Appendix E. Project Design Envelope and Maximum-Case Scenario

Empire proposes the Project using a PDE concept. This concept allows Empire to define and bracket proposed Project characteristics for environmental review and permitting while maintaining a reasonable degree of flexibility for selection and purchase of Project components such as WTGs, foundations, export cables, and OSS.[1]

BOEM provides Empire and other lessees with the option to submit COPs using the PDE concept—providing sufficiently detailed information within a reasonable range of parameters to analyze a "maximum-case scenario" within those parameters for each affected environmental resource. BOEM identified and verified that the maximum-case scenario based on the PDE provided by Empire and analyzed in this Draft EIS could reasonably occur if approved. This approach is intended to provide flexibility for lessees and allow BOEM to analyze environmental impacts in a manner that minimizes the need for subsequent environmental and technical reviews as design changes occur.

This Draft EIS assesses the impacts of the reasonable range of Project designs that are described in the COP by using the maximum-case scenario process. The maximum-case scenario analyzes the aspects of each design parameter that would result in the greatest impact for each physical, biological, and socioeconomic resource. This Draft EIS considers the interrelationship among aspects of the PDE rather than simply viewing each design parameter independently. This Draft EIS also analyzes the planned action impacts of the maximum-case scenario together with other past, present, and reasonably foreseeable future actions.

A summary of Empire's PDE parameters is provided in Table E-1 and Table E-2. Table E-3 details the full range of maximum-case design parameters for the proposed Project and which parameters are relevant to the analysis for each EIS section in Chapter 3, *Affected Environment and Environmental Consequences*.

Table E-1 Summary of PDE Parameters

Parameter	EW 1	EW 2	Total
Type of foundation (WTGs)	Monopile	Monopile	Monopile
Type of foundations (OSS)	Piled jacket	Piled jacket	Piled jacket
Number of foundations	58	91	149
Number of OSS	1	1	2
Number of WTGs	57	90	147
Rotor diameter	853 feet (260 meters)	853 feet (260 meters)	853 feet (260 meters)
Hub height	525 feet (160 meters)	525 feet (160 meters)	525 feet (160 meters)
Upper blade tip height	951 feet (290 meters)	951 feet (290 meters)	951 feet (290 meters)
Voltage of interarray cables	66 kV	66 kV	66 kV

[1] Additional information and guidance related to the PDE concept can be found here: https://www.boem.gov/Draft-Design-Envelope-Guidance.

Parameter	EW 1	EW 2	Total
Total length of interarray cables	116 nm (214 kilometers)	144 nm (267 kilometers)	260 nm (481 kilometers)
Voltage of submarine export cables	230 kV	230 kV	230 kV
Total length of submarine export cables	40 nm (74 kilometers)	26 nm (48 kilometers)	66 nm (122 kilometers)

Table E-2 Summary of Project Siting Options in the PDE

Project Element	EW 1	EW 2
POI	Gowanus	Oceanside
Submarine export cable route	EW 1 Route B	EW 2 Route C
Onshore substation	EW 1	EW 2 Onshore Substation A and EW 2 Onshore Substation C
Submarine export cable landfall	EW 1	EW 2 Landfall A: Riverside Boulevard and East Broadway EW 2 Landfall B: Shore Road and Monroe Boulevard EW 2 Landfall C: Lido Beach West Town Park EW 2 Landfall E: Laurelton Boulevard and West Broadway
Onshore cable route	EW 1	LB-A through LB-H, LB Variant, and IP-A through IP-H

Table E-3 Maximum-Case Design Parameters for the Empire Wind Project (an "X" indicates that the parameter is relevant to an EIS resource analysis)

Design Parameter	Empire Wind 1	Empire Wind 2	3.4 Air Quality	3.5 Bats	3.6 Benthic Resources	3.7 Birds	3.8 Coastal Habitat and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish, Invertebrates, and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel	3.17 Other Uses (Marine Minerals, Military Use, Aviation)	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Scenic and Visual	3.21 Water Quality	3.22 Wetlands
Wind Farm																					
Wind farm capacity	816 MW	1,260 MW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Wind Turbines																					
Approximate total number[1]	57	90	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	
Hub height above HAT	525 feet (160 meters)			X		X		X	X	X	X		X		X	X	X		X		
Upper blade tip above HAT	951 feet (290 meters)			X		X		X	X	X	X		X		X	X	X		X		
Lower blade tip above HAT[2]	85 feet (26 meters)			X		X		X	X	X	X		X		X	X	X		X		
Rotor diameter	853 feet (260 meters)			X		X		X	X	X	X		X		X	X	X		X		
Wind Turbine Oil/Grease/Fuel																					
Transformer oil	2,378 gallons (9,000 liters)		X		X	X				X		X			X			X		X	
Main bearing grease	95 gallons (360 liters)		X		X	X				X		X			X			X		X	
Yaw grease	32 gallons (120 liters)		X		X	X				X		X			X			X		X	
Yaw gear oil	95 gallons (360 liters)		X		X	X				X		X			X			X		X	
Main bearing grease	95 gallons (360 liters)		X		X	X				X		X			X			X		X	
Hydraulic oil	317 gallons (1000 liters)		X		X	X				X		X			X			X		X	
Cooling (water/glycerol)	872 gallons (3300 liters)		X		X	X				X		X			X			X		X	
Pitch lubrication (grease)	53 gallons (200 liters)		X		X	X				X		X			X			X		X	
Pitch system hydraulic accumulators (nitrogen)	17,171 gallons (65,000 liters)		X		X	X				X		X			X			X		X	
Pitch gearbox oil	18 gallons (70 liters)		X		X	X				X		X			X			X		X	
Gearbox oil (gear oil)	1,057 gallons (4,000 liters)		X		X	X				X		X			X			X		X	
Sulfur hexafluoride (SF_6 gas)	287 pounds (130 kilograms)		X		X					X		X			X			X			
Monopile Foundation																					
Base diameter	36 feet (11 meters)				X	X		X	X			X		X	X		X	X			
Seabed penetration	180 feet (55 meters)				X			X	X			X		X	X		X	X			
Seabed footprint (without scour protection)[3]	1,023 square feet (95 m^2)				X	X		X	X			X		X	X		X	X		X	
Seabed footprint (with scour protection)[4]	39,902 square feet (3,707 m^2)				X	X		X	X			X		X	X		X	X		X	
Diameter at MSL	33 feet (10 meters)							X				X			X		X		X		
Monopile Foundation Scour Protection																					
Depth of scour protection	16.4 feet (5 meters)				X			X	X			X					X			X	
Diameter for monopile (including foundation)	207 feet (63 meters)				X	X		X				X		X	X		X	X	X	X	

Design Parameter	Empire Wind 1	Empire Wind 2	3.4 Air Quality	3.5 Bats	3.6 Benthic Resources	3.7 Birds	3.8 Coastal Habitat and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish, Invertebrates, and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel	3.17 Other Uses (Marine Minerals, Military Use, Aviation)	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Scenic and Visual	3.21 Water Quality	3.22 Wetlands
Volume for monopile[5]	13,080 cubic yards (10,000 cubic meters)				X			X				X		X	X		X	X			
Monopile Foundation Parameters																					
Seafloor footprint of installation vessel[6]	0.5 acre (0.2 hectare)				X			X	X			X		X	X		X	X		X	
Seafloor penetration of installation vessel[6]	82 feet (25 meters)				X			X	X			X					X			X	
Pile hammer size	5,500 kilojoules			X	X	X		X				X		X			X	X			
Maximum blows per minute per pile at maximum energy setting	40			X	X	X		X				X		X			X	X			
Average piling time per pile	3 hours																				
Wind Turbine Installation Parameters																					
Seafloor footprint of wind turbine installation vessels[6]	0.5 acre (0.2 hectare)				X			X	X	X		X		X	X		X	X		X	
Estimated time per component (hours/wind turbine)	48 hours/wind turbine			X		X					X				X		X			X	
Offshore Substation																					
Piled Jacket Foundation[7]																					
Leg spacing at seabed	197 feet x 197 feet (60 meters x 60 meters)														X		X				
Pile diameter	8 feet (2.5 meters)				X							X		X	X		X	X			
Seabed penetration	197 feet (60 meters)				X				X			X					X				
Seabed footprint (without scour protection)[3]	38,750 square feet (3,600 m^2)				X	X			X			X		X	X		X	X		X	
Seabed footprint (with scour protection)[8]	93,560 square feet (8,692 m^2)				X	X			X			X		X	X		X	X		X	
Leg spacing at MSL	164 feet x 164 feet (50 meters x 50 meters)														X				X		
Piled Jacket Foundation Scour Protection[9]																					
Depth for piled jacket	6.6 feet (2 meters)								X												
Area (including foundation)	93,560 (8,692 m^2)								X						X						
Total Volume[5]	30,698 cubic yards (23,470 cubic meters)					X									X						
Piled Jacket Foundation Parameters																					
Seafloor footprint of piled jacket installation vessel (per jacket)[10]	0.5 acre (0.2 hectare)				X			X	X		X			X	X		X	X		X	
Seafloor penetration of installation vessel[10,11]	82 feet (25 meters)				X			X	X		X						X			X	
Pile hammer size	4,000 kilojoules			X	X	X		X			X			X				X			
Maximum blows per minute per pile at maximum energy setting	40			X		X											X				
Average piling time per pile[12]	4.2 hours																				
Offshore Substation Topside Maximum Parameters																					
Voltage	230 kV																				
Width	230 feet (70 meters)			X		X		X	X						X				X		
Length	230 feet (70 meters)			X		X		X	X						X				X		

Design Parameter	Empire Wind 1	Empire Wind 2	3.4 Air Quality	3.5 Bats	3.6 Benthic Resources	3.7 Birds	3.8 Coastal Habitat and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish, Invertebrates, and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel	3.17 Other Uses (Marine Minerals, Military Use, Aviation)	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Scenic and Visual	3.21 Water Quality	3.22 Wetlands
Height[13]	92 feet (28 meters)			X		X		X	X						X	X			X		
Base height AMSL (air gap)[2]	72 feet (22 meters)			X		X			X						X				X		
Offshore Substation Oil/Grease/Fuel Maximum Parameters[14]																					
Transformer/reactor oil	158,503 gallons (600,000 liters)		X		X	X						X		X	X			X		X	
Sulfur hexafluoride (SF_6 gas)	11,023 pounds (5,000 kilograms)		X									X		X	X			X			
Diesel fuel	7,925 gallons (30,000 liters)		X		X	X						X		X	X			X		X	
UPS batteries	66,139 pounds (30,000 kilograms)				X							X		X	X			X			
Submarine Export Cables																					
Number of routes	1	1			X	X		X	X	X		X	X	X	X	X	X	X		X	
Number of cables per route	2	3			X	X		X	X	X		X	X	X	X	X	X	X		X	
Total length[15]	40 nm (74 kilometers)	26 nm (48 kilometers)			X	X		X	X	X		X	X	X	X	X	X	X		X	
Voltage	230 kV														X						
Diameter (3 core cable)	1 foot (300 millimeters)								X	X					X	X					
Minimum target burial depth[16]	6 feet (1.8 meters) 15 feet (4.5 meters)[17]				X	X		X	X	X		X	X	X	X	X	X	X		X	
Trench depth[16]	8 feet (2.4 meters) 18 feet (5.5 meters)[17]				X	X		X	X	X		X	X	X	X	X	X	X		X	
Seafloor disturbance width[18]	33 feet (10 meters)				X	X		X	X	X		X	X	X	X	X	X	X		X	
Separation distance	33 to 300 feet (10 to 91 meters)				X	X		X	X	X		X	X	X	X	X	X	X		X	
Trench width[19]	5 feet (1.5 meters)				X	X		X	X	X		X	X	X	X	X	X	X		X	
Anchor corridor width[20]	1,250 feet (381 meters)[21]				X			X	X	X		X	X	X	X		X	X		X	
Siting corridor width[22]	500 feet (152 meters)	900 feet (274 meters)			X	X		X	X	X			X		X		X			X	
Permanent easement width[23]	200 feet (60 meters)								X	X			X		X		X			X	
Submarine Export Cable Protection Maximum Parameters (Provided per cable within each siting corridor)																					
Width at base	36 feet (11 meters)				X	X		X	X			X			X	X	X			X	
Width at top	5 feet (1.5 meters)				X	X		X	X			X			X	X	X			X	
Depth	5 feet (1.5 meters)				X	X		X	X			X		X	X	X	X	X		X	
Interarray Cable																					
Total length	116 nm (214 kilometers)	144 nm (267 kilometers)	X		X	X		X	X	X		X		X	X	X	X	X		X	
Voltage	66 kV														X						
Diameter	0.6 foot (170 millimeters)								X	X					X	X	X				
Target burial depth[16]	6 feet (1.8 meters)				X	X		X	X	X		X		X	X	X	X	X		X	

Design Parameter	Empire Wind 1	Empire Wind 2	3.4 Air Quality	3.5 Bats	3.6 Benthic Resources	3.7 Birds	3.8 Coastal Habitat and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish, Invertebrates, and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel	3.17 Other Uses (Marine Minerals, Military Use, Aviation)	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Scenic and Visual	3.21 Water Quality	3.22 Wetlands
Trench width[24]	5 feet (1.5 meters)				X	X		X	X	X		X		X	X	X	X	X		X	
Seafloor disturbance width[18]	33 feet (10 meters)				X	X		X	X	X		X		X	X	X	X	X		X	
Interarray Cable Protection Maximum Parameters (Provided per cable within each siting corridor)																					
Width at base	16 feet (5 meters)				X	X		X	X	X		X			X	X	X			X	
Width at top	3 feet (1 meters)				X	X		X	X	X		X			X	X	X			X	
Depth	3 feet (1 meters)				X			X	X	X		X		X	X	X	X	X		X	
Cable and Pipeline Crossings (Provided per cable within each siting corridor)																					
Width at base	53 feet (16 meters)				X	X		X	X	X		X	X		X	X	X			X	
Width at top	6.6 feet (2 meters)				X	X		X	X	X		X	X		X	X	X			X	
Depth	6.6 feet (2 meters)				X			X	X	X		X	X	X	X	X	X	X		X	
Onshore Export Cable Maximum Parameters																					
Number of cables	N/A	9+3 fiber optic cables		X		X	X		X	X	X		X						X	X	X
Route length[25]	N/A	5.6 miles (9.1 kilometers)	X	X		X	X		X	X	X		X						X	X	X
Number of routes	N/A	2	X	X		X	X		X	X	X		X						X	X	X
Voltage	N/A	230 kV									X										
Diameter	N/A	0.4 foot (133 millimeters)							X	X	X										
Construction corridor width (open cut)	N/A	150 feet (46 meters)[26]		X		X	X		X	X	X		X						X	X	X
Operational corridor width[27]	N/A	25 feet (8 meters)		X		X	X		X		X		X						X	X	X
Interconnection Cable Maximum Parameters																					
Number of cables per route	6+2 fiber optic cables	18+3 fiber optic cables		X		X	X		X	X	X		X							X	X
Total route length	0.2 mile (0.4 kilometer)	2.8 miles (4.5 kilometer)	X	X		X	X		X	X	X		X						X	X	X
Voltage	345 kV	138 to 345 kV									X										
Diameter	0.5 foot (150 millimeters)								X	X	X										
Construction corridor width (open cut)	50 feet (15 meters)	100 feet (30 meters)[26]		X		X	X		X	X	X		X		X				X	X	X
Operational corridor width[28]	25 feet (8 meters)			X		X	X		X		X		X		X				X	X	X
Export Cable and Interconnection Cable Installation Methods																					
Export Cable Landfall/Inland Waterway Crossings																					
Trenchless (HDD, direct pipe, jack and bore, or similar)	X	X				X	X	X	X			X	X	X	X			X		X	X
Open cut trench/jetting (with or without dredging)	X	X				X	X	X	X			X	X	X	X			X		X	X
Open cut/jetting (cofferdam)	X	X				X	X	X	X			X	X	X	X			X		X	X
Open cut/jetting (conduit through bulkhead with or without cofferdam)	X	X				X	X	X	X			X	X	X	X			X		X	X
Open cut/jetting (conduit over bulkhead with or without cofferdam)	X	X				X	X	X	X			X	X	X	X			X		X	X

Design Parameter	Empire Wind 1	Empire Wind 2	3.4 Air Quality	3.5 Bats	3.6 Benthic Resources	3.7 Birds	3.8 Coastal Habitat and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish, Invertebrates, and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel	3.17 Other Uses (Marine Minerals, Military Use, Aviation)	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Scenic and Visual	3.21 Water Quality	3.22 Wetlands
Above-water crossing (cable bridge)	-	X																			
Onshore Export Cable/Interconnection Cable Routes (Upland)																					
Open cut trench	X	X		X		X	X		X				X						X	X	X
HDD	X	X		X		X	X		X				X						X	X	X
Other trenchless (jack and bore)	X	X		X		X	X		X				X							X	X
Summary of Onshore Open Cut Trench Parameters																					
Depth of trench	10 feet (3 meters)								X				X								
Width of trench	10 feet (3 meters)	30 feet (9 meters)							X				X						X		
Construction corridor width	50 feet (15 meters)	150 feet (46 meters)[29]		X		X	X		X				X						X	X	X
Operational corridor width[30]	25 feet (8 meters)			X		X	X		X				X						X	X	X
Summary of HDD Parameters																					
Submarine Export Cable Landfall HDD																					
Onshore (entry) work area footprint	200 feet x 200 feet (61 meters x 61 meters)	246 feet x 246 feet (75 meters x 75 meters)		X		X	X		X				X							X	X
Offshore (exit) work area footprint	100 feet x 100 feet (30 meters x 30 meters)			X	X	X	X	X	X			X	X	X			X	X		X	X
Onshore Export Cable/Interconnection Cable Crossing HDD																					
Onshore work area footprint	200 feet x 200 feet (61 meters x 61 meters) x 2 (entry/exit)	246 feet x 246 feet (75 meters x 75 meters) x 2 (entry/exit)		X		X	X		X				X							X	X
Summary of Other Trenchless Crossing (non-HDD) Parameters																					
Work area footprint	60 feet x 60 feet (18 meters x 18 meters)			X		X	X		X				X						X	X	X
Bore pit footprint	60 feet x 60 feet (18 meters x 18 meters)			X		X	X		X				X							X	X
Receiving pit footprint	40 feet x 40 feet (12 meters x 12 meters)			X		X	X		X				X							X	X
Summary of Direct Pipe Workspace Parameters																					
Submarine Export Cable Landfall Direct Pipe Option																					
Onshore (entry) work area footprint	-	260 feet x 680 feet (79 meters x 207 meters)		X		X	X		X				X							X	X
Offshore (exit) work area footprint	-	100 feet x 100 feet (30 meters x 30 meters)		X	X	X	X	X	X			X	X	X			X	X		X	X

[1] The number of WTGs proposed allows for overplanting. Up to 147 WTG will be installed at any of 176 locations. The remaining two locations will be used for OSS.
[2] For this parameter, the minimum value represents the maximum PDE value to be used for assessing impacts.
[3] Per foundation.
[4] Per foundation if scour protection is required.
[5] Per foundation if scour protection is required. Includes protection for J-tubes where interarray cables meet the OSS.

[6] Accounts for jack-up installation vessels. Seafloor footprint will be the short-term impacts associated with construction and installation activities; operational footprint is the long-term impacts.
[7] Up to 12 piles per foundation. For piled jackets designed with up to four legs, three piles per leg. For piled jackets designed with six legs, up to two piles per leg or three piles per corner.
[8] Per foundation if scour protection is required. This footprint will also cover scour protection of the submarine cable protection for J-tubes entering the ISS.
[9] This scour protection will also cover scour protection of the submarine cable protection for J-tubes entering the OSS.
[10] Accounts for jack-up installation vessels. Seafloor footprint will be short term.
[11] Range is dependent on soil type.
[12] Only one foundation is proposed to be installed via pile driving at a given time for the Projects (i.e., there would be no overlap in pile-driving activities between EW 1 and EW 2).
[13] Height from lowest deck on topside or foundation to highest deck on topside.
[14] Values listed are per OSS. Listed fluids and values are representative; approximate actual values will be incorporated into the Projects' emergency response plan.
[15] The approximate distance along the centerline of the surveyed submarine export cable siting corridor from the edge of the Lease Area to the export cable landfall. Actual length of cables may increase as a result of micrositing and final location of OSS. Final installation would be within the surveyed corridor assessed.
[16] Burial depths to be based on CBRA and site-specific conditions, and may be greater than values listed here.
[17] In locations where the submarine export cable would cross federally maintained areas, in accordance with engagement with USACE and other stakeholders. This depth will be determined based upon the current or future authorized depth or the existing water depths, whichever is greater; therefore, minimum burial could be greater.
[18] Direct seabed disturbance, including tracks from the trenching tool.
[19] The width of the trench is defined here as the widest point of the bottom of the trench established by the clearing of the seabed by the trenching tool and will vary based upon the final installation method selected and soil conditions; the seabed surface trench width could be up to 10 feet (3 meters) in select locations, based upon the final installation method selected. Typical installation width is anticipated to be 1.5 feet (0.5 meter).
[20] The area in which a submarine export cable installation vessel may anchor in support of installation activities; distance measured from the edge of the siting corridor. Corridor width may increase or decrease where site constraints exist. Impacts from Project-related vessel anchoring are expected to be in up to 269 square feet (25 m^2) area, with a maximum penetration depth of 49 feet (15 meters) in up to 1,400 locations.
[21] For EW 1, the anchor corridor would be in New York and New Jersey state waters only.
[22] The area in which the submarine export cables could be installed. Assumes cables to be laid in parallel. Corridor width may increase or decrease where site constraints exist
[23] Distance from centerline for each cable. If a field joint is required, a wider easement may be required at the location of the joint.
[24] The widest point of the bottom of the trench established by the clearing of the seabed by the trenching tool. The seabed surface trench width could be up to 10 feet (3 meters) in select locations, based upon the final installation method selected and soil conditions.
[25] Represents maximum route length for a single onshore export cable route. For EW 2, up to two routes may be used.
[26] Where constrained by existing development, the onshore export cable construction corridor width may be less than 100 feet; the maximum width is included herein, as part of the PDE.
[27] Based on onshore cable conduits being installed side by side in a single corridor; however, conduits may also be split or stacked depending on site conditions.
[28] Based on onshore cable conduits being installed side by side in a single corridor; however, conduits may also be split or stacked depending on site conditions. As such, this width may vary in certain locations.
[29] Where constrained by existing development, the onshore export cable construction corridor width may be less than 150 feet (46 meters); the maximum width is included herein, as part of the PDE.
[30] Per cable circuit.
HAT = highest astronomical tide; MSL = mean sea level; N/A = not applicable; SF_6 = sulfur hexafluoride; UPS = uninterrupted power supply