PUBLIC SERVICE ELECTRIC AND GAS COMPANY
RECOMMENDED FLOOD PROTECTION MEASURE

QUESTION:

SEE QUESTION BELOW MARKED IN BOLD.

ANSWER:

Referring to the executive summary of the Substation Flood Impact Report by Black & Veatch submitted by PSEG in its response to S-PSEG-ES-14, the report reads: "Flood protection measures that were considered consisted of earthen berms, sheetpile barriers and concrete floodwalls. In general, earthen berms were selected for flood protection when sufficient space existed at the substation site as this is the lowest cost alternative, and sheetpile barriers were selected for use at sites where sufficient space does not exist for use of berms. Due to high cost, concrete floodwalls were not selected for any of the sites. Based on the preliminary evaluations, the total estimated cost for providing the recommended flood protection at all sites is $10,115,000 in 2012 dollars."

For each of the 10 substations impacted by Irene that are the subject of the Black and Veatch report, provide the following information in table form as follows:

The tabular information requested is provided below. Also, please see below for a station-by-station breakdown on how each station has been proposed to be mitigated.

Substation	Recommend flood protection measure per Black & Veatch	Estimated Cost per Black and Veatch Report ($M)	Recommended Flood Protection measure per Energy Strong	Estimated Cost per Energy Strong ($M)
New Milford	Sheetpile (or Earthen Berm)**	Earthen Berm - $1.235 Sheetpile - $1.9	Rebuild and Raise	$34
Hillsdale	Sheetpile barrier*	$1.525	Rebuild and Raise	$17
Somerville Sub	Sheetpile (or Earthen Berm)**	$0.450 (or $0.75)	Rebuild and Raise	$17
Jackson Road	Sheetpile (or Earthen Berm)*	$0.67 (or $1.17)	Rebuild and Raise	$30
Rahway Sub	Sheetpile Barrier*	$0.73	Rebuild and Raise	$13
Cranford	Sheetpile Barrier*	$0.525	Eliminate	$67
Ewing	Sheetpile Barrier*	$0.57	Rebuild and Raise	$17
Belmont	Sheetpile Barrier	$0.32	Flood Wall	$3
River Edge	Sheetpile Barrier**	$0.45	Eliminate	$31
Garfield Place	Rehabilitation**	$0.15	Eliminate	$20

NOTE: Garfield Place has been added to this table to reflect the stations in the initial Black & Veatch "Substation Flood Protection" study.

* Subsequent analysis shows that upstream impacts would result from the use of floodwalls at these locations; therefore, floodwalls are not a viable option for these locations.
** PSE&G's view is that a flood wall would not be the most suitable mitigation method for these stations based on PSE&G's experience with flood walls, the cumulative impact of the use of floodwalls on PSE&G's distribution system, and the potential for water intrusion through underground conduits at these locations.

For each substation for which recommended flood protection measures or the cost has changed from the Black & Veatch report to Energy Strong, explain in detail the reason for such changes.

The definition of success of the electric station flood mitigation program is for no customers to lose power due to station flooding. The Black & Veatch study was a targeted study that was focused on the use of flood walls as a mitigation strategy on twelve (12) stations and was commissioned prior to the events of Superstorm Sandy and the subsequent change in FEMA flood map levels. These two factors significantly increased the number of PSE&G customers and the number of stations at risk. During Superstorm Sandy twenty-one (21) stations were impacted and based on the current FEMA flood maps, approximately another sixty-one (61) stations may be at risk.

The events of Superstorm Sandy highlighted the catastrophic impact to PSE&G facilities in the event of a major storm or hurricane. As also discussed in response to subpart a. below, flood walls can be an appropriate measure for some stations but, as PSE&G has learned from actual experience, may not be an appropriate measure for particular sites. In addition, overall impacts on the system, particularly during a storm event, need to be considered in making choices among mitigation methods.

Items to consider in choosing mitigation methods include the fact that flood walls require ongoing maintenance (including maintenance of inflatable ballasts at all egress points), active monitoring during a flood event, and ancillary equipment for the life of the station, which in most cases will be several decades. In addition, for stations that are supplied from underground electric facilities versus overhead, flood walls require technology for duct sealing, dewatering systems (monitoring of pumps and fuel for the pumps), and other sealing methods if the flood wall solution is selected. The ongoing maintenance and the need for manual intervention at a large number of stations in the event of another storm introduces significant overall impact considerations.

PSE&G conducted additional internal engineering review of each option, considering the ability to obtain permits, constructability, the operational and maintenance impacts noted above, restoration impact, and other factors. Recognizing and evaluating these potential factors, PSE&G has reconsidered the recommendations Black & Veatch suggested in their pre-Sandy assessment.

a. For each of the 21 substations identified in Energy Strong as impacted, provide the following information in the table form as follows:

Substation	Recommended Flood Protection Measure per Energy Strong	Estimated Cost of protection measure per Energy Strong ($M)
Sewaren	Rebuild and Raise	$41
Essex	Rebuild and Raise	$41
Hudson*		
Linden	Rebuild and Raise	$19
Bayonne	Rebuild and Raise	$51
Marion	Rebuild and Raise	$25
Newark Airport	Flood Wall	$6
Hoboken	Rebuild and Raise	$35
Marshall Street	Eliminate	$26
River Road**		
South Waterfront	Rebuild and Raise	$25
Bayway	Eliminate	$52
Madison	Rebuild and Raise	$91
Hackensack	Rebuild and Raise	$39
Jersey City 13kV	Rebuild and Raise	$17
St Pauls	Flood Wall	$6
Little Ferry	Flood Wall	$6
Howell	Rebuild and Raise	$17
Cliff Road	Flood Wall	$6
Third Street	Rebuild and Raise	$20
Port Street	Rebuild and Raise	$13

* Hudson does not have any distribution assets and therefore was removed from the list.

** PSE&G has determined that it is appropriate to proceed with mitigation at this station outside of the Energy Strong Program.

For each of the substations above, explain why each lower cost flood protection measure (e.g., Berms and/or sheetpile barriers) was not selected.

As described above, PSE&G believes that for the number of stations, the rebuild and raise, or elimination strategies are the appropriate approaches to prudently and effectively mitigate against future water intrusion events. Additional pre-construction work, such as detailed engineering studies and site evaluations, will confirm or refine these conclusions.

Flood walls can be a good tool in some situations, but factors such as the size of the property involved; the underground facilities that must be moved, circumvented or modified; egress/ingress concerns; previous experience obtaining variances and permits; effectiveness; recurring maintenance; potential infiltration through ducts and conduits; impact of waves

requiring very robust designs; and the cumulative system impact of multiple floodwalls needing attention during a storm event, need to be considered.

Below provides additional details as to how PSE&G is proposing to protect each identified station.

New Milford Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $34M

New Milford is located on a large tract of land in New Milford Borough, Bergen County located within the NJDEP Riparian Buffer Zone, and has elevations along the Hackensack River and below the Oradell Dam. The site supplies 230kV to other Transmission stations and supplies 26kV and 13kV to several smaller Distribution stations and customers. This location experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.
- Installing new13 kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Decommissioning and removal of a 26kV switch rack.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Hillsdale Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $17M

Hillsdale Substation is located on a large tract of land in the Borough of Hillsdale in Bergen County. The Substation is located less than 200 feet from the Pascack Brook with a portion of the site located within the floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with FEMA recommendations. The site is also located within the NJDEP Riparian Buffer Zone. The site supplies 230kV to other Transmission stations and supplies 26kV to several smaller Distribution stations and 13kV to Distribution customers. This location experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.
- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Somerville Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $17M

Somerville Substation is located on a large tract of land in Somerville, Somerset County. Somerville Substation supplies 230kV to other Transmission stations and is the power source to transformers that provide 13kV to Distribution customers. This location experienced water intrusion during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.
- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Jackson Road Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $30M

Jackson Road Substation is located on a large tract of land in the town of Totowa, Passaic County. The site perimeter is located in close proximity to the limit of the 300 foot NJDEP Riparian Buffer Zone, and should be verified during design. The majority of the site lies within the 500-year flood zone, with small areas at the northwest and southeast corners shown in the 100-year flood zone. Jackson Road Substation supplies 230kV to other Transmission stations and is the power source to transformers that provide 13kV to Distribution customers. This location experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.

- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Rahway Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $13M

Rahway Substation is located in the city of Rahway, Union County adjacent to the Rahway River, located within the NJDEP Riparian Buffer Zone. This station experienced damage during Hurricane Irene and other water intrusion events and was impacted during Superstorm Sandy due to loss of its source. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- A portion of load is supplied from outdoor switchgear and can be transferred to adjacent stations. This involves pole and wire work outside the station converting approximately 5 miles of existing 4kV circuits to 13kV. The remaining 4kV network feeders will be relocated to an adjacent station.
- Reconfigure the transformer connections to 4kV bus from outside to a different point inside the station. This will require installing new underground cables to get the transformer's secondary into the building.
- Move auxiliary equipment from the basement to higher ground. This will require relocation of 125V DC battery from basement to second floor along with associated station light and power feeds that provide 120/208V power to the building.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing outdoor 4kV switchgear, which will include two 4kV capacitors in the rear of the yard, and one 4kV feeder position, and one 4kV transformer position along with associated controls and circuit breakers.
- The existing capacitor bank 4kV feeder breaker position will be utilized and upgraded for the transformer secondary connection.
- Removal of foundations for station equipment removed above.

Cranford Substation
Recommended Mitigation Method: Eliminate
Estimated Cost: $67M

Cranford Substation is located in the town of Cranford, Union County adjacent to the Rahway River. A portion of the Cranford site is located within the floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with FEMA recommendations. The site is also located within the NJDEP Riparian Buffer Zone. This station experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that Elimination is the most effective solution.

The flood wall option will create an increase in upstream water surface elevation. By removing, converting and spreading the load amongst many existing stations, the customers once supplied from Cranford will be connected to more resilient supplies and assets will be permanently removed from the floodway and NJDEP Riparian Buffer Zone.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to eliminate the station:

- A portion of load is supplied radially from Cranford Substation and can be transferred to adjacent stations. This involves pole and wire work outside the station converting approximately 55 miles of existing 4kV circuits to 13kV. The remaining 4kV network feeders will be relocated to an adjacent station.
- The installation of new 4kV switchgear consisting of several breakers, disconnect switches, protective relays, DC/AC auxiliary system and large numbers of control cables.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Decommissioning and removal of the Cranford Substation.

Ewing Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $17M

Ewing Substation is constructed in Ewing Township in Mercer County. A portion of the Ewing site is located within the floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with FEMA recommendations. This location experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 4kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Belmont Unit Substations
Recommended Mitigation Method: Flood Wall
Estimated Cost: $3M

Belmont Substation is constructed in the town of Garfield, Bergen County along the Passaic River. A portion of the Belmont site is located within the floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with FEMA recommendations. The site is also located within the NJDEP Riparian Buffer Zone. This location experienced damage during Hurricane Irene and other water intrusion events. The Belmont Substation utilizes a unit substation design that provides power to a small geographic area. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that a Flood Wall approach is the most effective solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to install a flood wall that meets FEMA flood elevations:

- Flood Impact Study
- Installation of footings and foundations along with pilings if required
- Installation of flood gates
- Dewatering pumping facility with backup power
- Installation of concrete flood wall

River Edge Substation
Recommended Mitigation Method: Eliminate
Estimated Cost: $31M

River Edge Substation is located in River Edge, Bergen County and is located at the confluence of the Hackensack River and the small tributary of Coles Brook. This location experienced damage during Hurricane Irene and other water intrusion events. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that Elimination is the most effective solution. Eliminating this station will remove assets out of floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with FEMA recommendations. The site is also located within the NJDEP Riparian Buffer Zone.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to eliminate the station:

- The entire station load can be transferred to adjacent stations. This involves pole and wire work outside the station converting approximately 23 miles of existing 4kV circuits to 13kV.
- An adjacent station may have to be expanded.
- Decommission and removal of River Edge Substation

Garfield Place Substation
Recommended Mitigation Method: Eliminate
Estimated Cost: $20M

Garfield Place Substation is located in the town of Wallington, Bergen County. A portion of the Garfield site is located within the floodway, which comprises the river channel and adjacent floodplain that should be kept free of encroachment in accordance with current FEMA recommendations. The site is also located within the NJDEP Riparian Buffer Zone. This station was outfitted several years ago with a flood wall and sump pump to mitigate water intrusion events, which has proven to be ineffective. By eliminating and converting the circuits at this station, the customers once supplied from this station will be fed from a new station that has all the benefits and redundancy offered by a typical 13kV supply.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to eliminate the station:

- The entire station load can be transferred to adjacent stations. This involves pole and wire work outside the station converting approximately 15 miles of existing 4kV circuits to 13kV.
- Adjacent station may have to be expanded.

- Decommissioning and removal of the Garfield Place Substation

Sewaren Switching Station
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $41M

Sewaren Switching Station is located on a large tract of land in Woodbridge Township, Middlesex County situated along the Arthur Kill. The site supplies 230kV and 138kV to other Transmission stations and supplies 26kV to several smaller Distribution stations. Sewaren experienced damage during Superstorm Sandy and the new Advisory Base Flood Elevation (ABFE) reveals high potential flood elevations. To avoid damaging effects of future storms, PSE&G considered three mitigation strategies, and believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 26kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of the existing duct bank system.
- Installing new 26kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 26kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Essex Switching Station
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $41M

Essex Switching Station is located on a large tract of land in Newark situated along the Passaic River and entrance to Newark Bay. The site supplies 230kV and 138kV to other Transmission stations and supplies 26kV to several smaller Distribution stations. Essex Switching Station experienced damage during Superstorm Sandy and the new Advisory Base Flood Elevation (ABFE) reveals high flood elevations. To avoid damaging effects of future storms, PSE&G considered three mitigation strategies, and believes that the Rebuild and Raise approach is the most effective solutions to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 26kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of the existing duct bank system.
- Installing new 26kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 26kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Hudson Switching Station
Recommended Mitigation Method: Removed from the Energy Strong Program

The Hudson Switching Station, while listed in the original petition, has been removed from the Energy Strong Program.

Linden Switching Station
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $19M

Linden Switching Station is located on a large tract of land in Union County situated along the Arthur Kill. The site contains three stations that currently supply 230kV and 138kV to other Transmission stations and supplies 26kV to several smaller Distribution stations. This location experienced damage during Superstorm Sandy and the new base flood elevation reveals high flood elevations. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 26kV switchgear consisting of several breakers, disconnect switches, protective

relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of the existing duct bank system.
- Installing new 26kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 26kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Bayonne Switching Station
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $51M

Bayonne Switching Station is located on a large tract of land in Hudson County in close proximity to Newark Bay. The site supplies 230kV and 138kV to other Transmission stations and supplies 26kV to several smaller Distribution stations. This location experienced damage during Superstorm Sandy and the new base flood elevation reveals high flood elevations. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank systems.
- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.
- In 26 kV relay house replace all protective relays are raise them above the anticipated high water levels mentioned above.

Marion Switching Station
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $25M

Marion Switching Station is located in Jersey City along the Hackensack River immediately adjacent to Hudson Switching station mentioned above. This location experienced damage during Superstorm Sandy. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 26kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of the existing duct bank system.
- Installing new 26kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 26kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Newark Airport Breaker Station
Recommended Mitigation Method: Flood Wall
Estimated Cost: $6M

Newark Airport Breaker Station will utilize a flood wall to protect its equipment and customers. The flood wall option satisfies immediate concerns and the flood wall should provide an effective solution until the airport expansion project is completed over the next few years. The current station will serve as a backup to the airport once the expansion project is completed.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to install a flood wall that meets FEMA flood elevations:

- Flood Impact Study
- Installation of footings and foundations along with pilings if required

- Installation of flood gates
- Dewatering pumping facility with backup power
- Installation of concrete flood wall

Hoboken Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $35M

Hoboken Substation is located on a tract of land in Hudson County that is in close proximity to the Hudson River. This location experienced damage during Superstorm Sandy. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solutions to satisfy the large and diverse nature of this location.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of existing duct bank system.
- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Marshall Street Substation
Recommended Mitigation Method: Eliminate
Estimated Cost: $26M

Marshall Street Substation is a substation located in Hoboken, Hudson County that has experienced several water intrusion events over the years. Three flood mitigation methods were considered and PSE&G subsequently determined that eliminating this station and combining the load from this station with the load at a newly raised and rebuilt Madison Street Substation is a long term, sustainable solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to eliminate the station:

- The entire station load can be transferred to the adjacent Madison Street station. This involves pole and wire work outside the station converting approximately 19 miles of existing 4kV circuits to 13kV.
- Adjacent station may have to be expanded.
- Decommission and removal of Marshall Street Substation

River Road Substation
Recommended Mitigation Method: Removed from Energy Strong Program
Estimated Cost: $0M

The River Road Substation, while listed in the original petition, has been removed from the Energy Strong Program.

South Waterfront Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $25M

South Waterfront Substation is located in Jersey City, Hudson County situated in close proximity to the Hudson River. The station is supplied by 230kV (currently being expanded) and supplies 13kV to several Distribution circuits. This location experienced water intrusion and damage during Superstorm Sandy. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective and technically feasible solution to satisfy the requirements of this location.

Rebuild and raise will be utilized on equipment in the yard and in general will be utilized to protect the 26kV switchgear, control house and utilized in future expansion and upgrade projects.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 26kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of the existing duct bank system.
- Installing new 26kV cables through new duct to manhole for connection to the grid.

- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 26kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Bayway Substation
Recommended Mitigation Method: Eliminate
Estimated Cost: $52M

Bayway Substation is located in Elizabeth, Union County in the city controlled floodway. The site is located within the NJDEP Riparian Buffer Zone, and the floodplain is controlled by existing levees along the Elizabeth River, including a large flood gate on the adjacent City of Elizabeth property. This location was affected by Superstorm Sandy, Hurricane Irene and other intrusion events. This station has six 4kV circuits that supply customers in the area. Three flood mitigation options were considered, and PSE&G believes that the elimination of this station is the most prudent, permanent and effective solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to eliminate the station:

- The entire station load can be transferred to adjacent stations. This involves pole and wire work outside the station converting approximately 44 miles of existing 4kV circuits to 13kV.
- Adjacent station may have to be expanded.
- Decommission and removal of Bayway Substation.

Madison Street Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $91M

Madison Street Substation is located in a highly populated area of Hoboken in Hudson County. Three flood mitigation options were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective and technically feasible solution to satisfy the requirements of this location. The plan for this station requires extensive planning, coordination and build out, but offers long term, reliable hardening benefits for the whole area. Under the Rebuild and Raise approach at the Madison Street Substation, PSE&G will convert 4kV customers to 13kV and incorporate or transfer customers from the elimination of Marshall Street Substation. This extensive rework and transfer of this area will strengthen and harden and provide long term benefits greater than those that might be gained if walls, rebuild and raise or other flood

mitigation methods were used individually at both locations. This location experienced water intrusion and damage during Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV and 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- A portion of load is supplied radially from Madison Street Substation and can be transferred to 13kV. This station will be replaced by a new 4kV and 13kV station. This will involve pole and wire work outside the station, 4kV built to 13kV and operated at 13kV.
- Modifications of existing duct bank systems.
- Installing new 4kV and13 kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of foundations for station equipment removed above.

Hackensack Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $39M

Hackensack Substation is located in Bergen County near the Hackensack River. This Substation supports many 4kV circuits and is the main source of power to the surrounding community. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution to satisfy the large and diverse nature of this location. This station experienced water intrusion and damage during Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.

- Modification of existing duct banks.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 4kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Jersey City Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $17M

Jersey City Substation is located in Jersey City, Hudson County in close proximity of the Hackensack River. All three flood mitigation options were considered. The relocate and eliminate options were found to be impractical due to limited access to suitable land and limited load carrying capabilities of nearby stations to pick up load if elimination was necessary. This station experienced water intrusion and damage during Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 13kV switchgear consisting of several breakers, disconnect switches, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank system.
- Installing new13kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of 13kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Saint Paul's Unit Substation
Recommended Mitigation Method: Flood Wall
Estimated Cost: $6M

Saint Paul's Unit Substation is located in Jersey City along the Hackensack River. The Substation will utilize a flood wall system. The Substation utilizes a unit substation design that

provides power to a small geographic area. This station experienced water intrusion and damage during Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to install a flood wall that meets FEMA flood elevations:

- Flood Impact Study
- Installation of footings and foundations along with pilings, if required
- Installation of flood gates
- Dewatering pumping facility with backup power
- Installation of concrete flood wall

Little Ferry Unit Substation
Recommended Mitigation Method: Flood Wall
Estimated Cost: $6M

Little Ferry Substation is located in the town of Little Ferry in Bergen County. The Little Ferry Substation utilizes a two unit substation design that provides power to a small geographic area. This location was affected by Superstorm Sandy. The solution for this small station will be to install a flood wall system at the station.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to install a flood wall that meets FEMA flood elevations:

- Flood Impact Study
- Installation of footings and foundations along with pilings, if required
- Installation of flood gates
- Dewatering pumping facility with backup power
- Installation of concrete flood wall

Howell
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $17M

Howell is located in Jersey City, Hudson County in close proximity of the Hackensack River. This location was affected by Superstorm Sandy. All three flood mitigation options were considered. The eliminate options were found to be impractical due to limited access to suitable land and limited load carrying capabilities of nearby stations to pick up load if elimination was necessary.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV switchgear consisting of several breakers, disconnect switches, reactors, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modifications of existing duct bank system.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of 4kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Cliff Road Unit Substation
Recommended Mitigation Method: Flood Wall
Estimated Cost: $6M

The Cliff Road Unit Substation is located in Sewaren, Middlesex County. The Substation will utilize a flood wall system. The Substation utilizes a unit substation design that provides power to a small geographic area. This location was affected by Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to install a flood wall that meets FEMA flood elevations:

- Flood Impact Study
- Installation of footings and foundations along with pilings, if required
- Installation of flood gates
- Dewatering pumping facility with backup power
- Installation of concrete flood wall

Third Street Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $20 M

Third Street Substation is a Distribution substation located in South Kearny, Hudson County far from the Passaic River. This Substation supports many 4kV circuits and is the main source of power to the surrounding community. To avoid damaging effects of future storms, three mitigation strategies were considered, PSE&G believes that the Rebuild and Raise approach is

the most effective solution to satisfy the large and diverse nature of this location. This location was affected by Superstorm Sandy.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV switchgear consisting of several breakers, disconnect switches, reactors, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of existing duct banks within the station property.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.
- Removal of existing relay control house including station battery, 4kV switchgear and control cables.
- Removal of foundations for station equipment removed above.

Port Street Substation
Recommended Mitigation Method: Rebuild and Raise
Estimated Cost: $13M

Port Street Substation is located in the city of Newark, Essex County in close proximity to Newark Bay. This station experienced damage during Superstorm Sandy. To avoid damaging effects of future storms, three mitigation strategies were considered, and PSE&G believes that the Rebuild and Raise approach is the most effective solution.

The project scope at this station includes the detailed engineering, design, procurement, permitting, and construction of the following major equipment and activities required to rebuild and raise equipment above FEMA flood levels:

- The installation of a new pre-fabricated control house on an elevated foundation, which includes 4kV switchgear consisting of several breakers, disconnect switches, reactors, protective relays for the feeders and transformers, DC/AC auxiliary system and large numbers of control cables. Each of these wires must be carefully terminated to ensure proper relay protection and control of equipment.
- Modification of existing duct banks within the station property.
- Installing new 4kV cables through new duct to manhole for connection to the grid.
- Upon completion of installation, a thorough testing and check out of new control systems is required, followed by a phased transfer of facilities to ensure continuity of service to customers.

- Removal of existing relay control house including station battery, 4kV switchgear and control cables.
- Removal of foundations for station equipment removed above.