A workover is necessary to convert the NYSEG CAES wells from brine production to compressed air energy storage. The steps to complete the conversion basically are: perform preliminary MIT, remove the nitrogen blanket, remove the 5-1/2" and 8-5/8" hanging casings, conduct baseline cased-hole logs, perform an open hole sonar survey, run in an 5-1/2" dewatering casing and install a gas wellhead.

1. Rig up wireline unit and run a density survey with CCL from the casing shoe to approx. 500 ft inside the casing. Zero wireline measurements at bradenhead flange.
2. Open nitrogen valve on leaching wellhead B section and track nitrogen / brine interface. Bleed nitrogen to a depth of approximately 2,380 ft and perform mechanical integrity test.
3. Depressure the nitrogen blanket into the frac atmosphere. Depressurization rate should not exceed 2.5 psi/minute. The operation will take approximately 9 hours.
4. Depressure the freshwater (pressure in 5-1/2" x 8-5/4" annulus) from the well.
5. Remove the wellhead piping. Install 1 (2 total) 4" ANSI 900 flange with 2" threaded connection on both the brine and fresh water side of the wellhead. Install 1 (2 total) 4" ANSI 900 blind flange on the opposite side of each.
6. Install rig anchors per the workover rig requirements.
7. Rig up workover rig. The 5-1/2" casing weight is approximately 46,000 pounds in air (2,630 ft of 5-1/2", 17.5 lb/ft casing. Rig up rig pump and tank.
8. Remove the upper section of the wellhead along with the wellhead brine B section. Nipple up the 13-5/8"" well control equipment.
9. Back out lock down screws located in the top flange of the wellhead C section.
10. Pick up a spear dressed for 5-1/2", 15.5 lb/ft casing and run in the hole. Set the spear. Pull 5-1/2" hanger/joint (approx. 46,000 lbs in air. Lay down spear and grapple.
11. Rig up the casing crew and tools to pull the 5-1/2" hanging casing.
12. Remove approx. 2,300 feet of 5-1/2", 17.5 lb/ft, J-55, BT&C casing. Place casing on location for on-site cleaning, inspection, and re-doping threaded connections. Transport the rejected 5-1/2" casing off-site for repairs. Transport remainder of 5-1/2" casing to designated lay down area for future use.
13. Nipple down the 13-5/8" well control equipment. Remove the wellhead C section. Nipple up the well control equipment (annular preventer).
14. Back out lock down screws located in the top flange of the wellhead B section..
15. Pick up a spear dressed for 8-5/8", 32.0 lb/ft casing and run in the hole. Set the spear. Pull casing hanger joint (approx. 80,000 lbs in air) and set in slips in the annular preventor. Lay down spear and grapple.
16. Rig up the casing crew and tools to pull the 8-5/8" hanging casing.

17. Remove approx. 2,530 ft of 8-5/8", BT&C casing. Place casing on location for on-site cleaning, inspection, and re-doping threaded connections. Transport the rejected 8-5/8" casing off-site for repairs. Transport remainder of 8-5/8" casing to designated lay down area for future use.
18. Rig up wireline unit and run a density survey with CCL from the casing shoe to approx. 500 ft inside the casing.

    Note: Have wireline company zero at bradenhead flange (BHF).
19. Rig up wireline unit and run a sonar survey. Rig down wireline unit.

    Note: Have sonar company zero at bradenhead flange (BHF). Tie in the sonar tool with the casing shoe and CCL Take sonar survey at 5 ft stations through the entire cavern interval and in the borehole to the cemented casing shoe. Tilt sonar tool and take thorough up shots of the cavern roof.
20. Rig up second wireline unit and run casing and cement evaluation logs (i.e. multi-finger caliper log (Profile Caliper), Vertilog and Segmented Bond Log) on the cemented casing. Rig down wireline unit.
21. Nipple down the 13-5/8" well control equipment.
22. Remove the wellhead B section. Remove the DSA w/pack-off. Nipple up new DSA w/pack-off. Nipple up wellhead B section air annulus casing spool. Activate and test the P-seals (2000-psi for 15 minutes) in the DSA.
23. Nipple up the 21-1/4" well control equipment (2M annular preventer).
24. Rig up a casing crew service and welders and run approx. 2.407' of type 316 stainless steel l PE casing.
25. Land casing liner hanger joint in wellhead B section hanger bowl.
26. Install wellhead C section DSA and master valve. (Ensure that Master Valve Remains Open). Install wellhead D Section.
27. Run in approx. 2,407 ft of 5-1/2", 17.5 lb/ft, J-55, LT&C casing. The 5-1/2" LT&C casing connections will be made up to the optimum torque. Externally pressure test (1,600 psi) the 5-1/2" casing and hold for 2 minutes as they are run in.

    Note: A digital recorder **WILL** be run in conjunction with the external tester.
28. Land casing using a casing spear dressed for 5-1/2", 17.5 lb/ft casing. Screw in lock down screws located in the top flange of the wellhead D section.
29. Nipple down the 21-1/4" well control equipment and install the wellhead D section w/pack-off. Activate and test P-seals (1600-psi for 15 minutes).
30. Install the upper portion of the wellhead F section.
31. Rig down and move out the workover rig.
32. Rig up wireline unit and nitrogen injection unit.

33. Perform nitrogen mechanical integrity test of the well. Warning, nitrogen must be injected simultaneously down the stainless steel nitrogen annulus and inside the stainless steel liner to prevent liner collapse.

34. Rig down MIT equipment, pipe wellhead, and begin dewatering operations.

This program presents the proposed steps for snubbing the 5-1/2" dewatering string out the NYSEG CAES caverns after dewatering and installing the final production wellhead. The caverns are located in Schuyler County New York near the town of Watkins Glen.

These steps are intended as a guideline for the snubbing operation. Actual conditions encountered during the work will dictate the appropriate steps to be taken. The basic steps involved in the operations are:

- Remove dewatering piping from wellhead and the logging valve assembly above the F section valve.
- Install two bridge plugs near the bottom of the casing.
- Rig up and snub 5-1/2" casing out.
- Close master valve and remove all wellhead components above the master valve.
- Install the final wellhead components.

SNUBBING PROGAM

1. Snubbing supervisor will inspect the well to verify snubbing operations setup.
2. Install rig anchors, anchor blocks or beam for anchoring snubbing unit (if necessary).
3. Move in and rig up a wireline unit with pressure control equipment and run a gauge ring for running 5-1/2" bridge plugs. If gauge ring will not pass through the cavern interval run caliper log to determine casing deformation and clearances. If casing deformation is excessive the program will have to be revised to address these conditions.
4. Run in hole with wireline bridge plug and set within bottom 10' of last 5-1/2" joint.
5. Bleed off tubing pressure to verify plug is holding.
6. Fill 5-1/2" casing with water then run in and set second bridge plug approximately 5' above the first plug.
7. Move in rig assist snubbing unit, BOP stack, hydraulic cranes, and miscellaneous snubbing equipment.
8. Nipple up BOP stack on top of F section valve and rig up cranes and rig assist snubbing unit.
9. Test BOP's to 2000 psig.
10. Release hold down pins from wellhead D section.
11. Make up a spear for 5-1/2", 17.5 lb/ft casing and spear hanger joint.
12. Lift casing string up to work basket and lay down hanger joint.
13. Snub out 5-1/2" casing.
14. Close 20" Master valve. Verify that valve is holding.
15. Nipple down BOP's and snubbing unit.

16. Nipple down wellhead D section and install production wellhead.
17. Rig down and move out snubbing unit and associated equipment.
18. Turn over wellpad to NYSEG for well piping.

OPEN HOLE LOGGING REQUIREMENT

Surface Hole:

17 1/2" Pilot Hole

1. Resistivity Log w/ SP and Gamma Ray
2. Compensated Neutron Log (Porosity)
3. Litho Density Log
4. Full Wave Sonic/Monopole sonic/Dipole Sonic Log.

After Opening Hole

1. Run a 60" (X-Y) Caliper Log. The 60" (X-Y) Caliper Log is to have a volume totalizer.

Production Hole:

17-1/2" Pilot Hole

1. Resistiveity Log w/ SP and Gamma Ray.
2. Compensated Neutron Log (Porosity).
3. Litho Density Log.
4. Full Wave Sonic/Monopole Sonic Dipole Sonic Log

After Opening Up Hole

1. Run a 60" (X-Y) Caliper Log. The 60" (X-Y) Caliper Log is to have a volume totalizer.

PB Energy Storage Services, Inc
ENGINEERING – CONSTRUCTION – OPERATIONS – MAINTENANCE

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www.pbenergy.com

December 13, 2011

James W. Rettberg, PE
Project Manager
NYSEG

Dear Mr. Rettberg;

Re: Dewatering Plan for NYSEG CAES Caverns

Introduction

Task 4.4.2.3 of the Technical Specification for the Cavern Development Consultant is to prepare a Preliminary Design for Cavern Dewatering System.

Cavern Description

NYSEG proposes to develop 3 storage caverns, each with a dewatered volume of approximately 970,000 bbl. The caverns are to be solution mined on property owned by Inergy near the U.S. Salt Refinery near Watkins Glen, NY. The caverns are designed to have a roof depth of approximately 2,402 ft below ground surface and a floor depth of approximately 2,527 ft. Brine string placement for dewatering is proposed to be at 2,525 ft.

Dewatering Plan

At the completion of solution mining a workover will take place to install the stainless steel cavern air injection string to a depth just below the cavern roof and a 5-1/2" dewatering string. Following the workover the cavern will undergo mechanical integrity testing at a nominal pressure of 1,500 psi (surface pressure). The mechanical integrity test will require that nitrogen be pumped down the inside and outside of the stainless steel air injection tubing to prevent collapse.

Following the mechanical integrity testing the cavern must be dewatered at a rate of approximately 350 gpm to Inergy. The wellhead configuration (provided in the Cavern Development Plan) will have a 20" isolation valve in place with a 5-1/2" tubing hanger positioned above the valve. The 20" valve must remain open until the dewatering string is snubbed from the cavern at the end of dewatering.

Due to the low dewatering rate portable diesel driven compressors will be used during the nominal 80 day dewatering period. A sketch of the proposed compressor arrangement for dewatering is provided in Figure 1. The maximum air pressure anticipated at the surface to dewater the cavern is 1,295 psia and the maximum air flow rate anticipated is approximately

3,750 scfm. A chart showing the surface air pressure and compressor volume flow rate is provided in Figure 2. Since the cavern interval is short (approximately 123 ft) very little dewatering pressure change will occur after the air / brine interface reaches the cavern roof.

As air is injected into the well the air / brine interface will fall as the pressure in the cavern increases and brine will be displaced. Figure 3 shows the interface and dewatered volume plotted change during the dewatering process.

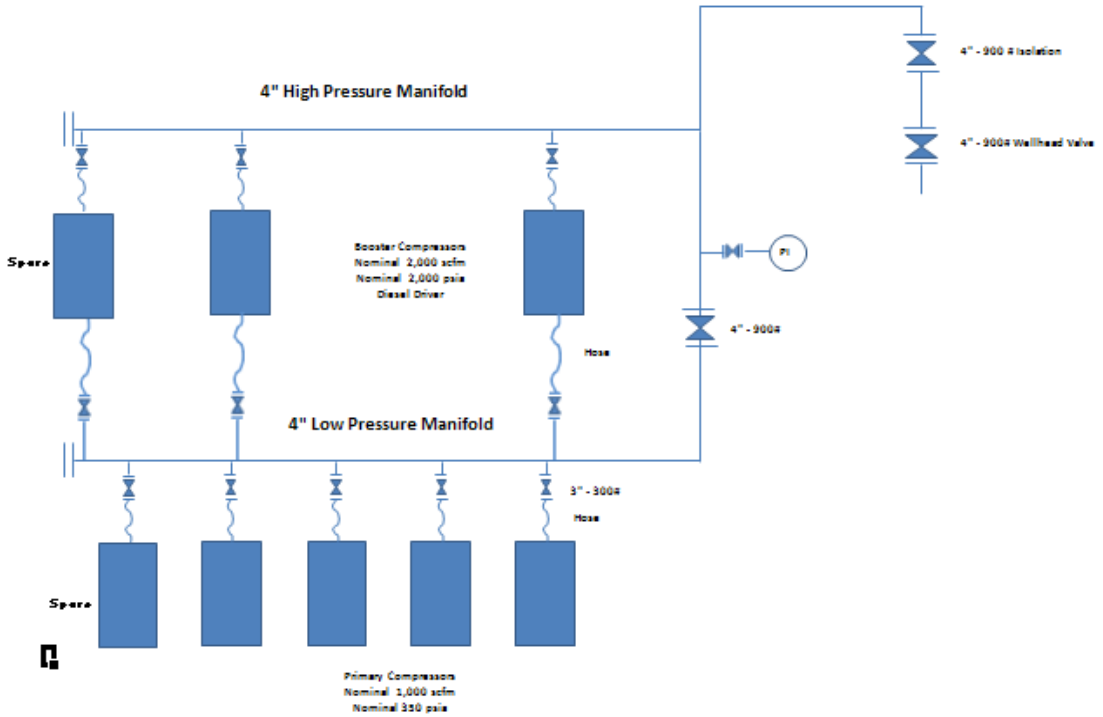
Please do not hesitate to call or email if you have questions or suggestions.

Regards,

James M. McHenry

James M McHenry

Schematic Flow Diagram
Compressed Air Manifold System



NYSEG

NYSEG CAES
Watkins Glen, NY
Figure 1 Dewatering Layout

PB Energy Storage Services, Inc

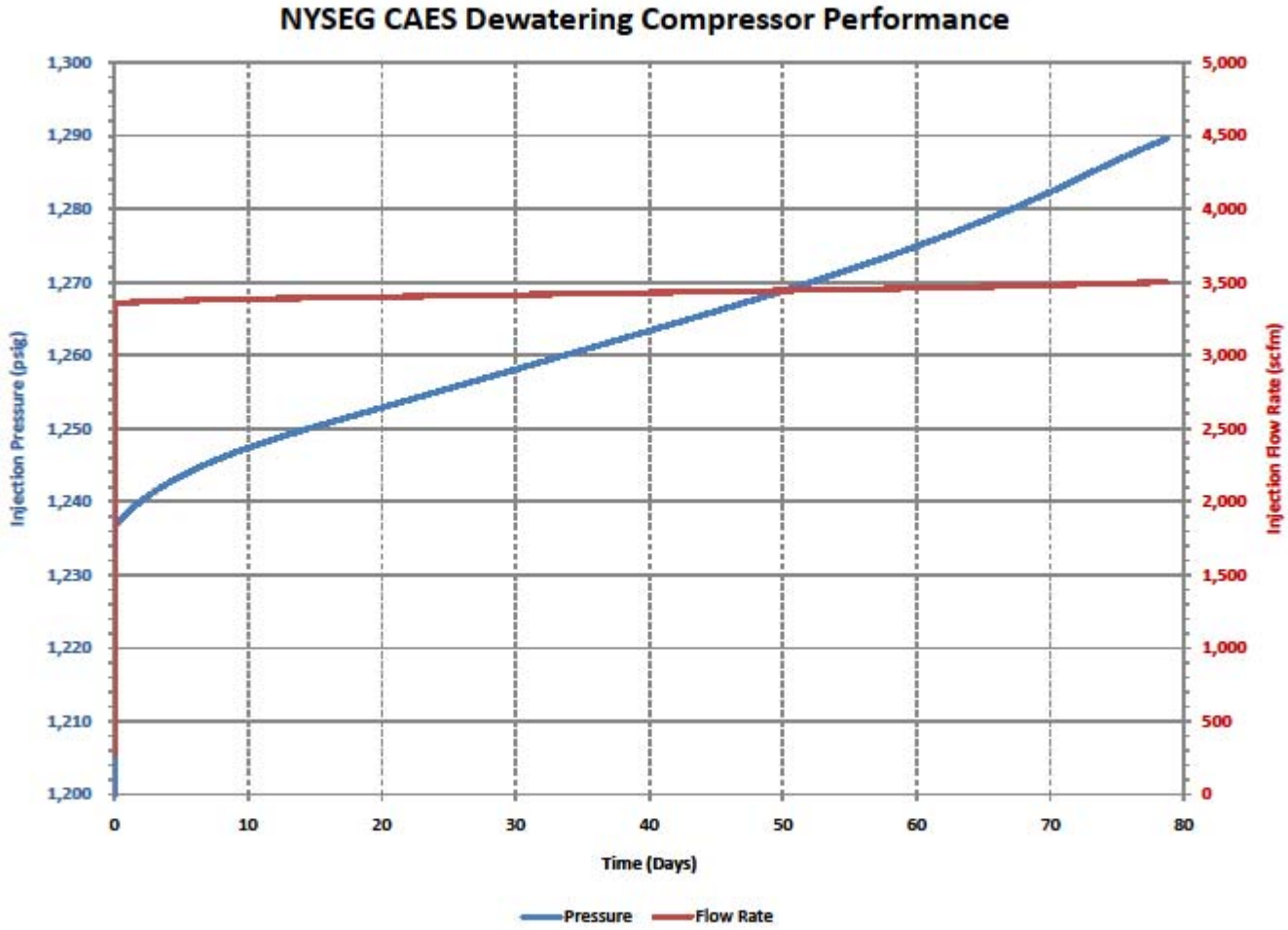


Figure 2 Compressor Performance

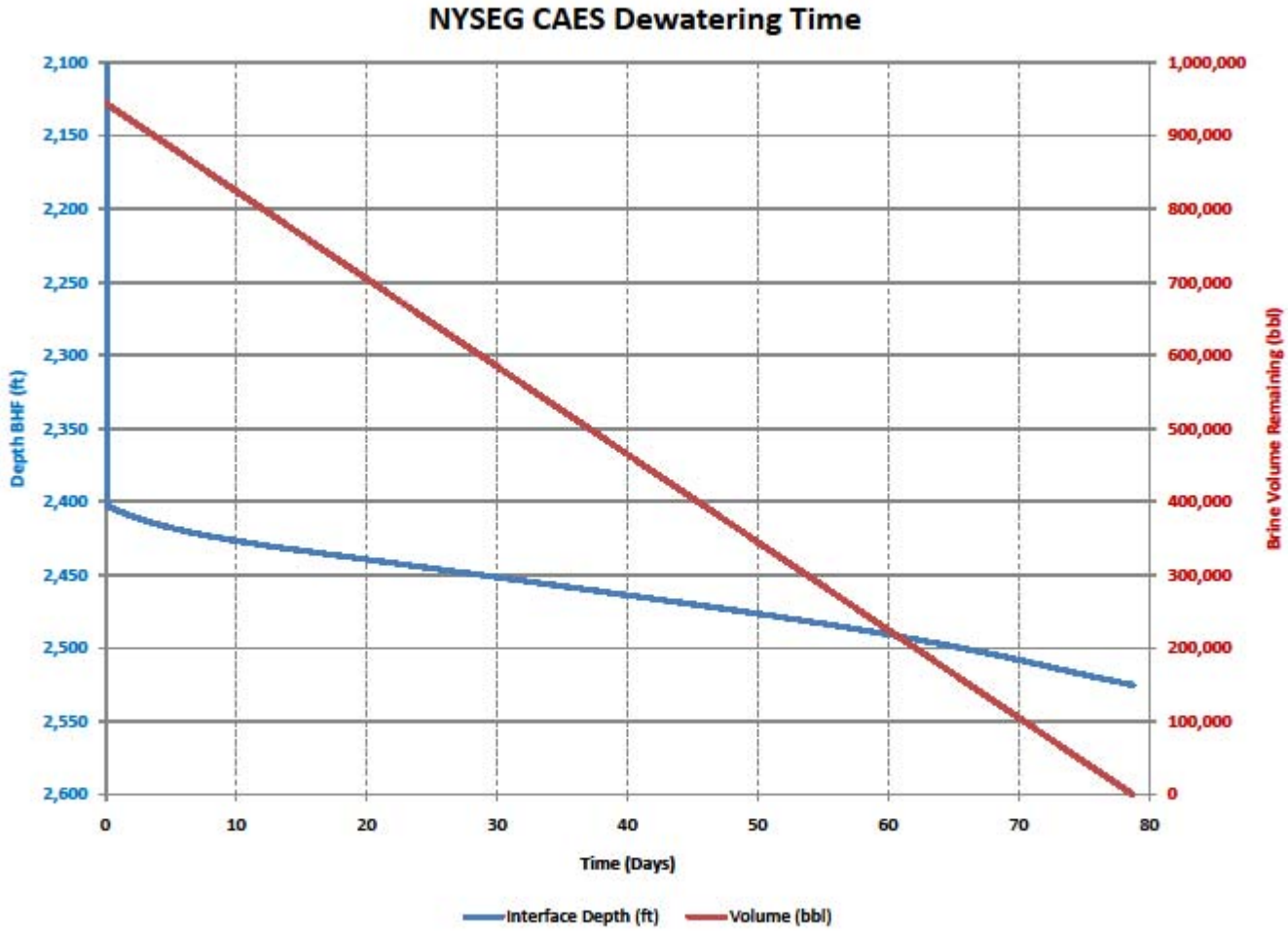


Figure 3 Dewatering Time

CAVERN TESTING PROGRAM

CAES STORAGE CAVERN

Watkins Glen, NY

Prepared for

NYSEG

Binghamton, New York

Prepared by

PB ENERGY STORAGE SERVICES, INC.

Houston, TX

Project No. 50756B

November 2011

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CAVERN TESTING PROGRAM
WATKINS GLEN CAES FACILITY

1.0 INTRODUCTION

This document describes the required cavern integrity testing that must take place before the cavern can be dewatered. Mechanical integrity testing of a storage cavern consists of two distinct parts. The first part of the testing is a nitrogen test of the cavern to determine gross leakage. The second part of the testing is an inspection of the well casing.

Each of the NYSEG CAES caverns will undergo nitrogen mechanical integrity testing twice. The first test will take place after the completion of leaching, but prior to the start of the final configuration workover. This test will be performed to ascertain the integrity of the cavern prior to running the welded stainless steel liner. The test will be performed by bleeding off a portion of the nitrogen blanket and establishing an interface in the borehole below the casing shoe.

After the final configuration workover is completed, the stainless steel liner has been run, and the dewatering wellhead is in place the cavern will undergo its final nitrogen mechanical integrity testing. For this test of the cavern it will be necessary to inject nitrogen simultaneously down the inside of the stainless steel liner and down the annulus to prevent liner collapse.

2.0 NITROGEN/BRINE INTERFACE METHOD

The purpose of performing a mechanical integrity test is to determine if the cavern system has mechanical integrity, and is therefore suitable for storage. The detailed nitrogen/brine interface test procedure will be developed prior to testing. The procedure involves an initial injection of nitrogen into the well to check for wellhead and casing leaks. This initial injection is followed by continued injection of nitrogen into the storage well to a specified test pressure so that the nitrogen interface is below the last cemented casing. The nitrogen interface depth can be affected by pressure and temperature changes caused by temperature equilibration, cavern leaching, and salt creep effects. In order to distinguish between these effects, and nitrogen volume losses caused by leaks, the pressure and temperature changes (as they affect nitrogen volume) must be considered.

The nitrogen (annulus) and brine (tubing) pressure and interface depth are monitored during the test period. Evaluation of the test results involves calculating the volume of nitrogen to the interface at the start of the test and at the end of the test. The difference in calculated volumes over the test period yields an apparent volume change. The integrity of the well can be confirmed if the calculated nitrogen volume change (loss/gains) is within the accuracy limits of the test method. An annual leak rate can be determined by extrapolating (linearly) the calculated change in nitrogen volume during the defined interval of the test period (minimum 24 hours).

2.1 MINIMUM DETECTABLE LEAK RATE

The minimum detectable leak rate (MDLR) is the smallest volume of gas loss that can theoretically be measured considering the accuracy of the interface log and the configuration of the well. The actual accuracy achievable in the field may be slightly less than the MDLR, but is of the same order of magnitude, and therefore the MDLR gives a good indication of the test sensitivity. The MDLR can be calculated using the following relationship:

$$MDLR = \frac{V \bullet r \bullet 365}{T}$$

Where:

MDLR = Minimum Detectable Loss Rate (bbls/year)

V = Unit Volume of Borehole (bbls/ft)

r = Resolution of Interface Detection (ft)

T = Duration of Test (days)

The resolution of the interface detection tool is determined from the logging tool and the depth scale used to record the interface log. The borehole volume versus depth is calculated from the metered volume of nitrogen injected, combined with the corresponding interface location. The wellhead pressure and the nitrogen temperature are also used in the calculations.

2.2 GAS VOLUME CALCULATIONS

In addition to measured quantities, knowledge of the well casing and tubular sizes and the diameter of the wellbore from the casing shoe to the interface (from logs), allows the nitrogen volume to be estimated. The following P-V-T gas equation is used to calculate the volume of nitrogen (at standard temperature and pressure conditions) in the wellbore at the start and at the end of the test:

$$V_{N_2} = N_{SCF} \bullet \sum_{i}^{N} \frac{\left[\left(P_{WB}\right)_i \bullet 144 \bullet \left(V_{WB}\right)_i\right]}{\left[\left(Z_{AVE}\right)_i \bullet R \bullet \left(T_{AVE}\right)_i\right]}$$

Where:

V_{N_2} = Volume of nitrogen measured in the wellbore over a specific depth interval "*i*" (scf)

$\left(P_{WB}\right)_i$ = Average calculated wellbore pressure over a specific depth interval "*i*" (psia)

$\left(V_{WB}\right)_i$ = Volume of wellbore of a specific depth interval "*i*" (ft^3)

NOTE: Determined by wellbore geometry, measured nitrogen volumes, and cavern sonar surveys

$\left(Z_{AVE}\right)_i$ = Gas Compressibility Factor at a specific depth interval[1] "*i*" (dimensionless)

R = Specific Gas Constant $\left[55.16\left(\frac{\left(ft \bullet lb_f\right)}{\left(lbmol \bullet \circ R\right)}\right)\right]$

$\left(T_{AVE}\right)_i$ = Average wellbore temperature over a specific depth interval "*i*" (°R)

$\left(N_{SCF}\right)$ = Gas Conversion for mass to volume at standard pressure and temperature conditions (13.8 SCF_{N2} = 1 lb_{N2})

$i = 1,2,...N$, N = total number of depth intervals

[1]Compressibility Factor (Z) research developed in NOWSCO Technical Manual, NOWSCO Services, 1980

The following equation is used to determine pressure at depth interval "*i*":

$$P_i = P_{i-1}\left[1 + \frac{L}{RZ_iT_i}\right]$$

$i = 1,2,...N$

Where:

P_i = Calculated pressure at a specific depth "*i*" (psia)

P_1 = Measure wellhead pressure (psia)

L = Depth Interval (ft)

Z_i = Gas Compressibility Factor at a specific depth interval "*i*" (dimensionless)

R = Specific Gas Constant $\left[55.16\left(\frac{\left(ft \bullet lb_f\right)}{\left(lbmol \bullet \circ R\right)}\right)\right]$

T_i = Measure wellbore temperature at a specific depth interval "*i*" (°R)

The volume calculation is performed for specific intervals throughout the wellbore from the surface to the interface. The total wellbore volume is determined by summing the specific volume for each regular interval.

The results of the volume and mass calculations (both "pre-test" and "post-test") are tabulated. The difference between the initial and final volume calculation determines the volume change at standard conditions.

It is important to note that the measured volume of nitrogen may not be equal to the calculated volume of nitrogen in the wellbore. The accuracy of the metered nitrogen is based on the accuracy of the turbine and temperature measurement made during nitrogen injection. The calculated test volumes are based on downhole temperature logs, surface pressure recorders, calculated downhole pressures, and borehole dimensions determined by nitrogen strapping

calculations or sonar volumes. All measurements are subject to the accuracy of the instrumentation being used and the well conditions at the time of the measurements.

At average wellbore conditions (at the conclusion of the test), the nitrogen volume change can be stated as:

$$\Delta V_{TEST} = \left(\frac{\left[\left(Z_{AVE} \right) \bullet R \bullet \left(T_{AVE} \right) \bullet \left(\Delta V_{STP} \right) \right]}{\left[\left(P_{WB} \right)_{AVE} \bullet 144 \bullet N_{SCF} \right]} \right)$$

Where:

ΔV_{TEST} = nitrogen volume changes over the test period based on wellbore conditions (ft^3)

$\left(P_{WB} \right)_{AVE}$ = Average wellbore pressure over the test period (psia)

$\left(\Delta V_{STP} \right)$ = Nitrogen volume change (scf), based on standard conditions

$\left(Z_{AVE} \right)$ = Average Gas Compressibility Factor over the test period

R = Specific Gas Constant $\left[55.16 \left(\frac{\left(ft \bullet lb_f \right)}{\left(lbmol \bullet \circ R \right)} \right) \right]$

$\left(T_{AVE} \right)$ = Average wellbore temperature over the test period (°R)

$\left(N_{SCF} \right)$ = Gas Conversion (13.8 SCF_{N2} = 1 lb_{N2})

2.3 CALCULATED LEAK RATE (CLR)

The equation below is used to calculate the annual calculated leak rate (CLR) from the volume change in nitrogen for the specified test period:

$$V_{CLR} = \frac{\left[\left(\Delta V_{TEST} \right) \bullet 24 \left(hours / day \right) \bullet 365 \left(days / year \right) \right]}{T_L}$$

Where:

V_{CLR} = CLR (bbls/year)

ΔV_{TEST} = Nitrogen volume change during the test period (bbls)

T_L = Test Duration (hours)

A positive CLR indicates a calculated loss of nitrogen from the wellbore during the test period. A negative CLR indicates a calculated increase in nitrogen volume during the test period.

The evaluation of the MIT consists of comparing the CLR with the MDLR. The results are expressed in barrels of nitrogen per year. When the CLR is less than the MDLR, no leak has been detected by the test. If the CLR is greater than the MDLR, further investigation is required, as the CLR cannot be explained by the limitations of the test equipment.

3.0 CASING INSPECTION

While the suspended casing is out of the well casing evaluation logs should be run to establish a baseline. The baseline will allow comparisons of casing condition for compliance with future mandated inspection of the cemented casing. A digital Vertilog, a multifinger caliper survey, and a gyroscopic survey should be performed. Due to the size of the well for the first cavern the digital Vertilog will be run of only Caverns 2 and 3.

3.1 DIGITAL VERTILOG

This survey uses a tool that generates an electromagnetic field that permeates the casing walls as it is pulled up through the casing. Defects in the casing wall will cause a leakage in this electromagnetic field or “flux” that can be measured and quantified to determine percentage of metal loss in the body of the pipe.

The Vertilog Service uses magnetic flux leakage measurements to identify and quantify the extent and penetration depth of both internal and external corrosion defects. The combination of an overlapping array of flux leakage (FL) sensors and two discriminator (DIS) sensor arrays

provides full circumferential inspection of the tubing or casing string, allows for differentiating between metal loss (corrosion) and metal gain , and distinguishes between general corrosion and isolated pitting.

Defects in the casing wall as small as 3/8” in diameter can be identified using this technique. Casing sizes from 13-3/8 to 22 in. can be evaluated. Once a baseline is established, the technique can be used to detect corrosion and depth of penetration. The tool provides 360 degree identification and quantification of small, isolated casing defects in real-time or memory mode

3.2 MULTI-FINGER IMAGING CALIPER

This survey uses a multi-finger caliper to measure the ID of the last cemented casing. The multi-finger caliper tool mechanically measures the inside diameter of downhole casing. Two channels of information are recorded at the surface. One recording shows the minimum measured internal radius and the other shows the maximum measured internal radius. When the casing is relatively new, the Multi-Finger Caliper Log reveals the casing's minimum and maximum inside diameter. This information is useful for determining whether there is abnormal casing wear caused by the rubbing of drill pipe on the inside casing wall.

3.3 GYROSCOPIC SURVEY

This survey uses a logging tool with a gyroscopic compass and inclination sensor to measure the well deviation and direction of the deviation every 25 feet from the surface down to the bottom of the last cemented casing. This information is necessary to establish the location of the casing shoe and ultimately the location of the cavern walls in space.

CONSTRUCTION EXECUTION PLAN

CAES STORAGE CAVERN

Watkins Glen, NY

Prepared for

NYSEG

Binghamton, New York

Prepared by

PB ENERGY STORAGE SERVICES, INC.

Houston, TX

Project No. 50756B

November 2011

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CONSTRUCTION EXECUTION PLAN
WATKINS GLEN CAES FACILITY

1.0 INTRODUCTION

NYSEG proposes to develop a compressed energy storage (CAES) project near Watkins Glen, NY which has a rated generating capacity of 180 MW. The storage chamber for the compressed air will consist of three nominal 970,000 barrel caverns developed in the F Salt Unit of the Salina Formation. The storage caverns are planned for development in the interval between 2,402 ft and 2.632 ft below ground surface and will be developed using solution mining methods. The total duration of the drilling and cavern development is estimated to be 7.4 years. The NYSEG CAES cavern development project is unique, and will require a high level of supervision and monitoring.

This construction execution plan describes the strategy to be employed for executing and managing activities required to build 3 storage caverns at the NYSEG Site near Watkins Glen, NY. Elements of this plan include:

- Construction Management
- Construction Schedule
- Construction Task Sequence
- Environmental Safety and Health
- Quality Assurance

2.0 CONSTRUCTION MANAGEMENT

The drilling, completion, cavern development monitoring, and testing required for construction of the NYSEG caverns will require the services of a specialty construction contractor. The Cavern Construction Manager will be responsible for all activities required to drill and complete the wells, solution mine the storage caverns, and prepare the storage caverns for CAES service. The contractor selected will require expertise in drilling and completion of large diameter gas storage wells in salt and the solution mining of storage caverns in salt.

The Construction Manager should be engaged as soon as possible after the decision has been made by NYSEG to proceed with the project. This early engagement will be required to locate, schedule, and place under contract, a drill rig capable of drilling the NYSEG wells. Acquisition of the drilling subcontractor is a critical path item in the cavern construction schedule.

The Construction Manager will be responsible for identifying available drill rigs which are capable of drilling the large diameter holes required by NYSEG and contracting with a drilling subcontractor for drilling all cavern storage wells. Based upon the drill rig capabilities the Construction Manager will provide drilling engineering services to prepare a final drilling program and specifications for major services required during drilling. The Construction Manager will solicit quotations from prequalified subcontractors, issue contracts with the various venders to supply materials and services required for drilling and completing all storage wells, and coordinate all services.

Table 1 is a list of the major specifications for services required for drilling, which the Construction Manager will be required to prepare prior to drilling operations.

Table 1 - Required Major Services For Drilling NYSEG Wells

1. Final Casing Specifications
2. Casing Crew Services Specification
3. Cement Evaluation Logging Specification
4. Cementing Hardware Specification
5. Cementing Services Specification
6. Coring Services Specification
7. Double Jointing Services Specification
8. Drilling Bits Specification
9. Drilling Fluids Services Specification
10. Drilling Rig Services Specification
11. External Casing Testing Services Specification
12. Gyro Survey Services Specification
13. Hole Openers Specification
14. Lift Rings Specification
15. Miscellaneous Rentals Specification
16. Nitrogen Pumping Services Specification
17. Open Hole Logging Services Specification
18. Shock Subs Services Specification
19. Solids Control Equipment Services Specification
20. Solids Handling and Disposal Services Specification
21. Stabilizer Services Specification
22. Under-reamer Services Specification
23. Vertitrak Services Specification

24. Welding Services Specification
25. Wellpad Construction Services Specification

The Construction Manager will provide resident drilling supervision at the wellsite on a 24 hour per day basis during mobilization, drilling, completion, and demobilization. The drilling supervisor will be responsible for coordination of subcontractor activities, daily progress reporting, and wellsite safety. The drilling supervisors used by the Construction Manager shall be thoroughly experienced in the drilling and completion of large diameter gas storage wells in salt.

The Construction Manager will provide workover supervision services required to perform well workovers for the intermediate workovers, the conversion workovers, and during final wellhead installation.

The MIT, planning, execution, data interpretation, and report preparation.

The construction contractor will provide onsite workover supervision during all workovers and wireline operations. Workover supervisors will be thoroughly experienced in well workover and storage well field intervention operations.

Construction supervisor will provide cavern engineering services required to evaluate data collected by Inergy, monitor solution mining progress, evaluate wireline logging results, and perform solution mining modeling and solution mining program adjustments after sonar surveys and open hole logging.

3.0 CONSTRUCTION SCHEDULE

The schedule submitted by PB ESS for cavern development is based upon an assumed start date of 12/06/2013 for wellpad construction. The actual start of drilling is dependent on the availability of a drill rig of adequate capacity to drill Well No. 1 (24” cemented casing). The schedule assumes that the three wells will be drilled sequentially, one immediately following the other, to ensure that the availability of drill rigs will not impact development of Caverns 2 & 3. Due to high demand for drilling rigs in the Marcellus, PB ESS recommends that a firm commitment be made by NYSEG to a drilling subcontractor at the earliest possible date.

Wellhead components and stainless steel liners will require delivery times of approximately one year. Due to uncertainties in delivery and fabrication time these items should be considered long lead items and should be ordered at the earliest possible date. Tubulars should be welded

into 80 foot lengths prior to shipment to the drill site to decrease the rig time required to run the stainless steel liner. The fabrication of the bradenhead flanges should be considered as part of the critical path since they will be required prior to well completion.

The cavern development schedule will require monthly update and tracking once the drill rig mobilizes. Due to the geologic uncertainties associated with drilling of large diameter wells and the solution mining of storage caverns unplanned schedule delays can occur. Schedule variances will be reported to NYSEG on a monthly basis.

4.0 CONSTRUCTION TASK SEQUENCE

The overall construction sequence for building the NYSEG caverns is listed below as Table 2.

Table 2 - Construction Sequence

1. Order wellhead components and long lead stainless steel tubulars.
2. Subcontract drilling rig services.
3. Build drilling access road.
4. Subcontract required major drilling services.
5. Build wellpad.
6. Mobilize drilling rig and drill well.
7. Demobilize drilling rig to next hole or off site if all wells drilled.
8. Install wellpad piping and connect to Inergy piping.
9. Hydrotest wellpad piping.
10. Inject nitrogen blanket.
11. Perform data analysis on weekly basis to estimate cavern development progress.
12. Perform periodic blanket interface checks and adjust nitrogen volume as required.
13. Bleed nitrogen blanket, perform sonar survey, and perform workover to adjust tubing lengths.
14. Inject nitrogen blanket.
15. Leach cavern in reverse.
16. Perform blanket interface surveys as required.
17. Perform casing cuts as required.
18. Perform through pipe sonar surveys after each leaching stage and revise solution mining models as required.
19. At completion of leaching bleed nitrogen back to establish interface in borehole.
20. Perform preliminary MIT.

21. Bleed nitrogen from well and perform conversion workover.
22. Perform mechanical integrity test.
23. Connect temporary compressors and inject air, displacing brine from cavern.
24. Snub dewatering string from well.
25. Install remaining wellhead components
26. Solution mine remaining wells.

5.0 ENVIRONMENTAL SAFETY AND HEALTH

All drilling and construction personnel shall observe and enforce all applicable governmental safety regulations and all safety rules that have been or are established during performance of this agreement

Each subcontractor employee is required to complete Basic Orientation Plus® training, which is developed and administered through the Association of Reciprocal Safety Council's Inc. or an OSHA 10-Hour Construction Industry Outreach training course.

Subcontractor shall provide a Safety Meeting prior to beginning work. Additional "Tailgate Safety Meetings" shall be held on a weekly basis, covering work related safety topics. Subcontractor shall require that all personnel attend meetings and shall provide documentation of this attendance and meeting topics to the Construction Manager

On a daily basis, subcontractors shall develop Job Safety Analysis (JSA) forms for each major work activity. The JSA must list each step for the job, the hazards associated with each step and steps to mitigate each hazard. Any time that the scope of the job changes, the JSA must be revised or a new one must be written.

Subcontractor must notify the Construction Manager, as soon as is reasonably possible, of all injuries that occur during performance of and relative to work performed for NYSEG. A written report of each injury must be submitted to the Construction Manager within 24 hours of the injury.

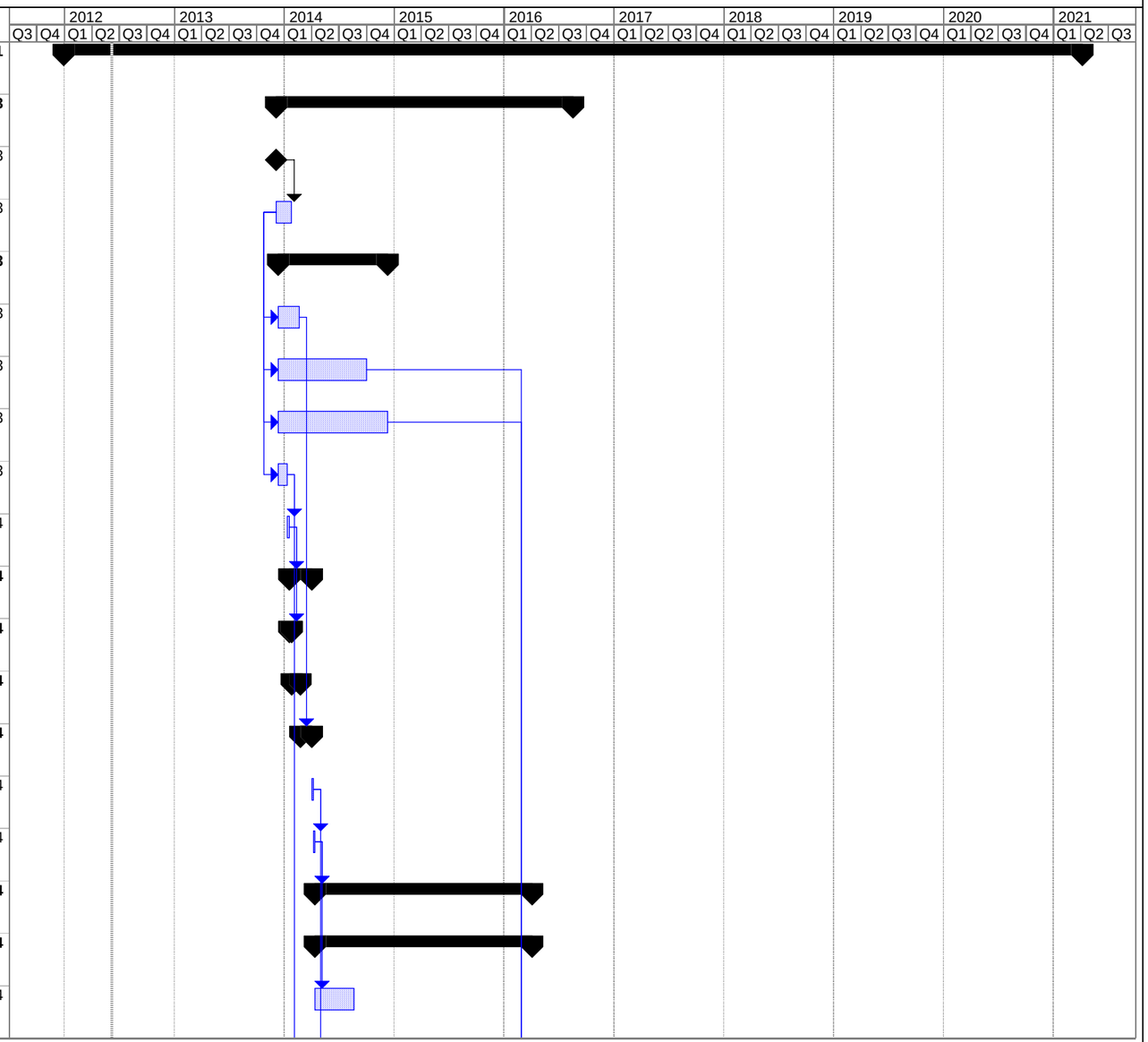
If services to be performed requires subcontractor to bring chemicals or hazardous products onto the job site, subcontractor must post an inventory of and accurate material Safety Data Sheets for such materials at the job site. All materials brought onto the job site must be properly labeled, handled and stored to comply with OSHA Hazard Communication Standard.

6.0 QUALITY ASSURANCE

The Construction Manager shall have in place a quality assurance program that meets the standards set forth in ISO 9000. Subcontractors shall perform the work in a quality manner using qualified, efficient and careful workers; in accordance with NYSEG project management plans, quality plans, drawings, and specification; in compliance with all applicable quality, environmental and safety rules and regulations; in a manner to protect the work and NYSEG's property from damage, and the property and persons or others from injury or loss arising in conjunction with the contract and as not to interfere with operations of others on the premises.

NYSEG
CAES Project Schedule
Watkins Glen, NY

ID	Task Name	Duration	Start
1		**3385.5 days**	**Sat 12/31/11**
2	**NYSEG CAES Project**	**986.5 days**	**Fri 12/6/13**
3	**NTP PHASE 2-PLANT CONSTRUCTION**	0 days	Fri 12/6/13
4	**Engineering and Procurement**	51 days	Fri 12/6/13
5	**Long Lead Procurement**	**364 days**	**Fri 12/13/13**
6	Procure Leaching wellhead (all wells)	10 wks	Fri 12/13/13
7	Procure Production Wellhead (all wells)	42 wks	Fri 12/13/13
8	Procure Stainless Steel Tubulars (all wells)	52 wks	Fri 12/13/13
9	Build Wellpad Location No. 1	30 days	Fri 12/13/13
10	Move in and rig up drilling rig	7 days	Sun 1/12/14
11	**Drilling and complete Cavern Well 1**	**75 days**	**Sun 1/19/14**
12	Conductor Hole	**8 days**	**Sun 1/19/14**
21	Surface Hole	**29 days**	**Mon 1/27/14**
31	Production Hole	**38 days**	**Tue 2/25/14**
41	Rig down	5 days	Fri 4/4/14
42	Connect wellhead piping and Inject Blanket - Well No. 1	5 days	Wed 4/9/14
43	**Develop Cavern No. 1**	**722 days**	**Mon 4/14/14**
44	Solution Mining	**722 days**	**Mon 4/14/14**
45	Sump / Chimney Stage No. 1	130 days	Mon 4/14/14



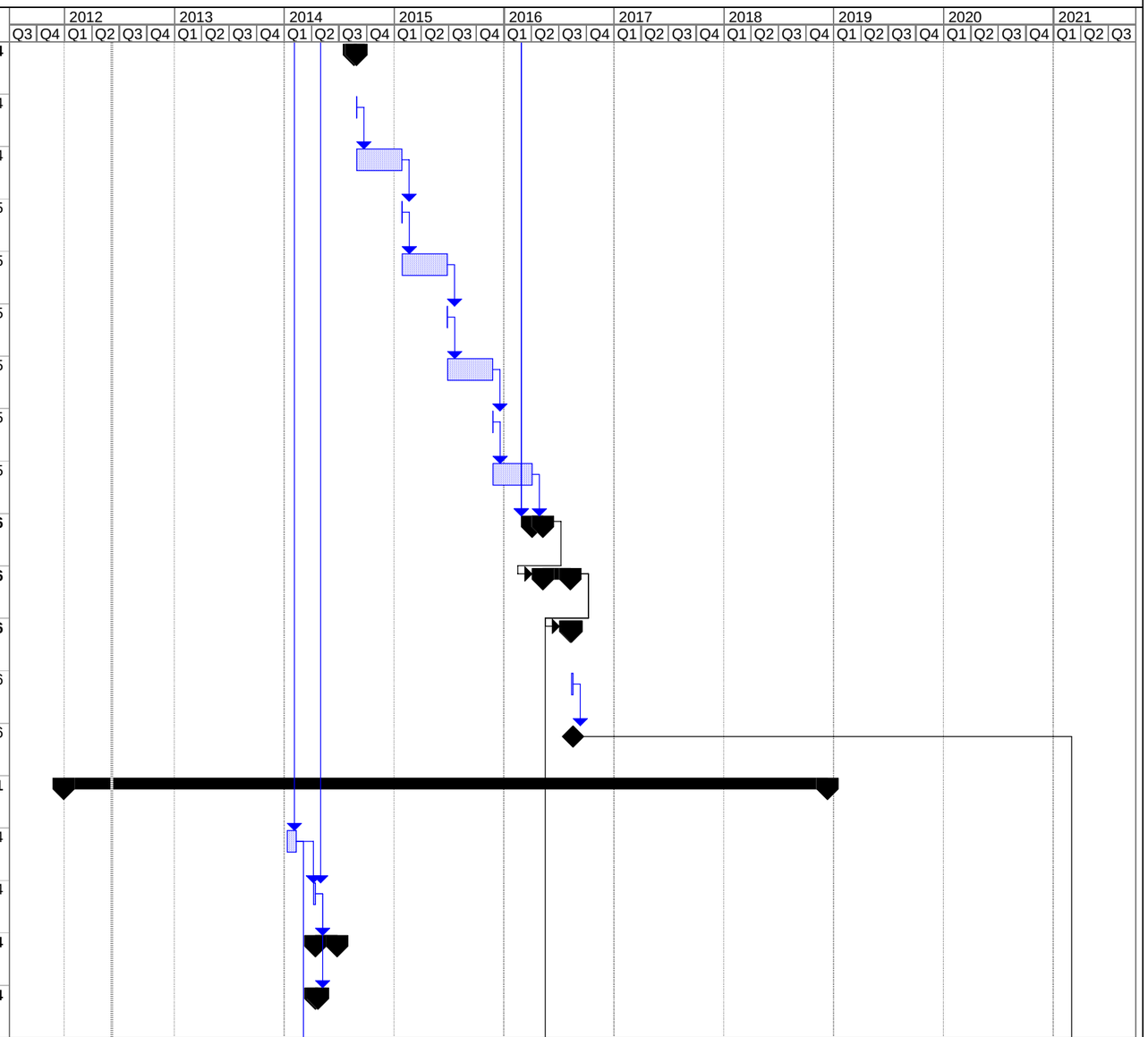
Project: 50756B NYSEG CAES
Date: Tue 6/5/12

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG
CAES Project Schedule
Watkins Glen, NY

ID	Task Name	Duration	Start
46	Intermediate Workover	**8 days**	**Fri 8/22/14**
58	Re-Inject Blanket	1 day	Sat 8/30/14
59	Reverse No. 1	150 days	Sun 8/31/14
60	Through Pipe Sonar and Blanket Move	1 day	Wed 1/28/15
61	Reverse No. 2	150 days	Thu 1/29/15
62	Through Pipe Sonar and Blanket Move	1 day	Sun 6/28/15
63	Reverse No. 3	150 days	Mon 6/29/15
64	Through Pipe Sonar	1 day	Thu 11/26/15
65	Reverse No. 4	130 days	Fri 11/27/15
66	**Perform Final Configuration Workover Cavern No. 1**	**35.5 days**	**Tue 4/5/16**
77	**Dewater Cavern No. 1**	**91 days**	**Tue 5/10/16**
81	**Snub Dewatering String From Cavern No. 1**	**4 days**	**Tue 8/9/16**
88	Install Remaining Wellhead ComponentsConnect CAES Surface Piping	5 days	Sat 8/13/16
89	Begin CAES Operation Cavern No. 1	0 days	Thu 8/18/16
90	**NYSEG - Watkins Glen, NY - CAES Cavern No. 2**	**2539 days**	**Sat 12/31/11**
91	Build Wellpad No. 2	30 days	Sun 1/12/14
92	Move in and rig up drilling rig	7 days	Wed 4/9/14
93	**Drill and complete Cavern Well 2**	**72 days**	**Wed 4/16/14**
94	Conductor Hole	**8 days**	**Wed 4/16/14**



Project: 50756B NYSEG CAES
Date: Tue 6/5/12

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
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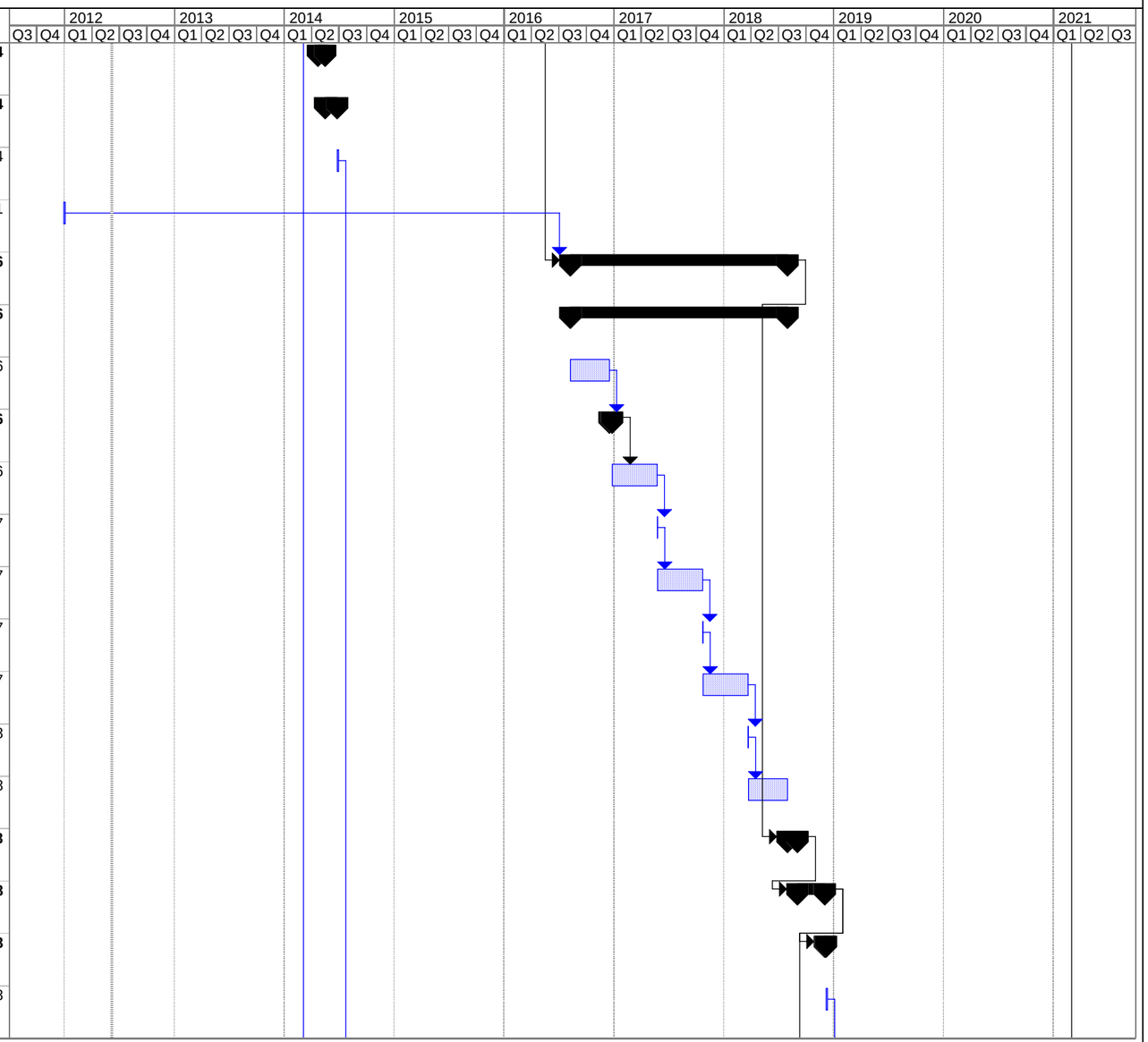
PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG
CAES Project Schedule
Watkins Glen, NY

ID	Task Name	Duration	Start
103	Surface Hole	**24 days**	**Thu 4/24/14**
112	Production Hole	**40 days**	**Sun 5/18/14**
130	Rig down	5 days	Fri 6/27/14
131	Connect wellhead piping and Inject Blanket - Well No. 2	5 days	Sat 12/31/11
132	**Develop Cavern No. 2**	**722 days**	**Tue 8/9/16**
133	Solution Mining	**722 days**	**Tue 8/9/16**
134	Sump / Chimney Stage No. 1	130 days	Tue 8/9/16
135	Perform Intermediate Workover Cavern No. 2	**9 days**	**Sat 12/17/16**
148	Reverse No. 1	150 days	Mon 12/26/16
149	Through Pipe Sonar and Blanket Move	1 day	Thu 5/25/17
150	Reverse No. 2	150 days	Fri 5/26/17
151	Through Pipe Sonar and Blanket Move	1 day	Mon 10/23/17
152	Reverse No. 3	150 days	Tue 10/24/17
153	Through Pipe Sonar	1 day	Fri 3/23/18
154	Reverse No. 4	130 days	Sat 3/24/18
155	**Perform Final Configuration Workover Cavern No. 2**	**33.5 days**	**Wed 8/1/18**
166	**Dewater Cavern No. 2**	**91 days**	**Tue 9/4/18**
170	**Snub Dewatering String From Cavern No. 2**	**4 days**	**Tue 12/4/18**
177	Connect CAES Surface Piping Cavern No. 2	5 days	Sat 12/8/18



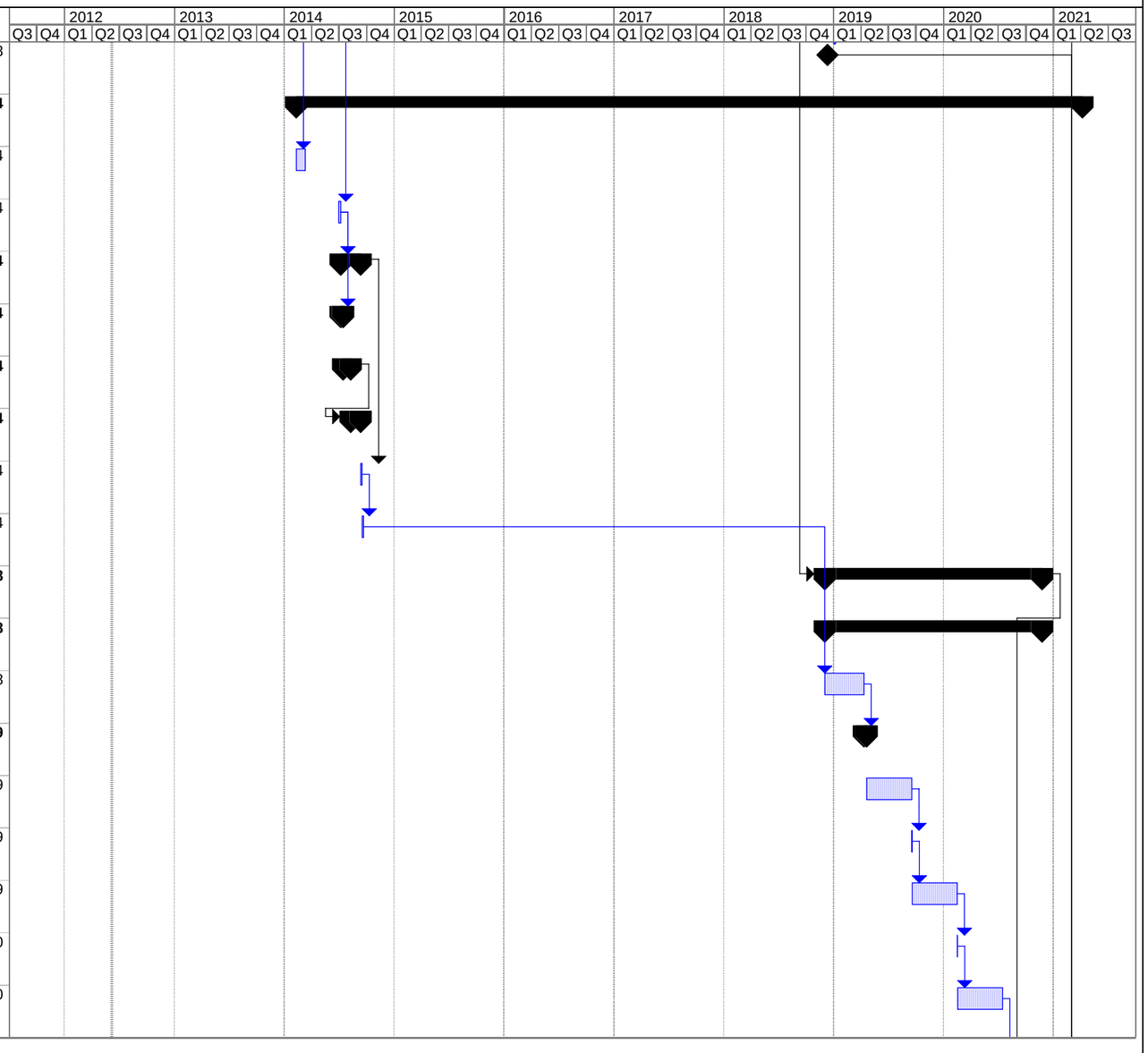
Project: 50756B NYSEG CAES
Date: Tue 6/5/12

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG
CAES Project Schedule
Watkins Glen, NY

ID	Task Name	Duration	Start
178	**Begin CAES Operation Cavern No. 2**	0 days	Thu 12/13/18
179	**NYSEG - Watkins Glen, NY - CAES Cavern No. 3**	**2612.5 days**	**Tue 2/11/14**
180	Build Wellpad No. 3	30 days	Tue 2/11/14
181	Move in and rig up drilling rig	7 days	Wed 7/2/14
182	**Drill and Complete Well No. 3**	**66 days**	**Wed 7/9/14**
183	Conductor Hole	**8 days**	**Wed 7/9/14**
192	Surface Hole	**25 days**	**Thu 7/17/14**
201	Production Hole	**33 days**	**Mon 8/11/14**
212	Rig down	5 days	Sat 9/13/14
213	Connect CAES Surface Piping and Inject Blanket - Cavern No. 3	5 days	Thu 9/18/14
214	**Develop Cavern No. 3**	**722 days**	**Tue 12/4/18**
215	**Solution Mining**	**722 days**	**Tue 12/4/18**
216	Sump / Chimney Stage No. 1	130 days	Tue 12/4/18
217	**Perform Intermediate Workover Cavern No. 3**	**9 days**	**Sat 4/13/19**
230	Reverse No. 1	150 days	Mon 4/22/19
231	Through Pipe Sonar	1 day	Thu 9/19/19
232	Reverse No. 2	150 days	Fri 9/20/19
233	Through Pipe Sonar	1 day	Mon 2/17/20
234	Reverse No. 3	150 days	Tue 2/18/20



Project: 50756B NYSEG CAES
Date: Tue 6/5/12

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
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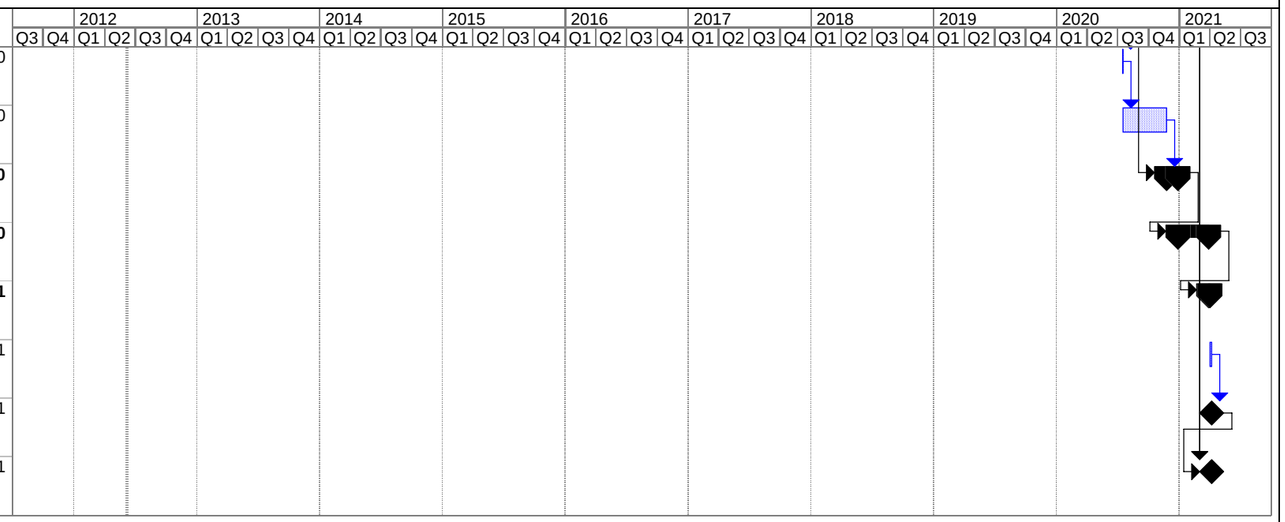
PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG
CAES Project Schedule
Watkins Glen, NY

ID	Task Name	Duration	Start
235	Through Pipe Sonar	1 day	Fri 7/17/20
236	Reverse No. 4	130 days	Sat 7/18/20
237	**Perform Final Configuration Workover Cavern No.3**	**33.5 days**	**Wed 11/25/20**
247	**Dewater Cavern No.3**	**91 days**	**Mon 12/28/20**
251	**Snub Dewatering String From Cavern No. 3**	**4 days**	**Mon 3/29/21**
258	Connect CAES Surface Piping Cavern No. 3	5 days	Fri 4/2/21
259	**Begin CAES Operation Cavern No. 3**	0 days	Wed 4/7/21
260	**Complete NYSEG CAES Project**	0 days	Wed 4/7/21



Project: 50756B NYSEG CAES
Date: Tue 6/5/12

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

Cavern Construction Cost Estimate

NYSEG CAES - Watkins Glen NY

	Description:		Overnight Cost	Cost Basis	Contract Date	Delivery / Completion Date	Duration (Days)
Material							
	Stainless Steel Air Pipe and Wellheads		$ 5,345,000	20-Oct-11	6-Jan-12	5-Jan-13	365
		Total - Bulks	**$ 5,345,000**				
Subcontract							
	Wellpad 1		$ 562,000	20-Nov-11	13-Dec-13	12-Jan-14	30
	Drilling No. 1		$ 7,771,000	20-Nov-11	19-Jan-14	4-Apr-14	75
	Piping and Blanket No. 1		$ 191,000	20-Nov-11	9-Apr-14	14-Apr-14	5
	Intermediate W/O and Blanket No. 1		$ 175,000	20-Nov-11	22-Aug-14	30-Aug-14	8
	Sonar and Blanket No. 1		$ 56,000	20-Nov-11	28-Jan-15	29-Jan-15	1
	Sonar and Blanket No. 1		$ 56,000	20-Nov-11	28-Jun-15	29-Jun-15	1
	Sonar No. 1		$ 25,000	20-Nov-11	26-Nov-15	27-Nov-15	1
	Final Configuration W/O No. 1		$ 1,178,000	20-Nov-11	5-Apr-16	10-May-16	35
	Snub No. 1		$ 194,000	20-Nov-11	9-Aug-16	13-Aug-16	4
	Final Wellhead Install No. 1		$ 61,980	20-Nov-11	13-Aug-16	18-Aug-16	5
	Wellpad No. 2		$ 562,000	20-Nov-11	12-Jan-14	11-Feb-14	30
	Drilling No. 2		$ 7,233,000	20-Nov-11	16-Apr-14	27-Jun-14	72
	Piping and Blanket No. 2		$ 191,000	20-Nov-11	2-Jul-14	7-Jul-14	5
	Intermediate W/O and Blanket No. 2		$ 175,000	20-Nov-11	17-Dec-16	26-Dec-16	9
	Sonar and Blanket No. 2		$ 56,000	20-Nov-11	25-May-17	26-May-17	1
	Sonar and Blanket No. 2		$ 56,000	20-Nov-11	23-Oct-17	24-Oct-17	1
	Sonar No. 2		$ 25,000	20-Nov-11	23-Mar-18	24-Mar-18	1
	Final Configuration W/O No. 2		$ 1,100,000	20-Nov-11	1-Aug-18	4-Sep-18	34
	Snub No. 2		$ 194,000	20-Nov-11	04-Dec-18	08-Dec-18	4
	Final Wellhead Install No. 3		$ 61,980	20-Nov-11	8-Dec-18	13-Dec-18	5
	Wellpad No. 3		$ 562,000	20-Nov-11	11-Feb-14	13-Mar-14	30
	Drilling No. 3		$ 7,067,000	20-Nov-11	9-Jul-14	13-Sep-14	66
	Piping and Blanket No. 3		$ 191,000	20-Nov-11	18-Sep-14	23-Sep-14	5
	Intermediate W/O and Blanket No. 3		$ 175,000	20-Nov-11	13-Apr-19	22-Apr-19	9
	Sonar and Blanket No. 3		$ 56,000	20-Nov-11	19-Sep-19	20-Sep-19	1
	Sonar and Blanket No. 3		$ 56,000	20-Nov-11	17-Feb-20	18-Feb-20	1
	Sonar No. 3		$ 25,000	20-Nov-11	17-Jul-20	18-Jul-20	1
	Final Configuration W/O No. 3		$ 1,100,000	20-Nov-11	25-Nov-20	28-Dec-20	33
	Snub No. 3		$ 194,000	20-Nov-11	29-Mar-21	2-Apr-21	4
	Final Wellhead Install No. 3		$ 61,980	20-Nov-11	2-Apr-21	4/7/2021	5
		Subtotal - Services	**$ 29,412,000**				
Operations and Maintenance							
	Inergy Labor		$ 999,000	20-Nov-11	14-Apr-14	25-Nov-20	2417
	Engineering Labor		$ 196,000	20-Nov-11	14-Apr-14	25-Nov-20	2417
	Miscellaneous Maintenance		$ 688,000	20-Nov-11	14-Apr-14	25-Nov-20	2417
		Operations Total	**$ 1,883,000**				
Total Estimate			**$ 36,640,000**				
Total Estimate (Rounded)			$ 36,640,000				

PB Energy Storage Services, Inc.

10/31/2011

PB Energy Storage Services, Inc. Cost Estimate

TITLE	NYSEG Seneca CAES Project			ESTIM TYPE	10 Percent	ESTIMATOR:	KS/Jm	REVIEWER:	JM	REV:	
				DISCIPLINE	All	DATE:	12/07/11	DATE:	12/07/11	DATE:	12/07/11

LINE NO	COVER SHEET Wellpad and Road	QTY	UNIT	UNIT MHRS	TOT MHRS	UNIT COST LABOR	UNIT COST MATL	UNIT COST EQUIP	UNIT COST SUBCON	TOTAL COST LABOR	TOTAL COST MATL	TOTAL COST EQUIP	TOTAL COST SUBCON	TOTAL
1	DIVISION 1 - GENERAL REQUIREMENTS													
2	Labor & Services (1A-1)				2,016					60,896	-	-	5,000	65,896
3	Construction Plant (1A-1)									-	8,850	-	5,000	8,850
4	Construction Equipment (1B-1)				-					-	-	58,800	-	58,800
5														
6	DIVISION 2 - SITE WORK				8,654					258,308	212,338	284,639	-	774,784
7	DIVISION 3 - CONCRETE				-					-	-	-	-	-
8	DIVISION 5 - METALS				-					-	-	-	-	-
9	DIVISION 9 - FINISHES				-					-	-	-	-	-
10	DIVISION 13 - SPECIAL CONSTRUCTION				-					-	-	-	-	-
11	DIVISION 15 - MECHANICAL				-					-	-	-	-	-
12	DIVISION 16 - ELECTRICAL				-					-	-	-	-	-
13	DIVISION 100 - PROCESS EQUIPMENT				-					-	-	-	-	-
14														
15														
16														
17														
18	SUB-TOTAL				10,670					319,203	221,188	343,439	10,000	908,329
19														
20														
21	Benefits & Burdens	34%	(of Labor)											108,529
22	Sm. Tools & Consumables	2%	(of Div 2 - 16)											18,167
23	SUB-TOTAL													1,035,025
24														
25	Business Tax (4.166% Subtotal)	8.00%	(of Subtotal)											82,802
26	SUB-TOTAL													1,117,827
27														
28	Contractor's Overhead	10%	(of Contract)											143,311
29	SUB-TOTAL													1,261,138
30														
31	Contractor's Profit	10%	(of Contract)											143,311
32	SUB-TOTAL													1,404,450
33														
34	Bond	2%	(of Contract)											28,662
35	TOTAL CONSTRUCTION COST													1,433,112
36	Engineering, Design & Inspection	7%	(of Contract)											100,318
37	SUB-TOTAL													1,533,430
38	Contingency & Changes	10%	(of Subtotal)											153,343
39	TOTAL JOB COST													1,686,773
40	ROUNDED TO													1,686,800

NYSEG Cavern No. 1	10/2/2011
Cost Estimate for MIT	
2011 COST ESTIMATE	Est By: JMc

ITEM	Budget Estimate
01 MANAGEMENT COST	
01 LABOR - OFFICE	$6,380
02 LABOR - FIELD	$0
03 EXPENSES	$2,125
04 MISCELLANEOUS (PRESSURE RECORDERS)	$3,000
SUBTOTAL - 01 MANAGEMENT COST	$11,505
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS (LOGGING FLANGES)	$1,500
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES (1 TRIP)	$31,250
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$0
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$20,000
16 CASING PULLING & RUNNING SERVICES	$0
17 WELDING	$0
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$0
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$3,750
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	$56,500
03 MATERIALS	
01 CASING	$0
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	$0
04 TAXES @ 7.25% OF CONSUMABLES, RENTALS & MATERIALS	$109
05 FEE @ 10% OF 02 + 04 AND 5% OF 03	$5,661
COST ESTIMATE W/OUT CONTINGENCY	$73,775
06 CONTINGENCY @ 0%	$0
TOTAL COST ESTIMATE WITH CONTINGENCY	$73,775

PB Energy Storage Services, Inc.

NYSEG Wells 2 & 3	10/2/2011
Nitrogen MIT Cost Each Well	
2011 COST ESTIMATE	Est By: JMc

ITEM	Budget Estimate
01 MANAGEMENT COST	
01 LABOR - OFFICE	$6,380
02 LABOR - FIELD	$0
03 EXPENSES	$2,125
04 MISCELLANEOUS (PRESSURE RECORDERS)	$3,000
SUBTOTAL - 01 MANAGEMENT COST	**$11,505**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS (LOGGING FLANGES)	$1,500
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES (1 TRIP)	$31,250
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$0
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$14,750
16 CASING PULLING & RUNNING SERVICES	$0
17 WELDING	$0
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$0
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$3,750
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$51,250**
03 MATERIALS	
01 CASING	$0
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$0**
04 TAXES @ 7.25% OF CONSUMABLES, RENTALS & MATERIALS	$109
05 FEE @ 10% OF 02 + 04 AND 5% OF 03	$5,136
COST ESTIMATE W/OUT CONTINGENCY	**$68,000**
06 CONTINGENCY @ 0%	$0
TOTAL COST ESTIMATE WITH CONTINGENCY	**$68,000**

PB Energy Storage Services, Inc.

AFE COST ESTIMATE — October 2011
Client: NYSEG — Revision 1
Well: CAES Well No. 1
Location: Watkins Glen, NY — Original

Phase	Cost Code	Description		Cost Estimate
01	**LABOR**			
	SUBTOTAL - 01 LABOR & EXP.		**$**	**312,963**
02	**SUBCONTRACTORS, SERVICES, AND RENTALS**			
	01	Location	$	-
	02	Rig Mobilization/DeMobilization	$	150,000
	03	Drilling Rig	$	1,672,500
	04	Fuel	$	361,173
	05	Drilling Water	$	40,000
	06	Drilling Fluids & Solids Control	$	438,900
	07	Bits	$	415,900
	08	Rental & Fishing Tools & Services	$	261,013
	09	Directional Drilling	$	173,135
	10	Cement, Cement Services, Hardware & Rental Equipment	$	328,295
	11	Open Hole Logging & Wireline Services	$	63,094
	12	Coring & Core Analysis	$	-
	13	Workover Rig	$	-
	14	Perforating	$	-
	15	Stimulation, Nitrogen, Pump Units	$	-
	16	Casing Crews & Tools - External Testers - Spear Services	$	140,016
	17	Welding	$	484,058
	18	Testing, Inspection & Repair Services	$	40,600
	19	Transportation	$	116,750
	20	Hauling, Vacuum Trucks & Disposal	$	255,015
	21	Miscellaneous Materials & Supplies	$	7,500
	22	Miscellaneous Services	$	449,644
	23	Site Communications	$	37,200
	24	Special Activities	$	-
	SUBTOTAL - 02 SUBCONTRCTORS, SERVICES & RENTALS		**$**	**5,434,794**
03	**MATERIALS**			
	01	Casing	$	702,927
	02	Wellhead Equipment	$	-
	03	Downhole Well Equipment	$	-
	SUBTOTAL - 03 MATERIALS		**$**	**702,927**
04	**PROJECT MANAGEMENT FEES**			
	01	Subs, Services, & Rentals 10%	$	543,479
	02	Materials 10%	$	70,293
	SUBTOTAL - 04 PROJECT MANAGEMENT FEES		**$**	**613,772**
		Contingency - 10%	$	706,446
TOTAL COST ESTIMATE			**$**	**7,771,000**

AFE COST ESTIMATE — October 2011
Client: NYSEG — Revision 1
Well: CAES Well No. 2
Location: Watkins Glen, NY — Original

Phase	Cost Code	Description		Cost Estimate
01	**LABOR**			
	SUBTOTAL - 01 LABOR & EXP.		**$**	**292,660**
02	**SUBCONTRACTORS, SERVICES, AND RENTALS**			
	01	Location	$	-
	02	Rig Mobilization/DeMobilization	$	150,000
	03	Drilling Rig	$	1,614,000
	04	Fuel	$	347,720
	05	Drilling Water	$	40,000
	06	Drilling Fluids & Solids Control	$	364,650
	07	Bits	$	373,900
	08	Rental & Fishing Tools & Services	$	232,778
	09	Directional Drilling	$	173,135
	10	Cement, Cement Services, Hardware & Rental Equipment	$	300,088
	11	Open Hole Logging & Wireline Services	$	63,094
	12	Coring & Core Analysis	$	40,135
	13	Workover Rig	$	-
	14	Perforating	$	-
	15	Stimulation, Nitrogen, Pump Units	$	-
	16	Casing Crews & Tools - External Testers - Spear Services	$	140,016
	17	Welding	$	465,500
	18	Testing, Inspection & Repair Services	$	40,600
	19	Transportation	$	122,000
	20	Hauling, Vacuum Trucks & Disposal	$	225,834
	21	Miscellaneous Materials & Supplies	$	7,200
	22	Miscellaneous Services	$	418,570
	23	Site Communications	$	31,300
	24	Special Activities	$	-
	SUBTOTAL - 02 SUBCONTRCTORS, SERVICES & RENTALS		**$**	**5,150,520**
03	**MATERIALS**			
	01	Casing	$	561,019
	02	Wellhead Equipment	$	-
	03	Downhole Well Equipment	$	-
	SUBTOTAL - 03 MATERIALS		**$**	**561,019**
04	**PROJECT MANAGEMENT FEES**			
	01	Subs, Services, & Rentals 10%	$	515,052
	02	Materials 10%	$	56,102
	SUBTOTAL - 04 PROJECT MANAGEMENT FEES		**$**	**571,154**
		Contingency - 10%	$	657,535
TOTAL COST ESTIMATE			**$**	**7,233,000**

AFE COST ESTIMATE — October 2011
Client: NYSEG — Revision 1
Well: CAES Well No. 3
Location: Watkins Glen, NY — Original

Phase	Cost Code	Description		Cost Estimate
01	**LABOR**			
	SUBTOTAL - 01 LABOR & EXP.		**$**	**283,305**
02	**SUBCONTRACTORS, SERVICES, AND RENTALS**			
	01	Location	$	-
	02	Rig Mobilization/DeMobilization	$	225,000
	03	Drilling Rig	$	1,497,000
	04	Fuel	$	320,813
	05	Drilling Water	$	40,000
	06	Drilling Fluids & Solids Control	$	364,650
	07	Bits	$	373,900
	08	Rental & Fishing Tools & Services	$	232,778
	09	Directional Drilling	$	173,135
	10	Cement, Cement Services, Hardware & Rental Equipment	$	300,088
	11	Open Hole Logging & Wireline Services	$	63,094
	12	Coring & Core Analysis	$	-
	13	Workover Rig	$	-
	14	Perforating	$	-
	15	Stimulation, Nitrogen, Pump Units	$	-
	16	Casing Crews & Tools - External Testers - Spear Services	$	140,016
	17	Welding	$	465,500
	18	Testing, Inspection & Repair Services	$	40,600
	19	Transportation	$	113,600
	20	Hauling, Vacuum Trucks & Disposal	$	225,834
	21	Miscellaneous Materials & Supplies	$	6,600
	22	Miscellaneous Services	$	405,807
	23	Site Communications	$	33,400
	24	Special Activities	$	-
	SUBTOTAL - 02 SUBCONTRCTORS, SERVICES & RENTALS		**$**	**5,021,816**
03	**MATERIALS**			
	01	Casing	$	561,019
	02	Wellhead Equipment	$	-
	03	Downhole Well Equipment	$	-
	SUBTOTAL - 03 MATERIALS		**$**	**561,019**
04	**PROJECT MANAGEMENT FEES**			
	01	Subs, Services, & Rentals 10%	$	502,182
	02	Materials 10%	$	56,102
	SUBTOTAL - 04 PROJECT MANAGEMENT FEES		**$**	**558,284**
		Contingency - 10%	$	642,442
TOTAL COST ESTIMATE			**$**	**7,067,000**

NYSEG	DATE: 10/31/11
INTERMEDIATE WORKOVER AND SONAR COST ESTIMATE - Per Well	Job # 50756B
2011 BUDGET COST ESTIMATE	Est By: JMc

ITEM	COST ESTIMATE
01 MANAGEMENT COST	
01 LABOR - OFFICE	$9,700
02 LABOR - FIELD	$6,930
03 EXPENSES	$2,550
04 MISCELLANEOUS	$1,500
SUBTOTAL - 01 MANAGEMENT COST	**$20,680**
02 SERVICES AND RENTALS	
01 LOCATION	$1,500
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS	$2,750
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES	$11,000
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$42,500
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$0
16 CASING PULLING & RUNNING SERVICES	$11,000
17 WELDING	$250
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$6,500
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$1,500
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$4,250
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$81,250**
03 MATERIALS	
01 CASING	$966
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$966**
04 TAXES @ 7.25% OF CONSUMABLES, RENTALS & MATERIALS	$269
05 FEE @ 6% OF 02 + 04 AND 5% OF 03	$4,939
COST ESTIMATE W/OUT CONTINGENCY	**$108,105**
06 CONTINGENCY @ 15%	$16,216
TOTAL COST ESTIMATE WITH CONTINGENCY	**$124,320**

PB Energy Storage Services, Inc.

NYSEG Caverns 1	DATE:10/15/2011
WORKOVER ESTIMATE CONVERSION WORKOVER	Job # 50756B
2011 Budget Estimate	Est By: JMc

ITEM	COST ESTIMATE
01 MANAGEMENT COST	
01 LABOR - OFFICE	$20,870
02 LABOR - FIELD	$33,000
03 EXPENSES	$7,700
04 MISCELLANEOUS	$1,500
SUBTOTAL - 01 MANAGEMENT COST	**$63,070**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS	$0
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES	$73,950
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$240,000
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$20,500
16 CASING PULLING & RUNNING SERVICES	$35,000
17 WELDING	$350,000
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$3,000
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$11,000
20 MISCELLANEOUS MATERIALS & SUPPLIES	$2,500
21 MISCELLANEOUS SERVICES	$28,000
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$763,950**
03 MATERIALS	
01 CASING	$48,682
02 WELLHEAD EQUIPMENT	
03 DOWNHOLE WELL EQUIPMENT	
SUBTOTAL - 03 MATERIALS	**$48,682**
04 TAXES @ 5.95% OF CONSUMABLES, RENTALS & MATERIALS	$3,045
05 FEE @ 10% OF 02 + 04 AND 10% OF 03	$81,568
COST ESTIMATE W/OUT CONTINGENCY	**$960,315**
06 CONTINGENCY @ 15%	$144,047
TOTAL COST ESTIMATE WITH CONTINGENCY	**$1,104,362**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG Caverns 2 & 3	DATE:10/15/2011
WORKOVER ESTIMATE CONVERSION WORKOVER	Job # 50756B
2011 Budget Estimate	Est By: JMc

ITEM	COST ESTIMATE
01 MANAGEMENT COST	
01 LABOR - OFFICE	$20,870
02 LABOR - FIELD	$26,400
03 EXPENSES	$6,800
04 MISCELLANEOUS	$1,500
SUBTOTAL - 01 MANAGEMENT COST	**$55,570**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS	$0
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES	$73,950
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$195,000
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$14,750
16 CASING PULLING & RUNNING SERVICES	$35,000
17 WELDING	$350,000
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$3,000
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$11,000
20 MISCELLANEOUS MATERIALS & SUPPLIES	$2,500
21 MISCELLANEOUS SERVICES	$28,000
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$713,200**
03 MATERIALS	
01 CASING	$48,682
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$48,682**
04 TAXES @ 5.95% OF CONSUMABLES, RENTALS & MATERIALS	$3,045
05 FEE @ 10% OF 02 + 04 AND 10% OF 03	$76,493
COST ESTIMATE W/OUT CONTINGENCY	**$896,990**
06 CONTINGENCY @ 15%	$134,549
TOTAL COST ESTIMATE WITH CONTINGENCY	**$1,031,539**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG - Watkins Glen Well No. 1		DATE: 10/31/11
Wellhead Installation Production		Job #
BUDGET COST ESTIMATE		Est By: JMc
ITEM		**COST ESTIMATE**
01 MANAGEMENT COST		
01 LABOR - OFFICE		$3,490
02 LABOR - FIELD		$3,300
03 EXPENSES		$600
04 MISCELLANEOUS		$0
SUBTOTAL - 01 MANAGEMENT COST		**$7,390**
02 SERVICES AND RENTALS		
01 LOCATION		$0
02 MOBILIZATION/DEMOBILIZATION		$0
03 RIG - DAYWORK		$0
04 FUEL		$0
05 WATER		$0
06 DRILLING FLUIDS		$0
07 BITS		$0
08 RENTAL TOOLS - SNUBBING STACK		$0
09 DIRECTIONAL DRILLING		$0
10 CEMENT, CEMENT SERVICES, HARDWARE		$0
11 LOGGING & WIRELINE SERVICES - CASING CUTS & BRIDGE PLUGS		$0
12 CORING & CORE ANALYSIS		$0
13 WORKOVER RIG		$22,500
14 PERFORATING		$0
15 STIMULATION, NITROGEN, PUMP TRUCKS		$0
16 CASING PULLING & RUNNING SERVICES		$0
17 WELDING		$0
18 TESTING , INSPECTION, & REPAIR SERVICES		$3,000
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION		$1,500
20 MISCELLANEOUS MATERIALS & SUPPLIES		$0
21 MISCELLANEOUS SERVICES		$17,505
22 SITE COMMUNICATIONS		$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS		**$44,505**
03 MATERIALS		
01 CASING		
02 WELLHEAD EQUIPMENT		
03 DOWNHOLE WELL EQUIPMENT		
SUBTOTAL - 03 MATERIALS		**$0**
04 TAXES @ 8% OF CONSUMABLES, RENTALS & MATERIALS	8.00%	$0
05 FEE @ 10% OF 02 + 03 + 04	10%	$4,451
COST ESTIMATE W/OUT CONTINGENCY		**$56,346**
06 CONTINGENCY @ 10%	10%	$5,635
TOTAL COST ESTIMATE WITH CONTINGENCY		**$61,980**

PB Energy Storage Services, Inc.

NYSEG - Watkins Glen		DATE: 10/10/11
Wellhead Installation Production Wells 2 & 3		Job #
BUDGET COST ESTIMATE		Est By: JMc
ITEM		**COST ESTIMATE**
01 MANAGEMENT COST		
01 LABOR - OFFICE		$3,490
02 LABOR - FIELD		$3,300
03 EXPENSES		$600
04 MISCELLANEOUS		$0
SUBTOTAL - 01 MANAGEMENT COST		**$7,390**
02 SERVICES AND RENTALS		
01 LOCATION		$0
02 MOBILIZATION/DEMOBILIZATION		$0
03 RIG - DAYWORK		$0
04 FUEL		$0
05 WATER		$0
06 DRILLING FLUIDS		$0
07 BITS		$0
08 RENTAL TOOLS - SNUBBING STACK		$0
09 DIRECTIONAL DRILLING		$0
10 CEMENT, CEMENT SERVICES, HARDWARE		$0
11 LOGGING & WIRELINE SERVICES - CASING CUTS & BRIDGE PLUGS		$0
12 CORING & CORE ANALYSIS		$0
13 WORKOVER RIG		$22,500
14 PERFORATING		$0
15 STIMULATION, NITROGEN, PUMP TRUCKS		$0
16 CASING PULLING & RUNNING SERVICES		$0
17 WELDING		$0
18 TESTING , INSPECTION, & REPAIR SERVICES		$3,000
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION		$1,500
20 MISCELLANEOUS MATERIALS & SUPPLIES		$0
21 MISCELLANEOUS SERVICES		$17,505
22 SITE COMMUNICATIONS		$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS		**$44,505**
03 MATERIALS		
01 CASING		
02 WELLHEAD EQUIPMENT		
03 DOWNHOLE WELL EQUIPMENT		
SUBTOTAL - 03 MATERIALS		
04 TAXES @ 8% OF CONSUMABLES, RENTALS & MATERIALS	8.00%	$0
05 FEE @ 10% OF 02 + 03 + 04	10%	$4,451
COST ESTIMATE W/OUT CONTINGENCY		**$56,346**
06 CONTINGENCY @ 10%	10%	$5,635
TOTAL COST ESTIMATE WITH CONTINGENCY		**$61,980**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG Cavern No. 1	10/2/2011
Cost Estimate for Setting Blanket	
2011 COST ESTIMATE	Est By: JMc

ITEM	Budget Estimate
01 MANAGEMENT COST	
01 LABOR - OFFICE	$2,960
02 LABOR - FIELD	$0
03 EXPENSES	$2,125
04 MISCELLANEOUS (PRESSURE RECORDERS)	$3,000
SUBTOTAL - 01 MANAGEMENT COST	**$8,085**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS (LOGGING FLANGES)	$1,500
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES (1 TRIP)	$16,250
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$0
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$20,000
16 CASING PULLING & RUNNING SERVICES	$0
17 WELDING	$0
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$0
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$1,250
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$39,000**
03 MATERIALS	
01 CASING	$0
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$0**
04 TAXES @ 7.25% OF CONSUMABLES, RENTALS & MATERIALS	$109
05 FEE @ 10% OF 02 + 04 AND 5% OF 03	$3,911
COST ESTIMATE W/OUT CONTINGENCY	**$51,105**
06 CONTINGENCY @ 0%	$0
TOTAL COST ESTIMATE WITH CONTINGENCY	**$51,105**

PB Energy Storage Services, Inc.

NYSEG Wells 2 & 3	10/2/2011
Set Blanket Wells 2 & 3	
2011 COST ESTIMATE	Est By: JMc

ITEM	Budget Estimate
01 MANAGEMENT COST	
01 LABOR - OFFICE	$6,380
02 LABOR - FIELD	$0
03 EXPENSES	$2,125
04 MISCELLANEOUS (PRESSURE RECORDERS)	$3,000
SUBTOTAL - 01 MANAGEMENT COST	**$11,505**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS (LOGGING FLANGES)	$1,500
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES (1 TRIP)	$16,250
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$0
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$14,750
16 CASING PULLING & RUNNING SERVICES	$0
17 WELDING	$0
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$0
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$1,250
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$33,750**
03 MATERIALS	
01 CASING	$0
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$0**
04 TAXES @ 7.25% OF CONSUMABLES, RENTALS & MATERIALS	$109
05 FEE @ 10% OF 02 + 04 AND 5% OF 03	$3,386
COST ESTIMATE W/OUT CONTINGENCY	**$48,750**
06 CONTINGENCY @ 0%	$0
TOTAL COST ESTIMATE WITH CONTINGENCY	**$48,750**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG - Watkins Glen		DATE: 10/31/11
SNUB 5-1/2" CASING OUT - Per Well		Job #
BUDGET COST ESTIMATE		Est By: JMc
ITEM		**COST ESTIMATE**
01 MANAGEMENT COST		
01 LABOR - OFFICE		$3,490
02 LABOR - FIELD		$5,500
03 EXPENSES		$2,200
04 MISCELLANEOUS		$1,000
SUBTOTAL - 01 MANAGEMENT COST		**$12,190**
02 SERVICES AND RENTALS		
01 LOCATION		$2,000
02 MOBILIZATION/DEMOBILIZATION		$0
03 RIG - DAYWORK		$0
04 FUEL		$0
05 WATER		$0
06 DRILLING FLUIDS		$0
07 BITS		$0
08 RENTAL TOOLS - SNUBBING STACK		$33,475
09 DIRECTIONAL DRILLING		$0
10 CEMENT, CEMENT SERVICES, HARDWARE		$0
11 LOGGING & WIRELINE SERVICES - CASING CUTS & BRIDGE PLUGS		$26,525
12 CORING & CORE ANALYSIS		$0
13 WORKOVER RIG - RIG ASSIST SNUBBING UNIT		$64,600
14 PERFORATING		$0
15 STIMULATION, NITROGEN, PUMP TRUCKS		$0
16 CASING PULLING & RUNNING SERVICES		$0
17 WELDING		$0
18 TESTING , INSPECTION, & REPAIR SERVICES		$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION		$0
20 MISCELLANEOUS MATERIALS & SUPPLIES		$0
21 MISCELLANEOUS SERVICES		$19,705
22 SITE COMMUNICATIONS		$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS		**$146,305**
03 MATERIALS		
01 CASING		$0
02 WELLHEAD EQUIPMENT		$0
03 DOWNHOLE WELL EQUIPMENT		$0
SUBTOTAL - 03 MATERIALS		**$0**
04 TAXES @ 8% OF CONSUMABLES, RENTALS & MATERIALS	8.00%	$2,678
05 FEE @ 10% OF 02 + 03 + 04	10%	$14,898
COST ESTIMATE W/OUT CONTINGENCY		**$176,072**
06 CONTINGENCY @ 10%	10%	$17,607
TOTAL COST ESTIMATE WITH CONTINGENCY		**$193,679**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

NYSEG	DATE: 10-11-11
CAES Cavern Sonar Survey - Each Survey	Job #
Cost Estimate	Est By: JMc

ITEM	COST ESTIMATE
01 MANAGEMENT COST	
01 LABOR - OFFICE	$4,840
02 LABOR - FIELD	$0
03 EXPENSES	$2,100
04 MISCELLANEOUS	$0
SUBTOTAL - 01 MANAGEMENT COST	**$6,940**
02 SERVICES AND RENTALS	
01 LOCATION	$0
02 MOBILIZATION/DEMOBILIZATION	$0
03 RIG	$0
04 FUEL	$0
05 WATER	$0
06 DRILLING FLUIDS	$0
07 BITS	$0
08 RENTAL TOOLS	$0
09 DIRECTIONAL DRILLING	$0
10 CEMENT, CEMENT SERVICES, HARDWARE	$0
11 LOGGING & WIRELINE SERVICES	$11,500
12 CORING & CORE ANALYSIS	$0
13 WORKOVER RIG	$0
14 PERFORATING	$0
15 STIMULATION, NITROGEN, PUMP TRUCKS	$0
16 CASING PULLING & RUNNING SERVICES	$0
17 WELDING	$0
18 WELLHEAD REPLACEMENT, TESTING, & REPAIR SERVICES	$0
19 VACUUM TRUCKS, HAULING, & TRANSPORTATION	$0
20 MISCELLANEOUS MATERIALS & SUPPLIES	$0
21 MISCELLANEOUS SERVICES	$2,700
22 SITE COMMUNICATIONS	$0
SUBTOTAL - 02 SUBCONTRACTS, SERVICES & RENTALS	**$14,200**
03 MATERIALS	
01 CASING	$0
02 WELLHEAD EQUIPMENT	$0
03 DOWNHOLE WELL EQUIPMENT	$0
SUBTOTAL - 03 MATERIALS	**$0**
04 Taxes @ 8%	$0
05 FEE @ 10%	$1,420
COST ESTIMATE W/OUT CONTINGENCY	**$22,560**
06 CONTINGENCY @ 10%	$2,256
TOTAL COST ESTIMATE WITH CONTINGENCY	**$24,816**

PB Energy Storage Services, Inc.
ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

PB Energy Storage Services, Inc. Cost Estimate

TITLE	NYSEG CAES Project			ESTIM TYPE	10%	ESTIMATOR:	JMc	REVIEWER:		REV:	0
				DISCIPLINE	All	DATE:	10/10/2011	DATE:		DATE:	10/10/2011

LINE NO	COVER SHEET Wellpad Piping	QTY	UNIT	UNIT MHRS	TOT MHRS	UNIT COST				TOTAL COST				TOTAL
						LABOR	MATL	EQUIP	SUBCON	LABOR	MATL	EQUIP	SUBCON	
1	DIVISION 1 - GENERAL REQUIREMENTS													
2	Labor & Services (1A-1)				57					3,213	-	-	-	3,213
3	Construction Plant (1A-1)				-					-	-	-	-	-
4	Construction Equipment (1B-1)				-					-	-	7,525	-	7,525
5	Cavern Development & Opns (1C-1)				-					-	-	-	-	-
6	DIVISION 2 - SITE WORK				-					-	-	-	-	-
7	DIVISION 3 - CONCRETE				28					1,198	386	8	-	1,592
8	DIVISION 5 - METALS				8					343	1,650	167	-	2,160
9	DIVISION 9 - FINISHES				-					-	-	-	119	119
10	DIVISION 13 - SPECIAL CONSTRUCTION				-					-	-	-	2,160	2,160
11	DIVISION 15 - MECHANICAL				260					11,636	49,462	-	528	61,626
12	DIVISION 16 - ELECTRICAL				-					-	-	-	7,315	7,315
13	DIVISION 100 - PROCESS EQUIPMENT				-					-	-	-	-	-
14	Labor competition * OT Factor									-				-
15														
16														
17														
18	SUB-TOTAL				354					16,391	51,498	7,699	10,121	85,709
19														
20														
21	Benefits & Burdens		(of Labor) (Included in Direct Cost)											-
22	Sm. Tools & Consumables	2%	(of Div 2 - 16)											1,714
23	SUB-TOTAL													87,423
24														
25	Sales Tax	8%	(of Subtotal)											6,994
26	SUB-TOTAL													94,417
27														
28	Contractor's Overhead	10%	(of Contract)											11,802
29	SUB-TOTAL													106,220
30														
31	Contractor's Profit	10%	(of Contract)											11,802
32	SUB-TOTAL													118,022
33														
34	Bond		(of Contract)											-
35	TOTAL CONSTRUCTION COST													118,022
36	Engineering, Design & Inspection	8%	(of Construction)											9,442
37	SUB-TOTAL													127,463
38	Contingency & Undefined Work	10%	(of Subtotal)											12,746
39	TOTAL JOB COST													140,210
40	ROUNDED TO													140,000

PB Energy Storage Services, Inc
ENGINEERING – CONSTRUCTION – OPERATIONS – MAINTENANCE

16285 Park Ten Place, Suite 400
Houston, Texas 77084

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Fax (281) 496-5865
www.pbenergy.com

August 11, 2011

Jim Rettberg
NYSEG
//via email//

Dear Mr. Rettberg:

Re: Seneca Lake CAES Project – Preliminary Cavern Criteria

Introduction

The PB Energy Storage Services (PB ESS) division of PB Americas was commissioned by NYSEG to determine the acceptability of the bedded salt at a site near Seneca Lake for compressed air energy storage (CAES) in accordance with the Technical Specification for the Cavern Development Consultant. Additionally, PB ESS tasking includes:

- Support a study by WorleyParsons (WP) to develop comprehensive cost estimates.
- Perform preliminary cavern design.
- Perform cavern thermodynamic modeling.
- Prepare a solution mining plan.
- Specify a program of inspections and tests to monitor cavern development.
- Prepare design specifications for wells and wellheads.
- Prepare a program to monitor the cavern during CAES operations.
- Prepare a mechanical integrity testing program.
- Prepare a list of procurement and construction specifications to develop and convert the cavern to storage operations.

This letter report was requested during our phone conversation of August 8, 2011. The purpose of the report is to provide cavern selection criteria for an existing cavern, which will meet the mission requirements of a maximum compression pressure of 1500 psi and the capability to generate electricity for 10 hours at an estimated mass flow rate of 550 lb/sec. Final thermomechanical models have not been run; however, based upon results to date the total cavern volume required is at least 3 MMbbls. Prior to using any cavern, the well(s) and cavern would need to be tested for integrity at pressures in excess of 1500 psi.

Criteria

The list of minimum requirements for consideration of an existing cavern for use by NYSEG is provided below.

1. De-waterable volume of at least 3.5 MMbbls.
2. Roof diameter or span of less than 260 ft.
3. Cavern roof at least 50 ft below top of salt (not leached to shale)
4. Proximity to other caverns of not less than 500 ft wall to wall
5. Never been used for LPG storage

Rationale

In establishing the criteria above, PB ESS has used the following rationale.

1. All of the preliminary thermomechanical modeling performed to date suggests that a cavern with a volume smaller than 3 MMbbls will exhibit tensile stress in the walls and/or roof. Since salt has a tensile strength of less than 300 psi, storage caverns are designed to have little or no tensile stress imposed during their operational life. At present, a volume of 3.5 MMbbls is believed to be adequate to meet this requirement.
2. Stable cavern roof diameter or roof span is established by assessment of the results of the thermomechanical modeling results. Typical storage industry practice limits cavern roof diameters to a range of 250 ft to 300 ft.
3. A review of available sonar surveys implies that cavern roof established within the shale present in the Camillus Formation has a significant potential for unraveling of the rock. The dolostones of the Bertie Formation are known to contain water. The presence of water implies that a cavern built with a roof in the Bertie Formation will not be pressure tight.
4. A 500 foot spacing is believed to be appropriate for preliminary design. This number is representative of intended cavern spacing at Watkins Glen.
5. Injection of air into a former LPG storage cavern will require initial purging of the cavern with an inert gas (e.g., nitrogen), which could prove difficult and costly.

Please do not hesitate to call or email if you have questions or suggestions.

Regards,

James M. McHenry

Jim McHenry

PB Energy Storage Services, Inc
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December 15, 2011

James W. Rettberg, PE
Project Manager
NYSEG

Dear Mr. Rettberg;

Re: Input to U.S. DOE Environmental Questionnaire

The NYSEG Cavern Development Consultant Technical Specification deliverable 4.4.2.11 directs PB ESS to provide estimates of emissions generated by equipment, solid or hazardous waste that will be generated and disposed of, chemicals and hazardous or toxic materials that will be used in the cavern testing, well installation and cavern dewatering phases of the project. Specifically:

- III.A.8 Activities
- III.A.10 Materials and estimates of quantities used / produced
- III.D.6.e,f,g Atmospheric Air Quality
- III.D.7 Hydrologic / Water Quality
- III.D.8 Solid and Hazardous Waste
- III.D.9 Health and Safety Factors

III.A.8 – Activities

Summarize the objectives of the proposed work. List activities planned at the location as covered by this Environmental Questionnaire.

Objectives

NYSEG proposes to construct three storage caverns, to be used for Compressed Air Energy Storage, in the Salina Salt near Watkins Glen, NY. Each cavern will be solution mined to have a net volume of 970,000 barrels. The cavern development interval is expected to be from 2,402 – 2,632 feet below ground surface.

Activities

1. **Build three 400 ft x 400 ft wellpads**
2. **Drill and Complete Well No. 1**
    a. Mobilize drilling rig to Wellpad No. 1
    b. Drill a 48” diameter hole and cement in place a 42” conductor pipe to a depth of approximately 175 feet below ground level.
    c. Drill a 36” diameter hole inside the conductor pipe and cement in place a 30” surface casing to a depth of approximately 850 feet below ground level.
    d. Drill a 30” diameter hole inside the surface casing and cement in place a 24” diameter final cemented casing to a depth of approximately 2,360 feet below ground level.
    e. Drill a 24” diameter hole inside the final cemented casing to a depth of approximately 2,632 feet.
    f. Install a wellhead and two concentric leaching casings (8-5/8” diameter to 2,530 feet below ground level and 5-1/2” diameter to 2,630 feet below ground level).
3. **Drill and Complete Well No. 2**
    a. Move drilling rig to Wellpad No. 2
    b. Drill a 48” diameter hole and cement in place a 42” conductor pipe to a depth of approximately 175 feet below ground level.
    c. Drill a 36” diameter hole inside the conductor pipe and cement in place a 26” surface casing to a depth of approximately 850 feet below ground level.
    d. Drill a 26” diameter hole inside the surface casing and cement in place a 20” diameter final cemented casing to a depth of approximately 2,360 feet below ground level.
    e. Drill a 24” diameter hole inside the final cemented casing to a depth of approximately 2,632 feet.
    f. Install a wellhead and two concentric leaching casings (8-5/8” diameter to 2,530 feet below ground level and 5-1/2” diameter to 2,630 feet below ground level).
    g. Fill wellbore with nitrogen.
4. **Drill and Complete Well No. 3**
    a. Move drilling rig to Wellpad No. 3
    b. Drill a 48” diameter hole and cement in place a 42” conductor pipe to a depth of approximately 175 feet below ground level.

c. Drill a 36” diameter hole inside the conductor pipe and cement in place a 26” surface casing to a depth of approximately 850 feet below ground level.
d. Drill a 26” diameter hole inside the surface casing and cement in place a 20” diameter final cemented casing to a depth of approximately 2,360 feet below ground level.
e. Drill a 24” diameter hole inside the final cemented casing to a depth of approximately 2,632 feet.
f. Install a wellhead and two concentric leaching casings (8-5/8” diameter to 2,530 feet below ground level and 5-1/2” diameter to 2,630 feet below ground level).
g. Demobilize drilling rig.
h. Fill wellbore with nitrogen.

5. Solution Mine Cavern No. 1

a. Run 4” diameter water and brine piping from edge of wellpad and connect to wellhead.
b. Hydrotest wellpad piping.
c. Inject nitrogen roof blanket to approximately 2,520 ft below ground surface.
d. Begin water injection at 350 gpm down the inner string, brine will be displaced through the outer string and will flow to U.S. Salt. (Direct Injection)
e. Continue direct injection for approximately 130 days.
f. Stop water injection.
g. Bleed nitrogen from wellbore.
h. Intermediate Workover Cavern No. 1
    i. Mobilize Workover Rig to wellpad
    ii. Remove approximately 100 ft of 5-1/2” diameter inner leach string and approximately 58 ft of 8-5/8” casing.
    iii. Demobilize workover rig.
    iv. Inject nitrogen blanket to 2.420 ft.
    v. Begin water injection at 350 gpm down 8-5/8” x 5-1/2” annulus, recovering brine up the 4-1/2” string. (Reverse Circulation)
    vi. Continue leaching in reverse for approximately 150 days.
    vii. Bleed nitrogen from wellbore and set interface at 2,410 feet below ground surface.
    viii. Continue leaching in reverse for approximately 150 days.
    ix. Bleed nitrogen from wellbore and set interface at 2,402 feet below ground surface.

x. Continue leaching in reverse for approximately 280 days.
xi. Stop water injection into well.
xii. Perform mechanical integrity test of cavern.
xiii. Bleed nitrogen from wellbore.

6. Conversion Workover Cavern No. 1

a. Mobilize workover rig to well.
b. Remove 5-1/2" and 8-5/8" casing from well.
c. Run and weld 20" diameter stainless steel suspended liner to approximately 2,407 feet below ground level.
d. Run new 5-1/2" dewatering string to approximately 2,407 ft below ground surface.
e. Install dewatering wellhead.
f. Perform mechanical integrity test of wellhead and wellbore.

7. Dewater Cavern No. 1

a. Connect portable surface compressors to wellhead.
b. Begin dewatering, injecting air at approximately 3,750 scfm and recovering brine through dewatering string at approximately 350 gpm.
c. Continue dewatering for approximately 80 days.
d. Stop air injection.

8. Final Configuration Workover – Cavern No. 1

a. Mobilize workover rig to well.
b. Snub 5-1/2" dewatering string from well.
c. Install remaining wellhead components.

9. Cavern ready for service.

10. Solution Mine Cavern No. 2

a. Run 4" diameter water and brine piping from edge of wellpad and connect to wellhead.
b. Hydrotest wellpad piping.
c. Bleed nitrogen from wellbore to set roof blanket to approximately 2,520 ft below ground surface.
d. Begin water injection at 350 gpm down the inner string, brine will be displaced through the outer string and will flow to U.S. Salt. (Direct Injection)
e. Continue direct injection for approximately 130 days.
f. Stop water injection.
g. Bleed nitrogen from wellbore.

h. Intermediate Workover Cavern No. 2

i. Mobilize Workover Rig to wellpad.

ii. Remove approximately 100 ft of 5-1/2" diameter inner leach string and approximately 58 ft of 8-5/8" casing.

iii. Demobilize workover rig.

i. Inject nitrogen blanket to 2.420 ft.

j. Begin water injection at 350 gpm down 8-5/8" x 5-1/2" annulus, recovering brine up the 4-1/2" string. (Reverse Circulation)

k. Continue leaching in reverse for approximately 150 days.

l. Bleed nitrogen from wellbore and set interface at 2,410 feet below ground surface.

m. Continue leaching in reverse for approximately 150 days.

n. Bleed nitrogen from wellbore and set interface at 2,402 feet below ground surface.

o. Continue leaching in reverse for approximately 280 days.

p. Stop water injection into well.

q. Perform mechanical integrity test of cavern.

r. Bleed nitrogen from wellbore.

11. Conversion Workover Cavern No. 2

a. Mobilize workover rig to well.

b. Remove 5-1/2" and 8-5/8" casing from well.

c. Run and weld 16"stainless steel suspended liner to approximately 2,407 feet below ground level.

d. Run new 5-1/2" dewatering string to approximately 2,407 ft below ground surface.

e. Install dewatering wellhead.

f. Perform mechanical integrity test of wellhead and wellbore.

12. Dewater Cavern No. 2

a. Connect portable surface compressors to wellhead.

b. Begin dewatering, injecting air at approximately 3,750 scfm and recovering brine through dewatering string at approximately 350 gpm.

c. Continue dewatering for approximately 80 days.

d. Stop air injection.

13. Final Configuration Workover – Cavern No. 2

a. Mobilize workover rig to well.

b. Snub 5-1/2" dewatering string from well.
c. Install remaining wellhead components.
d. Demobilize workover rig

14. Cavern ready for service.

15. Solution Mine Cavern No. 3

a. Run 4" diameter water and brine piping from edge of wellpad and connect to wellhead.
b. Hydrotest wellpad piping.
c. Bleed nitrogen from wellbore to set roof blanket to approximately 2,520 ft below ground surface.
d. Begin water injection at 350 gpm down the inner string, brine will be displaced through the outer string and will flow to U.S. Salt. (Direct Injection)
e. Continue direct injection for approximately 130 days.
f. Stop water injection.
g. Bleed nitrogen from wellbore.
h. Intermediate Workover Cavern No. 3
    i. Mobilize Workover Rig to wellpad.
    ii. Remove approximately 100 ft of 5-1/2" diameter inner leach string and approximately 58 ft of 8-5/8" casing.
    iii. Demobilize workover rig.
i. Inject nitrogen blanket to 2.420 ft.
j. Begin water injection at 350 gpm down 8-5/8" x 5-1/2" annulus, recovering brine up the 4-1/2" string. (Reverse Circulation)
k. Continue leaching in reverse for approximately 150 days.
l. Bleed nitrogen from wellbore and set interface at 2,410 feet below ground surface.
m. Continue leaching in reverse for approximately 150 days.
n. Bleed nitrogen from wellbore and set interface at 2,402 feet below ground surface.
o. Continue leaching in reverse for approximately 280 days.
p. Stop water injection into well.
q. Perform mechanical integrity test of cavern.
r. Bleed nitrogen from wellbore.

16. Conversion Workover Cavern No. 3

a. Mobilize workover rig to well.

b. Remove 5-1/2" and 8-5/8" casing from well.
c. Run and weld 16"stainless steel suspended liner to approximately 2,407 feet below ground level.
d. Run new 5-1/2" dewatering string to approximately 2,407 ft below ground surface.
e. Install dewatering wellhead.
f. Perform mechanical integrity test of wellhead and wellbore.

17. Dewater Cavern No. 3

a. Connect portable surface compressors to wellhead.
b. Begin dewatering, injecting air at approximately 3,750 scfm and recovering brine through dewatering string at approximately 350 gpm.
c. Continue dewatering for approximately 80 days.
d. Stop air injection.

18. Final Configuration Workover – Cavern No. 3

a. Mobilize workover rig to well.
b. Snub 5-1/2" dewatering string from well.
c. Install remaining wellhead components.
d. Demobilize workover rig

19. Cavern No. 3 ready for service.

III.A.10 - Materials and estimates of quantities used / produced

Identify major materials that would be used and produced by the project when the projects are larger than lab or bench scale.

Material Used	Estimated Quantity	Comments
Electricity	4,400,000 KWH	U.S. Salt power for injection pumps.
Water	1,071,000,000 gal	Supplied by U.S. Salt
Others - Diesel Fuel	920,000 gal	Drilling/Workover/Dewater

Material Produced	Estimated Quantity	Comments
Air Emissions	CO – 136,000 lbs NMHC -16,000 lbs NOX – 136,000 lbs PM – 5,200 lbs	Drilling Rig and Dewatering Compressors
Solid Waste	Mud – 12,800 bbl Cuttings – 8,300 bbl	Drill cuttings, drill mud, and cement waste
Brine	1,071,000,000 gal	Brine produced will not be waste product. Brine will be used by U.S. Salt

III.D.6.e - Materials and estimates of quantities used / produced

What types of air emissions, including fugitive emissions, would be anticipated from the proposed project, and what would be the maximum and minimum annual rate of emissions for the project?

Emitted	Maximum Annual Rate	Project Total
CO	46,000 lbs	136,000 lbs
NOx	46,000 lbs	136,000 lbs
PM	1,800 lbs	5,200 lbs

III.D.6.f- Materials and estimates of quantities used / produced

Would any types of emission control or particulate collection devices be used?
No.

III.D.6.g- Materials and estimates of quantities used / produced

If no control devices are used, how would emissions be vented?
Emissions would be from diesel equipment and vented to atmosphere.

III.D.7.a- Hydrologic Conditions / Water Quality

What is the closest body of water to the proposed project area and what is its distance from the project site?
Tributary 72 (Class C) to Seneca Lake is approximately 100 ft away from the closest well drilling site.

III.D.7.b- Hydrologic Conditions / Water Quality

What sources would supply potable water for the proposed project?
Water would be supplied by U.S. Salt from their intake structure on Seneca Lake.

III.D.7.c- Hydrologic Conditions / Water Quality

Quantify the annual amount of wastewater that would be generated by the proposed project.
None. All brine will be used piped to U.S. Salt to be used in their salt plant.

III.D.7.d- Hydrologic Conditions / Water Quality

What would be the major components of each type of wastewater?
No wastewater generated.

III.D.7.e- Hydrologic Conditions / Water Quality

Identify the local treatment facility that would receive wastewater from the proposed project.
No wastewater generated.

III.D.7.f- Hydrologic Conditions / Water Quality

Describe how wastewater would be collected and treated.
No wastewater generated.

III.D.7.g- Hydrologic Conditions / Water Quality

Would any runoff or leachates be produced from storage piles or waste disposal sites?
No.

III.D.7.h- Hydrologic Conditions / Water Quality

Would the project require issuance of new or modified water permits to perform project work or site development?
Yes, would require NPDES for storm water runoff from wellpads.

III.D.7.i- Hydrologic Conditions / Water Quality

Where would wastewater effluents from the proposed project be discharged?
Runoff water would be discharged to surface tributary to Seneca Lake.

III.D.7.j- Hydrologic Conditions / Water Quality

Would the proposed project be permitted to discharge effluents into an existing body of water?
Yes. No treatment of storm water required.

III.D.7.k- Hydrologic Conditions / Water Quality

Would a new or modified National Pollutant Discharge Elimination System (NPDES) permit be required?
Yes, required for surface runoff from wellpads.

III.D.7.l- Hydrologic Conditions / Water Quality

Would the proposed project adversely affect the quality or movement of groundwater?
No.

III.D.7.m- Hydrologic Conditions / Water Quality

Would the proposed project require issuance of an Underground Injection Control (UIC) permit?
Yes. A UIC permit is required to solution mine the cavern.

III.D.8.a- Solid and Hazardous Wastes

Identify and estimate major nonhazardous solid wastes that would be generated from the project.
Drilling mud and drill cuttings

Freshwater drilling mud	8,400 bbl
Saltwater drilling mud	4,500 bbl
Freshwater Drill Cuttings	4,700 bbl
Saltwater Drill Cuttings	3,700 bbl

III.D.8.b- Solid and Hazardous Wastes

Would the project require issuance of new or modified solid waste and / or hazardous waste related permits to perform project activities?
No.

III.D.8.c- Solid and Hazardous Wastes

How and where would solid waste disposal be accomplished?

Drilling mud and cuttings will be contained in a closed loop drilling system. Cuttings would be periodically (as required) transported to a NY State approved solid waste landfill for disposal. Drilling mud will be stabilized and transported to a NY State approved solid waste landfill at the end of freshwater drilling and at the end of drilling a well.

III.D.8.d- Solid and Hazardous Wastes

How would wastes be transported?
Wastes would be transported to landfill by truck.

III.D.8.e- Solid and Hazardous Wastes

Identify hazardous wastes that would be generated, used, or stored under this project.
None.

III.D.8.f- Solid and Hazardous Wastes

Would hazardous or toxic waste be collected and stored.
No.

III.D.8.g- Solid and Hazardous Wastes

If hazardous wastes would require off-site disposal, have arrangements been made with a certified TSD facility.
No hazardous wastes generated.

III.D.9.a- Health / Safety Factors

Identify hazardous or toxic materials that would be used in the proposed project.
Caustic soda may be used as part of the drilling fluids.

III.D.9.b- Health / Safety Factors

What would be the likely impacts of these project related hazardous materials on human health and the environment.
Caustic soda can cause severe chemical burns to unprotected skin.

III.D.9.c- Health / Safety Factors

Would there be any special physical hazards or health risks associated with the project?
No. Hazards typical of drilling, workover and construction will be present at the work site. NYSEG health and safety programs will be supplemented by programs put in place by specialized contractors who are thoroughly knowledgeable in the construction and operation of underground storage facilities..

III.D.9.d- Health / Safety Factors

Does a worker safety program exist at the location of the proposed project?
No. NYSEG has in place a thorough over riding safety program. This program will be supplemented by a site safety program prior to the start of construction.

During construction all NYSEG Subcontractor Personnel will be adequately trained and qualified to perform their duties. Knowledgeable drilling and workover specialists will be assigned to monitor the job site to make sure that the percentage of inexperienced labor being used by any subcontractor is not so great as to pose a safety hazard to themselves or others working around them.

Operations that require highly skilled or technical expertise will be performed only by those individuals who by virtue of training, experience or education are capable of safely performing the task.

III.D.9.e- Health / Safety Factors

Would safety training be necessary for any laboratory, equipment, or process involved with the project.
Yes. Contractors would have in place a formal safety program for activities.

III.D.9.f- Health / Safety Factors

Describe any increases in ambient noise levels to the public from construction and operational activities.
The noise generating sources for this project are all intermittent. The drilling rig has not been selected at this time. The rig selection, workover rig selection, and compressor selection will be dependent upon availability, making definitive estimates of noise levels unwarranted. Each of the activities listed below is expected to take place at different times (i.e. the noise for each activity is independent of the other activities). No ambient noise measurement or noise modeling has been performed.

Construction activities to build three wellpads are expected to take approximately 4 months. Equipment for building the wellpads includes a backhoe/front end loader, a dozer, a roller compactor, and dump trucks. Activities will be limited to daylight hours.

Rig up and down will be accomplished over an aggregate 36 day period. At present a single 600 hp diesel engine is envisioned as the primary noise source. These activities will take place during daylight hours.

Drilling activities are anticipated to take place on a 24 hr per day basis for an aggregate of 213 days. During drilling two 600 hp diesel engines are envisioned as the primary noise source.

Intermediate workovers are expected to take place over a time period of approximately 15 days. During that time a 500 hp workover rig with a 318 hp mud pump is expected to be operating during daylight hours.

Final configuration workover as scheduled to take place for approximately 90 days. During these workovers a 500 hp workover rig with a 318 hp mud pump is expected to be operating during daylight hours.

The most significant noise impact during cavern construction will be during dewatering. During dewatering 4 – 600 hp diesel driven compressors are anticipated to be operating during an aggregate time period of 234 days (3 – 78 day periods separated from each other by approximately 2 years). Noise data for a CAT C18 driver indicates a DB(A) = 89.1[1] at 49.1 ft. for unenclosed engines. Using a chart provided by NYSDEC[2] the aggregate noise level from 4 compressors is calculated as 95.1 DB(A) at 49.1 feet. NYSEG wells have a 300' buffer to public or private property. Using the methodology set forth by the NYSDEC[2] an aggregate noise level of 83.1 DB(A) is predicted at a distance 100 ft inside public or private property.

III.D.9.g- Health / Safety Factors

Would project construction result in the removal of natural barriers that act as noise screens?
Yes.
Tree removal for wellpad and drilling road construction.

III.D.8.h- Solid and Hazardous Wastes

Would hearing protection be required for workers?
Yes. Hearing protection in the form of earplugs, ear muffs, or combinations, as recommended or approved by NIOSH is mandatory when the sound levels exceed the permissible noise exposures.

Please do not hesitate to call or email if you have questions or suggestions.

Regards,

[1] Milton Caterpillar. www.miltoncat.com
[2] New York State DEP. ***Assessing and Mitigating Noise Impacts***. DEP-00-1. 2001.

James M McHenry