

STATE OF IOWA
BEFORE THE IOWA UTILITIES BOARD

IN RE:)
)
APPLICATION OF INTERSTATE) DOCKET NO. RPU-2016-0005
POWER AND LIGHT COMPANY FOR)
A DETERMINATION OF)
RATEMAKING PRINCIPLES)

DIRECT TESTIMONY
OF
THOMAS A. WIND (PUBLIC)

On Behalf of

Iowa Environmental Council
Environmental Law & Policy Center

September 15, 2016

1 **Q. What is your name and business address?**

2 A. My name is Thomas A. Wind and I work for Wind Utility Consulting, PC at 1639 320th
3 St., Jamaica, IA 50128.

4
5 **Q. On whose behalf are you testifying today?**

6 A. I am testifying on behalf of the Iowa Environmental Council and the Environmental Law
7 & Policy Center.

8
9 **Q. Please describe your background and experience in the field of wind generation.**

10 A. I graduated from Iowa State University in 1974 as an electrical engineer. I was employed
11 by Iowa Southern Utilities for 15 years from 1974 through 1989, primarily in the area of
12 transmission and generation resource planning. In 1989 I started my consulting business
13 as a professional engineer. My main areas of practice have included transmission
14 planning, electric load forecasting, energy efficiency program planning, and generation
15 resource planning. For the last 23 years I have been involved with planning and
16 development of wind generation projects that typically consist of 1 to 10 large utility-
17 scale wind turbines. Over this time period I have provided consulting and development
18 services for 39 projects totaling 112 megawatts of wind generation, which are now all in
19 operation. I also have a minority ownership interest in two multi-turbine community-
20 owned wind farms, and I provide ongoing management services for one of them.

21

22

23

1 **Q. What is the purpose of your testimony?**

2 A. The purpose of my testimony today is to comment on Interstate Power and Light
3 Company's (IPL) capacity factor projections for their proposed 500 MW wind generation
4 expansion.

5
6 **Q. Please describe your experience related to wind generation capacity factor
7 projections.**

8 A. The vast majority of my consulting work for wind generation projects involves the
9 technical and financial feasibility of proposed projects. A key factor of the analysis is
10 projecting the annual capacity factor. I have made these projections for 35 of the 39 wind
11 projects for which I have provided consulting services. Based on my long experience, I
12 have generally become more conservative in my projections over time.

13
14 **Q. What type of capacity factors are you projecting for new wind turbine projects that
15 you are involved with?**

16 A. The most recent project I have been involved with has a projected average annual
17 capacity factor of 51%. This project has a single GE turbine with a rating of 1.79 MW
18 with a 100-meter rotor on a tower providing an 80-meter hub height. It was installed in
19 June south of Anita, Iowa.

20
21 **Q. How does that project compare with the projects being proposed by IPL?**

22 A. The project I described had only one wind turbine and was connected to a distribution
23 substation. Since there is only one turbine, there will be no wake effect losses for this

1 project. Secondly, the hub height wind speed at the project will be slightly less than the
2 average wind speeds for the IPL proposed Whispering Willows turbines. Thirdly,
3 Whispering Willows will use a different wind turbine model than the model in the project
4 I described.

5
6 **Q. How would the differences between the project you described and the Whispering**
7 **Willows wind farms affect the projected annual capacity factors?**

8 A. Based on the data provided in the confidential technical report by Black & Veatch in
9 Schedule C in IPL Exhibit Lipari Direct, I have made calculations to adjust for the four
10 differences between the single turbine project and the Whispering Willows wind farms.
11 The first adjustment is for the higher wake effect losses. Table 8 in the Black & Veatch
12 report projects array efficiency losses of [REDACTED] based on a likely wind farm layout. The
13 array efficiency loss for the single turbine at Anita is 0.0% since there are no turbines in
14 the immediate area. The second adjustment was for a higher projected hub height wind
15 speed for the Whispering Willows projects. The Whispering Willows average wind
16 speed was projected to be [REDACTED] meters per second at a [REDACTED] meter hub height, compared to
17 8.1 meters per second for the single turbine project at an 80 meter hub height. The third
18 adjustment is for a different turbine model. It was assumed that the [REDACTED]
19 turbine model would be used for the Whispering Willow expansion project. This is the
20 same assumption that Black & Veatch made in their report. This turbine model will have
21 a higher capacity factor than the Anita project based on a comparison of the power curve
22 data for each turbine. This higher capacity factor is due to [REDACTED] larger rotor swept
23 area per kW of nameplate rating. The fourth adjustment is for a higher average annual air

1 density at Whispering Willows than at the Anita project. The turbine elevation elevations
2 average about 175 feet lower in elevation and the average annual temperature at
3 Whispering Willows is about 3.5 degrees Fahrenheit lower than at Anita. Both of these
4 factors combine to increase the capacity factor by 0.4 percentage points at the Whispering
5 Willows site compared to the Anita project, with all other factors being equal. The
6 cumulative impact of these four calculated adjustments shows that the average annual
7 capacity factor for the Whispering Willows wind farms that I have estimated would be
8 49%.

9
10 **Q. How does your projection of the Whispering Willows annual capacity factor**
11 **compare to IPL's projections?**

12 A. On page 6 of Mr. Lipari's direct testimony, he projects the approximate annual capacity
13 factor of the Whispering Willows project to be 44%, with a possible range being 44% to
14 51%. This range encompasses the 49% projection that I have made for the Whispering
15 Willows projects.

16
17 **Q. Are there some uncertainties in your capacity factor projections?**

18 A. Yes there are uncertainties in my projections. They primarily stem from these two
19 factors: 1) IPL has not finalized its selection of the wind turbine model, and 2) the turbine
20 layout and engineering have not been finalized. Both of these factors affect the capacity
21 factor projections. Having these uncertainties is not uncommon in wind farm planning
22 and development. The best way to minimize these uncertainties is to base assumptions

1 on past experience, adjust for factors that will be different, and then to be conservative in
2 the estimates. I believe this is what IPL has done in its projections.

3

4 **Q. Do you think IPL's projected capacity factors are reasonable?**

5 A. Yes. I have reviewed the detailed analysis provided in Mr. Lipari's testimony and
6 exhibits concerning IPL's capacity factor projections, and I have found nothing that I
7 thought was unreasonable. My calculations predict a capacity factor toward the upper
8 range that IPL has provided.

9

10 **Q. Does this complete your testimony?**

11 A. Yes, this completes my testimony.

AFFIDAVIT OF
THOMAS A. WIND

STATE OF IOWA)
) ss.
COUNTY OF GREENE)

I, Tom Wind, being first duly sworn on oath, depose and state:

1. that I am president of Wind Utility Consulting, PC; and
2. that I have personal knowledge of the facts alleged in the attached testimony; and
3. that said facts are true and correct to the best of my knowledge and belief as of the date of this Affidavit.

Further affiant sayeth not.

/s/ Thomas A. Wind

Thomas A. Wind

Subscribed and sworn to before me,
a Notary Public in and for said County and
State, this 15th day of September 2016.

/s/ Kimbery Bendickson
Notary Public in and for the State of Iowa