Seneca Advanced Compressed Air Energy Storage (CAES) 150 MW Plant Using an Existing Salt Cavern

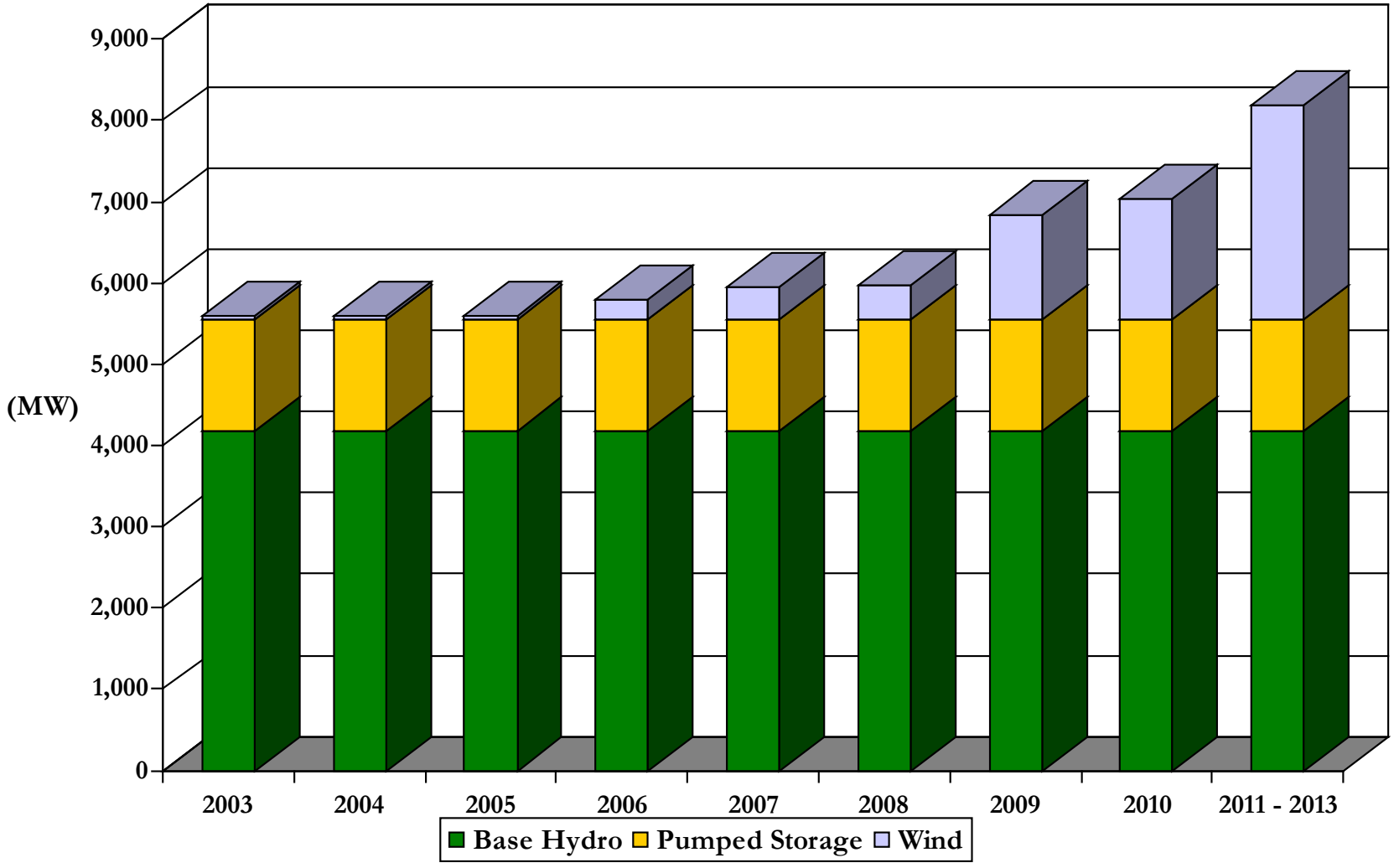
James Rettberg, P.E.
New York State Electric & Gas Corporation (NYSEG)
November 3, 2010

Funded in part by the Energy Storage Systems Program of the U.S. Department Of Energy through *National Energy Technology Laboratory*

Energy Storage Need Addressed by the Project

- Demonstrate how an advanced CAES plant can support the continued development of renewable generating resources in New York State.
  - Integrate renewable generation by making it "dispatchable" on-peak.
  - Provide relief to the NYSEG 115-kV/230-kV transmission system and potential deferral of transmission system capital expenditures.
  - Provide significant ancillary services to the New York Independent System Operator (NYISO) including VAR support, automatic generation control/frequency control, operating reserves.
  - Promote grid stability to accommodate rapid changes in generation levels associated with intermittent generation profile of wind generators.
  - Promote New York's "45 x 15" clean energy goal to meet 30% of its forecasted energy needs by 2015 through renewable energy and 15% through increased energy efficiency.

New York Renewable Energy Profile



Data Source: NYISO Load & Capacity Report (March 2010)

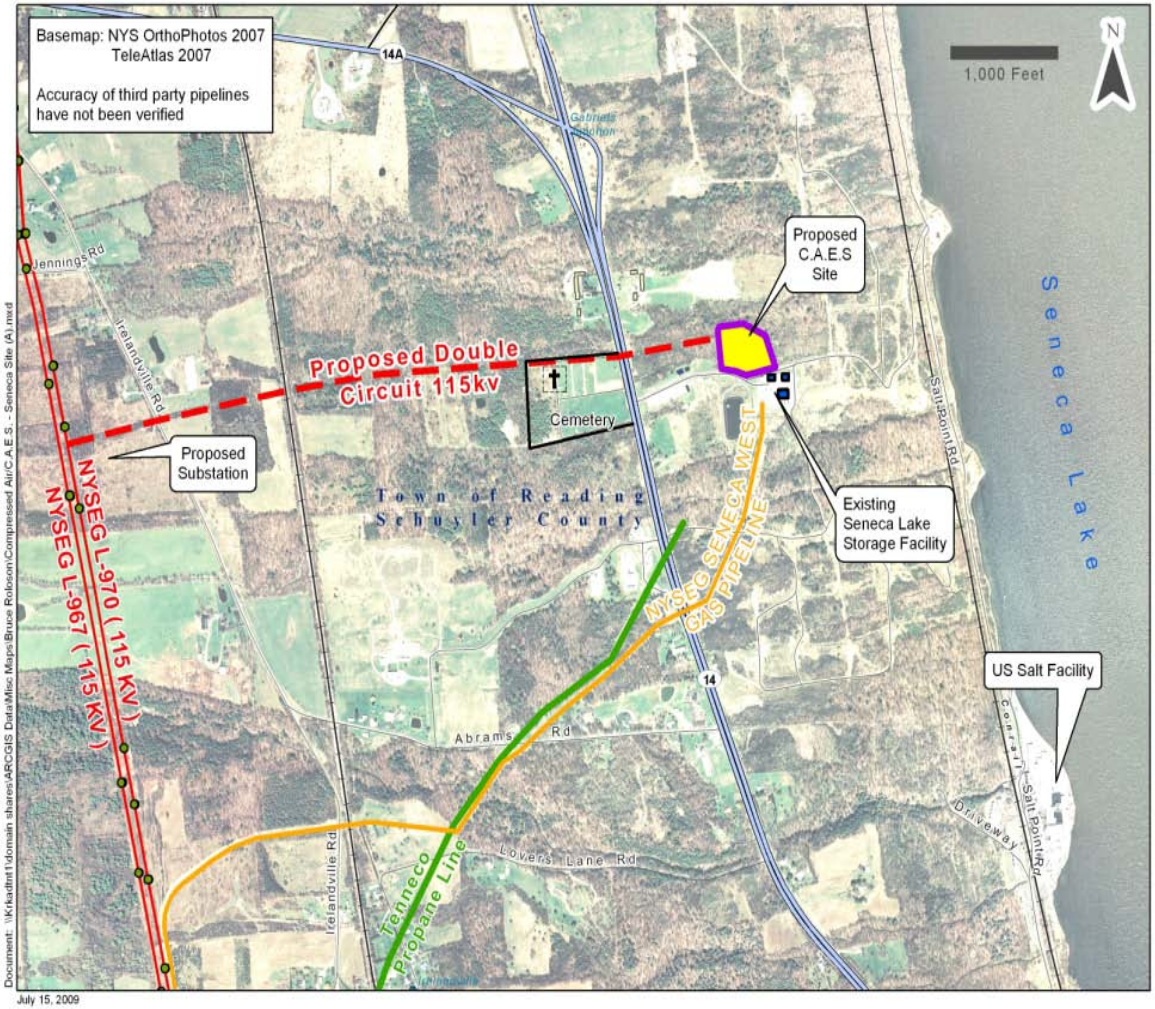
NYSEG/Iberdrola USA

- NYSEG is a wholly-owned subsidiary of Iberdrola USA which in turn is a wholly-owned subsidiary of Iberdrola, S.A.
- NYSEG serves 873,000 electricity and 259,000 natural gas customers across upstate New York.
- NYSEG divested its fossil and nuclear generation in the late 1990s in conjunction with electric restructuring in New York. While we retain ownership of approximately 80 megawatts (MW) of small hydro generation, we are essentially a transmission and distribution company.
- Iberdrola USA also owns Rochester Gas & Electric, Central Maine Power, Southern Connecticut Gas, Connecticut Natural Gas and Berkshire Gas.
- Iberdrola S.A. owns a wide array of regulated and unregulated electricity production, transmission and distribution companies in Europe and the Americas, and its Iberdrola Renewables subsidiary is one of the largest wind power developers and operators in the world.

Seneca CAES Project

- Project proposal submitted to the Department of Energy (DOE) was for a nominal 150-mw plant to be built adjacent to NYSEG's Seneca Lake Gas Storage facility. The cost estimate for the project was $125 million. In February 2010 DOE awarded NYSEG a $29.6 million Smart Grid Demonstration Grant.
- Three phases of the proposed project:
  - Phase 1: develop final engineering design including project capital costs; project financials based on the final engineering design and updated forecasts of energy market revenues; characterization of the salt cavern to be used for air storage; draft environmental permit applications and exhibits; draft NYISO interconnection filing.
    Cost: $5 million. Time to complete: up to 12 months.
  - Phase 2: plant construction with a target in-service date of late 2014.
  - Phase 3: commercial demonstration, testing, performance reporting
- NYSEG is ready to proceed with Phase 1; will begin to retain the technical resources required to move ahead immediately.

Seneca CAES Project: Location

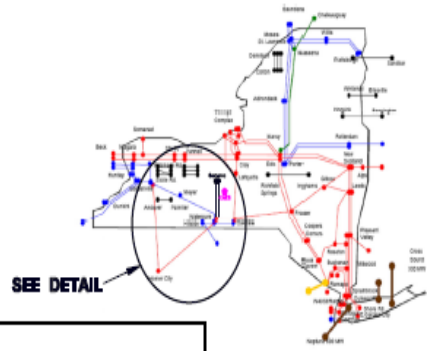


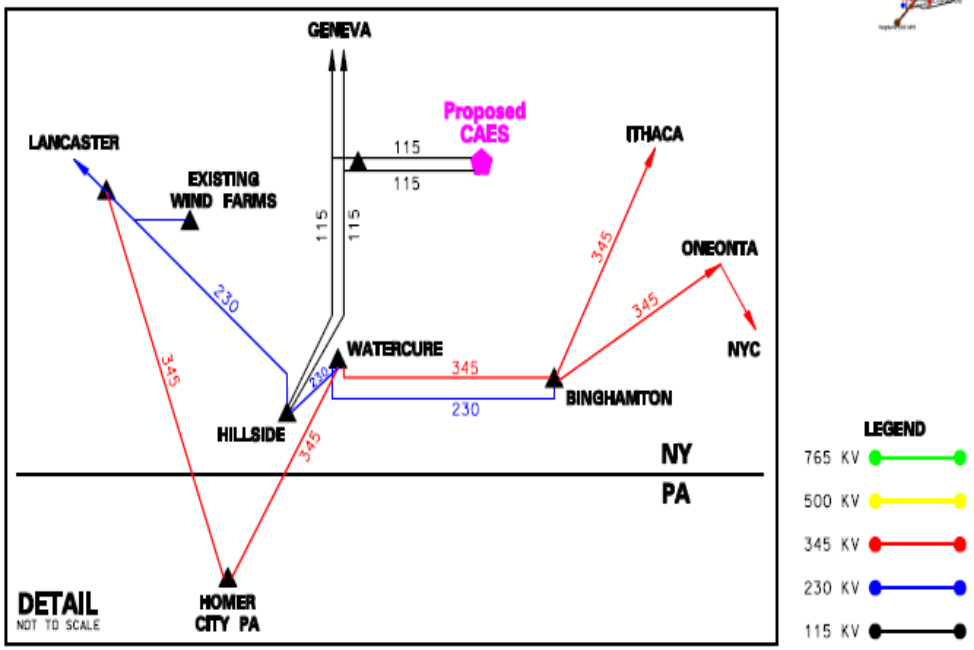
- 3 miles north of Watkins Glen on the west side of Seneca Lake.
- Site owned by US Salt, subsidiary of Inergy Midstream, LLC. Has been an active solution salt mine for the last 100 years.
- Inergy will re-open and test a solution-mined salt cavern capable of 0.5 bcf at maximum pressure and a working volume of at least a 0.32 bcf.
- The cavern and plant will have the capacity to provide more than 16 hours of a combination of power production.
- Site features an existing high-pressure natural gas pipeline and brine treatment facilities, and is located 1.5 miles from high voltage transmission lines.
- Site is ideally suited for future increases in plant capacity due to the existence of numerous depleted salt caverns.

NYSEG

IBERDROLA USA

Seneca CAES Project: Electrical Interconnection





- Interconnection to existing NYSEG 115-kv facilities.
- Wind generation connected to the NYSEG 230-kv system west of the Seneca Project:
  - 125-mw Canandaigua Farm (in service)
  - 112.5-mw High Sheldon Farm (in service)
  - 125-mw Wethersfield Farm (in service)
  - Additional 90 mw under active development
- Strategic location of Seneca CAES Project will help to back off constrained West-Central transfers during peak operations.
- Potential for additional wind development in Western and Central New York (NYISO Zones A-C) likely to continue to create congestion and potential reliability concerns.

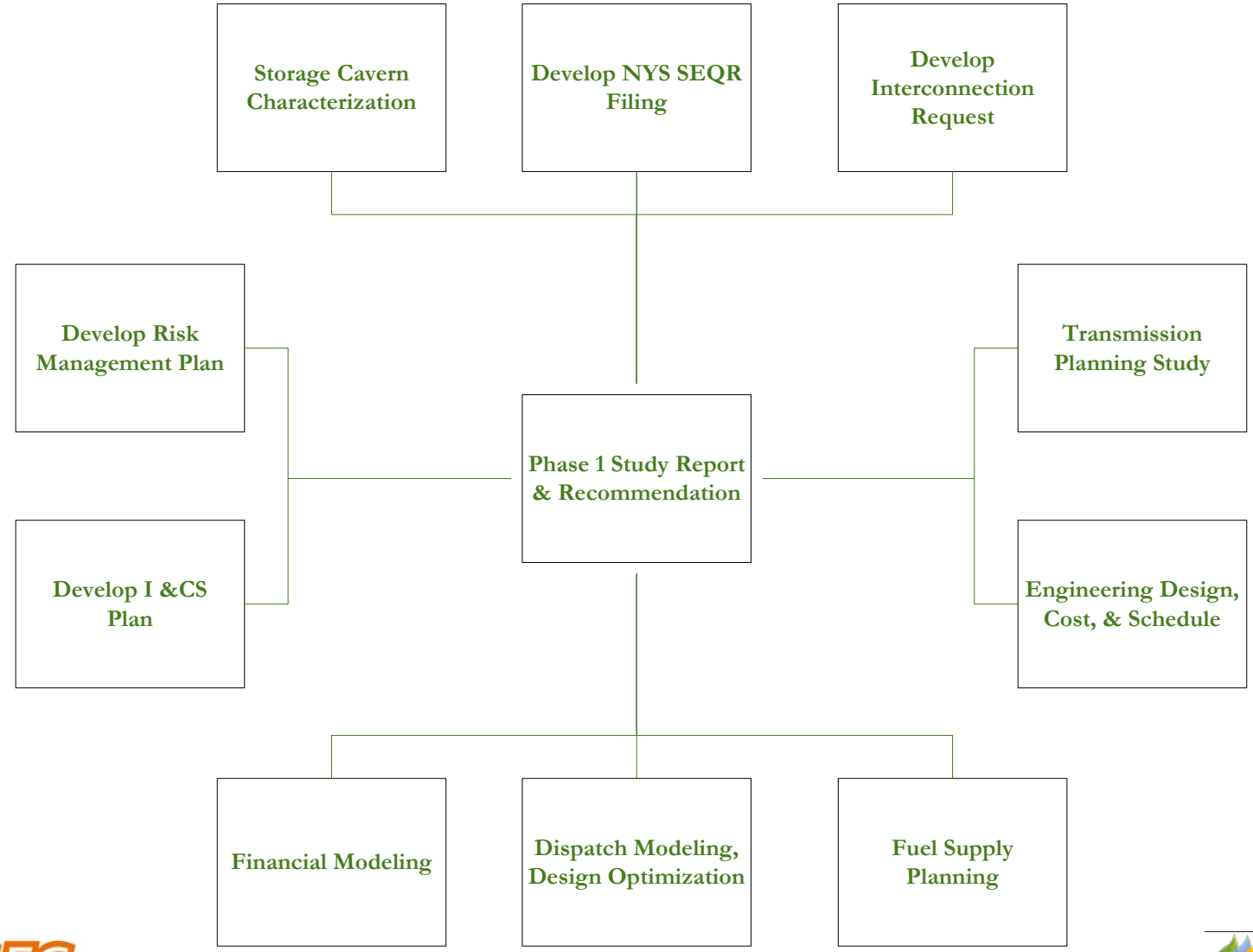
NYSEG

IBERDROLA USA

Seneca CAES Project: Phase 1 Major Tasks

- Salt cavern characterization and integrity testing to support design and licensing.
- Development of environmental siting and licensing documents and studies.
- Conduct study/assessment of project impact on transmission system.
- Conduct front-end engineering design, cost and schedule estimates.
- Develop preliminary natural gas supply and transportation plan.
- Develop optimized electric dispatch model of advanced CAES plant over 30-year life cycle.
- Develop financial model to illustrate potential impact of advanced CAES plant on customers.
- Develop NYISO Interconnection Request and supporting technical information.
- Develop petition to New York State Department of Public Service for Certificate of Public Convenience and Necessity.
- Develop an Interoperability and Cyber Security Plan.
- Develop a project Risk Assessment and Management Plan.

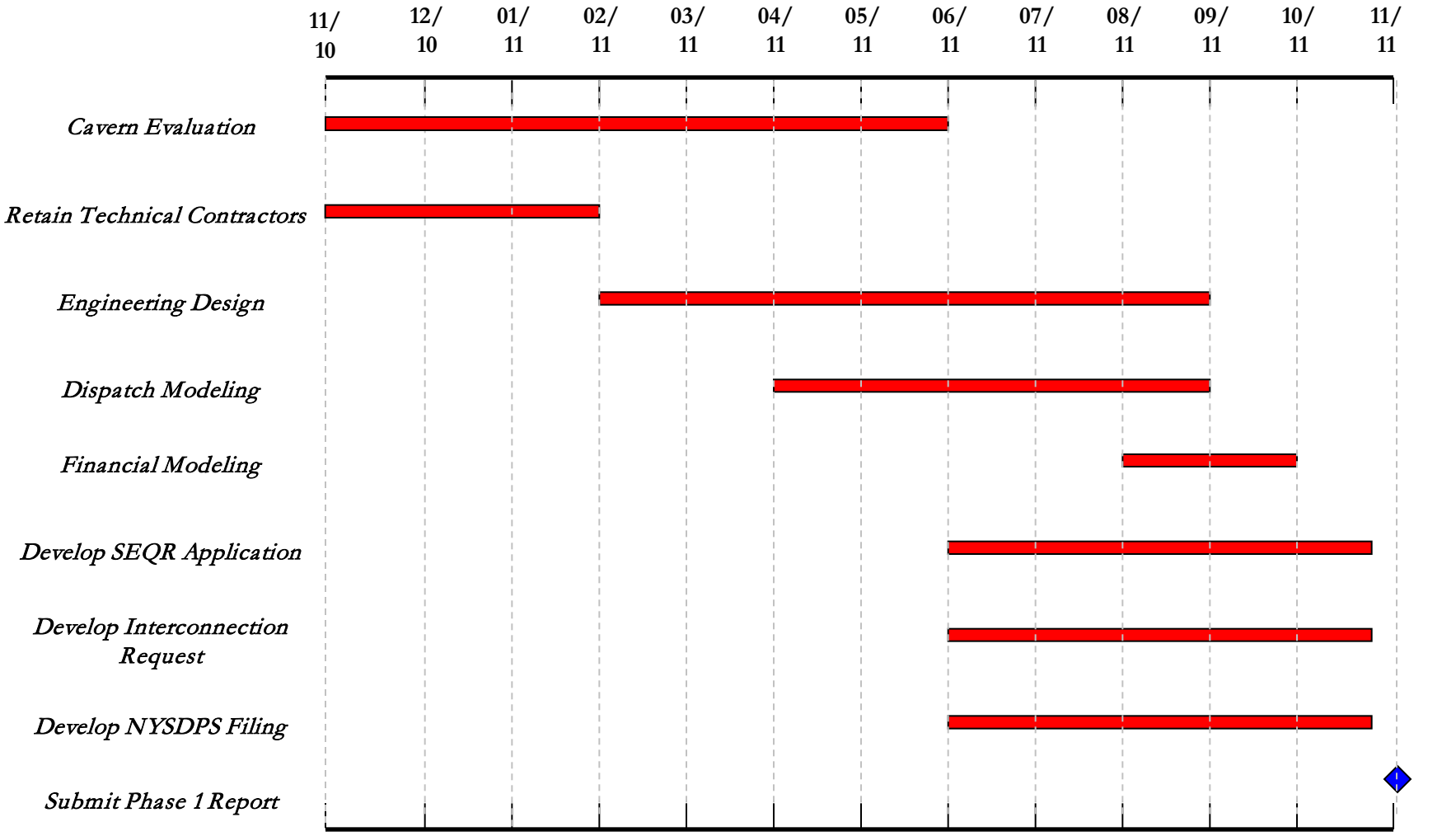
Seneca CAES Project: Phase 1 Overview



NYSEG

IBERDROLA USA

Seneca CAES Project: Phase 1 Timeline



NYSEG

IBERDROLA USA

Seneca CAES Project: Summary

- NYSEG is launching Phase 1 of the Seneca CAES Project with the objective of developing the technical, siting/licensing and financial modeling to permit a go/no go decision to be made by this time next year.
- During Phase 1, NYSEG will also be preparing all of the regulatory filings (state and federal), transmission studies and electrical interconnection applications needed to build and operate the Seneca CAES plant.
- NYSEG will be working with Inergy to evaluate and characterize the salt cavern that will be used for air storage for the project; this will include the development of studies and data necessary to license the salt cavern for compressed air storage.
- NYSEG will work closely with DOE staff to provide technical reporting of study findings and to share this information with all interested parties in a timely fashion.

NYSEG

IBERDROLA USA

Seneca CAES Project: Future Tasks

- Retain technical contractors for engineering, licensing, interconnection application preparation, dispatch modeling, financial modeling and technical report development.
- Conduct the technical studies and analyses necessary to address the project objectives, including both a technical and financial assessment of the feasibility of the advanced CAES technology as applied to the Seneca site located within the NYISO control area.
- Prepare permit applications for state and federal licensing, and prepare an interconnection application request to be submitted to the NYISO.
- Prepare a comprehensive report detailing the results of Phase 1 and presenting a recommendation on whether the advanced CAES technology provides a level of financial and societal benefit sufficient to seek formal DOE and regulatory approvals needed to proceed with Phase 2 project development.