emitters over time. Wind, solar and other renewable forms of energy are the most carbon neutral sources of electricity.

For more information:

- http://fti.neep.wisc.edu/FTI/POSTERS/sww_energy_ctr.pdf
- http://www.washingtonsblog.com/2013/04/nuclear-is-not-a-low-carbon-source-of-energy.html

GENERAL QUESTIONS ABOUT RENEWABLE ENERGY

Q39) Can we really supply 100% of our energy needs without fossil fuels?

Not just from wind and solar, at least not in the short term, but from a mix of all renewables and with conservation, and with no fossil fuels, absolutely. The Pembina Institute is one of several reputable Canadian agencies that has shown how Ontario can transition back to 100% renewable energy, without needing coal, nuclear, or even natural gas, as soon as 2020. Other reports have shown that a 100% renewably powered *world* is possible by 2050. These kinds of transitions require a significant commitment to energy conservation, but another study focused on Ontario showed that investing in renewables and energy efficiency will keep costs between 12 and 48% lower than if the same energy was supplied with nuclear power, and that this would also create 27,000 new conservation jobs in the process. Conservation consistently costs 7-10 times less than new generation of any type, and creates many many jobs along the way. The benefits of transitioning to renewable energy would be huge too: among others, projects can be built in smaller increments to match demand whereas nuclear is all or nothing, and the feed-in tariff program for renewables puts the risk of cost overruns on the developer whereas nuclear cost overruns are ultimately born by the taxpayer. 100% renewable energy is feasible, is affordable, and is possible in the short term: rather than refurbish our current fleet of nuclear reactors, they could be decommissioned on schedule and

immediately replaced with renewables, at a much lower cost, while creating more jobs, stimulating the economy, and protecting the environment.

For more information:

- http://www.renewableisdoable.com/
- http://www.pembina.org/pub/1496
- http://www.wwfblogs.org/climate/content/renewable-energy-can-phase-out-fossil-fuels-40-years
- http://wwf.panda.org/wwf_news/?199319/influential-voices-support-wwfs-100-renewable-energy-vision
- http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions22/renewable_energy/sustainable_energy_report/
- http://wwf.panda.org/about_our_earth/all_publications/?122201/climate-solutions-wwfs-vision-for-2050

Q40) Who supports wind energy projects?

Public opinion surveys show that 96% of Canadians and 70% of Ontarians support the continued development of wind energy, across all party lines. This is in addition to leading scientists and researchers investigating climate change, leading environmental groups, and national and local governments around the world. With no dangerous waste, no harmful emissions, and relatively simple maintenance requirements, the wind industry is growing at a rate of 30-35% around the world and is one of the fastest growing sources of safe, clean and renewable energy available.

For more information:

- http://www.canwea.ca/images/uploads/File/Resources/Membership_Fact_Sheet_-_Public_Opinion_ResearchJune_29.pdf
- http://environmentaldefence.ca/articles/new-poll-measures-ontarians-support-party-energy-proposals, or raw data here: http://environmentaldefence.ca/reports/party-energy-proposals-poll

Q41) What are the benefits of wind turbines?

Many! To understand the benefits of wind turbines, you really need to compare them to other sources of power and consider what we'd get if we didn't use wind turbines. Wind turbines produce electricity using a renewable source (ie: there's always going to be more wind), and do not produce any greenhouse gases or other emissions from their operation. This results in the following significant benefits:

- It reduces the amount of electricity generated from coal, nuclear, and other non-renewable fuel sources;
- It is a sustainable energy source (ie: it won't ever run out);
- By reducing the use of coal plants, we improve the air quality and significantly reduce respiratory problems. In turn, this help will reduce the burden on the health care system and free up much-needed medical resources by an estimated $3 billion annually;
- Renewable energy means less carbon in the atmosphere, which helps in the fight climate change.

For more information:

- http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/videos/wind_energy_video.html
- http://www.nrel.gov/learning/re_wind.html
- http://cpconference.ca/Storage/44/3601_Summary,_conclusions_and_bios.pdf

Q42) How many Ontarian's are actually using the FIT and microFIT programs?

Well over 50,000 Ontario residents have applied for contracts under the Green Energy Act to produce clean electricity. Roughly half of these are rural, and half are urban. Ontarians are showing strong support for the Green Energy Act and its programs. More than 2,000 mid-size and large-scale Feed-in Tariff projects have been awarded contracts, representing enough electricity each year to power more than a million homes. Since 2009, more than 30 businesses have announced they are setting up or expanding plants in Ontario to

manufacture parts for the solar and wind industries. Ontario leads Canada in solar capacity and is currently home to the world's largest operational solar photovoltaic park located in Sarnia. In 2003, Ontario had only 10 wind turbines. Today, the province has more than 1,000 wind turbines and is home to Canada's four largest wind farms.

In short, Ontario's media tells a mixed story, but the numbers show that Ontarians believe in green energy, and have been very receptive to the Green Energy and Green Economy Act and its Feed-in Tariff system.

Q43) I hear that in Europe, especially Germany, the wind projects are coming to a halt. Is this true?

Definitely not. Wind power in Germany grew by 12% in 2006 alone (their fastest recent growth year), has seen steady growth for more than two decades, and currently provides more than 6% of all power needs in Germany. Canada has lagged far behind Europe in the use of wind power with only ~1,500 MW installed, which accounts for approximately 0.5% of our power needs. Germany has nearly achieved grid parity for new solar energy projects, meaning that solar energy is now so cost effective in Germany that it is almost cheaper to install than their normal spot-market grid rates, and will therefore shortly not need a tariff.

For more information:

- http://www.gwec.net/index.php?id=129 (showing ongoing increased installations in Germany even as Tariff rates are reduced)
- http://www.gtai.com/fileadmin/user_upload/Downloads/Industries/Renewable_Energies/Wind/1_Englisch/IndustryOverview_WindEnergy_April2010_GTAI.pdf
- http://www.ewea.org/fileadmin/ewea_documents/images/publications/offshore_report/ewea-offshore_report.pdf (Delivering Offshore Wind Power in Europe)

Q44) What is the future of wind energy in Ontario?

Especially between 2011 and 2018, Ontario's wind energy industry is offering 80,000+ person years of employment, which will create 38,000 direct jobs and 42,000 indirect jobs. An incredible 5.6GW (nameplate rated capacity) of wind energy will be added to the Ontario grid by 2018 - for a total of 7.1GW in Ontario. Wind will bring a total market value of $16.4 billion dollars in investment to Ontario, over $8.5 billion of which will remain in the province: $1 billion per year staying in Ontario. $1 million in payments will be made to landowners over that time frame and $245 million will be paid in municipal taxes.

For more information:

- http://www.canwea.ca/pdf/economic_impacts_wind_energy_ontario2011-2018.pdf

QUESTIONS ON MUNICIPAL AND COMMUNITY CONTROL

Q45) Why are wind turbines built in rural locations instead of in cities where the energy is used?

Municipalities in Ontario used to supply their own power prior to the days of the electrical grid. Now that we have a provincial grid, we all have grown accustomed to getting our power from a few very large generators (eg: Bruce Nuclear, Nanticoke coal), which spread their emissions across the whole province as well. Wind turbines, solar panels, small hydro dams and mills, and other renewable sources of electricity are making it possible for local communities to provide their own power again, or at least a portion of it, and to use technologies that work well in the areas where they live.

Wind turbines do not work well in cities. The buildings break up the wind, which means a turbine will not produce much electricity in this environment. City dwellers and rural landowners can often partner for mutual benefit by locating turbines in rural areas, and selling the electricity (through the grid) to the city. The rural landowners benefit financially, but also benefit from helping reduce the need for large coal and nuclear facilities, replacing emissions and expenses with clean air and rural revenue.

Q46) Hasn't the Green Energy Act usurped municipal planning authority?

Another way to ask this question would be to ask whether municipalities used to be responsible for providing for their own electricity before the Green Energy Act was passed. The answer is no: the Province was and is responsible to plan and provide electricity to us all.

Municipalities never had the ability to plan and zone their energy supply: the province has held this right and responsibility ever since the grid was first established. Though some have tried to suggest that the Green Energy and Green Economy Act has somehow reduced municipal rights, it has in fact given the new opportunity to municipalities to generate their own electricity, and to own electrical generation assets. Municipalities can do more about electricity now than they could before, not less.

When responsibilities for the environment and health are downloaded onto municipalities, standards become inconsistent and malpractice may result as it did in the Walkerton drinking water crisis. The energy market is a complicated beast. Although many municipal *politicians* like the idea of having control over where wind and solar projects should be permitted to be physically located, municipal *staff* all across Ontario are typically stretched very thin in their work already, are wary of taking on further liabilities, and don't have the experience or resources to approve or deny wind and solar projects properly: municipal staff tend to welcome central authority, especially for complicated topics like managing the electricity grid. Can you imagine what it would be like if municipal politicians were responsible to plan and negotiate the supply of local electricity for their citizens? With everyone saying they don't want power plants installed near them, but they still want the power to show up at their house when needed? When topics are broad and generally affect all municipalities of Ontario, they tend to be managed best at the provincial level.

When municipalities had the authority to approve the location of wind turbines, many permitted them closer than the current minimum setback requirement of 550 metres, and some municipalities refused to grant permission regardless of setbacks. There was no consistency, and there was a general lack of expertise in understanding how to manage the additional work of approving local power generation projects (whether gas, wind, nuclear, or other), especially in the smaller municipalities with fewer staff resources.

The Green Energy and Green Economy Act added to the old provincial process for planning our electricity system by adding rules for smaller and more local electricity generation projects (ie: smaller than nuclear plants and Niagara Falls), by standardizing the rules across the province for these types of smaller projects and simplifying the efforts required to get projects built (eg: not requiring a farmer installing a wind turbine to get the same permits as a nuclear plant needs), and by creating a "Renewable Energy Facilitation Office" at the Ministry of Energy to offer technical support to local projects: projects by farmers, school boards, faith groups, First Nations, municipalities, and ordinary homeowners installing wind turbines, solar panels, biomass systems, or restoring old hydro dams (mills).

Municipalities don't need to plan where to buy electricity from for their citizens, and can now embrace the authority given to them under the Green Energy Act to generate their own clean renewable energy, just as many communities already have. The Green Energy Act empowers those concerned about climate change and the deadly health effects of burning coal to actually do something about it, and to create local jobs and improve the robustness of the local electrical grid while they do.

For more information:

- http://www.search.e-laws.gov.on.ca/en/isysquery/1fadf0b2-c2c7-4e7c-a83e-d9a64a0ccd09/1/doc/?search=browseStatutes&context=#hit1

Q47) How does the Green Energy Act allow all communities to generate clean energy?

With its across-the-board prices for renewable energy, and additional financial help for community groups, the Green Energy Act lets everyone profit from producing clean power. The point of the act is to level the playing field, and not require a farmer to compete with Bruce Nuclear when he wants to sell his electricity to

the grid. The Green Energy Act made it possible for small generators (eg: farmers and home owners) to sell electricity at fair rates, which in turn makes it possible for them to get loans in order to build their projects.

Q48) Why "community power"? Why not just leave it to the government?

Ontario is one of the only places in the world where we call electricity "hydro", and that's because all of our electricity was once generated from small hydro dams, literally thousands of them, located everywhere throughout the province. "Hydro" means "water". When Ontario began to experiment with a large centralized grid, it became necessary to have a central operator coordinate that grid, so Ontario Hydro was created as a publically owned mega-utility to coordinate all our power needs. Ontario Hydro evolved quite naturally toward wanting to manage fewer generators that were increasingly large and could serve more and more communities from fewer and fewer supply sources, until "Ontario Hydro" went broke and needed to be deregulated, and we eventually ended up with the grid we have now: large and fragile, where the 1998 ice storm caused severe and extended power outages, or where one nuclear reactor needing maintenance means that we need to import power for 6 months, or where one technician missing the wrong warning signal somewhere in Ohio caused the 2003 blackout of Ontario and the whole northeastern US, or… or we could just go back to having many smaller, less expensive and more manageable generators all over Ontario, and if any of them needs to be taken offline and serviced, then the grid as a whole will continue to work fine without it.

Community Power is built from the desire to help local communities control their own power supply as much as is reasonably possible. Local control means letting local people generate and sell electricity to other local people, in a fair and regulated way. The Green Energy Act makes all of this possible, and is helping us move away from the fragilities of a mega-grid, back towards the increased stability and flexibility of a distributed grid, all built on the principle of going local. As an added benefit, tools like the Green Energy Act not only enable communities to generate their own power, but in doing so they also help depoliticize the grid: Ontario's electrical grid is in serious disrepair right now after several decades of government neglect because it wasn't politically expedient to spend more money on the grid. By helping communities step up and add their own generators, rather than using tax dollars to build new gas or nuclear generators, we reduce the effort that the Province needs to invest in building new generation, and we free up provincial money to invest in repairing and properly maintaining the grid, simultaneously reducing the cost of electricity and improving the system, all while going local and letting communities take charge of their own power supply.

FOR MORE INFORMATION:

Q49) Where can I find more credible information about Ontario's energy industry, renewable energy, human impacts, air quality, or similar issues?

1. **Environmental Defence (ED): www.environmentaldefence.ca**
   Environmental Defence advocates for human health, for environmental health, and for the synergies of humanity with the environment on a number of fronts. They faithfully oppose irresponsible industry that neglects health or the environment in the pursuit of "progress" or profit, and have been key supporters of initiatives such as Ontario's Green Belt Act and the Green Energy and Green Economy Act.

2. **Farmers for Economic Opportunity (FEO): http://www.farmenergy.ca/**
   FEO's members and funders are farmers who care about the environment, about economic development, and about building strong farming communities by using renewable energy systems (wind, solar, biomass, etc.) as an economic opportunity.

3. **The Ontario Clean Air Alliance (OCAA): www.cleanairalliance.org**
   The OCAA represents over six million Ontarians, allied in 1997 to achieve the phase-out of Ontario's dirty coal-fired power plants and to move Ontario towards a renewable electricity future.

4. **The Ontario Sustainable Energy Association (OSEA): www.ontario-sea.org**
   OSEA is a member-based, non-profit organization representing more than 1500 individuals including private citizens, cooperatives, farmers, First Nations, businesses, institutions and municipalities. OSEA members are engaged in or supporting Community Power projects and renewable energy.

5. **The Pembina Institute: www.pembina.org**
   Pembina is a Canadian non-profit think tank that promotes environmental, social and economic sustainability by performing research and developing practical solutions for communities, individuals, governments and businesses. Pembina has several reports published online and available for free download, covering many topics from transportation to alternative plans for Ontario's energy supply mix.

Q50) What about the groups that oppose wind energy?

The unfortunate truth is that some of the first large scale wind energy projects in Ontario were implemented by developers who did not treat the local communities very well: they tended to offer poor lease agreements and in some cases used bullying negotiating tactics. These projects are a very poor contrast with what the Green Energy Act is enabling, and some of those projects were not even related to the Green Energy Act: they were large corporate power projects, like coal or nuclear, but done with wind, and done through the same legal procurement processes as coal or nuclear (the RFP process). The Green Energy Act enables local communities to develop their own energy resources on a much smaller scale and to sell their own electricity to the grid. Many of the opponents of wind energy change to allies when they are properly respected during the development process, especially when they're invited to invest and own a piece of the project themselves.

There are non-profit groups that have emerged in various places across Ontario who oppose wind energy. Some of these groups are more organized than others, and some are more qualified than others. One of the two most noteworthy groups was funded by the nuclear lobby. The other was founded by a political science graduate who ran as a candidate for the Liberal Party, but had a tragic falling out with its leadership, and now vehemently opposes the Green Energy Act (created by the Liberals who rejected him), and also received funding indirectly from the coal and nuclear lobbies. All of these groups would likely disagree with this FAQ document, but will not be able to present science based arguments to defend why they disagree.

Q51) Why should I believe reports from people who are clearly pro-wind / pro-solar?

One of the greatest problems in the debates about wind and solar energy is that normal people are caught in the middle, without really having time or expertise to properly compare the opinions they're hearing. Those who are the most upset tend to speak the loudest, and it can be very difficult to sift out the facts from the emotions. Tragically, the energy debate in Ontario has been much more about politics than about science, despite the claims of the lobbyists.

The anti-wind lobby tends to use a small, cherry-picked, and often factually incorrect collection of data without context that continually recirculates on websites and in reports, even after being disproven. Some of this is summarized online at http://this.org/magazine/2010/06/15/wind-power/, including references to where the data actually originated from. And again, since most people have neither the time nor the technical education to tease out the truth from the misinformation, the general public is more than a bit confused over the health, economic, environmental and climate-related impacts of wind energy that are addressed earlier in this FAQ. The media is known for hyping stories, and has made their own contribution to this debate as well. The vast majority of the scientific community is overwhelmingly convinced that wind is good, and the public in Ontario supports wind on the whole, especially if it's not in their backyard, but there is a surprising distrust against the scientific reports that are properly researched.

Keep this in mind: scientists do research for a living, and they need to be paid for their work (ie: their families need to eat too). It's easy for an upset neighbour to complain about a rumour they've heard, or to make-up a rumour themselves, but it takes time and money for a scientist to do the research to prove them wrong. Anti-wind information is widely available for free online, as is anti-solar to a lesser extent, and both are relatively simplistic (targeted at the general public), while the science debunking their claims tends to be complex and is often hidden behind an academic journal's user fees: buy a membership or you can't see the report.

Scientists need to be paid for their work, and academic journals need to earn money to function and publish, but this often makes it very difficult to promote good information. Bad information is free, easily spread, and often easier to find. This FAQ document is published free online in an attempt to help share good information more broadly.

The wind and solar industries have the most to lose in this debate, and are investing the most in proper research. Most of the companies in Ontario's wind and solar industries are small, contrary to the claims of their antagonists. The Canadian Federation of Independent Business will testify that the majority of businesses in Canada are small businesses, including the wind and solar sectors, who are investing their livelihood in ensuring that their work is done safely and for the betterment of all.

As Farhad Manjoo wrote in his 2008 book True Enough: Learning to Live in a Post-Fact Society, we live in an era of infinite information where the average person can find whatever answer they want to believe, and inherent biases cause the type of situation we see in Ontario's wind debate today: instead of determining truth through proper research, through examining methodology, testability, reproducibility, and peer review, the average person decides to trust the conclusions of whichever speaker appears most impressive to them at the time, and we might add, places a heavy value in the opinions of their peers and friends.

We might like to think that it should be obvious when people are using bad science, but if you're not a scientist in the right field or don't have a sufficient technical background, then how can you be expected to know the difference between good science and hype? This FAQ has attempted to provide brief answers to very complex questions in a way that is fair, but not burdensome. Wind and solar professionals are the experts on their fields, and they deserve our respect.

For more information:

- http://this.org/magazine/2010/06/15/wind-power/
- http://www.cfib-fcei.ca/english/article/1148-small-business-facts.html
- http://environmentaldefence.ca/articles/new-poll-measures-ontarians-support-party-energy-proposals

PROJECT SPECIFIC QUESTIONS:

This FAQ document is used for all Mindscape projects and is regularly updated to reflect new questions we are asked with each new project. All the questions above are general in nature and apply commonly to all our projects or to the broader industry. The following questions are specific to this project:

Q52) Will more turbines be added after this one is installed?

Every approved project is approved with very specific details: the utilities and various government ministries need to know the exact nature and size of the equipment being connected to the grid, otherwise they can't connect it safely, and they won't approve it. The utility needs to provide a certain degree of connection equipment, and this equipment will be designed and procured to match the approved turbine(s). Nothing further can be added without restarting the whole process and seeking new approvals: an additional new turbine would be a separate new project that would need to be approved separately.

Q53) Who checks the accuracy of your reports and assessments?

This FAQ document includes references to research done by top industry experts, but even still, this document (along with any report it is part of) will be reviewed by various government agencies each and every time a new project is proposed. In Ontario, renewable energy projects (wind, solar, etc) are required to obtain a number of permits and approvals before they may begin construction. Several of these approvals are focused solely on electricity issues and how to connect safely to the grid, but the "Renewable Energy Approval" (REA) is a much more comprehensive study of the ecological and human impacts of the project, and project proponents are required to obtain this approval from the Ontario Ministry of the Environment (MOE). MOE will ensure that the project complies with applicable laws and that it is being managed by suitably qualified people: people who have hired appropriate support professionals such as licensed

Engineers, Ecologists, and Archaeologists, to do the required studies in order to ensure that they fully comply with the MOE's regulations and guidelines. Lastly, but certainly not least, the process of obtaining an REA requires public consultation, and the general public is also invited to challenge the project and help ensure that it respects local environmental concerns.

For more information:

- http://www.ene.gov.on.ca/environment/en/index.htm
- http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_090359_e.htm
- http://www.mnr.gov.on.ca/en/