

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

**Complaint of Michael Mabee and Petition)
to Order Mandatory Reliability Standards) Docket No. EL21-99-000
for Equipment and Monitoring Systems)
Marketed from the People’s Republic of China)**

**MOTION TO INTERVENE AND COMMENT OF THE
FOUNDATION FOR RESILIENT SOCIETIES
Submitted to FERC on September 15, 2021**

Pursuant to Rules 206, 212, and 214 of the Rules of Practice and Procedure¹ of the Federal Energy Regulatory Commission (hereafter “FERC” or “Commission”) and the FERC Notice of Complaint in Docket No. EL21-99-000², the Foundation for Resilient Societies (“Resilient Societies”), a non-profit 501(c)(3) organization engaged in research and public education to strengthen the resilience of critical infrastructures, files this Motion to Intervene in support of the Complaint of Michael Mabee (“Complaint”).

Resilient Societies has conducted an engineering review of the text and exhibits of the Complaint and has determined that ample factual predicate exists for the Commission to order a survey by the designated Electric Reliability Organization (ERO), the North American Electric Reliability Corporation (NERC), to determine the potential threat to Bulk Power System (BPS) posed by large power transformers of Chinese manufacture. To reach this conclusion, we reviewed each of the 158 Line Items in Exhibit A of the Complaint. Based on the Line Item descriptions, we made our best effort to determine the Equipment Category, Destination, Utility Name, Maximum Voltage, and Maximum MVA Rating for each item. We also categorized the largest or highest voltage piece of equipment for each Line Item by BPS qualification, “Large Power Transformer” class, and “Extra High Voltage” class. We then performed tabulations of the transformers as displayed in Appendix 1 to this comment.

¹ 18 C.F.R. §§ 385.206, 385.212, and 285.214 (2019).

² Filed with the Commission on August 26, 2021.

Based on our analysis and tabulations, we make these observations:

1. We found 82 Chinese manufactured transformers with primary or secondary voltage at 100 kV or greater, therefore qualifying for use within the BPS.
2. We found 64 Chinese manufactured transformers with capacity 100 MVA or greater, meeting the “large power transformer” definition in the U.S. Department of Energy report, “Large Power Transformers and the U.S. Electric Grid.”³
3. We found 28 Chinese manufactured transformers with primary or secondary voltage at 345 kV or greater, therefore qualifying as “extra high voltage transformers” in common industry classification.

We therefore conclude that number, voltage class, and capacity of Chinese manufactured transformers for the BPS are possibly sufficient to cause a cascading failure of the Eastern, Western, or ERCOT interconnections if a large proportion of these transformers were to be remotely disabled in a coordinated manner. Moreover, using only the information in the Complaint, we have determined that use of Chinese transformers is often concentrated by utility, with some utilities ordering multiple units for a single power plant or regional electric grid. This concentration within utilities increases the risk of deliberate system destabilization.

No reliable public information exists as to whether transformers of Chinese manufacture can be remotely disabled. However, according to a May 27, 2020 article in the *Wall Street Journal*, “U.S. Seizure of Chinese-Built Transformer Raises Specter of Closer Scrutiny,”⁴ federal authorities seized a Chinese transformer at the Port of Houston in the summer of 2019 and transported it nearly 900 miles to Sandia National Laboratory for forensic investigation. Because large power transformers are difficult and expensive to transport, and because forensic examination would almost surely void the manufacturer warranty, one could

³ U.S. Department of Energy. “Large Power Transformers and the U.S. Electric Grid.” June 2012.

⁴ Smith, Rebecca. “U.S. Seizure of Chinese-Built Transformer Raises Specter of Closer Scrutiny.” *Wall Street Journal*. May 27, 2020.

reasonably conclude that sufficient information already exists to order an investigation of how Chinese transformers might be remotely disabled.

A NERC survey could initially consist of a form to be filled out by Registered Entities and—if necessary—follow-up interviews with Entities that have purchased Chinese grid equipment and placed it in operational use in the BPS or, alternatively, have placed this equipment in spare pools. This NERC survey could be part of a larger investigation by FERC, NERC, the National Laboratories of the U.S. Department of Energy, and the U.S. intelligence agencies.

With additional effort, the NERC survey might be expanded to other critical grid equipment of foreign manufacture such as reactors, capacitors, current coupling capacitors, large generators, backup generators, substation voltage regulators, shunt capacitor equipment, automatic circuit reclosers, instrument transformers, coupling capacity voltage transformers, protective relaying, metering equipment, high voltage circuit breakers, generation turbines, industrial control systems, distributed control systems, and safety instrumented systems. Without such a survey of Registered Entities, the Commission and other federal authorities will not be able to accurately gauge the potential threat from grid components of foreign manufacture.

A thorough investigation by FERC, NERC, the National Laboratories, and U.S. intelligence agencies could determine whether equipment of foreign manufacture presents a current or future threat to the reliability of the BPS and distribution grid. Depending on the results of the investigation, NERC could initiate a Standards Authorization Request (SAR) of its own volition or, alternatively, the Commission could order development of a reliability standard.

Respectfully submitted by:



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<u>Exhibit A</u>						<u>Large:</u>	<u>EHV:</u>	
<u>Line Item</u>				<u>Max MVA</u>	<u>BPS: 100kV</u>	<u>100MVA</u>	<u>345kV or</u>	
<u>Number</u>	<u>Equipment Category</u>	<u>Destination</u>	<u>Utility Name</u>	<u>Max Voltage</u>	<u>Rating</u>	<u>or More</u>	<u>or More</u>	<u>More</u>
142	Transformer	USA	Able Grid Infrastructure Holdings	120	125	Yes	Yes	No
132	Transformer	USA	Ablemarle Beach Solar LLC			No	No	No
7	Transformer	USA	AES	345		Yes	Yes	Yes
71	Transformer	USA	AES	69	36	No	No	No
70	Transformer	USA	AES	22	26	No	No	No
94	Transformer	USA	AES			No	No	No
137	Transformer	USA	APR Energy USA LLC			No	No	No
138	Transformer	USA	APR Energy USA LLC			No	No	No
140	Transformer	USA	APR Energy USA LLC			No	No	No
8	Transformer	USA	Bayonne Energy Center LLC	345	610	Yes	Yes	Yes
32	Transformer	USA	Bayonne Energy Center LLC	345	610	Yes	Yes	Yes
46	Transformer	USA	Bayonne Energy Center LLC	345	610	Yes	Yes	Yes
47	Transformer	USA	Bayonne Energy Center LLC	138	160	Yes	Yes	No
87	Transformer	USA	Bayonne Energy Center LLC			No	No	No
95	Transformer	USA	BC Hydro			No	No	No
19	Transformer	USA	Braintree Electric Light Department	115	70	Yes	No	No
67	Transformer	USA	Braintree Electric Light Department	115	70	Yes	No	No
68	Transformer	USA	Braintree Electric Light Department	115	50	Yes	No	No
1	Transformer	USA	City of Anaheim	69	56	No	No	No
81	Transformer	USA	City of Anaheim	69	50	No	No	No
17	Transformer	USA	City of Lakeland	230	150	Yes	Yes	No
36	Transformer	USA	City of Lakeland	230	150	Yes	Yes	No
66	Transformer	USA	City of Tallahassee	230	269	Yes	Yes	No
26	Transformer	USA	ConEdison	345	610	Yes	Yes	Yes
154	Transformer	USA	Connectgen LLC (TX)	35	5	No	No	No
128	Transformer	USA	EDF Renewables	345	156	Yes	Yes	Yes
129	Transformer	USA	EDF Renewables			No	No	No
136	Transformer	USA	EDF Renewables			No	No	No
143	Transformer	USA	EDF Renewables			No	No	No
144	Transformer	USA	EDF Renewables			No	No	No
150	Transformer	USA	EDF Renewables			No	No	No
151	Transformer	USA	EDF Renewables			No	No	No

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155	Transformer	USA	Enel Green Power North America			No	No
75	Transformer	USA	Everpower Renewables	115	70	Yes	No
13	Transformer	USA	Florida Power & Light			Yes	Yes
74	Transformer	USA	Florida Power & Light	36	32	No	No
157	Transformer	USA	Florida Power & Light			No	No
33	Transformer	USA	Grand River Dam Authority	345	280	Yes	Yes
10	Transformer	USA	Grand River Dam Authority	345	280	Yes	Yes
72	Transformer	USA	Grand River Dam Authority	345	280	Yes	Yes
97	Transformer	USA	Grand River Dam Authority			No	No
153	Transformer	USA	Green Mountain Power (VT)			No	No
42	Transformer	USA	Iberdrola	345	110	Yes	Yes
40	Transformer	USA	Iberdrola	220	150	Yes	Yes
43	Transformer	USA	Iberdrola	115	245	Yes	Yes
44	Transformer	USA	Iberdrola	115	170	Yes	Yes
39	Transformer	USA	Iberdrola	115	80	Yes	No
6	Transformer	USA	Iberdrola	115	50	Yes	No
38	Transformer	USA	Iberdrola	115	50	Yes	No
41	Transformer	USA	Iberdrola	115	50	Yes	No
45	Transformer	USA	Iberdrola	18	24	No	No
73	Transformer	USA	Indeterminate	230	80	Yes	No
24	Transformer	USA	Indeterminate	69	40	No	No
113	Transformer	USA	Indeterminate		2	No	No
117	Transformer	USA	Indeterminate		1	No	No
99	Transformer	USA	Indeterminate			No	No
88	Transformer	USA	Indeterminate			No	No
90	Transformer	USA	Indeterminate			No	No
104	Transformer	USA	Indeterminate			No	No
121	Transformer	USA	Indeterminate			No	No
134	Transformer	USA	Indeterminate			No	No
146	Transformer	USA	Indeterminate			No	No
147	Transformer	USA	Indeterminate			No	No
96	Transformer	USA	Indeterminate			No	No

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<u>Number</u>	<u>Equipment Category</u>	<u>Destination</u>	<u>Utility Name</u>	<u>Max Voltage</u>	<u>Rating</u>	<u>or More</u>	<u>or More</u>	
14	Transformer	USA	Invenergy LLC	230	133	Yes	Yes	No
82	Transformer	USA	LADWP Los Angeles	35	5	No	No	No
118	Transformer	USA	MidAmerican Energy Company	345	560	Yes	Yes	Yes
131	Transformer	USA	MidAmerican Energy Company	345	200	Yes	Yes	Yes
31	Transformer	USA	MidAmerican Energy Company	345	180	Yes	Yes	Yes
83	Transformer	USA	MidAmerican Energy Company	345	180	Yes	Yes	Yes
63	Transformer	USA	MidAmerican Energy Company	161	180	Yes	Yes	No
84	Transformer	USA	MidAmerican Energy Company	161	180	Yes	Yes	No
141	Transformer	USA	MidAmerican Energy Company			No	No	No
122	Transformer	USA	Nebraska Public Power District			No	No	No
5	Transformer	USA	New York Power Authority	230	140	Yes	Yes	No
54	Transformer	USA	New York Power Authority	230	135	Yes	Yes	No
11	Transformer	USA	New York Power Authority	138	120	Yes	Yes	No
55	Transformer	USA	New York Power Authority	138	120	Yes	Yes	No
92	Transformer	USA	New York Power Authority			No	No	No
93	Transformer	USA	New York Power Authority			No	No	No
30	Transformer	USA	NV Energy	525	500	Yes	Yes	Yes
78	Transformer	USA	NV Energy	525	500	Yes	Yes	Yes
29	Transformer	USA	NV Energy	525	149	Yes	Yes	Yes
79	Transformer	USA	NV Energy	525	133	Yes	Yes	Yes
123	Transformer	USA	NV Energy			No	No	No
124	Transformer	USA	NV Energy			No	No	No
21	Transformer	USA	NY Oil & Gas	115	22	Yes	No	No
69	Transformer	USA	NYSEG	230	300	Yes	Yes	No
4	Transformer	USA	NYSEG	230	300	Yes	Yes	No
127	Transformer	USA	Ormat Nevada Inc.			No	Yes	No
149	Transformer	USA	Ormat Nevada Inc.		3	No	No	No
101	Transformer	USA	Ormat Nevada Inc.			No	No	No
110	Transformer	USA	Ormat Nevada Inc.			No	No	No
119	Transformer	USA	Ormat Nevada Inc.			No	No	No
156	Transformer	USA	Ormat Nevada Inc.			No	No	No
27	Transformer	USA	Pacificorp	525	217	Yes	Yes	Yes

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28	Transformer	USA	Pacificorp	345	700	Yes	Yes	Yes
3	Transformer	USA	Pacificorp	230	125	Yes	Yes	No
112	Transformer	USA	Pacificorp	161		Yes	No	No
91	Transformer	USA	Pacificorp			No	No	No
109	Transformer	USA	Pacificorp			No	No	No
111	Transformer	USA	Pacificorp			No	No	No
135	Transformer	USA	Pacificorp			No	No	No
56	Transformer	USA	PacifiCorp/MidAmerica	525	215	Yes	Yes	Yes
80	Transformer	USA	PacifiCorp/MidAmerica	525	133	Yes	Yes	Yes
62	Transformer	USA	PacifiCorp/MidAmerica	345	180	Yes	Yes	Yes
60	Transformer	USA	PacifiCorp/MidAmerica	230	250	Yes	Yes	No
57	Transformer	USA	PacifiCorp/MidAmerica	230	125	Yes	Yes	No
58	Transformer	USA	PacifiCorp/MidAmerica	230	112	Yes	Yes	No
59	Transformer	USA	PacifiCorp/MidAmerica	116	50	Yes	No	No
61	Transformer	USA	PacifiCorp/MidAmerica	67	30	No	No	No
50	Transformer	USA	Paducah	161	93	Yes	No	No
2	Transformer	USA	Perennial Power	230	351	Yes	Yes	No
76	Transformer	USA	Perennial Power	230	350	Yes	Yes	No
77	Transformer	USA	Perennial Power	15	22	No	No	No
145	Transformer	USA	PHR LLC			No	No	No
100	Transformer	USA	PNM Resources	345	450	Yes	Yes	Yes
51	Transformer	USA	PNM Resources	138	70	Yes	No	No
18	Transformer	USA	PNM Resources	138	70	Yes	No	No
89	Transformer	USA	PNM Resources			No	No	No
108	Transformer	USA	PNM Resources			No	No	No
85	Transformer	USA	Rocky Mountain Power	138	150	Yes	Yes	No
35	Transformer	USA	Sacramento Municipal Utility Department	230	269	Yes	Yes	No
15	Transformer	USA	Sacramento Municipal Utility Department	138		Yes	No	No
34	Transformer	USA	Sacramento Municipal Utility Department	116	40	Yes	No	No
16	Transformer	USA	Sacramento Municipal Utility Department	115	70	Yes	No	No
102	Transformer	USA	Sammons Renewable Energy	345	136	Yes	Yes	Yes
130	Transformer	USA	Starwood Energy Group Global LLC	100	167	Yes	Yes	No

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148	Transformer	USA	Talen Montana LLC			No	No	
20	Transformer	USA	UPC Wind	230	140	Yes	Yes	
52	Transformer	USA	UPC Wind	220	140	Yes	Yes	
53	Transformer	USA	UPC Wind	115	125	Yes	Yes	
25	Transformer	USA	WAPA	345	600	Yes	Yes	
116	Transformer	USA	WAPA		500	No	Yes	
12	Transformer	USA	Windy Point Partners	230	80	Yes	No	
23	Transformer	Canada	BC Hydro	230	400	Yes	Yes	
37	Transformer	Canada	BC Hydro	230	400	Yes	Yes	
9	Transformer	Canada	BC Transmission Corp.	230		Yes	No	
48	Transformer	Canada	Fortis BC Canada	236	200	Yes	Yes	
22	Transformer	Canada	Fortis BC Canada	230	200	Yes	Yes	
49	Transformer	Canada	Fortis BC Canada	161	150	Yes	Yes	
65	Transformer	Canada	Indeterminate	69	40	No	No	
64	Transformer	Canada	Indeterminate	46	24	No	No	
86	Shunt Reactor	USA	WAPA			Yes	Yes	
106	Reactor	USA	Indeterminate			No	No	
158	Reactor	USA	PG&E			No	No	
126	Radiator	USA	MidAmerican Energy Company			No	No	
114	Radiator	USA	Ormat Nevada Inc.			No	No	
115	Parts	USA	Indeterminate			No	No	
103	Line tuner	USA	Alstom Grid LLC d.b.a. GE Grid Solutions			No	No	
107	Line tuner	USA	Alstom Grid LLC d.b.a. GE Grid Solutions			No	No	
120	Line tuner	USA	Grid Solutions			No	No	
125	Line tuner	USA	Grid Solutions			No	No	
133	Line tuner	USA	Grid Solutions			No	No	
152	Line tuner	USA	Grid Solutions			No	No	
105	Insulator	USA	Indeterminate			No	No	
139	Circuit breaker	USA	APR Energy USA LLC			No	No	
98	Bare cable	USA	LADWP Los Angeles			No	No	
Total Affirmative Count						82	64	28

Document Content(s)

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