

The Role of Hydropower in Ithaca's Local Action Plan to Reduce GHG Emissions

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Ithaca's hydropower history

The birth of the City of Ithaca as a commercial force began with a single event. In 1830, a tunnel 15 feet high, 12.5 feet wide, and 200 feet long was cut through bedrock to conduct water from the dam above Fall Creek to mills and factories, providing the power to make the paper, farm equipment, boats, guns, clocks, and other manufactured goods that put Ithaca on the map. The 23-year-old in charge of this remarkable engineering feat, one Ezra Cornell, went on later in life to make further contributions to the community's economy, but none were to be as important to the establishment of the City itself as the tunnel on Fall Creek.

Fall Creek powered industry in Ithaca for over a hundred years. For a long time the Fall Creek water power was purely hydraulic, turning wheels that drove machinery through belts and shafts. Eventually the flow was used to generate electricity, enough to run both a paper factory and a gun factory up through the middle of the twentieth century.

Six Mile Creek yielded power for a long time, too. For 60 years, the Creek drove turbines at Van Natta's Dam to provide all the hydraulic power needed to pump Ithaca drinking water to the hills above the City.

Any moving mass of water provides kinetic energy that can be turned into electricity — clean, very cheap electricity. The energy is there whether it's harnessed or not; our choice is to use it or just watch it go by. For the last half century, we've chosen to burn coal in place of the electricity we used to get from the creeks.

Climate change caused by greenhouse gas emissions, and the prospect of an imminent peak and decline in worldwide production of oil and natural gas, make it imperative that we develop clean sources of energy, and in particular local sources of energy, as much and as quickly as possible. We can no longer continue to waste the City's best potential sources of energy. And we cannot ignore the relevance of clean, local power to achieving the reduction in greenhouse gas emissions mandated by the Local Action Plan adopted by the City in 2006. But redevelopment of the City's greatest natural energy resources will require the City to overcome some regrettable decisions made at a time when it seemed that cheap energy would last forever and climate change was purely theoretical.

Two lost opportunities

City development of its hydropower resources is an idea of proven practicability. In addition to the historical evidence, two major studies conducted by the City in the 1980s firmly established both the hydropower potential of Fall Creek and Six Mile Creek and the fact that this potential could be realized at negligible cost to the local environment.

Fall Creek

In the 1980s, the City developed and for a number of years very seriously considered a plan to reactivate "Ezra's tunnel" and make the most of Fall Creek's hydropower potential. Some of the considerable paperwork on file with the City Department of Public Works has been scanned into a PDF file at <http://ibiblio.org/tcrp/lapepc/fallcreek.pdf>.

Several years of intensive study paid for by the City can be summed up as follows:

- ◆ Fall Creek hydropower can be developed with no adverse effect on the environment or the recreational potential of the creek.
- ◆ A flow of water over the falls sufficient to both preserve the aesthetic beauty of the falls and to maintain the fish population of the creek would generate just over 7 million kWh annually. If a generous 5 percent is allowed for down time, this nets out to about 6.67 million kWh annually.
- ◆ In 1982, the project was estimated to cost between \$3.1 million and \$3.7 million. At that time, the savings in electrical costs to the City would have paid for the project in 8 to 9 years and then generated around \$400,000 in savings every year thereafter.
- ◆ If we double the cost of the project to \$7 million today, then at the current rate of about 10 cents per kWh, the project would pay for itself in under 11 years and return \$667,000 in savings to the City every year thereafter.

After years of study, the Fall Creek hydropower project was finally rejected by Common Council in 1989 — not because it couldn't successfully turn Fall Creek to practical as well as recreational use, but because realizing the practical benefits of hydropower was never the City's purpose in proposing the plan. The City was simply trying to prevent the consideration of two other competing development plans, one from Cornell and one from a private consortium, that might not have sufficiently protected the Fall Creek environment. When it was discovered that the City could protect Fall Creek from private development by having it declared a New York State Recreational River, the City's own environmentally friendly alternative development plan was dropped — and this is why the City budget does not enjoy an extra input of two-thirds of a million dollars annually today.

It is no shame to admit that we know more about global warming and energy independence now than we did almost twenty years ago, and it is likely that the same decision today would go very differently. But the designation of Fall Creek as a State Recreational River has put a difficult and completely unnecessary hurdle in the way of revisiting that decision.

Six Mile Creek

1989 also saw Common Council reject a proposal to rehabilitate the power room at Van Natta's dam, site of the former turbine pump plant and the lowest of the three dams on Six Mile Creek that for the past century have provided the City's drinking water. A core collection of the documents relating to this proposal has been scanned into a file at <http://ibiblio.org/tcrp/lapepc/vannatta.pdf>.

Based on careful study at the time, and with due regard to environmental concerns (which were found to be almost nonexistent, the dam being located at the lowest part of the watershed that is considered environmentally sensitive), it was determined in 1989 that rehabilitation of the old turbine facilities at Van Natta's Dam would enable the flow of water past the existing dam to generate a calculated 1.42 million kWh per year. If we generously allow for 5 percent downtime, this nets out to 1.35 million kWh per year.

At a current rate of about 10 cents per kWh, a power plant at Van Natta's Dam would yield income to the City of about \$135,000 annually. Rehabilitation would obviously cost much more now than the projected one million dollars it would have cost in 1989; a safe guess in advance of an expert reappraisal might be in the neighborhood of three million dollars. So at current rates, the power plant on Six Mile Creek would pay for itself in about 22 years.

Revisiting the Van Natta's Dam proposal now would not be as difficult as rescinding the NYS ban on Fall Creek development, but it would require people concerned about preservation of the Six Mile Creek Natural Area to understand that the dam and creek maintenance required for a hydropower plant (or a water treatment plant, or both) is what would be required to meet state dam safety requirements in any case.

Ithaca's hydropower potential

While the political and bureaucratic obstacles to City hydropower development are considerable, the benefits far outweigh the difficulties.

Based on the two studies referred to, the combined hydropower development of Fall Creek and Six Mile Creek would have the following characteristics:

- ◆ Net damage to the aesthetic, environmental, and recreational uses of the two creeks: **zero**
- ◆ Combined cost: about **10 million dollars**
- ◆ Combined electrical output, assuming 5 percent down time: **8.02 million kWh per year**

To put this in perspective, all City of Ithaca operations combined use about 7.9 million kWh annually.

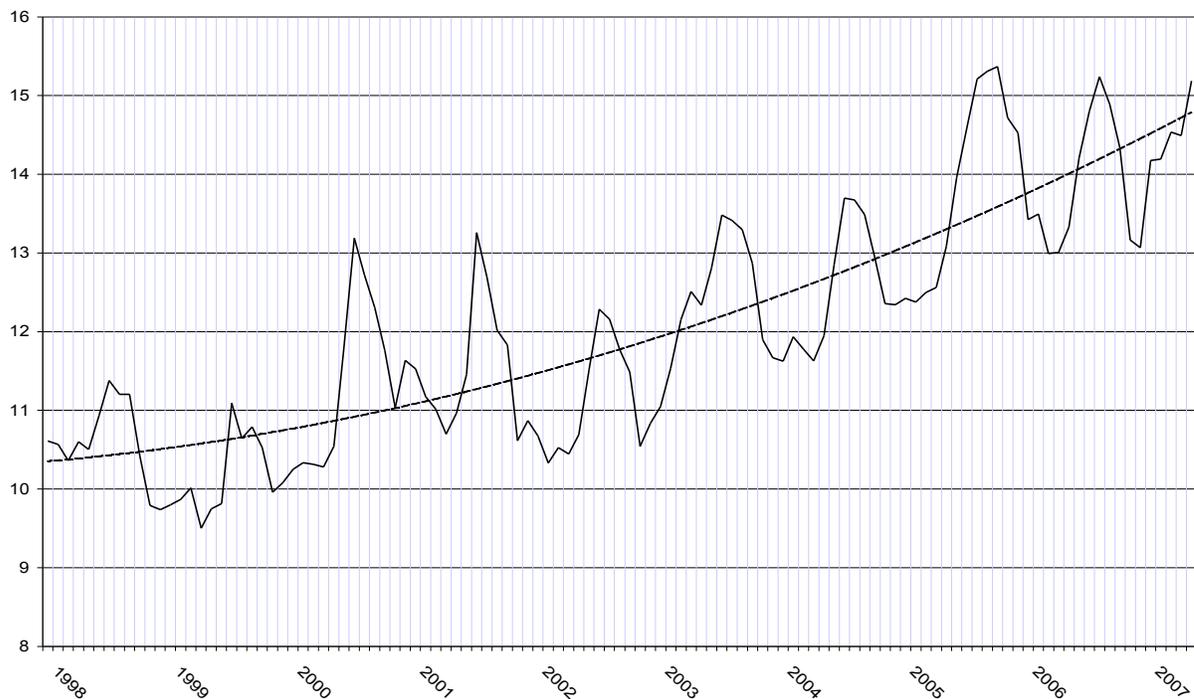
- ◆ Payback for the project as a whole, assuming that the cost of electricity does not increase: **13 years**

This is an extremely conservative estimate considering that the cost of electricity certainly will increase.

- ◆ Continuing gross income to the City, assuming that the cost of electricity does not increase: **\$802,000 per year**

Again, this is an extremely conservative estimate. Over the last 10 years, the average retail price of electricity (all sectors) in New York has increased over 4 percent a year.

Price for New York electricity (cents per kWh), all sectors, Jan 1998 – May 2007 (EIA), with “best fit” curve (second-order polynomial)



If we were able to keep the rate of increase to four percent (which itself looks like an optimistic assumption), by 2020 the electricity produced by an integrated City hydropower project would be

returning about \$1.2 million a year to the City budget. Extending the best-fit polynomial (the dotted line in the graph) puts electricity at 32 cents per kWh by 2020, roughly double the average today; extrapolating from our current 10 cents (assumed), that would put our rate at about 20 cents and therefore make the output of the hydro plants worth about \$1.6 million annually at that point. A reasonable estimate of the eventual and continuing return to the City (before the cost of maintenance) is probably somewhere between those two figures.

Given the increase in electricity prices we can expect to see over the coming decades, it's clear that continuing to throw away the energy contained in the water flowing through City creeks would be fiscally irresponsible. As the Energy Policy Committee of the City of Ithaca Local Action Plan for greenhouse gas reduction, however, our official concern is with the consequences for GHG reduction of switching some 8 million kWh a year from coal burned at Milliken to clean hydropower. And in this respect, the case for development of our available hydropower potential is inescapable. Replacing coal-generated electricity with local hydropower would decrease the City's production of CO₂ by about 7,700 metric tons a year. This is about three and a half times the total CO₂ reduction (2,180 tons annually) that the City hopes to achieve under the entire Local Action Plan by 2020.

The hydropower development of Fall Creek and Six Mile Creek dwarfs any other measure or combination of measures the City could undertake to reduce the carbon footprint of City operations. If we're serious about reducing GHG emissions, we cannot escape the necessity to pursue development of this vital civic resource, as difficult as the bureaucratic aspects of proceeding at this point might be.

Recommendations

The Committee recommends that the City begin a two-stage program for hydropower development.

Stage one: Assign the City Department of Public Works, assisted by such outside consultation as may be necessary, to establish the following key items of planning information:

- ◆ The current cost of the projects originally planned in the 1980s, taking into account deterioration of existing facilities and increased costs of construction
- ◆ Best case, worst case, and average case estimated annual electrical output of Fall Creek and Six Mile Creek power plants given estimates of future rainfall patterns as affected by regional climate change
- ◆ Estimated income stream and payback for hydropower development given best case, worst case, and average case estimated increases in electricity costs
- ◆ The process by which the City could request permission from the State to develop Fall Creek (which may or may not require the State to rescind its designation as a State Recreational River)

Stage two: Act on the basis of the DPW findings to develop the hydropower potential of Fall Creek and Six Mile Creek in a way that maximizes the City's energy independence and minimizes its carbon footprint to the greatest extent possible while maintaining the beauty, wildlife, and enjoyability of these major civic resources.