



State of New Jersey
DIVISION OF RATE COUNSEL
140 EAST FRONT STREET, 4TH FL.
P.O. Box 003
TRENTON, NEW JERSEY 08625

PHIL MURPHY
Governor

SHEILA OLIVER
Lt. Governor

BRIAN O. LIPMAN
Director

August 29, 2022

Via Electronic Mail

Honorable Carmen Diaz, Acting Board Secretary
NJ Board of Public Utilities
44 South Clinton Avenue
1st Floor, P.O. Box 350
Trenton, NJ 08625-0350

**Re: In the Matter of the Petition of Ocean Wind LLC Pursuant to
N.J.S.A. 48:3-87.1(f) for a Determination that Certain Easements
and Consents Needed for Certain Environmental Permits in, and
with Respect to, the County of Cape May are Reasonably
Necessary for the Construction or Operation of the
Ocean Wind 1 Qualified Offshore Wind Project
BPU Docket No. QO22050347**

Dear Acting Secretary Diaz:

Pursuant to the procedural schedule issued by President Fiordaliso on July 14, 2022, please find attached the direct testimony of Maximilian Chang filed on behalf of the New Jersey Division of Rate Counsel in connection with the above-referenced matter.

Consistent with the Order issued by the New Jersey Board of Public Utilities in *In the Matter of the New Jersey Board of Public Utilities' Response to the COVID-19 Pandemic for a Temporary Waiver of Requirements for Certain Non-Essential Obligations*, BPU Docket No. EO20030254, Order dated March 19, 2020, this document is being electronically filed. No paper copies will follow. Please acknowledge receipt of this submission.

Thank you for your consideration and assistance.

Respectfully submitted,

Brian O. Lipman, Esq.
Director, Division of Rate Counsel

By: /s/ Maura Caroselli
Maura Caroselli, Esq.
Deputy Rate Counsel

MC
Enclosure
cc: Service List

**In the Matter of the Petition of Ocean Wind LLC Pursuant to N.J.S.A. 48:37.1(f) for a Determination that Certain
Environmental Permits in, and with Respect to, the County of Cape May are Reasonably Necessary for the
Construction or Operation of the Ocean Wind 1 Qualified Offshore Wind Project
BPU Docket No. QO22050347
Service List**

Carmen D. Diaz, Acting Secretary
NJ Board of Public Utilities
44 South Clinton Avenue, 1st Floor
P.O. Box 350
Trenton, NJ 08625-0350

Brian O. Lipman, Director
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

Maura Caroselli, Esq.
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

T. David Wand, Esq.
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

Megan Lupo, Esq.
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

Robert Glover, Esq.
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

Carlena Morrison, Paralegal
Division of Rate Counsel
140 East Front Street, 4th Floor
P.O. Box 003
Trenton, NJ 08625

Robert Brabston, Esq.
Executive Director
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Andrea Hart, Esq.
Senior Program Manager
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Carol Artale, Esq.
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Kimberly Diamond, Esq.
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Stacy Peterson
Deputy Executive Director
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Abe Silverman, Esq.
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Jim Ferris
Bureau Chief of New Technology
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Veronique Oomen
Project Manager Renewable Energy
Division of Clean Energy
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Kelly Mooji, Esq.
Director
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Kira Lawrence
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Michael Kammer
Director
Board of Public Utilities
44 South Clinton Avenue
P.O. Box 350
Trenton, NJ 08625

Aaron Bullwinkel
Senior Legal Counsel
Orsted Offshore North America
399 Boylston St., 12th floor
Boston, MA 02116

Michael J. Connolly, Esq.
Cozen O'Connor PC
One Gateway Center, Suite 910
Newark, NJ 07102

Matthew Kaplan
Orsted
437 Madison Avenue, 19th Floor
New York, NY 10022

Marc Reimer
Orsted Offshore North America
399 Boylston St., 12th Floor
Boston, MA 02116

Pamela Owen, DAG
Assistant Section Chief
Public Utilities Section
R.J. Hughes Justice Complex
25 Market Street
P.O. Box 112
Trenton, NJ 08625

Gregory Eisenstark, Esq.
Cozen O'Connor PC
One Gateway Center, Suite 910
Newark, NJ 07102

William Lesser, Esq.
Cozen O'Connor PC
3 WTC, 175 Greenwich Street
55th Floor
New York, NY 10007

David Apy, AAG
Environmental Practice Group
R.J. Hughes Justice Complex
25 Market Street
P.O. Box 093
Trenton, NJ 08625

Daren Eppley, DAG
Section Chief
Public Utilities Section
R.J. Hughes Justice Complex
25 Market Street
P.O. Box 112
Trenton, NJ 08625

Paul Youchak, DAG
Public Utilities Section
R.J. Hughes Justice Complex
25 Market Street
P.O. Box 112
Trenton, NJ 08625

Melissa Rasner
Municipal Clerk
City of Ocean City
861 Asbury Avenue
Ocean City, NJ 08226

Dorothy F. McCrosson, Esq.
City Solicitor
McCrosson & Stanton, P.C.
200 Asbury Avenue
Ocean City, NJ 08226

Hon. Jay Gillian, Mayor
City of Ocean City
861 Asbury Avenue
Ocean City, NJ 08226

Bobby Barr
Council President
118 Roosevelt Boulevard
Ocean City, NJ 08226

Tomaso Rotondi
Council Vice President
407 Bay Avenue
Ocean City, NJ 08226

Karen Bergman
City Council Member
39 Bayview Place
Ocean City, NJ 08226

Keith Hartzell
City Council Member
720 Asbury Avenue, Apt 3
Ocean City, NJ 08226

Jody Levchuk
City Council Member
2 Bayonne Place
Ocean City, NJ 08226

Peter V. Madden
City Council Member
47 Bay Road
Ocean City, NJ 08226

Terrence Crowley Jr.
City Council Member
123 Bay Avenue
Ocean City, NJ 08226

Kevin Lare, Acting Administrator
Board of County Commissioners
Cape May County
4 Moore Road
Cape May Courthouse, NJ 08210

Gerald M. Thornton
Commissioner Director
Board of County Commissioners
Cape May County
4 Moore Road
Cape May Courthouse, NJ 08210

Rita M. Rothberg
County Clerk
County of Cape May
7 N Main Street
P.O. Box 5000
Cape May Courthouse, NJ 08210

Shawn M. LaTourette, Commissioner
Department of Environmental
Protection
401 E. State St.
7th Floor, East Wing
P.O. Box 402
Trenton, NJ 08625-0402

Sean D. Moriarty
Deputy Commissioner for Legal
Regulatory and Legislative Affairs
401 E. State St., 7th Floor, East Wing
P.O. Box 402
Trenton, NJ 08625-0402

Martha Sullivan Sapp
Director, Green Acres Program
Green Acres Program
Mail Code 501-01
P.O. Box 420
501 East State Street, 1st Floor
Trenton, NJ 08625-0420

Erica Fisher, President
Ocean City Crew Boosters Inc.
P.O. Box 205
Ocean City, New Jersey 08226

Max Chang
Synapse Energy Economics, Inc.
485 Massachusetts Avenue, Suite 2
Cambridge, MA 02139

Michael J. Donohue, Esq.
Blaney Donohue & Weinberg, P.C.
2123 Dune Drive, Suite 11
Avalon, NJ 08202

Jeffrey R. Lindsay, Esq.
County Counsel County of Cape May
7 N Main Street
P.O. Box 5000
Cape May Court House, NJ 08210-
5000

John G. Donnadio, Esq.
New Jersey Association of Counties
150 West State Street
Trenton, NJ 08608

Ana Murteira, Esq.
PSEG Service Corp.
80 Park Plaza, T5
Newark, NJ 07101

Cara Lewis, Esq.
PSEG Service Corp.
80 Park Plaza, T5
Newark, NJ 07101

Township of Lower
c/o Kyle D. Weinberg, Esq.
Blaney, Donohue & Weinberg, P.C.
2123 Dune Drive, Suite 11
Avalon, NJ 08202

Township of Middle
c/o Steven A. Morris, Esq.
Karavan & Morris, P.C.
3311 New Jersey Avenue
P.O. Box 1310
Wildwood, NJ 08260

City of North Wildwood
Mayor Patrick T. Rosenello
c/o Kyle Rutherford, Confidential Aide
to the Mayor
901 Atlantic Avenue
North Wildwood, NJ 08260-5778

Upper Township
c/o M. James Maley, Jr., Esq.
Maley Givens, P.C.
1150 Haddon Avenue, Suite 210
Collingswood, NJ 08108

Borough of Avalon
c/o Nicole J. Curio, Esq.
Blaney, Donohue & Weinberg, P.C.
2123 Dune Drive, Suite 11
Avalon, NJ 08202

Township of Dennis
c/o Kyle D. Weinberg, Esq. Blaney,
Donohue & Weinberg, P.C.
2123 Dune Drive, Suite 11
Avalon, NJ 08202

New Jersey State League of
Municipalities
c/o Frank Marshall, Esq.
222 West State Street
Trenton, NJ 08608

City of Sea Isle City
c/o Paul L. Baldini, Esq.
Law Offices of Paul J. Baldini, P.A.
4413 New Jersey Avenue
Wildwood, NJ 08260

Borough of Stone Harbor
c/o Steven A. Morris, Esq.
Karavan & Morris, P. C.
3311 New Jersey Avenue
P.O. Box 1310
Wildwood, NJ 08260

Borough of Wildwood Crest
c/o Ronald J. Geizunas, Esq.
Ronald J. Geizunas, LLC
P.O. Box 1288
Wildwood Crest, NJ 08260

City of Wildwood
c/o Louise A. DeLollis, Esq.
Monze Catanese Hillegass, P.C.
211 Bayberry Drive, Suite 2A
Cape May, Court House NJ 08210

STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE)
PETITION OF OCEAN WIND,)
LLC PURSUANT TO N.J.S.A 48:3-)
87.1(F) FOR A DETERMINATION)
THAT EASEMENTS ACROSS)
GREEN ACRES-RESTRICTED)
PROPERTIED AND CONSENTS)
NEEDED FOR CERTAIN)
ENVIRONMENTAL PERMITS IN,)
AND WITH RESPECT TO THE)
COUNTY OF CAPE MAY ARE)
REASONABLY NECESSARY FOR)
THE CONSTRUCTION OR)
OPERATION OF THE OCEAN)
WIND I QUALIFIED OFFSHORE)
WIND PROJECT)

BPU DOCKET NO. QO22050347

DIRECT TESTIMONY OF MAXIMILIAN CHANG
ON BEHALF OF DIVISION OF RATE COUNSEL

BRIAN O. LIPMAN, ESQ.
DIRECTOR, DIVISION OF RATE COUNSEL

NEW JERSEY DIVISION OF RATE COUNSEL
140 EAST FRONT STREET, 4th FLOOR
P.O. BOX 003
TRENTON, NJ 08625

FILED: AUGUST 29, 2022

TABLE OF CONTENTS

	Page No.
I. Statement of Qualifications	1
II. Purpose and Summary	3
III. Ocean Wind's Preferred Plan	5
IV. Relationship to BPU QO22020041.....	11
V. The Board's Determination of What is Reasonably Necessary.....	12
VI. Alternative Routes.....	13
VII. Transmission Upgrade Cost Concerns.....	15
VIII. Conclusions and Recommendations	18

Attachment 1

1 **I. STATEMENT OF QUALIFICATIONS**

2 **Q. Please state your name, positions, and business address.**

3 A. My name is Maximilian Chang. I am a Principal Associate with Synapse Energy
4 Economics, an energy consulting company located at 485 Massachusetts Avenue,
5 Cambridge, Massachusetts.

6 **Q. On whose behalf are you submitting testimony in this proceeding?**

7 A. I am submitting testimony on behalf of the New Jersey Division of Rate Counsel
8 (“Rate Counsel”).

9 **Q. Mr. Chang, please describe your professional background at Synapse Energy**
10 **Economics.**

11 A. My experience is summarized in my resume, attached as **Attachment 1**. I am an
12 environmental engineer and energy economics analyst who has analyzed energy
13 industry issues for 13 years. In my current position at Synapse Energy Economics,
14 I focus on economic and technical analysis of many aspects of the electric power
15 industry, including: (1) utility mergers and acquisitions, (2) utility reliability
16 performance and distribution investments, (3) nuclear power, (4) wholesale and
17 retail electricity markets, and (5) offshore wind.

18 **Q. Mr. Chang, please describe your educational background.**

19 A. I hold a Master of Science degree from the Harvard School of Public Health in
20 Environmental Health and Engineering Studies, and a Bachelor of Science degree
21 from Cornell University in Biology and Classical Civilizations.

1 **Q. Mr. Chang, have you previously submitted testimony before the Board of**
2 **Public Utilities?**

3 A. Yes. I filed testimony before the Board in several dockets, including, but not
4 limited to: I/M/O the Petition of South Jersey Gas Company for Approval of an
5 Energy Efficiency Program ("EEP") with an Associated Energy Efficiency
6 Tracker ("EET") Pursuant to N.J.S.A. 48:3-98.1, BPU Docket No. GO12050363;
7 I/M/O the Merger of Exelon Corporation and Pepco Holdings, Inc., BPU Docket
8 No. EM1406581; I/M/O the Verified Petition of Rockland Electric Company for
9 Establishment of a Storm Hardening Surcharge, BPU Docket No. ER14030250;
10 I/M/O the Merger of the Southern Company and AGL Resources, Inc., BPU
11 Docket No. GM15101196; I/M/O the Application of PSEG Nuclear, LLC and
12 Exelon Generation Company, LLC for the Zero Emission Certificate Program -
13 Salem Unit 1, BPU Docket No. ER20080557, I/M/O the Application of PSEG
14 Nuclear, LLC and Exelon Generation Company, LLC for the Zero Emission
15 Certificate Program - Salem Unit 2, BPU Docket No. ER20080558, and I/M/O the
16 Application of PSEG Nuclear, LLC for the Zero Emission Certificate Program –
17 Hope Creek, BPU Docket No.ER20080559; I/M/O the Petition of Public Service
18 Electric and Gas Company for Approval of the Second Energy Strong Program
19 (Energy Strong II), BPU Docket Nos. EO18060629 and GO18060630; I/M/O the
20 Verified Petition of Jersey Central Power & Light Company for Approval of an
21 Infrastructure Investment Program, BPU Docket No. EO18070728; I/M/O the
22 Petition of Atlantic City Electric Company for Approval of an Infrastructure
23 Investment Program, and Related Cost Recovery Mechanism, Pursuant to

1 N.J.A.C. 14:3-2A.1, et seq., BPU Docket No. EO18020196, and I/M/O the Ocean
2 Wind, LLC Pursuant to N.J.S.A. 48:3-87.1(f) for a Determination that Easements
3 across Green Acres-Restricted Properties and Consents Needed for Certain
4 Environmental Permits in, and with Respect to the City of Ocean City, BPU
5 Docket No. QO22020041.

6 **Q. Mr. Chang, have you previously testified before utility regulatory agencies or**
7 **legislative bodies?**

8 A. Yes. I previously testified before the District of Columbia Public Service
9 Commission, the Hawaii Public Utilities Commission, Illinois State Senate, the
10 Illinois Property Tax Appeal Board, the Maine Public Utilities Commission, the
11 Maryland Public Service Commission, and the Massachusetts Department of
12 Public Utilities. I also filed testimony before the Delaware Public Utilities
13 Commission, the Kansas Commerce Corporation, the Illinois Commerce
14 Commission, the United States District Court for the District of Maine, and the
15 Virginia State Corporation Commission.

16 **II. PURPOSE AND SUMMARY**

17 **Q. What is the purpose of your testimony in this proceeding?**

18 A. The purpose of my testimony is to review the petition¹ filed by Ocean Wind, LLC
19 (“Company” or “Ocean Wind”) requesting a determination from the New Jersey
20 Board of Public Utilities (“Board”) that its preferred onshore export cable route

¹ I/M/O the Petition of Ocean Wind, LLC Pursuant to N.J.S.A. 48:3-87.1(f) for a Determination that Easements Across Green Acres-Restricted Properties and Consents Needed for Certain Environmental Permits in, and with Respect to the County of Cape May are Reasonably Necessary for the Construction or Operation of the Ocean Wind 1 Qualified Offshore Wind Project, BPU Docket No. QO22050347.

1 (“Preferred Route”) is reasonably necessary for the construction and operation of
2 the 1,100-megawatt (“MW”) Ocean Wind I project (“Ocean Wind” or “Project”).
3 Ocean Wind also requests the Board to find and determine that the easements
4 described in its petition over property owned by the County of Cape May
5 (“County”) are reasonably necessary for the construction and operation of the
6 Ocean Wind I. Lastly, Ocean Wind requests the Board issue an Order preempting
7 or superseding all consents needed from the County pertaining to New Jersey
8 Department of Environmental Protection permits.

9 **Q. Please summarize your findings and recommendations.**

10 A. My findings and recommendations are summarized as follows:

- 11 • Ocean Wind’s preferred plan requires a temporary easement over Block
12 3350.01, Lot 17.01, in Ocean City, New Jersey.²
- 13 • Ocean Wind’s Preferred Route would impact 0.257 acres.³
- 14 • While Ocean Wind indicated that it did quantify the cost of its Preferred
15 Route, Ocean Wind did not provide the projected costs of the Preferred Route
16 and it indicated that it had not quantified the costs of the alternative routes.⁴
17 Further, Ocean Wind contends that the costs associated with the transmission
18 from the offshore wind turbines to the onshore substation are solely borne by
19 Ocean Wind. Ocean Wind also contends that the preferred route will not
20 impact the Transmission System Upgrade Sharing Mechanism costs that are
21 shared by ratepayers and Ocean Wind.

² Id. at ¶ 30.

³ Id. at ¶ 30.

⁴ Response to RCR-INF-14.

- 1 • Since Ocean Wind is unwilling to provide cost information of its Preferred
2 Route and claims that it bears the sole responsibility of the costs to the
3 onshore substation, I recommend that the Board find that Ocean Wind has not
4 demonstrated that its Preferred Route is reasonably necessary.
- 5 • Should the Board grant Ocean Wind its requested easement, I recommend that
6 the Board require Ocean Wind to provide an estimate of the network
7 transmission upgrade costs associated with each of the point of
8 interconnection (“POI”) options under different build out scenarios for Ocean
9 Wind I and future phases, since ratepayers are obligated to share transmission
10 network upgrade costs with Ocean Wind, and assume 100% of the
11 transmission network upgrade costs beyond \$174 million.

12 **III. OCEAN WIND’S PREFERRED PLAN**

13 **Q. Please summarize the Company’s proposed plan.**

14 A. Ocean Wind’s petition describes the Company’s plans to install its export cables
15 from its offshore wind turbines along what it has deemed the Preferred Route that
16 follows the north side of Roosevelt Boulevard to a horizontal direction drilling
17 (“HDD”) entry point on the east side of the bridge across Peck Bay, continues
18 under wetlands and Peck Bay to an HDD exit point on the west side of Peck Bay,
19 and then continues to State Route 9.⁵ The Preferred Route eventually connects to
20 a substation located at the decommissioned B.L. England generating station where
21 it will interconnect with the PJM grid as described in more detail in Ocean Wind’s

⁵ Response to RCR-INF-9.

petition.⁶ The Preferred Route is also predicated on Ocean Wind obtaining approval of other permanent rights of way and easements under Green Acres encumbered parcels pertaining to the Project's cable beach crossings in Ocean City, New Jersey. These rights of way and easements associated with the cable beach crossings are the subject of a separate open proceeding before the BPU in Docket No. QO22020041. The Company's Preferred Route is dependent on the Board's approval of easements in BPU Docket No. QO22020041 and this proceeding. Therefore, the Board is also de facto determining whether the Preferred Route is reasonably necessary for both proceedings simultaneously. Without the approval of the easements and rights of way in this proceeding or in BPU Docket No. QO22020041, the path of Preferred Route would be altered

Q. Does the Company have an alternative for its Preferred Route in this petition?

A. Yes, but the proposed alternatives all follow Roosevelt Avenue either to the North or South of the roadway.⁷ As such, all the alternative routes are the same as the Preferred Route with only minor differences.

Q. Please describe your understanding of the Board's obligations in this proceeding.

A. It is my understanding that the Board must decide that the temporary easement required for the Preferred Route - and therefore the route itself - are "reasonably necessary for the construction or operation of the qualified offshore wind project

⁶ Petition at ¶ 13.

⁷ Response to RCR-INF-9.

1 or open access offshore wind transmission facility.”⁸ If the Board finds that the
2 Company’s petition is consistent with the “reasonably necessary” standard, then
3 the applicable statute states:

4 [T]he board shall issue an order approving the acquisition
5 of the requested easement, right-of-way, or other real
6 property interest, and notwithstanding the provisions of any
7 other State law, rule, or regulation to the contrary, such
8 order shall effectuate the qualified offshore wind project's
9 or the open access offshore wind transmission facility's
10 property interest and shall be recorded by the appropriate
11 county recording officer at the request of the qualified
12 offshore wind project or open access offshore wind
13 transmission facility.⁹
14
15

16 Additionally, I understand that in similar matters where the Board is asked to
17 approve a utility route and the associated easements, the Board is required under
18 applicable case law to consider cost as a factor in its analysis when it determines
19 whether the route is “reasonably necessary.”¹⁰

20 **Q. Has the Company provided a cost estimate for its proposed plan?**

21 **A.** No. Instead, Ocean Wind contends that:

22 [M]any of Rate Counsel’s requests seek information
23 relating to the cost of alternatives considered by Ocean
24 Wind. Given the structure of the Board of Public Utilities’
25 [Offshore Renewable Energy Certificate] OREC Order and
26 award, the financial risk and costs association with
27 alternative routes falls largely on Ocean Wind. It is Ocean
28 Wind, and not New Jersey electric utility ratepayers, that

⁸ N.J.S.A. 48:3-87.1(f)(2) .

⁹ Ibid.

¹⁰ In re Pub. Serv. Elec. & Gas Co., 35 N.J. 358, 377 (1961)(emphasis added). See also In re S. Jersey Gas Co., 447 N.J. Super. 459, 481 (App. Div. 2016) and In re Pub. Serv. Elec. & Gas Co., 2013 N.J. Super. Unpub. LEXIS 304, 32 (2013)(finding that the Board fulfilled its obligation to consider cost in determining reasonable necessity).

1 bears the risk of the project costs for onshore transmission
2 to the substation.¹¹
3

4 Accordingly, Ocean Wind did not provide cost estimates for its Preferred Route
5 or any of the qualitatively evaluated alternative paths.¹²

6 **Q. Does the Company contend that it bears the cost risks associated with the**
7 **onshore connection to the B.L. England substation?**

8 A. Yes, the Company contends that the cost of the onshore connection to the B.L.
9 England substation for the Preferred Route and the analyzed alternatives are part
10 of the project costs that are borne by the developer.¹³

11 **Q. Do you agree with the Company's contention regarding the financial risks**
12 **and costs of the project costs?**

13 A. I accept Ocean Wind's statement that it will bear the risk of project costs for
14 onshore transmission to the substation and that the network upgrade costs would
15 be the same regardless of the route.¹⁴ That said, Ocean Wind should be obligated
16 to provide the Board and Rate Counsel with information regarding actual costs of
17 its Preferred Route since ultimately ratepayers are bearing the full cost of the
18 project through the approved OREC structure.

¹¹ Introductory statement applicable to Responses RCR-INF-1 through RCR-INF-16. July 28, 2022.

¹² The Company's Response to RCR-INF-14 indicates that costs were not quantified for any of the proposed routes other than the Preferred Route, but the Company did not provide a cost estimate for the Preferred Route in discovery.

¹³ Response to RCR-INF-16.

¹⁴ Response to RCR-INF-16.

1 **Q. Has the Company identified specific transmission system upgrade costs in**
2 **this petition?**

3 A. No, the Company's petition does not explicitly identify any related transmission
4 system network upgrade costs.

5 **Q. Does the Company identify substation upgrades in its petition?**

6 A. Yes, in response to a discovery question served by Rate Counsel, the Company
7 provided a limited narrative of the required substation upgrade costs that would be
8 required at the B.L. England, Higbee, and Ontario substations.¹⁵ Specifically,
9 Ocean Wind noted that the B.L. England substation would be "able to receive up
10 to 432 MW without any upgrades" but in the next sentence, Ocean Wind noted
11 that there would need to be a substation upgrade of \$1.5 million.¹⁶ In the same
12 response, Ocean Wind indicated that the Higbee and Ontario substations would
13 require "significant grid upgrades" since the operating voltage for both
14 substations would need to change from 69 kilovolt ("kV") to 138 kV, and that
15 both substations would not be able to handle the injection of capacity from Ocean
16 Wind I.¹⁷ Ocean Wind further indicated that upgrades for the Higbee substation
17 could cost in the range of \$285 million.¹⁸

¹⁵ Response to RCR-INF-4.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Ibid.

1 **Q. If there are no specific transmission system upgrade costs specified in the**
2 **petition, why are you concerned about costs to ratepayers?**

3 A. When the Board issued its 2019 Order approving the Ocean Wind project, the
4 Board contemplated that there would be transmission upgrade costs expected to
5 be between \$36 to \$130 million.¹⁹ Even with the proposed B.L. England and
6 Oyster Creek substation POIs, Ocean Wind anticipates that its project will
7 require transmission upgrade work, since the completed wind farm will inject
8 more power into the transmission network.^{20 21} At this time there appears to be
9 limited opportunities for stakeholders to provide input to the Board as Ocean
10 Wind embarks on its process to install 1,100 MW of offshore wind. There is a
11 nexus between the decisions about the easements for the export cable routes and
12 the substation requirements, which then impact the POI for the project. These
13 decisions, in turn, impact what transmission upgrades will be required for the
14 Project. Later in my testimony, I illustrate how the Board's transmission upgrade
15 cost sharing allocation appears to create an incentive for the Company to propose
16 more expensive transmission upgrades, since the Company's cost share becomes
17 capped if there is a transmission upgrade cost of more than \$174 million.²²

¹⁹ I/M/O the Board of Public Utilities Offshore Wind Solicitation for 1,100 MW – Evaluation of the Offshore Wind Applications, BPU Docket No. QO18121289, Order dated June 21, 2019, at p. 18.

²⁰ The Company notes that the B.L. England site had a capacity of 450 MW and the Oyster Creek site had a capacity of 636 MW.

²¹ Ocean Wind, Construction and Operations Plan: Ocean Wind Offshore Wind Farm. Volume 1, March 2021, page 23.

²² Ibid.

1 **IV. RELATIONSHIP TO BPU DOCKET NO. QO22020041**

2 **Q. How does this proceeding relate to the offshore-wind matter pending in BPU**
3 **Docket No. QO22020041?**

4 A. This proceeding is linked to the BPU Docket No. QO22020041 which is currently
5 before the Board since the instant Ocean Wind petition is predicated on the
6 approval of its petition in BPU Docket No. QO22020041 for the 35th Street
7 landing and route through Ocean City. Both petitions concern Ocean Wind's same
8 Preferred Route that follows 35th Street to Roosevelt Boulevard. Should the Board
9 reject Ocean Wind's petition in BPU Docket No. QO22020041, Ocean Wind
10 indicates that it would utilize either the 5th Street or 13th Street landing that would
11 both end at Roosevelt Boulevard.²³

12 **Q. Are there other components of the Preferred Route that could be part of**
13 **another proceeding?**

14 A. It seems likely that Ocean Wind could seek additional approvals for easements
15 along N. Shore Drive in Upper Township, which appears to be the route to the
16 B.L. England substation. It is not known what easements Ocean Wind will need
17 for other sections of the Preferred Route.

18 **Q. Do you have concerns about this process of filing separate petitions?**

19 A. Yes, I am concerned that the piecemeal process of filing separate petitions for
20 approvals of property rights along the Preferred Route makes it more difficult to
21 track and analyze Ocean Wind's overall approvals required to connect Ocean

²³ Response to RCR-INF-8.

1 Wind I to the B.L. England substation location. I am also concerned that the
2 piecemeal process also does not allow stakeholders the opportunity to look at the
3 totality of the proposed scope of work.

4 **V. THE BOARD'S DETERMINATION OF WHAT IS REASONABLY**
5 **NECESSARY**

6 **Q. How should the Board determine if the easement and the Preferred Route**
7 **are reasonably necessary if Ocean Wind does not provide cost information?**

8 A. In light of the lack of cost information from Ocean Wind and its commitment to
9 bear 100 percent of the connection cost to the onshore substation, I recommend
10 that the Board find that Ocean Wind has not demonstrated that its Preferred Route
11 is reasonably necessary at this time. Ocean Wind should demonstrate that its
12 Preferred Route will be the most cost efficient.

13 **Q. Has Ocean Wind provided parameters how it evaluated the impacts**
14 **associated with its route selection?**

15 A. Yes, Ocean Wind has listed its evaluation elements. In response to RCR-INF-1,
16 Ocean Wind provided a Table that identified its qualitative considerations for the
17 evaluation of onshore pathways.²⁴ These elements are summarized below.

²⁴ Response to RCR-INF-1.

Table 1 Ocean Wind Onshore Export Cable Route Criteria

Minimize extreme changes in slope
Prioritize property availability, including State- and county-owned roadways, and existing utility ROW.
Avoid known Superfund Sites or sites designated as hazardous
Avoid known locations of historic or archaeological resources.
Avoid or minimize number of infrastructure (e.g., roads, bridges, culverts) crossings to reduce impacts to existing onshore infrastructure
Minimize impacts to wetlands and floodplains
Minimize the overall length of the route to minimize impacts to terrestrial communities, wildlife species, and sensitive habitats
Minimize impacts to aesthetic resources
Minimize impacts to sensitive receptors such as hospitals, schools, and churches.

Q. Does the proposed path meet the evaluation criteria?

A. According to Ocean Wind it does, but the Preferred Route and the alternate routes that are the subject of this petition all follow Roosevelt Avenue under Peck Bay, as I noted earlier in my testimony. In the absence of additional information from Ocean Wind, I cannot determine if the Preferred Route in this petition is the most cost efficient route.

VI. ALTERNATIVE ROUTES

Q. Please summarize your findings regarding the Company's proposed alternative routes.

A. While Ocean Wind provided maps for six alternative routes,²⁵ Ocean Wind did not provide quantitative estimates of the cost of each route. At a high level, Ocean Wind contends that the Preferred Route has the "least impacts to natural

²⁵ Direct Testimony of Pilar Patterson, Appendix C.

resources, including wetlands and water bodies and residential and historic properties.”²⁶ However, Ocean Wind has not provided a quantitative assessment of the number of residential houses that would abut the Preferred Route versus alternative routes, nor has it provided supporting documentation of the linear feet of existing roadways and right of ways of the Preferred Route relative to the alternative routes.

Q. Did the Company provide a summary of the length of roadway disturbed among the considered onshore cable routes?

A. Yes. Ocean Wind provided a summary of the disturbed length of roadway for the six considered routes, as contained in Appendix C of Ms. Patterson’s testimony.²⁷

This table is shown below:

Table 2 Length of Disturbed Roadways of Proposed Cable Routes²⁸

Route Color	Location	Length of Road (miles)
Pink	5 th Street	7.7
Blue	13 th Street	6.6
Purple	Railroad	0.6
Green	Strathmere and Route 9	16.2
GSP	Sea Isle City and GSP	12.4
Orange (Preferred)	35 th Street	4.3

Table 2 demonstrates that the Company’s Preferred Route has the shortest length of disturbed roadway in comparison to all of the other alternative routes, with the exception of the purple railroad route (“Railroad Route”). However, the road mile

²⁶ Id. at p. 12, lines 13 to 14.

²⁷ Id. at Appendix C.

²⁸ Response to RCR-INF-13.

1 length does not identify the abutters that would be affected by the Preferred
2 Route. For example, the Railroad Route impacts historic districts, but follows an
3 abandoned railroad right of way. The Great Egg Harbor route impacts shellfish
4 areas, but would have a lesser impact on residential and commercial properties.

5 **Q. Are there other possible routes that have not been presented by Ocean**
6 **Wind?**

7 A. Yes. Ocean Wind describes six routes, but there may be other alternatives that
8 may be longer than the Preferred Route but may impact fewer stakeholders or
9 may be lower cost, and thus should be considered by the Board.

10 **VII. TRANSMISSION UPGRADE COST CONCERNS**

11 **Q. Please summarize your concerns regarding transmission upgrade costs.**

12 A. Ocean Wind's petitions concern rights of way and easements that are required for
13 the export cables from Ocean Wind I through Ocean City. The proposed export
14 cables will connect to the B.L. England substation as the POI with PJM. In this
15 proceeding, as in the other pending proceeding in BPU Docket QO22020041,
16 Ocean Wind has indicated that the B.L. England substation is currently capable of
17 receiving 432 MW.²⁹ Ocean Wind has also indicated that it has not considered the
18 Higbee and Ontario substations since both substations would need to be converted
19 from 69 kV to 138 kV.³⁰ While I have no reason to disagree with Ocean Wind's
20 assessment, nonetheless, Ocean Wind has not provided any cost estimates of the

²⁹ Response to RCR-INF-4.

³⁰ Ibid.

1 transmission upgrades required for any of the options considered, since it has
2 taken the position that the cost of the transmission to the onshore substation is
3 Ocean Wind's responsibility.³¹ While the cost of connecting to the onshore
4 substation is acknowledged by Ocean Wind to be its responsibility, the costs
5 associated with transmission system network upgrades beyond the onshore
6 substation are shared between Ocean Wind and ratepayers. Therefore, the Board
7 should know the range of projected transmission network upgrade costs that may
8 be imposed on ratepayers because of the implementation of Ocean Wind I based
9 on the onshore substation options.

10 **Q. Did the Board require a cost sharing mechanism for transmission upgrade**
11 **costs?**

12 A. Yes. The Board's 2019 Order for the approval of ORECs for Ocean Wind I
13 detailed the following transmission upgrade cost sharing mechanism:

- 14 • First \$10 million: 100% Ocean Wind
- 15 • \$10 million to \$130 million: 70% Ocean Wind, 30% Ratepayers
- 16 • \$130 million to \$174 million: 50% Ocean Wind, 50% Ratepayers
- 17 • Over \$174 million: 100% Ratepayers³²

18 I note that it appears the Board chose the \$174 million based on Ocean Wind's
19 Downside Case of \$174 million and Ocean Wind's expected upgrade cost range
20 of \$36 to \$130 million at the time of the proceeding.³³

³¹ Ocean Wind has indicated that the Oyster Creek substation will be the other POI for the project.

³² I/M/O the Board of Public Utilities Offshore Wind Solicitation for 1,100 MW – Evaluation of the Offshore Wind Applications, BPU Docket No. QO18121289, Order dated June 21, 2019, at p. 18.

1 **Q. How does the transmission upgrade impact Ocean Wind?**

2 A. I believe the cost sharing mechanism does not create an incentive for Ocean Wind
3 to find the least-cost transmission upgrade solution since any transmission
4 upgrade cost above \$174 million will be borne by ratepayers. Effectively, the
5 transmission upgrade cost sharing mechanism caps Ocean Wind's transmission
6 upgrade costs at \$116 million. For illustrative purposes, I have created a table
7 below that demonstrates how the cost sharing mechanism flows to Ocean Wind
8 and ratepayers at various amounts given the formula that was established by the
9 Board in 2019:

10 **Table 3 Illustrative Transmission Upgrade Costs and Cost Sharing**
11 **Allocations based on Board-Approved Transmission Upgrade Cost Sharing³⁴**
12

Illustrative Transmission Upgrade Costs (\$M)	Ocean Wind Obligation (\$M)	Ratepayer Obligation (\$M)
\$10.00	\$10.00	\$0.00
\$75.00	\$55.50	\$19.50
\$125.00	\$90.50	\$34.50
\$175.00	\$116.00	\$59.00
\$200.00	\$116.00	\$84.00
\$250.00	\$116.00	\$134.00
\$300.00	\$116.00	\$184.00
\$350.00	\$116.00	\$234.00

13
14 As shown in Table 3, any transmission upgrade cost that is above \$174 million
15 will fall mostly to ratepayers as a result of the cost-sharing formula established by
16 the Board. For example, transmission upgrade costs of \$175 million will require a

³³ Ibid.

³⁴ Ibid.

1 cost share of \$116 million for Ocean Wind and \$59 million for ratepayers.³⁵ If the
2 required transmission upgrade costs are \$350 million, then Ocean Wind's cost
3 share still remains at \$116 million whereas ratepayers' cost share increases to
4 \$234 million. I have concerns that this cost sharing mechanism may incent Ocean
5 Wind to preference transmission upgrades that are not the least-cost or most cost
6 efficient solution since Ocean Wind's investment in transmission upgrades are
7 capped at \$116 million.

8 **Q. Do you have any recommendations for the Board?**

9 A. Yes. I recommend that the Board require Ocean Wind to provide an estimate of
10 the network transmission upgrade costs associated with each of the POI
11 alternatives under different build-out scenarios considered by the Company. This
12 estimate should be required prior to the Board making a determination that the
13 easement is needed and which route is reasonably necessary for the Project.
14 Although Ocean Wind may only be able to provide initial cost estimates, timely
15 and updated estimates will provide more clarity to ensure that Ocean Wind is
16 pursuing a transmission solution for Ocean Wind I and other phases that will be
17 supported by engineering data at a reasonable cost to ratepayers.

18 **VIII. CONCLUSIONS AND RECOMMENDATIONS**

19 **Q. What are your findings and recommendations?**

20 A. My findings and recommendations are summarized as follows:

³⁵ In this example, Ocean Wind's portion would be: $(\$174 \text{ million} - \$130 \text{ million}) * 0.5 + (\$130 \text{ million} - \$10 \text{ million}) * 0.7 + \10 million . The ratepayer portion would be: $\$1 \text{ million} + (\$174 \text{ million} - \$130 \text{ million}) * 0.5 + (\$130 \text{ million} - \$10 \text{ million}) * 0.3$.

- 1 • Ocean Wind's Preferred Route requires a temporary easement over Block
2 3350.01, Lot 17.01, in Ocean City New Jersey.³⁶
- 3 • Ocean Wind's Preferred Route would impact 0.257 acres.³⁷
- 4 • While Ocean Wind indicated that it did quantify the cost of its Preferred
5 Route, Ocean Wind did not provide the projected costs of the Preferred Route
6 and the Company indicated that it had not quantified the costs of the
7 alternative routes.³⁸ Further, Ocean Wind contends that the costs associated
8 with the transmission from the offshore wind turbines to the onshore
9 substation are solely borne by Ocean Wind. Ocean Wind also contends that
10 the preferred route will not impact the Transmission System Upgrade Sharing
11 Mechanism costs that are shared by ratepayers and Ocean Wind.
- 12 • Since Ocean Wind is unwilling to provide cost information of its Preferred
13 Route and claims that it bears the sole responsibility of the costs to the
14 onshore substation, I recommend that the Board find that Ocean Wind has not
15 demonstrated that its Preferred Route is reasonably necessary.
- 16 • Should the Board grant Ocean Wind its requested easement, I recommend that
17 the Board require Ocean Wind to provide an estimate of the network
18 transmission upgrade costs associated with each of the point of
19 interconnection ("POI") options under different build out scenarios for Ocean
20 Wind I and future phases. This is due to the fact that ratepayers are obligated

³⁶ Petition at ¶ 30.

³⁷ Id. at ¶ 30.

³⁸ Response to RCR-INF-14.

1 to share transmission network upgrade costs with Ocean Wind, and assume
2 100% of the transmission network upgrade costs beyond \$174 million.

3 **Q. Does this conclude your testimony?**

4 A. Yes. However, I reserve my right to modify my testimony based on additional
5 information provided by the Company or other parties later in this proceeding.

ATTACHMENT 1

Maximilian Chang, Principal Associate

Synapse Energy Economics | 485 Massachusetts Avenue, Suite 3 | Cambridge, MA 02139 | 617-453-7027
mchang@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, 2013 – present, *Associate*, 2008 – 2013.

Consults and provides analysis of technologies and policies, electric policy modeling, evaluation of air emissions of electricity generation, and other topics including energy efficiency, consumer advocacy, environmental compliance, and technology strategy within the energy industry. Conducts analysis in utility rate-cases focusing on reliability metrics and infrastructure issues and analyzes the benefits and costs of electric and natural gas energy efficiency measures and programs.

Environmental Health and Engineering, Newton, MA. *Senior Scientist*, 2001 – 2008.

Managed complex EPA-mandated abatement projects involving polychlorinated biphenyls (PCBs) in building-related materials. Provided green building assessment services for new and existing construction projects. Communicated and interpreted environmental data for clients and building occupants. Initiated and implemented web-based health and safety awareness training system used by laboratories and property management companies.

The Penobscot Group, Inc., Boston, MA. *Analyst*, 1994 – 2000.

Authored investment reports on Real Estate Investment Trusts (REITs) for buy-side research boutique. Advised institutional clients on REIT investment strategies and real estate asset exchanges for public equity transactions. Wrote and edited monthly publications of statistical and graphical comparison of coverage universe.

Harvard University Extension School, Cambridge, MA. *Teaching Assistant*, 1995 – 2002.

Teaching Assistant for Environmental Management I and Ocean Environments.

Brigham and Women's Hospital, Boston, MA. *Cancer Laboratory Technician*, 1992 – 1994.

Studied the biological mechanism of tumor eradication in mouse and human models. Organized and performed immunotherapy experiments for experimental cancer therapy. Analyzed and authored results in peer-reviewed scientific journals.

EDUCATION

Harvard University, Cambridge, MA
Master of Science in Environmental Science and
Engineering, 2000

Cornell University, Ithaca, NY
Bachelor of Arts in Biology and Classics, 1992

PUBLICATIONS

Knight, P., Chang, M., Hall, J., White, D., Frost, J., Havumaki, B., Odom, C., Bhandari, D., Lane, C., Hopkins, A., Litynski, J., Kwok, S., Biewald, B., Chernick, P., Harvey, J., Deman, L., Rosenkranz, J., Gifford, J., Yuen, P.Y. 2021. *Avoided Energy Supply Costs in New England: 2021 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Kallay, J., A. Napoleon, B. Havumaki, J. Hall, C. Odom, A. Hopkins, M. Whited, T. Woolf, M. Chang, R. Broderick, R. Jeffers, B. Garcia. 2021. *Performance Metrics to Evaluate Utility Resilience Investments*. Synapse Energy Economics for Sandia National Laboratories.

Bhandari, D., M. Chang, P. Eash-Gates, J. Frost, S. Letendre, J. Litynski, C. Roberto, A. Takasugi, J. Taberner. R. Wilson. 2021. *Exelon Illinois Nuclear Fleet Audit*. Synapse Energy Economics for Illinois Environmental Protection Agency.

Kallay, J., A. Hopkins, A. Napoleon, B. Havumaki, J. Hall, M. Whited, M. Chang., R. Broderick, R. Jeffers, K. Jones, M. DeMenno. 2021. *The Resilience Planning Landscape for Communities and Electric Utilities*. Synapse Energy Economics for Sandia National Laboratories.

Napoleon, A., J. Hall, J. Kallay, M. Chang, P. Eash-Gates, N. L. Seidman, C. James, D. Torre, D. Brutkoski, J. Migden-Ostrander, K. Colburn, K. Maddux, D. Harlow, M. Power. 2020. *Energy Infrastructure: Sources of Inequities and Policy Solutions for Improving Community Health and Wellbeing*. Synapse Energy Economics, Regulatory Assistance Project, and Community Action Partnership for the Robert Wood Johnson Foundation.

Knight, P., E. Camp, D. Glick, M. Chang. 2018. *Analysis of the Avoided Costs of Compliance of the Massachusetts Global Warming Solutions Act*. Supplement to 2018 AESC Study. Synapse Energy Economics for Massachusetts Department of Energy Resources and Massachusetts Department of Environmental Protection.

Knight, P., Chang, M., White, D., Peluso, N., Ackerman, F., Hall, J., Chernick, P., Harper, S., Geller, S., Griffiths, B., Deman, L., Rosenkranz, J., Gifford, J., Yuen, P.Y., Snook, E., Shoesmith, J. 2018. *Avoided Energy Supply Costs in New England: 2018 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Fagan, B., M. Chang, S. Fields. 2017. *Fair and Non-Discriminatory Transmission Access on Prince Edward Island: Compliance of Maritime Electric Company Ltd. (MECL) Open Access Transmission Tariff with US Federal Energy Regulatory Commission Standards*. Synapse Energy Economics for Carr, Stevenson and Mackay (CSM), Counsel to the Prince Edward Island Regulatory and Appeals Commission.

Horowitz, A., A. Allison, N. Peluso, B. Fagan, M. Chang, D. Hurley, P. Peterson. 2017. *Comments on the United States Department of Energy's Proposed Grid Resiliency Pricing Rules (FERC Docket RM18-1-000)*. Prepared for Earthjustice.

Kallay, J., A. Napoleon, M. Chang. 2016. *Opportunities to Ramp Up Low-Income Energy Efficiency to Meet State and National Climate Policy Goals*. Synapse Energy Economics.

Malone, E., W. Ong, M. Chang. 2015. *State Net-to-Gross Ratios: Research Results and Analysis for Average State Net-to-Gross Ratios Used in Energy Efficiency Savings Estimates*. Synapse Energy Economics for the United States Environmental Protection Agency.

Vitolo, T., M. Chang, T. Comings, A. Allison. 2015. *Economic Benefits of the Proposed Coolidge Solar I Solar Project*. Synapse Energy Economics for Coolidge Solar I, LLC.

Chang, M. 2014. *Making the Grid More Resilient within Reason: Case Study in Public Service Electric and Gas "Energy Strong" Petition*.

White, D. E., M. Chang, B. Biewald. 2013. *State Energy Efficiency Embedded in Annual Energy Outlook Forecasts: 2013 Update*. Synapse Energy Economics for U.S. Environmental Protection Agency.

Hornby, R., P. Chernick, D. White, J. Rosenkranz, R. Denhardt, E. A. Stanton, J. Glifford, B. Grace, M. Chang, P. Luckow, T. Vitolo, P. Knight, B. Griffiths, B. Biewald. 2013. *Avoided Energy Supply Costs in New England: 2013 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Nogee, A., M. Chang, P. Knight, E.A. Stanton. 2013. *Electricity Market Restructuring and the Nuclear Industry*. Synapse Energy Economics for Whitt Law.

Koplow, D., M. Chang. 2013. *Vogtle 3 and 4 Conditional Loan Guarantee: Review of Documents Pertaining to Department of Energy Conditional Loan Guarantees for Vogtle 3 & 4*. Synapse Energy Economics and Earth Track.

Chang, M., D. White, E. Hausman. 2012. *Risks to Ratepayers: An Examination of the Proposed William States Lee III Nuclear Generation Station, and the Implications of "Early Cost Recovery" Legislation*. Synapse Energy Economics for Consumers Against Rate Hikes.

Fagan, R., M. Chang, P. Knight, M. Schultz, T. Comings, E. Hausman, R. Wilson. 2012. *The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region*. Synapse Energy Economics for Energy Future Coalition.

Chang, M., D. White, P. Knight, B. Biewald. 2012. *Energy Benefits Resulting from the Investment of 2010 RGGI Auction Revenues in Energy Efficiency*. Synapse Energy Economics for Regulatory Assistance Project.

Chang, M., D. White, E. Hausman, N. Hughes, B. Biewald. 2011. *Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the US*. Synapse Energy Economics for Union of Concerned Scientists.

Hornby, R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M. Wittenstein, R. Wilson, B. Biewald. 2011. *Avoided Energy Supply Costs in New England: 2011 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Chang, M., D. White, L. Johnston, B. Biewald. 2010. *Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis*. Synapse Energy Economics for Regulatory Assistance Project.

Fisher, J., J. Levy, P. Kirshen, R. Wilson, M. Chang, J. Kallay, C. James. 2010. *Co-Benefits of Energy Efficiency and Renewable Energy in Utah*. Synapse Energy Economics for the State of Utah Energy Office.

Napoleon, A., W. Steinhurst, M. Chang, K. Takahashi, R. Fagan. 2010. *Assessing the Multiple Benefits of Clean Energy: A Resource for States*. Synapse Energy Economics for US Environmental Protection Agency.

Hornby, R., P. Chernick, C. Swanson, D. White, I. Goodman, B. Grace, B. Biewald, C. James, B. Warfield, J. Gifford, M. Chang. 2009. *Avoided Energy Supply Costs in New England: 2009 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Biewald, B., D. White, J. Fisher, M. Chang, L. Johnston. 2009. Incorporating Carbon Dioxide Emissions Reductions in Benefit Calculations for Energy Efficiency: Comments on the Department of Energy's Methodology for Analysis of the Proposed Lighting Standard. Synapse Energy Economics for New York State Attorney General.

ABSTRACTS

Koehler, D., M. Chang. 1999. "Search and Disclosure: Corporate Environmental Reports." *Environment* 41 (2): 3.

Makoto, N., P. S. Goedegebuure, U. L. Burger, M. Chang, T. J. Eberlein. 1995. "Successful adoptive immunotherapy (AIT) is dependent on the infiltration of host CD8+ and CD4+ T cells into tumor." *Surgical Forum* 66:528–531.

Burger, U.L., M. Chang, P. S. Goedegebuure, T. J. Eberlein. 1994. "Changes in host T-cell concentrations but not in donor TIL concentrations at the tumor site following adoptive immunotherapy." *Surgical Forum* 45 (0): 513–515.

Burger, U.L., M. Chang, S. L. Adams, D. D. Schoof, T. J. Eberlein. 1993. "The role of CD4+ and CD8+ T-cells during TIL+ rIL-2 treatment in cancer immunotherapy." *Surgical Forum* 64:467–469.

Zuber, M., D. L. Leonard-Vidal, A. L. Rubinstein, A. F. Massaro, M. Chang, D. D. Schoof, T. J. Eberlein. 1990. "In vivo efficacy of murine tumor-infiltrating lymphocytes (TIL) reactivated by anti-CD3." *Journal of Cancer Research and Clinical Oncology* 116; A3.112.28.

Eberlein, T.J., A. F. Massaro, S. Jung, A. L. Rubinstein, U. L. Burger, M. Chang, D. D. Schoof. 1989. "Cyclophosphamide (Cy) immunosuppression potentiates tumor-infiltrating lymphocytes (TIL) therapy in the mouse." Proceedings Annual Meeting: American Association Cancer Research. A30.A1472.

TESTIMONY

Virginia State Corporation Commission (Docket PUR 2021-00142): Direct testimony on the application of Dominion Energy Virginia for the development of offshore wind project pursuant to the Virginia Clean Economy Act of 2020. On behalf of Clean Virginia. March 25, 2022.

Maryland Public Service Commission (Docket No. 9666): Direct and rebuttal testimony on the applications of Skipjack Wind and US Wind for the development of offshore wind projects pursuant to the Maryland Clean Energy Jobs Act of 2019. On behalf of Maryland Office of People's Counsel. September 24, 2021.

Illinois Senate Energy and Public Utilities Committee Hearing: Oral testimony on Exelon Nuclear Fleet Financial Audit Report. On behalf of the Illinois Environmental Protection Agency. April 22, 2021

New Jersey Board of Public Utilities (Docket No. ER20080557, ER20080558, ER30080559): Direct testimony on PSEG and Exelon Generation's applications for Zero Emissions Credits. On behalf of the New Jersey Division of Rate Counsel. January 29, 2021

Maryland Public Service Commission (Docket No. 9629): Direct testimony on the applications of Skipjack Wind for a turbine design change pursuant to the compliance with conditions approved in 2017. On behalf of Maryland Office of People's Counsel. May 22, 2020.

New Jersey Board of Public Utilities (Docket No. EO18060629 and GO18060630): Direct testimony on Public Service Electric and Gas' petition for approval of the Second Energy Strong Program. On behalf of the New Jersey Division of Rate Counsel. March 1, 2019.

New Jersey Board of Public Utilities (Docket No. EO18070728): Direct testimony on Jersey Central Power and Light Company's petition for an Infrastructure Investment Program. On behalf of the New Jersey Division of Rate Counsel. December 17, 2018.

New Jersey Board of Public Utilities (Docket No. EO18020196): Direct testimony on Atlantic City Electric Company's petition for an Infrastructure Investment Program. On behalf of the New Jersey Division of Rate Counsel. September 4, 2018.

New Jersey Board of Public Utilities (Docket No. ER18010029 and GR18010030): Direct testimony on Public Service Electric and Gas' petition for base rate adjustments. On behalf of the New Jersey Division of Rate Counsel. August 6, 2018.

Illinois Commerce Commission (Docket No. 18-0211): Direct Testimony regarding Ameren Illinois Company's voltage optimization plan and the importance of prioritizing low-income communities. On behalf of the People of the State of Illinois, represented by the Office of the Illinois Attorney General. March 7, 2018.

Maryland Public Service Commission (Docket No. 9431): Direct testimony on the applications of US Wind and Skipjack Wind for the development of offshore wind projects pursuant to the Maryland Offshore Wind Energy Act of 2013. On behalf of Maryland Office of People's Counsel. February 15, 2017.

Kansas Corporation Commission (Docket No. 16-KCPE-593-ACQ): Direct testimony on clean energy and coal fleet retirement concerns related to the petition of Great Plains Energy Inc., Kansas City Power and Light, and Westar Energy, Inc. for the acquisition of Westar by Great Plains Energy. On behalf of Sierra Club. December 16, 2016.

Maryland Public Service Commission (Docket No. 9424): Direct testimony on Delmarva Power and Light Company's application for a rate adjustment to recover smart grid costs. On behalf of Maryland Office of People's Counsel. October 7, 2016.

Maryland Public Service Commission (Docket No. 9418): Direct testimony on Potomac Electric Power Company's application for a rate adjustment to recover smart grid costs. On behalf of Maryland Office of People's Counsel. July 6, 2016.

Illinois Commerce Commission (Docket No. 16-0259): Direct and rebuttal testimony on Commonwealth Edison Company's annual formula rate update and revenue requirement reconciliation on distribution and business intelligence investments. On behalf of the Office of Illinois Attorney General. June 29, 2016 and August 11, 2016.

Illinois Property Tax Appeal Board (Case Nos. 12-02297, 12-01248) Direct testimony on history of nuclear deregulation in Illinois and the impact of deregulation on Exelon nuclear units. On behalf of Byron Community School District. April 2016.

Maryland Public Service Commission (Docket No. 9406): Direct testimony on Baltimore Gas and Electric Company's application for a rate adjustment to recover smart grid costs. On behalf of Maryland Office of People's Counsel. February 8, 2016.

New Jersey Board of Public Utilities (Docket No. ER14030250): Direct testimony on Rockland Electric Company's petition for investments in storm hardening measures. On behalf of the New Jersey Division of Rate Counsel. September 4, 2015.

Hawaii Public Utilities Commission (Docket No. 2015-0022): Direct testimony on reliability, clean energy, competition, and management and performance concerns related to the petition of NextEra Corporation and Hawaiian Electric Companies (HECO) for the acquisition of HECO by NextEra. On behalf of the Hawaii Division of Consumer Advocacy. August 10, 2015.

Delaware Public Service Commission (Docket No. 14-193): Direct testimony evaluating the benefits and commitments of the proposed Exelon-Pepco merger. On behalf of the Delaware Department of Natural Resources. December 12, 2014.

State of New Jersey Board of Public Utilities (Docket No. EM14060581): Direct testimony on the reliability commitments filed by Exelon Corporation and Pepco Holdings, Inc. in their joint petition for the merger of the two entities. On behalf of the New Jersey Division of Rate Counsel. November 14, 2014.

District of Columbia Public Service Commission (Formal Case No. 1119): Direct and answer testimony on the reliability, risk, and environmental impacts of the proposed Exelon-Pepco merger. On behalf of the District of Columbia Government. November 3, 2014 and March 20, 2015.

United States District Court District of Maine (C.A. No. 1:11-cv-00038-GZS): Declaration regarding the ability of the New England electric grid to absorb the impact of a spring seasonal turbine shutdown at four hydroelectric facilities. On behalf of Friends of Merrymeeting Bay and Environment Maine. March 4, 2013.

State of Maine Public Utilities Commission (Docket 2012-00449): Testimony regarding the Request for Approval of Review of Second Triennial Plan Pertaining to Efficiency Maine Trust. On behalf of the Maine Efficiency Trust. January 8, 2013.

New Jersey Board of Public Utilities (Docket No. GO12050363): Testimony regarding the petition of South Jersey Gas Company for approval of the extension of energy efficiency programs and the associated cost recovery mechanism pursuant to N.J.S.A 48:3-98:1. On behalf of the New Jersey Division of Rate Counsel. November 9, 2012.

Resume updated March 2022