Marmora Pumped Storage–Hydro Power

Marmora and Lake
Home of Ontario's Best Pumped Storage Opportunity

Marmora Site Location

From an Open Pit Iron Mine…

With mining closed in 1979, the site is ready for a makeover
70 million tons of waste rock pile (12 stories high) is infertile and very visible from nearby highways and properties.

300 jobs lost when the mine operation closed.

Open pit is over 200 metres (700 ft) deep. That's 4 times the drop of Niagara Falls.

Nearly a kilometre long and half a kilometre across (area equivalent to 7.5 Rogers Centres).

To a Major Electricity System Asset…

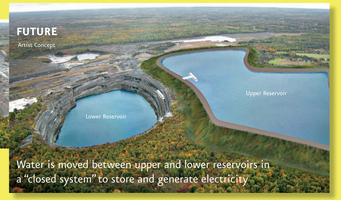
Economic: Makes use of existing man-made infrastructure from three decades of mining. As a result, it is cheaper than wind, solar and natural gas-fired power (without the emissions).

Versatile: Stores surplus power for use when the power is needed, provides instantaneous response to daily power demand, helps balance the fluctuating nature of renewable power.

Exceptional location: Close to transmission (only 8 km away) with ample capacity to handle the 400 MW output. Easily accessible for employees, equipment and supplies.

Timely: Could be in service by 2016/2017 to augment Ontario's growing renewable energy supply and shift surplus baseload generation for use when the power is needed.

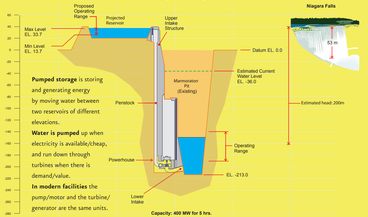
Since 1979, the pit has filled with approximately 160 metres (500 ft) of water.



Water is moved between upper and lower reservoirs in a "closed system" to store and generate electricity.

Approximately 3 Rogers Centers in volume of water is pumped up to the upper reservoir at night when electricity prices are low and released down to the lower reservoir during the day to generate power when it is needed.

The Marmora Pumped Storage Design



Pumped storage is storing and generating energy by moving water between two reservoirs of different elevations.

Water is pumped up when electricity is available/cheap, and run down through turbines when there is demand/value.

In modern facilities the pump/motor and the turbine/generator are the same units.

To an Economic Development Engine for Eastern Ontario…

- $700 million private sector investment
- 800+ engineering and construction jobs
- 45 full and part time jobs
- Tourism employment and related revenue
- Education and training partnerships with area colleges and universities
- Eco-tourism opportunities for the area are significant:
  - Linking existing historic trail system with trails to reservoirs, wetlands, …
  - Scenic and "engineering/construction marvel" look-out points
  - Passive recreation for all seasons e.g., hiking, biking, cross-country skiing…
  - Area mining history and interpretive programs, rock and mineral exploring
  - Green energy education

It's being done around the world…
Pumped storage sites in Europe and the US draw tens of thousands of visitors annually.

Electric Mountain Pumped Storage
Gwynedd, Wales, UK
Size: 1,800 MW
Operational: 1984
The Visitors Center welcomes over 250,000 visitors per year.

Raccoon Mountain Pumped Storage
Tennessee, USA
Size: 1,600 MW
Operational: 1978

The area surrounding Raccoon Mountain is a state-designated Wildlife Observation area. It is also a active recreation area, popular among hikers, mountain bikers, and geocachers.

Unprecedented support for a power project in Ontario:
- Supported by all 13 municipalities in Hastings County and Hasting County Council
- Unanimously supported by Eastern Ontario Wardens' Caucus
- Letters of support from area residents, businesses and associations
- Area post secondary educational institutions support the project given the significant education opportunities

NORTHLAND POWER

INTELLIGENT **ENERGY** for a GREENER PLANET