

March 23, 2009

Jack Ruderman
Director, Sustainable Energy Division
Public Utilities Commission
21 S. Fruit Street, Suite 10
Concord, NH 03301-2429

RE: **Greenhouse Gas Emissions Reduction Fund
Proposal to Reduce Greenhouse Gas Emissions in New Hampshire**

Dear Mr. Ruderman:

The City of Rochester, New Hampshire hereby submits this proposal for grant funding under the above referenced program.

1.1 Program Title

Rochester, New Hampshire Municipal Wastewater Treatment Facility
Replacement of Two Aeration Blowers

1.2 Program Type

This is a category 5 type project: Energy efficiency related industrial process and control systems.

1.3 Program Summary

The City of Rochester, NH owns and operates an extended aeration type municipal wastewater treatment facility (WWTF). The treatment process utilizes high volume, low pressure, compressed atmospheric air to provide oxygen to support aeration system. The current process is comprised of two aeration basin trains, which can operate in parallel. Only one train is required for operation, and the second train sits idle.

The current aeration system utilizes four (4) 200 h.p. positive displacement type rotary lobe blowers. Each blower has a capacity of 4,246 standard cubic feet per minute (scfm). Two (2) of the blowers are constant speed with soft starts, and two (2) are variable speed with variable frequency drives. One blower on variable frequency drive is normally operated at an output of 4,000 scfm.

To reduce the energy demand at the WWTF, the City proposes to replace the one (1) constant speed blowers with one (1) single stage centrifugal type blower manufactured by Turblex Inc., a Siemens Company. Single stage centrifugal blowers are more efficient than rotary lobe type blowers and do not require variable frequency drives to vary output. The remaining three (3) blowers will remain in place.

1.4 Low Income Residential Customer Qualification.

While not directly affecting low income customers, increasing the efficiency of the WWTF operations can result in reduced user fees for all users.

1.5 Identification of Applicant Organization

Applicant:

The City of Rochester WWTF

Physical Address:

175 Pickering Road
Gonic, New Hampshire 03839

Mailing Address:

45 Old Dover Road
Rochester, New Hampshire 03867

The City of Rochester is incorporated in the State of New Hampshire, and the WWTF is wholly owned by the City of Rochester.

Contact:

David Green
Chief Plant Operator
175 Pickering Road
Gonic, NH 03839

Tel (603) 332-8950

Email: david.green@rochesternh.net

1.6 Identification of Subcontractors and Partners

The City of Rochester has selected Turblex Inc., A Siemens Company, to supply the blowers. Subcontractors to Siemens will be Brown and Caldwell and Apex Construction.

1.7 Authorized Negotiator(s)

David Green
Chief Plant Operator
175 Pickering Road
Gonic, NH 03839

Tel (603) 332-8950

Email: david.green@rochesternh.net

1.8 Projected Energy Savings

The proposed project will reduce energy consumption at the WWTF by approximately 36%, as follows

System Output (scfm)	Existing PD Blower Energy Use (MWH/yr)	Projected Centrifugal Blower Energy Use (MWH/yr)	Projected Energy Savings (MWH/yr)
4,000	1,307	835	472

1.9 Projected Greenhouse Gas Emissions Reductions

Based on a carbon dioxide (CO₂) emission factor of 1,087 lbs/MWH for electrically powered equipment, and a projected savings of 472 megawatt-hours per year, it is estimated that the project will reduce CO₂ emissions by 513,000 lbs per year, or 5,100 tons over the projected 20 year life of the project.

1.10 Length of Program

The standard design life for municipal projects of this type is 20 years. Assuming installation is complete by December 2009, the blower will continue in operation through December 2029.

1.11 Total Program Costs

The total project cost is estimated to be \$394,000. This cost includes \$218,600 for the blowers, \$130,400 for installation and \$45,000 for engineering.

1.12 GHGER Funds Requested

The City of Rochester is requesting 100% of the project cost to be funded through the GHGER Fund. If this percentage of funding is not available, the City would evaluate their ability to finance the project, based on a specific level of funding made available through the GHGER Fund.

2) Executive Summary

The City of Rochester WWTF utilizes positive displacement rotary lobe blowers to provide oxygen, in the form of compressed atmospheric air, to the secondary treatment process. This type of equipment is not as efficient as centrifugal type blowers. Therefore, to improve efficiency, the City has elected to replace the rotary lobe blowers with Turbplex centrifugal blowers.

Positive displacement rotary lobe blowers range from 45% efficiency at 40% capacity to 60% efficiency at 100% capacity. A Turbplex blower, with the proposed dual point control system, will range from 80% efficiency at 40% capacity to 85% efficiency at 100% capacity.

At the time the WWTF upgrade was constructed in 1999, these types of blowers were not readily available in the United States in this size, and therefore were not considered for the upgrade. Since that time, the smaller Turbplex centrifugal blowers have become more prevalent in the United States and are now available for this size blower.

The Turblex blowers operate at a constant speed, but can change air delivery volume by automatically changing the pitch in the air delivery vanes based on air demand, as required by the dissolved oxygen sensing system. As the air volume required is reduced, the energy required to supply the air is also reduced. This relationship is nearly linear. At 100% capacity, the Turblex blower will consume approximately 95 kW, and at 60% capacity, will consume approximately 66 kW.

With the replacement of the existing blowers, the City would reduce its CO₂ emissions by an estimated 513,000 lbs per year through electrical savings.

3) Proposed Work Scope and Schedule

The work involves selection of the Turblex blower, which is complete, to meet the demands of the WWTF, the design of the replacement blower, and the installation of the replacement blower.

The design effort will include minor piping modifications, control system modifications, minimum structural support changes, minor electrical modification, startup, and commissioning of the new equipment.

The installation will include the removal of one existing constant speed positive displacement blower from the blower room in the basement of the mechanical building. This will include removal of the electric motor, blower, and inlet and outlet silencers. It has been confirmed by the proposed installation contractor that the blower and motor can be removed through the access hatch between the basement and first floor. The intake and discharge silencers will need to be scrapped and removed in pieces.

The new Turblex blower will be installed in the same location as the positive displacement blower. The Turblex blower will be installed in four major components:

1. Blower, gear motor and frame,
2. Oil system,
3. Control system, and
4. Silencers

The proposed installation contractor has determined that the proposed blower and related components can be installed in the basement through the access hatch between the basement and first floor.

The existing motor starter, currently used for the constant speed blower will be re-used, as will the inlet air filter. All other components, including the control system, will be provided new with the Turblex blower.

Upon approval of the project, the design will require approximately four (4) weeks. The blower will be shipped to the project sites within 24 weeks of design approval. It is

estimated that construction will require approximately four (4) weeks, and that startup and commissioning will require an additional four (4) weeks. The total project time frame is 36 weeks, or nine (9) months.

4) Project Benefits

4.1 Based on a CO₂ emissions of 1,087 lbs/MWH, the project is projected to reduce greenhouse gas emissions by 513,000 lbs per year. Please refer to GHG Reduction, Attachment 1.

4.2 The project will reduce operating costs at the WWTF by \$45,200 per year. Please refer to the Cost Effective Analysis table provided in Attachment 2.

4.3 The project will reduce the overall electrical load required. The current blower installation cannot match air demand with blower output due to limitations of the equipment associated with VFD harmonics. Since Turblex blowers do not require VFDs, harmonics will not be an issue, and greater peak demand load shaving will be recognized.

4.4 The WWTF blower market can be transformed by this project. While there are 340 Turblex blower installations in the U.S., and 21 in New England, there are no Turblex blower installations in New Hampshire. The Turblex blower is unique in its design, but has been in the market for over 25 years. The application of Turblex blowers to other larger WWTFs in New Hampshire which are currently utilizing positive displacement blowers or less efficient multiple stage centrifugal blowers could potentially reduce greenhouse gas emissions.

4.5 Please refer to question No. 4.4.

4.6 Economic development will be promoted on a small scale through the utilization of local engineering and construction firms to design and install the blowers. The blower impeller and gear box are manufactured in Europe. However, most of the remaining components are manufactured and assembled in the U.S. It is estimated that 2.5 full time engineers will be employed for approximately 30 to 45 days and that 4 construction workers will be employed for 30 to 45 days.

4.7 This project will promote energy cost savings through use of more efficient equipment.

4.8 Proven cost savings may result in other NH WWTF's utilizing the proposed equipment which may result in additional saving.

4.9 A WWTF can be the single highest energy user in any given town/city. Operation of the aeration system of a WWTF is typically the highest energy use at the WWTF. Proven savings with this project could result in greenhouse gas reduction, when applied to other WWTFs in NH.

5) Measurement and Verification

The energy use of the positive displacement blower has been calculated based on a constant output volume of 4,000 scfm and a constant pressure of 7.0 psig. In addition, air temperature, relative humidity, motor efficiency, blower efficient, and drive system efficiency (including the belt drive and the VFD) have also been accounted for. The energy savings with the Turblex blower has been calculated based on these same parameters. In reality, additional savings above and beyond that estimated herein will be realized since the Turblex blower output will be matched to the oxygen demand of the system. This is currently not done, and the blowers are operated at a near constant 4,000 scfm output.

If GHGER grant funds are made available, the City will install kW monitoring devices on the existing PD blowers to confirm the calculated energy use, if desired by the PUC. Once the Turblex blowers are installed, energy use will be confirmed by the same energy monitoring system as utilized for the PD blowers, if desired by the PUC.

6) Budget

Turblex has quoted the City of Rochester a total cost of \$218,600 for the blower system, shipped to the WWTF. Additional costs will include design and installation costs. An engineering allowance of \$45,000 includes the design of the new blower layout, review of shop drawings, and resident project representation during construction. A construction allowance of \$130,400 includes rigging, setting of the new blower, removal of the old blower, wiring and instrumentation and all other work necessary for a complete system.

Please refer to the Requested, Minimum and Maximum Grant Request tables, Attachment 3.

7) Applicant Qualifications (one page)

The work will be undertaken wholly by Turblex, a Siemens Company. Siemens will work with local engineering consultant Brown and Caldwell and Apex Construction.

Brown and Caldwell, with offices nationwide and in Portsmouth, New Hampshire, specialize in the design of WWTFs and their components. The firm has designed more than 100 large scale WWTFs utilizing similar equipment as that proposed herein. Mark Allenwood, P.E. will lead the design for Brown and Caldwell. Apex Construction, with its office in Rochester, New Hampshire will perform the installation work. Apex construction specializes in the construction of WWTFs and components. Please refer to resumes, Attachment 4.

8) Additional Information

None applicable.

9) Letters of Interest or Commitment (as attachments)

Please refer to Attachment 5, Letter of Interest, from Turblex.

Thank you for your consideration for the grant request.

Sincerely
CITY OF ROCHESTER

John Scruton
City Manager

Attachment 1

GHG Reduction Table

Attachment 2

Cost Effective Analysis Table

Attachment 3

Requested, Minimum and Maximum Grant Request Tables

Attachment 4
Resumes for:

Mark Allenwood, P.E. Brown and Caldwell
Apex Construction, Inc.

Attachment 5
Letter of Interest from Turblex