



Town of Caroline

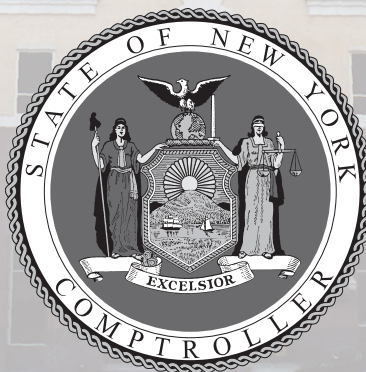
Renewable Energy

Report of Examination

Period Covered:

January 1, 2010 — September 18, 2013

2013M-325



Thomas P. DiNapoli

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State of New York Office of the State Comptroller

Division of Local Government and School Accountability

January 2014

Dear Town Officials:

A top priority of the Office of the State Comptroller is to help local government officials manage government resources efficiently and effectively and, by so doing, provide accountability for tax dollars spent to support government operations. The Comptroller oversees the fiscal affairs of local governments statewide, as well as compliance with relevant statutes and observance of good business practices. This fiscal oversight is accomplished, in part, through our audits, which identify opportunities for improving operations and Town Board governance. Audits also can identify strategies to reduce costs and to strengthen controls intended to safeguard local government assets.

Following is a report of our audit of the Town of Caroline, entitled Renewable Energy. This audit was conducted pursuant to Article V, Section 1 of the State Constitution and the State Comptroller's authority as set forth in Article 3 of the General Municipal Law.

This audit's results and recommendations are resources for local government officials to use in effectively managing operations and in meeting the expectations of their constituents. If you have questions about this report, please feel free to contact the local regional office for your county, as listed at the end of this report.

Respectfully submitted,

*Office of the State Comptroller
Division of Local Government
and School Accountability*

Introduction

Background

The Town of Caroline (Town) is located in Tompkins County, covers an area of about 55 square miles and serves approximately 3,200 residents. The Town is governed by the Town Board (Board), which comprises the Town Supervisor (Supervisor) and four elected Board members. The Board is responsible for the general management and control of the Town's financial affairs. The Supervisor, who serves as the chief executive officer and the chief financial officer, is responsible, along with other administrative staff, for the day-to-day management of the Town under the direction of the Board.

The Town provides various services to its residents, including maintenance and improvement of Town roads, snow removal and general government support. These services are financed mainly by real property taxes, departmental income and State aid. The Town's 2013 budgeted appropriations for all funds are approximately \$1.7 million.

In 2004, Board members donated all or a portion of their income to provide a portion of the municipality's energy needs by wind power.¹ Shortly afterwards, Town residents became more involved in assisting the Town in becoming independent of fossil fuels. In 2006, a group of public officials and Town residents formed Energy Independent Caroline (EIC) which, later in 2006, was officially designated as a Town Advisory Committee by the Board. In 2009, the Town started construction of the new Town hall that would be near-carbon-neutral, equipped with photovoltaic solar panels, geothermal heating and cooling, solar tubes for day lighting, and positioned to increase contact with the sun and block cold air. The building and its energy producing/saving components were finalized at the beginning of 2010.²

Objective

The objective of our audit was to examine the Town's energy usage for Town facilities. Our audit addressed the following related question:

- Have Town officials reduced the amount of energy purchased for use in Town facilities?

¹ Deregulation of energy companies allows energy purchasers to choose where their energy comes from. For 2005, 2006 and 2007, all municipal electric needs were supplied by wind power. After that, it was a combination of wind and landfill methane power.

² Source: <http://www.townofcaroline.org/wp-content/uploads/2011/10/Caroline-Case-Study.pdf>

**Scope and
Methodology**

We examined energy usage at the Town of Caroline for the period January 1, 2010 through September 18, 2013.

We conducted our audit in accordance with generally accepted government auditing standards (GAGAS). More information on such standards and the methodology used in performing this audit is included in Appendix C of this report.

**Comments of
Local Officials**

The results of our audit have been discussed with Town officials and their comments, which appear in Appendix A, have been considered in preparing this report. Town officials generally agreed with our report.

Renewable Energy

The Board should seek to provide services to Town residents in the most cost-effective manner. The cost of energy purchased for use in Town facilities can be reduced by implementing renewable energy technologies and building position and design to increase contact with the sun and block cold air. These efforts will not only reduce expenditures, but also reduce the impact on the environment by reducing greenhouse gas emissions. According to the Environmental Protection Agency (EPA), the most common renewable energy technologies include solar (photovoltaic, solar thermal), wind, biogas (e.g., landfill gas/wastewater treatment digester gas), geothermal, biomass, low-impact hydroelectricity and emerging technologies - wave and tidal power.³

In 2005, the Board authorized the Town to begin purchasing all of the Town's electricity from wind-powered sources. In response to requests and suggestions from residents to be more energy independent and environmentally responsible, in 2009, the Board also authorized the construction of a new town hall taking advantage of renewable energy technologies and an energy efficient position and design. The new town hall building project included the following cost-saving measures, which are illustrated in Appendix B:

- Solar panels installed on the south-facing side of the building. The total cost of the solar panels, including installation, was \$97,903. To offset this cost, the Town received a grant from the New York State Energy Research and Development Authority (NYSERDA) for \$63,000 and donations from Town residents totaling \$6,000, which reduced the impact on taxpayers by \$69,000, or 70 percent of the total cost of the solar panels.
- A geothermal heat pump system installed to maintain the building temperature, instead of a traditional heating and air condition system. A geothermal heat pump is a central heating and/or cooling system that pumps heat to or from the ground. It uses the earth as a heat source (in the winter) or a heat sink (in the summer). This design takes advantage of the moderate temperatures in the ground to boost efficiency and reduce the operational costs of heating and cooling systems. Costs to purchase and install the geothermal system totaled \$29,800, but the Town received a grant from NYSERDA for \$2,300 to offset this cost.

³ <http://www.epa.gov/statelocalclimate/local/topics/renewable.html#one>

- A Town hall that was purposely positioned facing south with no windows or doors on the north side. The Supervisor told us this was purposely done to increase building contact with the sun and block cold air coming in from the north.
- Sun tubes installed on the roof of the Town hall to channel light from outside to illuminate the building's interior. Six sun tubes greatly reduce energy consumption by artificial lighting.

By incorporating renewable energy technologies and efficient building placement and design, the Town Board has reduced the amount of energy purchased and the greenhouse gas emissions for Town facilities. Since April 2010, the Board has generated 48,584 kilowatt-hours (kWh), of which 22,202 kWh were utilized by the Town, resulting in savings of \$2,500, or a 36 percent reduction in energy purchased. The remaining 26,382 kWh (48,584 minus 22,202) were sold back to the energy provider, resulting in additional savings of \$3,000.⁴ The Board also has reduced carbon dioxide emissions by 76,000 pounds, which is equivalent to annual greenhouse gas emissions from seven passenger vehicles, or carbon dioxide emissions from the electricity use of five homes for one year.⁵

⁴ The kWh sold back to the energy provider were credited to the Town's account. The total savings of \$5,500 was calculated based on an average price per kWh the Town had paid from 2010 to 2013 (approximately \$0.11 per kWh).

⁵ To determine the reduction of greenhouse gas emissions, we took the gross amount of energy generated from the solar panels (48,584 kWh) and used the EPA calculator for emission savings on September 18, 2013: <http://epa.gov/cleanenergy/energy-resources/calculator.html>

APPENDIX A

RESPONSE FROM LOCAL OFFICIALS

The local officials' response to this audit can be found on the following page.



TOWN OF CAROLINE
P O Box 136
Slaterville Springs, NY 14881

Don Barber, Supervisor
(607) 539-3395

January 13, 2014

NYS Office of State Comptroller, Chief Examiner
Division of Local Government and School Accountability
NYS Office of the State Comptroller
44 Hawley Street, Room 1702
Binghamton, NY 13901-4417

Re: Town of Caroline Renewable Energy 2013M-325

I have read this document and discussed it with senior examiners.
I concur with these findings. And the technical detail is covered in a very concise
and understandable manner.

Thank You

Sincerely,

Don Barber
Caroline Town Supervisor


APPENDIX B

ENERGY EFFICIENT TECHNOLOGIES

Solar Panels on the South-Facing Side of the Building



Geothermal Heat Pump Specifications



Geothermal Heating & Cooling Caroline Town Office Building

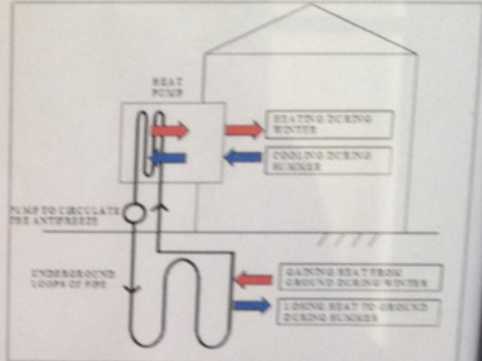

Using The Constant Temperature Of The Earth To Heat And Cool

6 feet underground, the earth temperature is approximately 50 degrees year-round. A geothermal system concentrates the energy in the earth with a compressor to create higher temperatures for heating. The system can cool the building, moving heat back to the earth.

Three loops of pipe buried underground carry an anti-freeze and water solution that transfers heat to and from the geothermal furnace.

At the Town Office, the geothermal loops are in the water table. This provides excellent heat transfer plus the water carries new heat energy constantly, increasing performance.

Since the earth is the main source of energy, the system is very efficient. For each unit of energy used to run the system, we get more than 4 units of heat - that's over **400% efficient**.



In the spring and fall we don't need as much heat as the middle of winter. The system starts operating in first-stage and if more heating is needed switches to second stage. Matching the needs of the building this way increases comfort and efficiency. It does the same in cooling mode.

Since the refrigerant system was installed in ideal conditions in a factory and is protected from the weather, it is expected to operate years longer than a standard furnace/air conditioner with much less maintenance, saving taxpayer money.

A heat recovery ventilator and high-efficiency media filter provide clean, fresh air through the same ductwork used for heating and cooling.

North Side of Building with Sun Tubes on the Roof



Building Interior with Sun Tube Lighting



APPENDIX C

AUDIT METHODOLOGY AND STANDARDS

The overall objective of our audit was to determine if Town officials reduced the amount of energy purchased for use in Town facilities for the period January 1, 2010 through September 18, 2013. To accomplish our objective and to obtain appropriate audit evidence, we performed the following steps:

- We interviewed local officials to gain an understanding of the reason and decision to implement energy savings ideas.
- We determined the total cost savings by using solar panels versus purchasing energy from the utility company.
- We determined the amount of carbon dioxide avoided and its equivalents using the EPA's resource calculator.
- We determined the net cost of the solar panels and the benefits of solar panels, sun tubes, geothermal energy, building direction and wind energy.

We conducted this performance audit in accordance with generally accepted government auditing standards (GAGAS). Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

APPENDIX D

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