PROJECT DESIGN PHASE 2

CUSTOMER JOURNEY

Team ID : PNT2022TMID12095
Project Name : Predicting the energy output of wind turbine based on weather conditions

Wind power generation has tripled over the past decade — and continues to grow as renewable energy gains momentum. However, the small wind market (<100 kW), dominated in the past by residential customers, has largely been supplanted by solar installations. By comparison, commercial and industrial companies have installed over 360 onsite wind turbines. Excluding independent power producers and municipals, the average installation size is roughly 800 kW ranging from 50 kW to 3 MW in size according to the **United States Wind Turbine Database**. Before investing in wind power, your utility's commercial and industrial customers need to understand the keys to wind power success.

Wind poweí safety issues:

In high wind conditions, the geneíatoí and geaí box can íun too fast and oveíheat. Allwind tuíbines disengage the geneíatoí at some píedeteímined cutout wind speed (typically 55 mph). A wind tuíbine will also need lightning píotection.

What's the best wind tuíbine size?

1'he tuíbine size will depend on youí customeí's eneígy use, the aveíage wind speed at theií site, the diameteí at the blade tips and the height of the wind tuíbine, all of which will affect the amount of eneígy it geneíates. When wind tuíbine capacity is augmentedby eneígy stoíage (duíing slow wind conditions), eneígy stoíage is sized to píovide onlyabout 14% of tuíbine full capacity.

Financial analysis and incentives for wind power:

1'he **1**'axpayeí Ceítainty and Disasteí **1**'ax Relief Act of 2020 extended the deadline foí wind píojects staíted in eitheí 2020 oí 2021 to qualify foí a **Píoduction 1'ax Cíedit** (P**1**'C) of $0.015/kWh on the electíical output foí 10 yeaís.Wind píojects can íeceive the tax cíedit based on eitheí the yeaí the píoject begins opeíation oí the yeaí in which 5% of the total capital cost foí the píoject has been spent and constíuction has begun. **1**'he cíedit is claimed by completing IRS Foím 8835, "Renewable Electíicity Píoduction
Cíedit." **1**'he Investment **1**'ax Cíedit (**I**l'C), píeviously at 30%, is no longeí available foí on-shoíe wind píojects.

Conducting a simple investment analysis foí youí customeís can help them undeístandthe financial obligations of wind poweí moíe cleaíly. Foí example, the assumptions andcalculation below outlines how to estimate the total net cost and payback of an aveíage-size onsite wind tuíbine.