

GREEN INITIATIVES FOR THE SWINE SECTOR

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As part of the new Green Energy Act, Ontario has introduced a number of processes to streamline the development of green energy projects. These processes include changes to several acts...

- Planning Act
 - exempts renewable energy generation facilities and renewable energy projects from zoning by-laws
- Environmental Protection Act
 - creates one approval process called Renewable Energy Approval (REA)
- Electricity Act
 - gives renewable energy generation facilities that meet prescribed requirements priority access
 - directs the Ontario Power Authority (OPA) to develop a Feed-In Tariff (FIT) program

Of particular interest to swine operations is the development of the FIT program. This program offers 20 year contracts for the purchase of renewable power from solar, wind, water, biogas and biomass systems. There are many categories of renewable energy types and sizes with the following being of high interest.

Micro Solar ≤10 kW	Roof or Ground	80.2 cents per kWh
Solar >10 kW to 250 kW	Roof	71.3 cents per kWh
Biogas >100 kW	“On-Farm” (regulated under the Nutrient Management Act (NMA))	19.5 cents per kWh
Biogas >250 kW	“On-Farm” (regulated under the Nutrient Management Act (NMA))	18.5 cents per kWh
Biogas >500 kW	All cases	16 cents per kWh

- all biogas may be able to obtain an additional 0.4 cent per kWh community adder
- all biogas gets a 35% bonus for production during peak hours and a 10% reduction for production during non peak
- all biogas gets a 20% of CPPI inflation increase

As a general note, the current average value of the energy component of non-renewable electricity is around 5 cents per kWh so all the prices specified above are substantial incentives.

SOLAR OPPORTUNITIES

The Ontario FIT price paid for solar energy is one of the highest incentives in the world.

Swine farmers in Ontario have the following number of opportunities to “harvest” the sun. There are 4 categories of systems that could be considered for rural use.

Micro-Fit System (<10 kW)

A 20 year contract for \$0.802 cents per kWh is available from the OPA. A micro-fit project can be located on a roof or on the ground. Due to increased complexities in attaching the panels to the roof (primarily unknown structural capacity of the roof) it is anticipated that most micro-fit systems being installed in rural Ontario will be ground mount systems. Conversely, in more densely populated areas, it will be difficult to find unshaded locations for ground mount trackers so likely roof mount systems will be most common.

The ground mount systems can be fixed or be a tracker system. A tracker system will give a significantly higher electrical yield but capital and operating costs will be higher. There is not a consensus on which type of system is most economically viable.

Installation costs for 10 kW micro fit systems will range from \$70,000 to \$110,000. Annual yields of 1000 to 1600 kWh per kW of panel can be expected giving returns in the 11% range after annual costs such as depreciation and maintenance are removed.

The FIT contract is obtained via the OPA website. There are no fees for this application.

For systems installed in 2010, 40% of the system must be constructed in Ontario to meet domestic content requirements. The OPA has a chart that must be followed to meet this requirement. For 2010, either the panels, the inverter (unit that safely converts power from DC to AC allowing connection to the grid) or the support system (unit that attaches the panels to the ground or roof) must be constructed in Ontario.

In 2011, this requirement increases to 60%. This means that at least a component of the panels must be constructed in Ontario.

A number of announcements have been made indicating that several solar panel manufacturers will be locating in Ontario.

Roof Mounted System

For good quality panels properly located it takes about 70 ft² of roof area to have 1 kW of power production. Many of Ontario's larger livestock and machinery storages have southern exposed roof areas of 10000 ft² or greater. This allows for at least 100 kW of solar panels.

The roof must be strong enough to support the solar panels and any additional loads they cause. Conventional solar panels (and supports) will add about 3.5 to 5 lbs per ft². In many cases, an engineer's report proving an existing roof is strong enough may be necessary to obtain a building permit (and insurance).

There are alternative panels available that are very thin and flexible that bond to roof membrane materials. These types of panels may be better for use on existing roofs due to their minimal weight.

Adjusting new construction to maximize solar panels should be fairly inexpensive. This involves orienting the building and roof slope to maximize solar exposure and building the structure strong enough to support the additional weight of the panels.

The FIT price is \$0.713 per kWh for systems 250 kW or less, \$0.635 per kWh for systems 500 kW or less, and \$0.539 per kWh for systems up to 1000 kW. Most farm based systems will be less than 250 kW.

The cost per kW installed is estimated to range from \$5,000 to \$7,000 per kW. If the panels are well located, between 1000 to 1200 kWh can be expected per kW of panel. So a gross return of \$71,000 to \$85,000 per year on a 100 kW may be available from a system costing \$500,000 to \$700,000.

Connecting to the grid will more be challenging with these larger systems especially if only a single phase line is available to the farmstead. Systems under 250 kW (500 kW in some cases) are classified in Ontario as a "Capacity Allocation Exempt Facility". This classification will give some benefits to gain connection to the grid and to move thru the FIT approval process. However, single phase lines will likely not be able to handle inputs much greater than 100 kW. This may be lowered if several generators are located on the same line.

For 2001, the domestic content requirement is 50%. This means (in most cases) the inverter and support system or the panels must be constructed in Ontario. After 2001, the requirement increases to 60% (same as micro-fit).

Ground Mount System

The FIT price for ground mount systems drops to \$0.442 per kWh so interest is expected to be mostly for very large systems. Systems over 100 kW cannot be installed on class 1 and 2 soils with a 500 MW limit on class 3 soils (if the areas are zoned for agricultural use).

There may be some interest in installing 100 kW systems in rural Ontario.

BIOGAS OPPORTUNITIES

The Ontario FIT prices for biogas are not the highest in the world but have the potential to give a good return for some larger livestock facilities if the project is reasonably priced and works well.

Feedstocks for digesters include manure, purpose grown energy crops and off farm sourced organics. It is generally thought that the Ontario FIT prices are not high enough to facilitate systems operating with a high percentage of energy crops as inputs.

At least 22 biogas projects are operating or being constructed in Ontario. All these projects are using some manure (one project only uses manure for startup and infrequent additions) and off farm source materials such as grease trap wastes from restaurants.

Swine manure has some limitations. It is generally high in moisture content (limits energy yields) and higher in nitrogen content (may inhibit biological process). Swine manure works well in co-junction with dairy or beef manure inputs and off farm sourced material inputs (if they have lower nitrogen content).

Using the OMAFRA AD Calculator, the following information is developed (note this calculator assumes that the full biological yield of materials are obtained. This requires fresh manure requiring daily removal of manure from barn).

- 5000 Hog Finishing Barn produces 8000 m³ of manure at 7% DM per year. A 1300 m³ digester is required giving a total methane yield of 130,000 m³. Assuming an operating time of 7500 hours per year, a 63 kW generator is required at 35% electrical efficiency. At a FIT price of \$0.199 per kWh (assumes community adder is available) the annual yearly electrical income is \$97,000.
- It is estimated that the system costs \$500,000 (\$8000 per kW (el)). Considering generator costs, insurance, electricity use, maintenance and using an interest rate of 7% and a 10 year payback, the annual cost is \$96,000. This gives a return of about \$1000.
- Increasing the payback period to 15 years generates an annual return for labour and risk of \$17,000.
- The addition of good quality off farm material (20% DM) at 25% of the total input volume will increase the required generator size to 218 kW. Using a 10 year payback the spreadsheet predicts an annual return for labour and risk of \$54,000.

The above points demonstrate the reason why off farm material is used as an input in all digesters built so far in Ontario. There is a concern that there will be a limit on the availability of these materials depending on number of plants built and future uses.

Prices and knowledge will continue to evolve. The OPA has committed to reviewing the FIT prices within a 2 year period. Ontario based technology and knowledge is rapidly improving due to the installation of the 22+ projects.

For swine operations new ideas such as the use of very heavily bedded pack barns should be considered. The value of the additional electricity produced by the addition of the bedding is anticipated to be much higher than the cost of the bedding.

Future barns should be developed considering integration of green energy systems such as solar panels and biogas systems. This means the use of south facing, steeply slope roofs and manure systems that minimize dilution and allow for transfer of fresh manure from the barns.