COMPRESSED AIR ENERGY STORAGE

NYSEG SENECA LAKE PROJECT

FINAL REPORT

Prepared for

NYSEG

Binghamton, New York

Prepared by

PB ENERGY STORAGE SERVICES, INC.

Houston, TX

Project No. 50756B

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NYSEG SENECA LAKE CAES PROJECT
WATKINS GLEN CAES FACILITY

1.0 INTRODUCTION

NYSEG proposes to develop a compressed air energy storage (CAES) project near Watkins Glen, NY which has a rated generating capacity of 135 - 210 MW. The proposed site is located in the in the town of Reading, NY near the intersection of State Route 14 and State Route 14A (Figure 1).

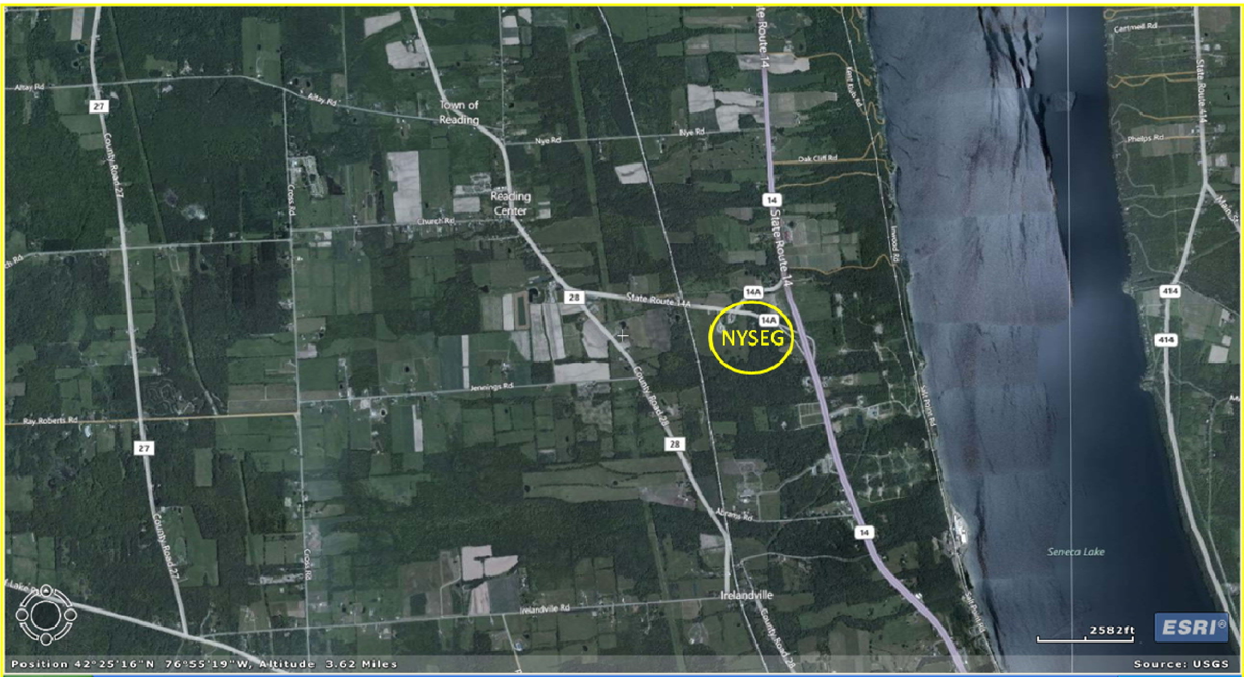


Figure 1 – NYSEG CAES Site Location

CAES facilities use electricity from the electric grid, at times of low electricity demand, to compress air and store the compressed air in storage chambers for later use. During periods of high electricity demand air is withdrawn from the CAES reservoir, heated, and expanded through a turbine to drive an electric generator. The CAES plant electricity generation cycle uses about 1/3 the amount of fuel that is required to generate the electricity using conventional combined cycle gas turbines.

NYSEG plans to store the compressed air in underground caverns solution mined from the bedded salt deposits of the Syracuse Formation, located approximately 2,400 feet below the NYSEG Site. Water for the solution mining will be provided by the U.S. Salt and the brine resulting from the salt dissolution will be processed in the U.S. Salt evaporation plant. Salt has been actively mined using solution mining techniques at the Watkins Glen Field since the 1890's.

This report is a synopsis of the individual contract submittals prepared by PB Energy Storage Services in its role as the Cavern Development Consultant. Each subject heading is followed by superscripts that reference contract submittals. The submittals are identified in Section 11.0 of this report.

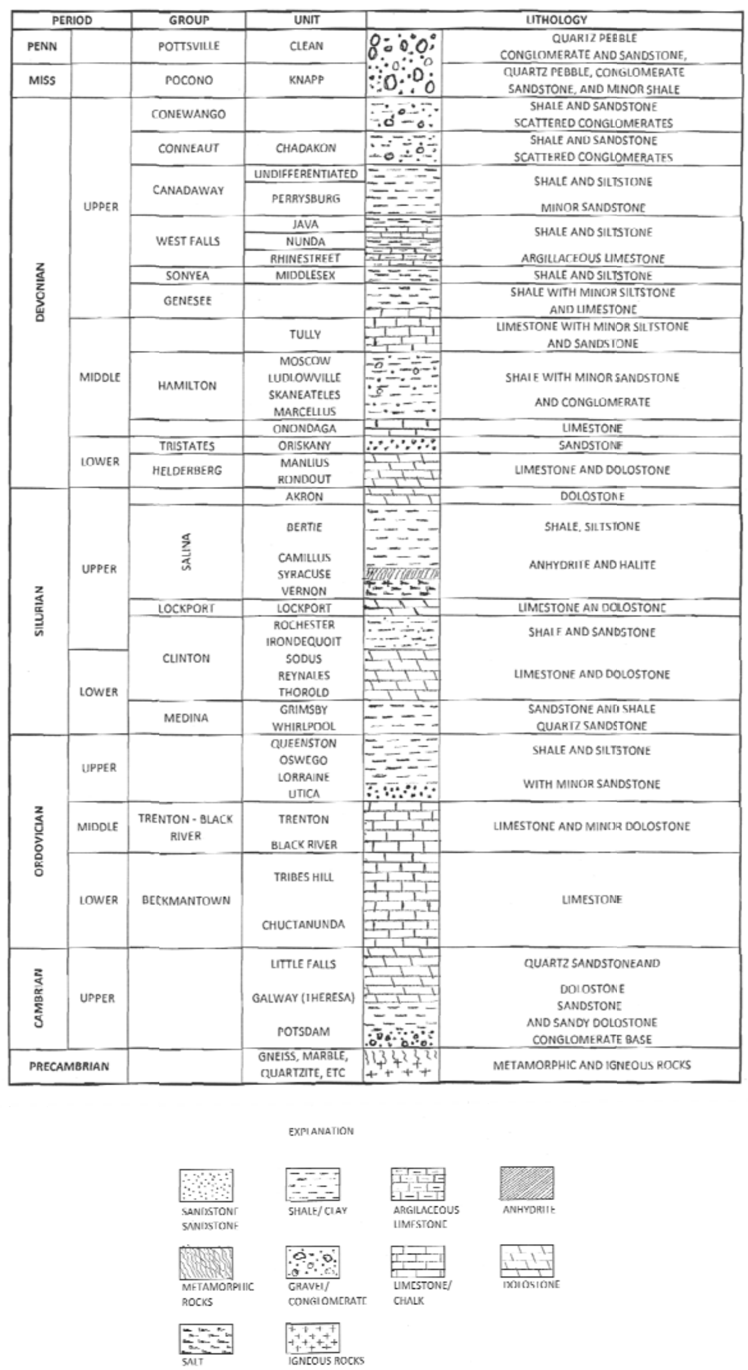
2.0 GEOLOGY[A-D]

Western New York lies in the north end of the Appalachian Synclinorium. The geologic setting consists of a series of gently dipping sedimentary formations overlying the basement complex. The sedimentary-rock surface is mantled by glacial deposits which resulted from glaciation of stream valleys. A generalized geologic column for Western New York is given in Figure 2.

Structural deformation of the Watkins Glen area salt deposits and overlying formations probably occurred during the Appalachian Orogeny, a major period having several cycles of major tectonic activity which took place between late Devonian and the end of Permian time. Compressive forces acting in a nearly north-south direction caused a series of parallel folds oriented approximately N 80° E., thrust faults striking in a similar direction, and high angle north-south strike-slip faults in Silurian and Devonian rocks in the area.

The salt beds underlying the NYSEG site are part of the Salina Group, deposited in the late Silurian time. Overlying the Salina Group is the Akron Dolomite and below the Salina is the Bertie Limestone. The Salina Group is made up of four formations (Figure 3), which are in ascending order:

- Vernon Formation
- Syracuse Formation
- Camillus Formation
- Bertie Formation



PERIOD		GROUP	UNIT	LITHOLOGY
PENN		POTTSVILLE	CLEAN	QUARTZ PEBBLE CONGLOMERATE AND SANDSTONE,
MISS		POCONO	KNAPP	QUARTZ PEBBLE, CONGLOMERATE SANDSTONE, AND MINOR SHALE
DEVONIAN	UPPER	CONEWANGO		SHALE AND SANDSTONE SCATTERED CONGLOMERATES
		CONNEAUT	CHADAKON	SHALE AND SANDSTONE SCATTERED CONGLOMERATES
		CANADAWAY	UNDIFFERENTIATED PERRYSBURG	SHALE AND SILTSTONE MINOR SANDSTONE
		WEST FALLS	JAVA NUNDA RHINESTREET	SHALE AND SILTSTONE ARGILLACEOUS LIMESTONE
		SONYEA	MIDDLESEX	SHALE AND SILTSTONE
		GENESEE		SHALE WITH MINOR SILTSTONE AND LIMESTONE
	MIDDLE		TULLY	LIMESTONE WITH MINOR SILTSTONE AND SANDSTONE
		HAMILTON	MOSCOW LUDLOWVILLE SKANEATELES MARCELLUS	SHALE WITH MINOR SANDSTONE AND CONGLOMERATE
			ONONDAGA	LIMESTONE
	LOWER	TRISTATES	ORISKANY	SANDSTONE
		HELDERBERG	MANLIUS RONDOUT	LIMESTONE AND DOLOSTONE
SILURIAN	UPPER		AKRON	DOLOSTONE
		SALINA	BERTIE CAMILLUS SYRACUSE VERNON	SHALE, SILTSTONE ANHYDRITE AND HALITE
		LOCKPORT	LOCKPORT	LIMESTONE AN DOLOSTONE
	UPPER / LOWER	CLINTON	ROCHESTER IRONDEQUOIT SODUS REYNALES THOROLD	SHALE AND SANDSTONE LIMESTONE AND DOLOSTONE
	LOWER	MEDINA	GRIMSBY WHIRLPOOL	SANDSTONE AND SHALE QUARTZ SANDSTONE
ORDOVICIAN	UPPER		QUEENSTON OSWEGO LORRAINE UTICA	SHALE AND SILTSTONE WITH MINOR SANDSTONE
	MIDDLE	TRENTON - BLACK RIVER	TRENTON BLACK RIVER	LIMESTONE AND MINOR DOLOSTONE
	LOWER	BECKMANTOWN	TRIBES HILL CHUCTANUNDA	LIMESTONE
CAMBRIAN	UPPER		LITTLE FALLS GALWAY (THERESA) POTSDAM	QUARTZ SANDSTONEAND DOLOSTONE SANDSTONE AND SANDY DOLOSTONE CONGLOMERATE BASE
PRECAMBRIAN			GNEISS, MARBLE, QUARTZITE, ETC	METAMORPHIC AND IGNEOUS ROCKS

Figure 2 - Generalized Geologic Column for Western New York (From Van Tyne et al - 1983)

The Syracuse Formation consists of layers of salt separated by layers of insoluble rock. The major non-salt beds are generally continuous across the field, although the thickness and composition of the beds change. Many of the thinner units cannot be traced between adjacent wells. Geologic interpretation of available well log data near the proposed NYSEG Site implies that the top of the F salt unit is at approximately 2,352 feet below ground level and it will be 475 to 480 feet thick.

3.0 CAVERN CONCEPTUAL DESIGN[E,F]

Preliminary cavern design was based upon the anticipated geology at the NYSEG Site, the average brine flow rate that can be accommodated by U.S. Salt (350 gpm), the time allocated for solution mining by NYSEG (730 days), the need to maintain a salt roof for the cavern, and the desire to minimize the maximum cavern diameter.

The cavern will be mined in the F unit of the Salina formation. Figure 4 is a conceptual diagram of the F unit at the proposed location. The F unit extends from about 2,352 feet to about 2,827 feet below ground level and is about 475 feet thick at the NYSEG Site. Of the 475 foot F Unit thickness, about 334 feet is salt. For the conceptual design, 50 feet of salt will be left to form the roof of the cavern.

Cavern solution mining simulation modeling was performed to determine the maximum cavern volume that could be developed. All solution mining modeling was performed using SANSMIC. SANSMIC is a cavern simulation model designed to project the development of caverns from a single well. SANSMIC, a widely used cavern modeling program, was developed by Sandia National Laboratories. The model is a two-dimensional numerical simulation code, which approximates the dissolution of salt by water.

Table 1 shows the results of the SANSMIC modeling of caverns developed in three different intervals within the Syracuse Formation. As can be seen in the table, higher vertical percentages of salt in the cavern interval result in larger open cavern volumes. The difference in volume between the last two intervals in the table is very small; however, the increase in cavern diameter from the second to the third interval is significant. Based upon these modeling results a cavern interval from 2,402 feet to 2,632 feet was selected for cavern development.

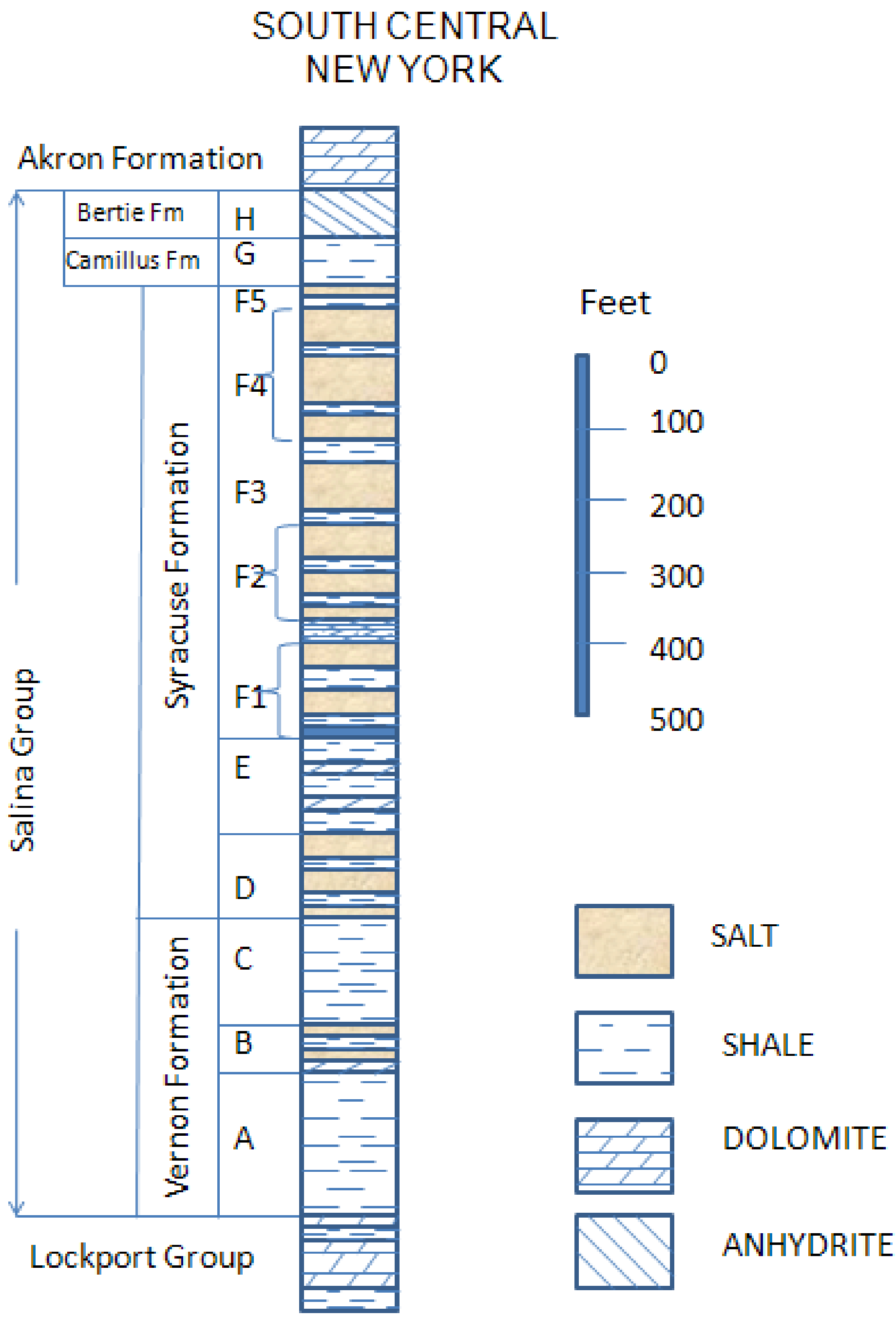


Figure 3 - Generalized Section of the Salina Group in South Central NY (From Johnson)

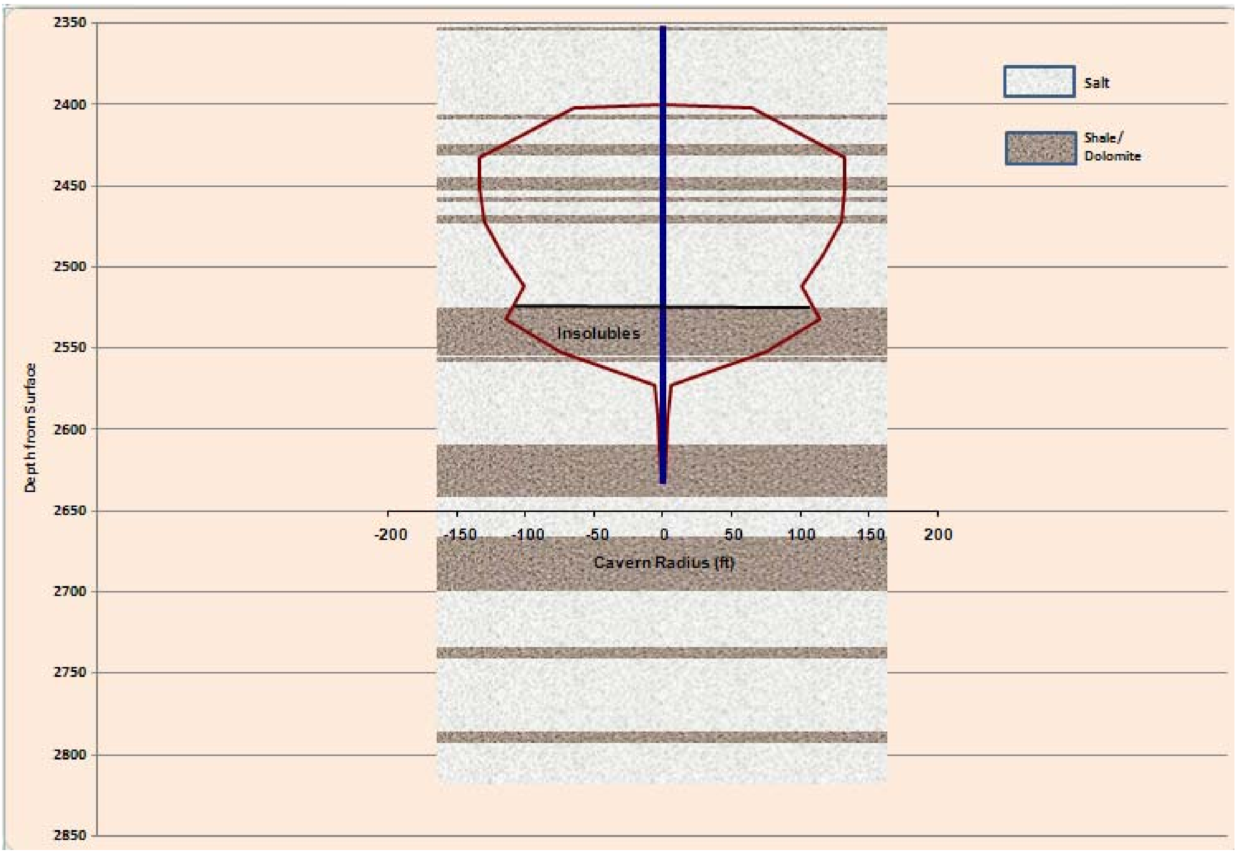


Figure 4 - Cavern Location in Expected Stratigraphy of F Salt at CAES Site

SANSMIC modeling for the interval between 2,402 feet and 2,632 feet indicates that a cavern with an open volume of 970,000 barrels can be solution mined in 710 days. The solution mining will require an intermediate workover after the completion of the first reverse leaching stage to re-position leaching strings. Results from the leaching simulation runs are provided in Table 2 and the predicted final cavern shape, and position within the Salina Salt is shown in Figure 4.

Table 1 Comparison of Caverns Developed at Three Depth Ranges

Modeled Depth Range Feet	Open Volume Barrels	Floor Depth Feet	Maximum Diameter Feet	Vertical Thickness of Salt Percent
2,402 – 2,832	933,000	2,567	258	66
2,402 – 2,632	970,000	2,527	266	71
2,402 – 2,532	974,000	2,508	284	79

Table 2 – Results of Final Leaching Simulation Model Runs

Mining Step	Step Time at 350 gpm Days	Total Mining Time Days	Open Mined Volume Barrels	Gross Cavern Volume Barrels	Brine Saturation Percent
Sump/Chimney	130	130	67,000	105,000	52.1
Reverse	150	280	272,000	324,000	84.8
Reverse	150	430	506,000	575,000	88.6
Reverse	150	580	752,000	840,000	90.8
Reverse	130	710	970,000	1,073,000	90.8

4.0 CAVERN THERMODYNAMIC MODELING[G]

Site specific geology, preliminary CAES duty cycle, and cavern conceptual design data were used to perform thermodynamic modeling of cavern operations. Modeling was performed by RESPEC Inc. using the Salt Cavern Thermal Simulator (SCTS).[1] The SCTS Model was developed by PB Energy Storage Services and RESPEC Inc. to simulate the thermodynamic performance and heat transfer resulting from storage operations of a natural gas storage cavern developed in salt. The version of SCTS used by RESPEC Inc. was modified from the original to include the thermodynamic properties of hydrogen and air.

Thermodynamic modeling of a storage cavern with an open volume of 970,000 bbl, using the NYSEG duty cycle and operating at pressures between 800 psi and 1500 psi, indicated that large swings in temperature could occur. Temperature swings during cavern operation of more than 85°F were predicted by SCTS.[2] When air is withdrawn from a cavern the air will decompress, causing a decrease in the air temperature that results in the development of thermal stresses in the salt. If the pressure drop is too great, the resultant pressure drop creates a stress state in the salt surrounding the cavern that eventually becomes tensile and the salt fails in tension.

Preliminary geomechanical analyses were performed to assess the impact of the temperature swings on cavern stability. These analyses indicated that tensile stress would develop in the cavern wall due to thermodynamically induced stress when wellhead pressures fall below 1,150

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[1] Nieland, J. D. . ***Salt Cavern Thermal Simulator Version 2.0 User's Manual***. RSI-1760. RESPEC, Inc. 2004

[2] Ratigan, Joe L. Presentation to NYSEG. ***Cavern Volume Review – Seneca Lake CAES Project.*** August 3, 2011.

psi. Since salt has a very low tensile strength, caverns are designed to avoid tensile stress development. The preliminary modeling results indicated that three 970,000 bbl caverns, operated at pressures between 1,150 psi and 1,500 psi, would be required to eliminate the development of tensile stresses during CAES operations.

Based upon these modeling modeling results, the cavern design basis was revised. The revised cavern preliminary design requirements are three storage caverns, each with an open volume of 970,000 barrels, operating between 1,150 psi and 1,500 psi.

Thermodynamic modeling of the revised cavern design was performed by RESPEC, using SCTS, to estimate the temperature boundary condition for the heat transfer numerical modeling and to establish the required diameters for the casing liners. The results of the thermodynamic modeling indicated that:

- The first cavern would require a 20 inch diameter casing liner to compress air at the design rate of 639 lbs per second and withdraw air at 617 lbs per second for 2.3 hours of electrical power generation.
- The second and third caverns require a 16 inch diameter casing to flow air at a combined rate of 639 lbs per second and to withdraw air at 617 lbs per second for 4.9 hours of electrical power generation.
- All three caverns combined are required to generate electricity in accordance with the preliminary NYSEG duty cycle.
- The wellhead temperature will vary from 71° F to 101° F during CAES operations.
- The Salt temperature will cycle between 85° F and 126° F during CAES operations.
- Wellhead Pressures will cycle between 1,150 psi and 1,500 psi at the wellhead during CAES operations.

5.0 THERMAL AND THERMOMECHANICAL MODELING[H]

Numerical modeling of a single 970,000 barrel CAES cavern, operating at pressures between 1,150 psi and 1,500 psi, was performed by RESPEC. The modeling was performed to evaluate cavern stability, determine cavern closure due to creep, and to estimate well casing strains during CAES operation. The modeling was composed of two separate models; the heat transfer finite element model and the thermomechanical model.

Cavern stability is a function of the stress state in the salt surrounding the opening, which in turn is a function of the cavern shape, the air pressure inside the cavern, the insitu stress, cavern creep and the thermally induced stresses in the salt. The thermally induced stresses, due to pressure cycling of the cavern during operation, have a significant impact on the stress state in the salt surrounding the cavern.

5.1 HEAT TRANSFER FINITE ELEMENT MODEL

SPECTROM-41[3] was used to simulate the heat transfer between the cavern wall and the surrounding salt. SPECTROM-41 is a finite element heat transfer program developed by RESPEC, Inc. to model heat transfer in geologic formations.

Heat transfer modeling was performed to simulate a thirty year time period, during which the cavern was cycled between minimum and maximum operating pressure in accordance with the preliminary NYSEG CAES duty cycle. Temperature fluctuations in the salt surrounding the cavern, due to cavern operations, ranged from 25°F at the cavern wall to 0° F five feet beyond the wall of the cavern. Predicted temperatures at the salt walls of the cavern are shown in Figure 5.

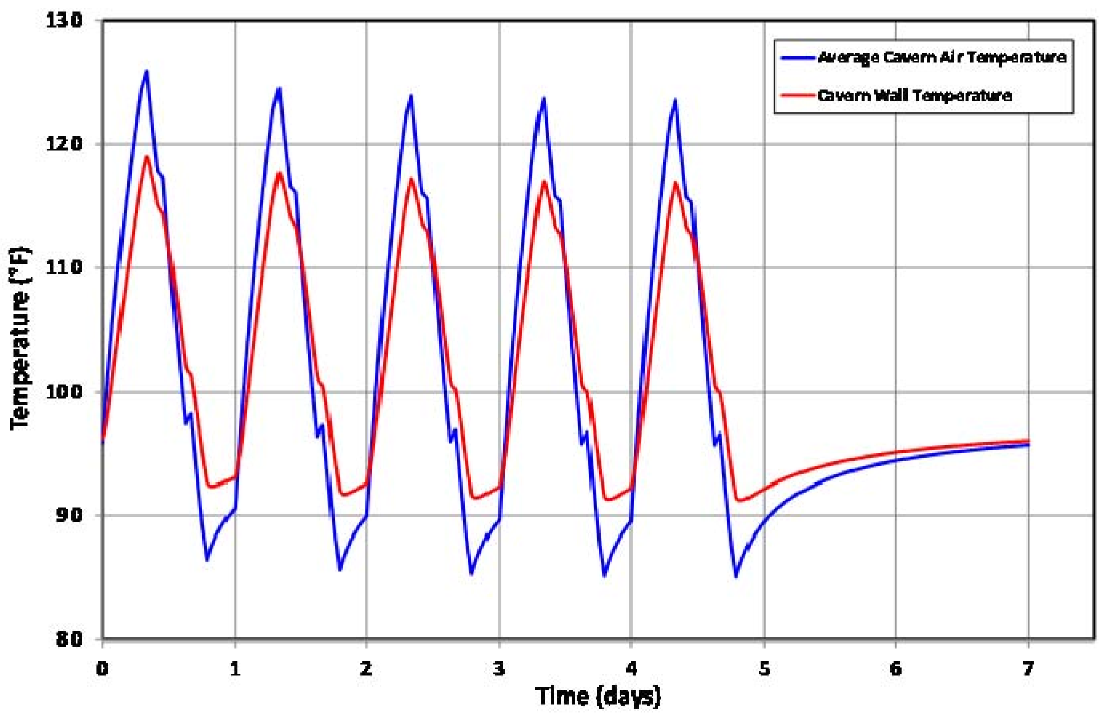


Figure 5 – Salt Wall Predicted Temperatures After 5 Years of Operation

[3] Svalstad, D. K. ***Documentation of SPECTROM-41: A Finite Element Heat Transfer Analysis Program***. RE/SPEC Inc. 1989.

The preliminary geomechanical modeling results, discussed in Section 4.0, implied that tensile stress would not develop in the cavern walls for the temperature swing of 25°F. The results from the heat transfer modeling were used in the thermomechanical modeling to assess cavern stability.

5.2 THERMOMECHANICAL MODELING

Cavern salt temperature modeling results, predicted cavern pressures during operations, insitu stress, rock material properties, and rock thermal properties were used to model the thermomechanical behavior of the cavern over a 30 year operating period. The numerical modeling code SPECTROM-32[4] was used for the thermomechanical modeling. SPECTROM 32 was developed by RESPEC for simulation of underground openings in both brittle rock and in rock which behaves viscoplastically like salt.

Thermomechanical modeling for a period of 5 years of cavern operations was performed to evaluate the potential for salt dilation and hydraulic fracture. A 30 year thermomechanical model, at minimum cavern pressure, was used to estimate cavern creep closure, shear failure of non-salt geologic units, and strain in the well casing.

Modeling results from the cavern operation model were evaluated by calculating factors of safety in the salt and non salt units relative to dilation (for salt) and shear failure in nonsalt units. Modeling results indicate that minimal salt dilation is predicted to occur in the upper corner of the cavern and the floor of the cavern during the first two weeks of operation. While the dilation may result in sloughing of the salt it is not expected to affect cavern stability. No shear failure of the nonsalt units above the cavern was predicted during cavern operations. Fracturing of thin nonsalt units intersecting the cavern are not expected to result in instability or loss of cavern integrity. Stresses surrounding the cavern remained compressive for the five year cavern operation modeling period, implying that no thermally induced fractures are predicted perpendicular to the cavern walls.

Cavern closure and strain in the cemented casing were evaluated during a simulated 30 year period of operation at minimum cavern pressure (1,150 psi). A creep closure of 0.48% was predicted over the 30 year simulation period. This magnitude of creep closure is very small relative to other salt storage caverns. This closure rate will result in strain rates in the cemented

[4] Callahan, G. D., A. F. Fossum, and D. K. Svalstad. ***Documentation of SPECTROM-32: A Finite Element Thermomechanical Stress Analysis Program***, RE/SPEC Inc., 1989.

casing of less than 7 mircostrain and is not expected to result in casing failure during the life of the cavern.

6.0 DRILLING AND COMPLETION[I-V]

The drilling and completion programs for the proposed NYSEG CAES wells are premised on the NYSEG requirements that:

- All three caverns must flow in parallel at the design rate for the NYSEG specified duty cycle.
- The first cavern must flow at the design flow rate.
- Any two caverns must flow in parallel at the design flow rate

6.1 CASING AND TUBULAR SPECIFICATIONS

Based upon these requirements the well casing, casing liner, and tubulars for solution mining and dewatering were selected. All casing performance was assessed in accordance with American Petroleum Institute (API 5C3).

Casing for the first well will be a 42” surface conductor casing set and cemented to approximately 175 feet below ground surface, a 30” diameter surface casing set and cemented to a depth of approximately 850 feet below ground surface, a 24” final cemented casing set and cemented to a depth of approximately 2,360 feet below ground surface, and a 20” suspended stainless steel production liner set at a depth of 2,407 feet below ground surface.

Casing for Wells 2 & 3 will be a 42” surface conductor casing set and cemented to approximately 175 feet below ground surface, a 26” diameter surface casing set and cemented to a depth of approximately 850 feet below ground surface, a 20” final cemented casing set and cemented to a depth of approximately 2,360 feet below ground surface, and a 16” suspended stainless steel production liner set at a depth of 2,407 feet below ground surface.

Leaching tubulars are sized for a brine flow rate of 350 gpm, subject to the requirement to be able to pass a 4” conventional sonar survey tool. The casing depths are specified in the leaching plan. Setting depths, at the start of solution mining, are 2,530 feet below ground level for the outer 8-5/8” casing and 2,630 feet below ground level for the inner 5-1/2” tubing.

6.2 WELLHEAD SPECIFICATIONS

Wellheads were specified in accordance with API 6A. The leaching wellhead was selected to suspend tubulars for solution mining. Upon completion of solution mining, the leaching wellhead sections above the bradenhead flange will be replaced with corrosion resistant wellhead sections. Following dewatering, the dewatering string will be snubbed out of the cavern, the master valve shut, and corrosion resistant wellhead components installed to prepare the cavern for CAES operations.

6.3 DRILLING PROGRAM

Final drilling procedures will be developed after selecting a drilling contractor and final casing setting depths will be established after wellbore logging. The drilling program developed for NYSEG consists of:

- Drilling, running, and cementing the conductor pipe.
- Mobilizing drilling rig to the wellpad.
- Drilling the surface hole, running the surface casing, and cementing it in place.
- Drilling the production hole, running the production casing, and cementing it in place.
- Drilling the hole through the cavern interval to the total depth. Coring will be performed during the drilling of Well No. 2 only.
- Running the leaching strings and installing the surface wellhead.
- Demobilizing drilling rig from wellpad.

7.0 DEWATERING[W]

Upon completion of solution mining the cavern will undergo preliminary mechanical integrity testing, followed by a conversion workover to ready the cavern for dewatering. The workover consists of removing the leaching tubulars and leaching wellhead components, running and welding the stainless steel cemented casing liner, installing the dewatering sections of the wellhead, and running a dewatering string to a depth near the floor of the cavern.

Due to the low rate of brine acceptance by U.S. Salt it will be necessary to dewater the cavern using temporary compressors. Injection of air will take place down both the annulus between the dewatering string and the liner and between the liner and the final cemented casing to prevent casing collapse. The dewatering will take approximately 78 days. After the air / brine interface reaches the roof of the cavern the wellhead pressures will not increase significantly during dewatering. A maximum air pressure of 1,300 psi and a maximum flow rate of 3,750 scfm are anticipated during dewatering.

8.0 MECHANICAL INTEGRITY TESTING[X]

Each NYSEG cavern will undergo preliminary mechanical integrity testing prior to the start of the conversion workover. This test will assess the integrity of the cavern prior to running and welding the stainless steel liner. The nitrogen interface will be set between the casing shoe and the cavern roof by removing a portion of the nitrogen which makes up the roof blanket. Once the nitrogen interface is set, the wellbore integrity will be evaluated using nitrogen mechanical integrity testing techniques.

The final MIT for the NYSEG caverns will take place after running the stainless steel liner, and installing the dewatering casing and wellheads. This test is designed to test the cavern wellbore, dewatering wellhead components, and dewatering string for gross leakage prior to the start of dewatering.

9.0 CAVERN CONSTRUCTION EXECUTION[Y-AA]

Cavern construction execution is composed of the overall project schedule, combined, with a proposed methodology of contracting wellpad construction, drilling, solution mining, workovers, and final conversion. A cavern development construction manager who is thoroughly familiar with drilling large diameter cavern storage wells, cavern well workover, and the management of solution mining of storage caverns is critical to the success of the project.

The responsibilities of the cavern development construction manager include specification development, specialized procurement, management and contracting of drilling and workover operations required, management of solution mining operations, and engineering support required to successfully develop storage caverns.

10.0 CAVERN CONSTRUCTION COST[BB]

A final revised cavern construction cost estimate of $36.6 million (2011 dollars) was developed by PB ESS based upon actual historical costs experienced along the Gulf Coast and in New York. This cost does not include land acquisition cost, access road cost, or costs associated with the permitting of a CAES facility in New York.

11.0 SUBMITTALS

A. Eyermann, Thomas. ***Overview of Geology of the Area Around the US Salt Watkins Glen Refinery***. PB Energy Storage Services Inc. September 2011.

B. PB ESS Inc. Letter Report: ***Location of TEPPCO Watkins Glen Propane Storage Facility***. October 20, 2011.

C. PB ESS Inc. Letter Report: ***Constituents and Quality of Formation's Salts***. October 24, 2011.

D. PB ESS Inc. Letter Report: ***Update of Earthquake Data 1998 – 2011***. November 30, 2011.

E. Eyermann, Thomas. ***Initial Cavern Design Watkins Glen CAES***. PB Energy Storage Services Inc. October 2011.

F. PB ESS Inc. Drawing: ***Storage Well Site Plan***. November 2011.

G. Nieland, Joel. Letter Report. Nieland to McHenry. Subject: ***Thermodynamic Evaluation of Proposed New York State Electric & Gas Corporation Compressed Air Energy Storage Cavern Design***. RESPEC Inc. October 4, 2011.

H. RESPEC Inc. ***Geomechanical Evaluation of the New York State Electric & Gas Corporation Compressed Air Energy Storage Cavern Design***. Topical Report RSI – 2240. November 2011.

I. PB ESS Inc. ***Well Casing and Tubulars – Watkins Glen CAES***. November 2011.

J. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Leaching Wellhead – Cavern No. 1.*** November 2011.

K. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Leaching Wellhead – Cavern No. 2 & 3***. November 2011.

L. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Dewatering Wellhead – Cavern No. 1.*** October 2011.

M. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Dewatering Wellhead – Cavern No. 2 & 3***. October 2011.

N. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Production Wellhead – Cavern No. 1.*** October 2011.

O. PB ESS Inc. ***NYSEG Seneca Lake CAES Proposed New Production Wellhead – Cavern No. 2 & 3***. October 2011.

P. PB ESS Inc. ***NYSEG Watkins Glen Proposed CAES Well No. 1 – Drilling Program.*** September 2011.

Q. PB ESS Inc. ***NYSEG Watkins Glen Proposed CAES Well No. 2 – Drilling Program.*** November 2011.

R. PB ESS Inc. ***NYSEG Watkins Glen Proposed CAES Well No. 3 – Drilling Program.*** November 2011.

S. PB ESS Inc. ***Intermediate Workover Program – Well No. 1, 2, & 3***. November 17, 2011.

T. PB ESS Inc. ***Conversion Workover Program – Well No. 1, 2, & 3***. November 17, 2011.

U. PB ESS Inc. ***Snubbing Program – Well No. 1, 2, & 3***. November 17, 2011.

V. PB ESS Inc. ***NYSEG Watkins Glen Open Hole Logging Plan***. November 2011.

W. PB ESS Inc. Letter Report: ***Dewatering Program for NYSEG CAES Caverns***. McHenry to Rettberg. December 13, 2011.

X. PB ESS Inc. ***Cavern Testing Program – CAES Storage Cavern***. November 2011.

Y. PB ESS Inc. ***Construction Execution Plan – CAES Storage Cavern***. November 2011.

Z. PB ESS Inc. Drawing: ***NYSEG Seneca Lake Wellpad Sections and Details***. November 2011.

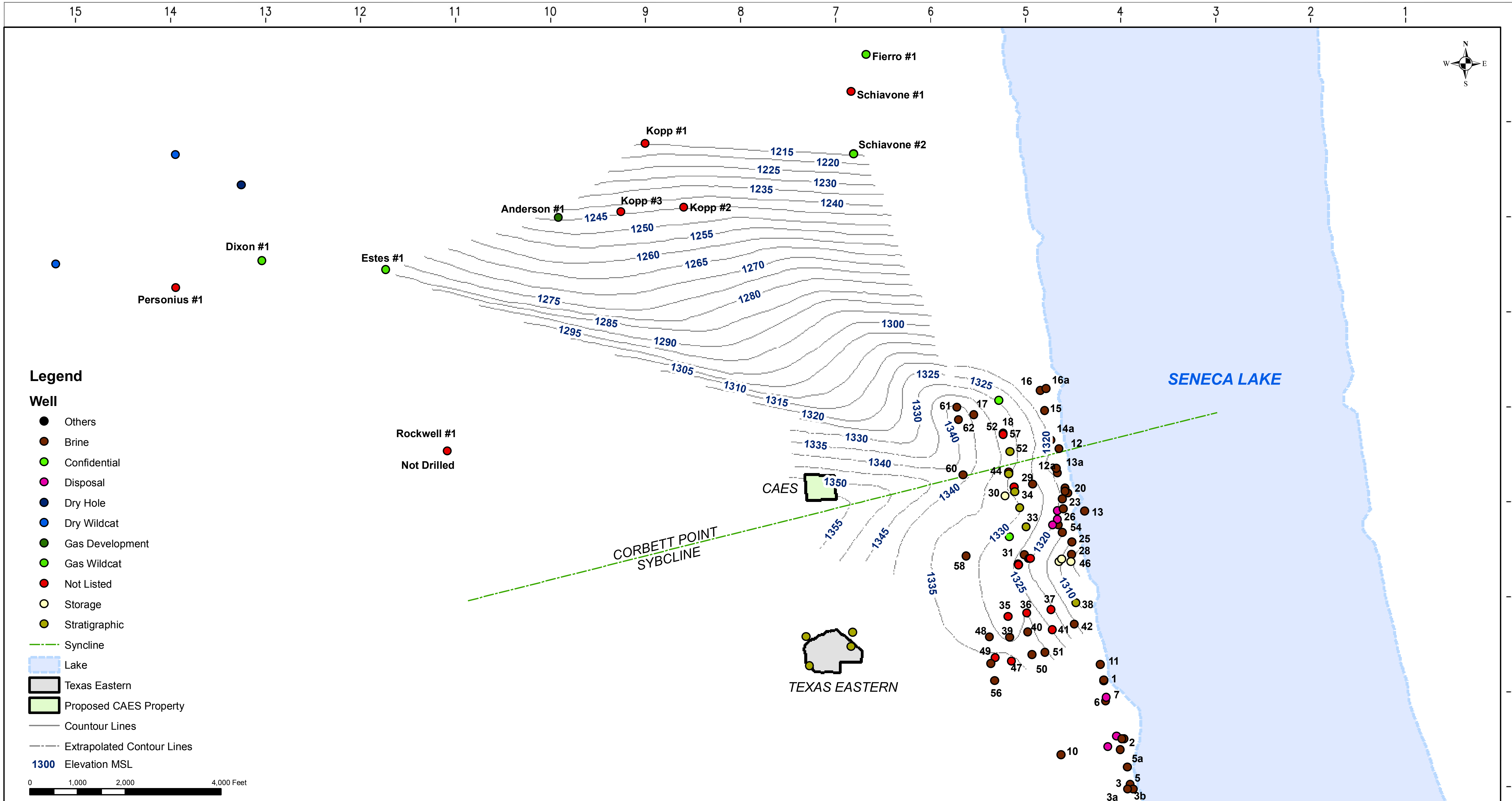
AA. PB ESS Inc. ***NYSEG CAES Project Schedule***. Delivered in Microsoft Project 2007 Format. October 2011.

BB. PB ESS Inc. ***Individual Cost Estimates***.

   a. Cavern Construction Cost Estimate. October 31, 2011.
   b. Wellpad Cost Estimate. December 7, 2011.
   c. MIT Cost Estimate – Cavern No. 1. October 2, 2011.
   d. MIT Cost Estimate – Cavern No. 2 & 3. October 2, 2011.
   e. Drilling Cost Estimate Well No. 1. October 2011.
   f. Drilling Cost Estimate Well No. 2. October 2011.
   g. Drilling Cost Estimate Well No. 3. October 2011.
   h. Intermediate Workover Cost Estimate. October 31, 2011.
   i. Conversion Workover Cost Estimate Well No. 1. October 15, 2011.
   j. Conversion Workover Cost Estimate Well No. 2 & 3. October 15, 2011.
   k. Final Wellhead Installation Cost Estimate Well No. 1. October 31, 2011.
   l. Final Wellhead Installation Cost Estimate Well No. 2 & 3. October 10, 2011.
   m. Set Nitrogen Blanket Cost Estimate Well No. 1. October 2, 2011.
   n. Set Nitrogen Blanket Cost Estimate Well No. 2 & 3. October 2, 2011.
   o. Snubbing Cost Estimate. October 31, 2011.
   p. Sonar Survey Cost Estimate. October 11, 2011.
   q. Wellpad Piping Cost Estimate. October 10, 2011.

CC. PB ESS Inc. Letter Report: Preliminary Cavern Criteria. August 11, 2011.

DD. PB ESS Inc. Letter Report: Environmental Report Questionnaire Input. December 15, 2011.



GENERAL NOTES	REV. No.	REVISIONS	REVISED BY	REVISED DATE	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE

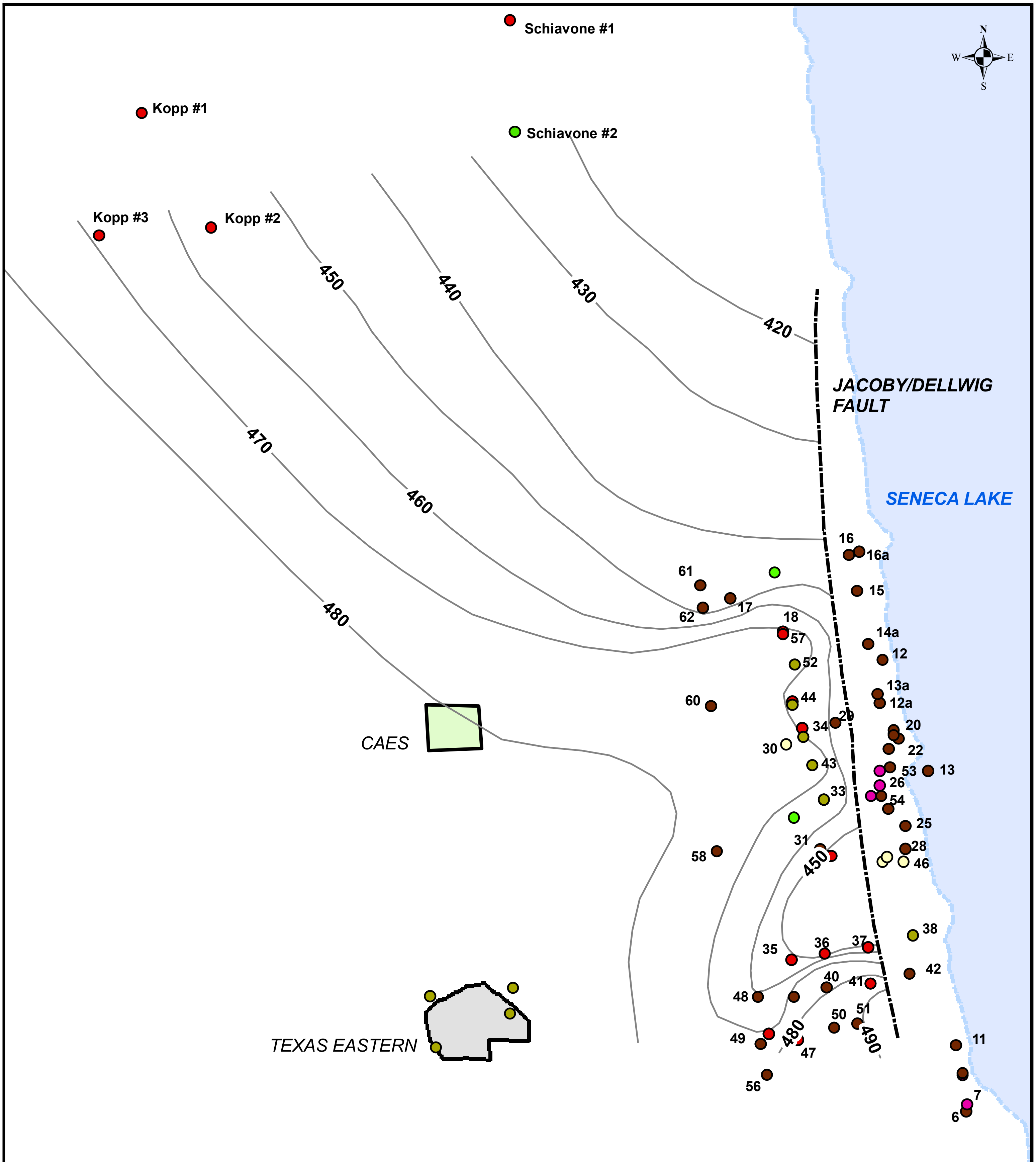
THIS DRAWING PREPARED FOR:

NYSEG

PB Energy Storage Services, inc.

NYSEG CAES FACILITY
Structural Contour Map
Top of Syracuse Salt
Seneca Lake, Schuyler County, New York

DESIGN BY: BR	DATE: 08/11	DRAWN BY: HH	DATE: 08/11	SCALE:
CHECKED BY: JM	DATE: 08/11	APPROVED BY: JM	DATE: 08/11	PROJECT No: 50756B
FILE NAME:		DRAWING No. FIGURE 4		LATEST REVISION:



Generalized F Salt Isopachs

Seneca Lake, Schuyler County, New York

PB Energy Storage Services, inc.

ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE

0 750 1,500 3,000 Feet

DESIGN: TE	DRAWN: HH	CHECKED: JM	DATE: 08/11	SCALE:	JOB No.
					DRAWING No. FIGURE 5