

JOURNAL OF

**NEW HAMPSHIRE  
WATER WORKS  
ASSOCIATION**



*The Newington Tank, a 1.5 MG tank constructed in 1957 at the site of the Newington Booster Pump Station—Construction Field Day 2019.*



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**Journal of  
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<b>Town</b>	<b>System</b>	<b>Name</b>
Alton	Alton Water Works	Courtney Mitchell
Andover	Andover Water Works	Todd Cartier
Antrim	Antrim Water Works	Matthew Miller
Ashland	Ashland Water Works	Russell Cross
Bartlett	Bartlett Village Precinct	Scott Hayes
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Bath	Bath Village Water Works	Timothy Bemis
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Berlin	Berlin Water Works	Craig Carrigan
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Bow	Bow Municipal Water System	Eric Burkett
Brentwood	Rockingham County Home	Tom Schulte
Bristol	Bristol Water Works	Jeffrey Chartier
Campton	Campton Village Precinct	Peter Vaillancourt
Campton	Waterville Estates Village District	Corey Smith
Canaan	Canaan Water Department	John Coffey
Carroll	Carroll Water Works	Scott Sonia
Carroll	Rosebrook Water System	David Candeias
Charlestown	Charlestown Water Works	Dave Duquette
Claremont	Claremont Water Works	Robert Lauricella
Colebrook	Colebrook Water Works	Brian Sullivan
Concord	Concord Water Treatment Plant	Marco Philippon
Contoocook	Contoocook Water Precinct	Charles Damour
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Conway	N. Conway Water District	Jason Gagnon
Derry	Derry Water Works	Thomas Carrier
Dover	Dover Water Works	John Storer
Durham	UNH/Durham Water Works	George Thomas
Enfield	Enfield Village Fire Precinct	James Taylor
Epping	Epping Water Works	Jim Pouilot
Epsom	Epsom Village District	Joseph Damour

<b>Town</b>	<b>System</b>	<b>Name</b>
Errol	Errol Water Works	Pierre Rousseau
Exeter	Exeter Water Works	Paul Roy
Farmington	Farmington Water Department	Charles Tiffany
Fitzwilliam	Fitzwilliam Village Water District	Joseph Damour
Francestown	Francestown Village Water	Dennis Orsi
Franconia	Franconia Water Works	Justin Benes
Franklin	Franklin Water Works	Brian Sullivan
Freedom	Freedom Water Precinct	Francis Lyons
Georges Mills	Sunapee Water Works	Dave Bailey
Gilford	Dockham Shores Estates	Justin Benes
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Greenville	Greenville Water Works	Dave Brennan
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Jackson	Jackson Water Works Company	Scott Hayes
Jaffrey	Jaffrey Water Works	Andrew Baranowski
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Lancaster	Lancaster Water Works	Timmy Bilodeau
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<b>Town</b>	<b>System</b>	<b>Name</b>
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Sunapee	Sunapee Water Works	Dave Bailey
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Tamworth	Tamworth Water Works	Justin Benes
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Walpole	N. Walpole Village District	Robert McGuiirk
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Waterville Valley	Waterville Valley Water	Robert Burhoe, Jr.
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Wolfeboro	Wolfeboro Water & Sewer	Janine Gillum
Woodstock	Pennichuck Water Service	Bernie Rousseau

# Supplying Power to a New Water Storage Facility in Hooksett, NH

## When Utility Power is not an Option

Bruce W. Lewis, P.E.

Lewis Engineering, PLLC – Litchfield, NH

*A recent observation relative to a familiar and well recognized term “water works facilities design” is that part of the opportunity from time to time often includes the need to be able to provide reasonable solutions to specific areas of difficulty that arise within a current project design.*

### Introduction

For the past number of years, the Hooksett Village Water Precinct, HVWP, and Superintendent Michael Heidorn have been working diligently to bring a new water storage facility with a connecting water transmission main to the west side of their system. The new water storage facility is located on Precinct property within the existing Pike crushed stone quarry located on the west side of the F.E. Everett Turnpike in Hooksett. The water storage tank is a new 1 million gallon (MG) tank installed by Statewide Aquastore, Inc. This is a bolted lap-joint design, glass fused to steel tank with a self-supporting geodesic dome roof. A new 12” diameter water transmission main was installed easterly from the tank site, directionally bored under the Turnpike, and connected into HVWP’s existing distribution system located on Pinnacle Road.

The site includes a new utility control building adjacent to the tank. During the design process, it was discovered that although the quarry has electricity from the utility company, there was no practical way to have power extended to the

tank site. A concept was investigated to bring utility power from the east side of the Turnpike. This was found to be cost prohibitive.

### Utility Building Design

The utility building was designed and installed as a 16' x 20' x 8' reinforced concrete building that uses a form made of vinyl. This provides finished



interior and exterior walls.

*Utility building with solar panel and standby LPG  
Genset*

The forms have 2" foam insulation incorporated into them. Vinyl clapboard siding, an insulated metal door, and vents are part of the building. The Arlen Company of New Ipswich, NH provided and installed this NUFORM Building Technologies Systems building with appurtenances. These include; a common wood framed, insulated, roof with Advantech roof sheathing, ice and water shield, and 25-year fiberglass shingles. The building has a reinforced concrete frost wall, with a 6" – 4,000 psi concrete floor slab with Fiber-Mesh 300 additive, and a floor drain.

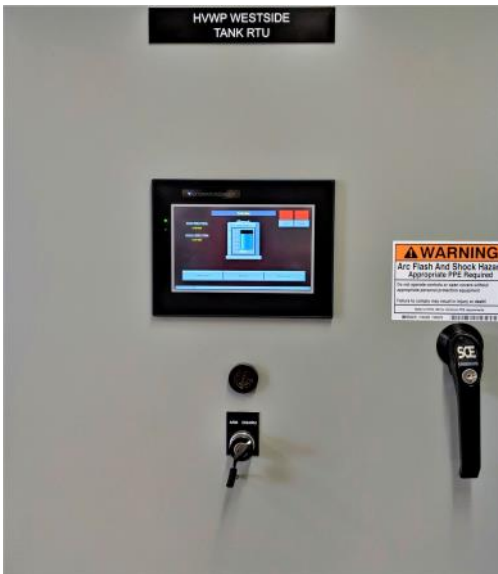
The building is heated by a LPG convection furnace with a pilot light and thermostat. The furnace requires no electricity. The ceiling lights and outside light are 120 VAC, LED fixtures. 120 VAC GFCI outlets are also provided inside the building.

The building uses an automatic solar power system for its primary day to day low (12VDC) power requirements, and a

13 KW Cummings, 240/120 V, LPG, outdoor weather-enclosed, generator set which provides 120 VAC power, as needed. The generator has been set up to allow the Precinct to start it using either a switch at the generator or using a local manual switch located inside the station. The generator also starts automatically if voltage provided by the solar powered system's batteries is too low, or if the generator battery's voltage is too low. A "Generator-Running" Alarm is communicated to the HVWP through the Remote Terminal Unit (RTU). Automatic start and alarms are all handled through PLC programming.

### Solar Power and Controls

The heart of the solution for the requisite power required at this site was resolved by working closely with Electrical Installations, Inc., of Moultonboro, NH, which was the Precinct's control integration company for this job along with the general site contractor Pichette Brothers, their generator supplier, and electrical contractor. It is noted that all equipment supplied and installed at the station is non-proprietary, "off the shelf", which provides for more efficient and reliable parts replacement and upgrades over time.



*RTU control panel with OIT touchscreen*

A summary of the major RTU equipment and the solar power equipment with integrated control items, is as follows:

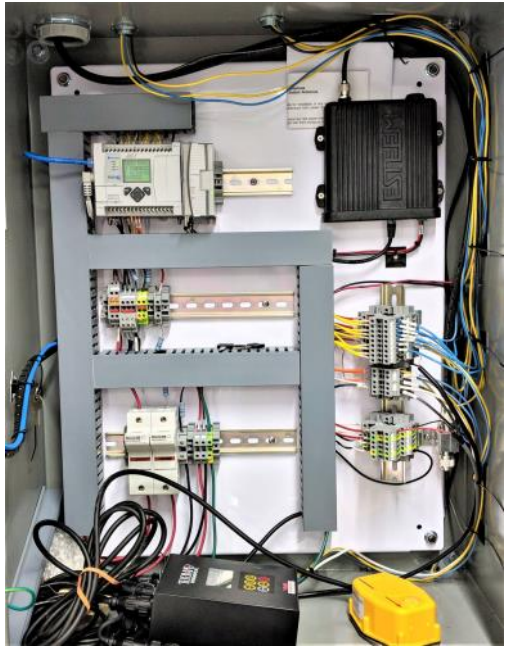
### Remote Terminal Unit Equipment

1. The RTU communicates with the Precinct using two 220mHz radio transceivers, with antennas, cabling and surge arrestors and grounding.
2. RTU instrumentation includes and Allen-Bradley 1400 Micrologic PLC. An operator interface unit (OIT) color touchscreen is mounted on the outside of the door for the NEMA 12 control panel. The panel is UL508A listed. The PLC provides communication capability through the radio transceivers, with operator adjustable set points, and alarm points, for the Water Storage Tank, Solar Controls, and Standby Generator set.
3. The tank water level is generated using a pressure transmitter with a 4-20 milliamps signal into the PLC which may be monitored at the building, or via a remote link to the Precinct. There is also a manual pressure gauge (feet) located within the utility building.



*Tank level gauge and tank level transmitter*





*RTU Panel open with geo-phone (yellow)*

4. A low building temperature switch, flood alarm contact, smoke-carbon monoxide-heat detector, and intrusion door contact closures are also provided.
5. All equipment was supplied and installed with start-up and operator training by Electrical Installations, Inc.
6. As a note of interest, the control panel also includes a very sensitive automatic geo-phone with a monitoring and alarm system. This is because blasting is still a part of the quarry's operation. This monitors seismic activity and will automatically provide alarm notification to the Precinct, if required.

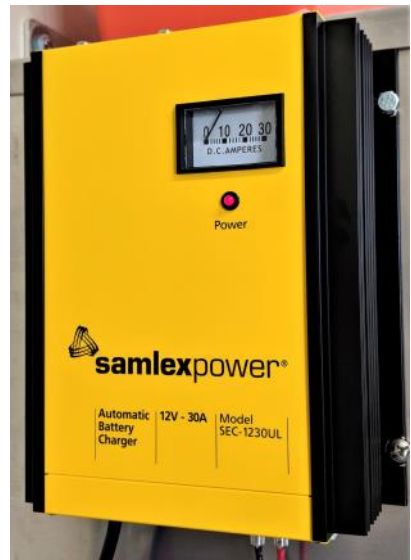
### **Solar Equipment and Related Automatic Controls**

1. A solar panel array is mounted on its own support panel outside the building. This consists of 3 – solar modules wired in parallel that provides a total of 360 watts at 12 VDC, for 330 amp-hours (AH). These are all solid state, fused, and have integral surge protection.



*Solar panel controls and batteries*

2. DC power comes into the building and feeds into a SunSaver Duo charge controller. The huge advantage of this controller is that the power is also able to be used to charge the 3 - 12 VDC batteries wired in parallel that provide power to the RTU equipment, and at the same time, also separately provide power to the standby generator's 12 VDC battery. This is very important as the Generator with its control panel has to maintain a charge in its battery without utility power. Using the Solar option to charge the generator's battery avoids the automatic starting of the generator to charge its own battery, which, as a long-term cost savings, avoids starts that consume propane.
3. There is a second SunSaver charge controller to monitor and provide power into the RTU cabinet's PLC and Radio Transceiver.
4. Finally, there is a 120 VAC Simplex Battery Charger that is operational



*Battery charger*

whenever the generator is running. This will normally be an automatic generator start that is initiated if battery voltages, which are monitored through the PLC, drop too low. The charger is powered by one of the 120 VAC circuits inside the building. Voltage is also available with the generator running for lights and outlets. The charger is then used to charge the RTU batteries, and the generator's battery. A generator start may be initiated as noted above, to low 12 VDC system voltage at either battery location; during an operator's visit to the station, and can also be remotely started at HVWP's discretion from their Water System Monitoring PC.

## **Conclusion**

It is important for water works operators to realize that most issues associated with the operation and control of water works systems have reasonable solutions that are available. In the case of the new water storage tank site for the HVWP, not having utility power available was able to be resolved with an "off-the-grid" approach. The Precinct by working closely and interactively together with the overall key contractors, and designers for the design, installation, and integration of a solar power VDC power solution provided a good solution. This included a standby generator component that is available for on-site 120 VAC power to the building, as may be required when working at the site, or in the event of low battery power conditions.

***Bruce W. Lewis, P.E.** is the Manager of Lewis Engineering, PLLC. The company offices are located in Litchfield, NH. Over the course of his career, and for more than 40 years, Mr. Lewis has been affiliated with a broad range of water works engineering, operation, and construction projects. He may be contacted by e-mail at [lewis.h2o@comcast.net](mailto:lewis.h2o@comcast.net), or by telephone at 603-886-4985.*

# Construction Field Day

August 7, 2019



*Construction Field Day attendees prepare to load the bus and start the tour from the Portsmouth Water Treatment Plant in Madbury, NH.*

During Construction Field Day 2019, attendees visited a number of sites in the Portsmouth area. The day started with an overview of the Portsmouth water system at the Portsmouth Water Treatment Plant in Madbury. The group then loaded the bus and was off.

Emery & Garrett Groundwater Investigations, a Division of GZA (EGGI), provided a presentation regarding its work at the Collins Well site. Due to PFAS contamination in one of the wells supplying Pease Tradeport, EGGI was hired to do a groundwater contaminant threats assessment; groundwater recharge availability review; mapping of both bedrock and surficial geology; bedrock fracture/lineament analyses; and selection of favorable Groundwater Development Areas.

The tour also included a visit to the Grafton Road Water Treatment Plant which is undergoing renovations and upgrades to treat PFAS contamination. Weston & Sampson engineers provided a presentation on the treatment system they designed with GAC filters, backwash waste recycle tanks, a below grade pipe gallery, and an electrical room.



*Presentation  
at the Grafton  
Road Water  
Treatment  
Plant.*

The final stop of the day was the Newington Booster Pump Station where Stantec engineers reviewed their design to upgrade the 1957 station. The new design includes a trihalomethane (THM) aeration system.

**Thank you** to Brian Goetz and all the folks at the City of Portsmouth for welcoming us to their city and sharing their challenging projects!



*Inside the  
Newington  
Booster Pump  
Station.*

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**Deadlines:** Journal Vol. I - April 1 | Journal Vol. II - September 1

Winter Newsletter - February 15 | Summer Newsletter - June 15 | Fall Newsletter - November 15

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