

[8/20/2020]

Members Present: Natile McDonald, Barry Benson, Aaron Zeek, Alexander Kennedy, Joseph Conroy, Brittany Taga, Tore Cadman, Bryce Connor, Naveen Madhushanka Vidanage

Meeting Date/ Time: 08/20/2020 7:00 Pm

Location: Microsoft teams

Time of meeting: 1:36:14

Meeting Notes:

- Dr. Willy Lead the meeting for the first half.
- All team members brought up the separation of teams for the project (Mechanical Test team and Sitting team)
- Dr. Willy went into the importance of being able to set up both teams and allow for some cross over, He expressed the fact that working on both sides of the project would not only let us gain more knowledge of the project but also make all team members more desirable when looking for further employment.
- Some of the topics that Dr. Willy expressed would be important for people to understand would be topics such as material selection, generation, as well as location
 - Material Selection: These components would have to be specially investigated. Some of the important aspects would need to be specifically examined. Some of these would parts such's as the blades could be made from carbon fiber; however, this would add extra costs as well as require the design team to make molds and casts for the blade design.
- After Material selection, the team asked about the new rules and regulations for 2021 and when they would be published. Dr. Willy was not sure about the exact date this was due to the Department of Energy looking into newer software for the competition.
 - Dr. Willy expressed that we as a team need to be ready for all rules to change at the last minute due to potential Covid-19 factors.
- Dr. Willy discussed the main importance of the overall project, this is be able to design not only a wind turbine, but be able to design a power plant that would be able to lower the price of energy to rival that of coal and fossil fuel prices.
 - With the he also mentioned the top job markets in renewable energy
 - Wind turbine technician
 - Design Power Grid
 - Powerplant Development
- One important thing that was mentioned by the team was document submission. Dr. Willy gave the team two ideas.
 - Dr. Willy suggested that we talked to Dr.Traves (Faculty Lead) about documentation for both teams.
 - Dr. Willy also said that for the competition, all deliverables need to be submitted to the Department of Energy.
- One of the last parts that Dr. Willy suggested that we also break into sub teams. One good example that he used was looking at something like the blades. The biggest thing that we as a team need to think about is the make, buy decision process. This is basically is whereas a team you decide will it be easier to design and take the time to make the part, or just buy the part for the design.
 - The example that he went in depth on was blade design. Teams in the past have spent the extra time to design the blades, these designs were based off pitch

angle, as well as the overall length. Whereas teams in the past have used drone blades and reversed them.

- One of the last things that Dr. Willy left the team with is that the dynamometer will be provided for us. As well as potential sub teams that we as a team should think about were the critical paths. These paths should include Blade design, Pitching angles, Generation, as well as the usage of the New software from the Department of Energy.
 - After this Dr. Willy had to leave to attend student's office hours.
 - The Team then stayed in the meeting room to discuss a document the Bryce had made, This document was made to help us as a team get a better idea of how the sub teams were going to be broken up as well as who would be contributing to what roles within in the team. This document can be found within the team's files
 - After all roles were assigned all team members moved over to the team charter. Each section of the charter was divided up to have two members per section. The team also discussed a day to have the document finished in order to make final revisions. The agreed date was Saturday August 22nd at 11:59 pm.
 - Natalie also made a doodle poll for the team to get a more accurate day on when it would be a god time for all team members to meet and discuss up coming due dates as well as project developments and deliverables for the Department of Energy.
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[8/25/2020]

Members Present: Natile McDonald, Barry Benson, Aaron Zeek, Alexander Kennedy, Joseph Conroy, Brittany Taga, Tore Cadman, Bryce Connor, Naveen Madhushanka Vidanage

Meeting Date/ Time: 08/25/2020 4:15Pm

Location: Microsoft teams

Length of meeting: 1 hour 14 minutes

1. **Biggest concern** → Rules for the 2021 competition have not been released yet.
2. Design Challenges: Most of the design challenges won't have changed from the previous year.
 - 45x45x45 design
 - Cut out Test
 - Break Test
3. Where we can start now: After we receive the OpenWind tutorial files from Willy all the team members can start going through them.
4. Material strength sub-team to be changed to **Tower** or **Yawing**(Passive was suggested) team. Material strength can be a responsibility of the blade group.
5. Siting Sub Teams: Permitting, Economics (cost/cashflow over 20 years/Market Conditions), Salvaging, Terrain/Roughness data, Wind data from Wind Prospector
6. Blades: Drag, Weight Rotation, Torque when breaking, Number of blades, mold or no mold, Control Theory.

7. Bonus Challenge will be to design a Power Plant on the fly given data at the CWC.
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[12/22/2021]

Meeting with Willy (1-22-21)

- Land owners
 - LLC (limited reliability)
- Site 6 is far from the nearest transmission line and tie them into the substation
- Alex- question on acreage
 - Distance to substation and acreage has changed according to new calculations
 - Where did calculation come from?
 - Having calculations with wind direction
 - Grid pattern
 - 3-5000 ball parking for acreage
 - Stagger helps too
 - The acreage can be easily decreased
 - Stop calculating but gotta put in software
- Trust land – own property outside of the reservation within the trust
 - Ask Karin for more help on this type of information
- Site 6: Indian Butte Ranch
 - A lot of acreage
 - Could have neighboring land with leases
 - Lease the land for other uses
 - Negative - far from transmission line
 - 4 owners – 78000 \$\$ per year
 - There is a phone call we can call
- Western Power Administration may have more information about the transmission line
 - Could have smaller transmission lines
 - FEMA made a lot of the data bases and couldn't redo it
 - FEMA 94 was reverted back to
 - Make sure to call the people!!!!
- Call and ask about the biz and see if they can point us in another direction
- ALEX – CALL SOMEONE IN MEADE COUNTY AND MANY OTHER COUNTIES ABOUT ORDINANCES
 - GET LAND OWNERS INFORMATION
- CALL 2-3 COOPS
- Call a couple of companies to develop wind energy in the area
- No permission needed it is ok to call them
- NEXTERA – contact info
 - Make sure to contact people
- There is a lot of financial stuff that needs to be worked on
- Call people and get a site picked by next Friday
- Go to wind prospector and see if you can import met time series data
- Re analysis data has been generated by multiple met towers throughout time
- Reuse the met data -> follow the tutorial
- Make sure you can see it and look at wind rose to double check whats happening
 - Once have meera 2 data, same as met tower data

- May not have to filter and it is simulated data
 - Determine if there are some bad simulations and wont have to do met tower scrubbing and can prob skip that and go to meera 2
 - Need something from prospecting
 - There will be quality control
 - Wind pro with own quality control
- Ask Elizabeth Walls is first off: we would like to use MEERA 2 Data and is there is a reason why to use MET data, update her of where we are at and where we want to go, ask to have a little meeting to talk about possibly scheduling a meeting
 - Try getting MEERA 2 data and skip to the next step to see what happens
- Can weight confidence in MCP process
- 3 references- user guide, overview, and individual tutorials
- Any advice, what is being built, and so forth
- Aaron is calling Wind Quarry, voltage capacity, and so fourths
 - What do you have for suggestions
 - What do you recommend
 - Land usage
 - Power usage
 - Sub station (can we use the substation)
 - Does transmission line have room
- Alex is calling Meade County and Beutte County and each county
 - Ordinances
 - Environmental policies
 - Best perks
 - County involvement
- Brittany is calling Vestas and GE renewables and transmission line people (Western Power Area Administration)
 - Turbines being manufactured in the area
 - What can be used in the area
 - How are the turbines being transferred
 - What do you recommend
 - Training people to upkeep the turbines
 - Disassembly
 - Transmission lines: what is the capacity, which company is specifically using the transmission lines, what is the population of people using the transmission lines
 - Contracts
 - Suggestions for use of land or being hooked up to the transmission line

115-161 voltage capacity

Maybe in Perkins county

South dakota rural electric association

Contact grand/ moreau grand for coops

Look into thunder spirit project for hettinger

Allette clean energy

MDU Resources Group

Keep calling yall

[1/14/2021]

What main objectives:

- Transmission lines information
 - Who owns?
 - Whats the capacity
 - How deep is it (underground)
 - How much does it cost to hook up to it
 - Exact corrdinates of siad transmission line (need for power hub station)
- Policies
 - Policies on Meade county?
 - Environmental policy?
 - Bird contracts?
 - Environemntal contracts?
- Power hub station
 - Whos building it?
 - Us or if it does exist gotta tap.
 - How much is it to keep it running?
 - Will it be privately owned?
 - Whats happening with it after 20 some years?
 - Who will manage it?
 - For power plant and is part of the power plant
 - Could take a drive to the power plant and see whats happening
 - Can see substation
 - Gated
- Ordinances
 - What is needed?
 - Government involvement?
 - Meade County Specific items?

Meeting:

- Calculations:
 - Area needed for the plant
 - Direction of prodominant winds: want to be 6-10 rotor diameters perpendicular to that is closer to 4 rotor diameters
 - Usually start there then run a simulation and run a wake loss for the turbines and others is needed. Array efficiency for looking at turbines as a whole. Can get away with staggering. Will need to run simulations

Can do a wake model given enough distance so wind recovers. Atmospheric boundry layer. Further away the wake decreases and boundary layer recovers its velocity

- Does wake spread? Yes. Cone behind the rotor. Cone angle?

- Different wake models. Easiest is the park wake model. Algebraic expression and not a full CFD simulation
- Software can simulate the different wake effects
- Simulation is a time varying simulation, can see how vortexes are shedding off of blades and are rotating. Shedding with the blade
- No large Eddy simulations but spart with the park/eddy-viscosity model
- Wind changes can effect things as well
- Analyze model at particular site
- Wind rose will give lots of information with being able to determine the wind direction. Do a wind rose for Meade county
 - Take wind rose and drop it into the site and see whats happening
- Wind prospecting with met tower (continuum and SAM should have)
 - Wind prospector can be used to generate these models
- Can have a phase 1 and 2 for land
- Probably reach out to them if possible for land owner. Send an email that is a lease agreement that can initially look at
- Land ownership. Time to reach out
- Schedule for software overview
- Time to create more simulations
- Transmission line is owned by western power administration
- In viewer, can click on transmission line. NREL's tools (tribal energy atlas)
- Possible field trip??????????
- Are we in charge of disassembly? After 20 years. (Decommission)
 - We are responsible for it or give them access to ester account then the county can take care of it
 - Sgrel account tax, financial headache
- Focus on one company for selling power
- Take permit
- Take advantage of the terrain
- Make sure we are not on any specific wind farms. WE MAYBE ON ONE
- Wind Turbine Data Base
- Substation next to the transmission line is probably the easiest
- Can see who owns the plants
 - Contact owners maybe
 - See if can connect
 - Jon Baker
- Alex will be doing the calculations
- Talk to the manager at the power plant for guidance

[12-22-2020]

Meeting Questions for Willy (siting)

Need a load center for the power plant, selling to the grid?

Need power purchase agreement for the project
Know where electricity is going? Black forest utilities (map of utilities?) Need map of utilities to fully know who we are selling to
Load centers are important and know how many people are being provided for
Maybe even to different states
Where is everything going?
How much load is being taken with the power plant and the area around there? (try to talk to companies to see if it is a feasible power plant) Need to know the transmission lines throughout but do not know if energy is being sold to different electricity places
Who are we sending electricity to? Understand how the corporations go
City does not have a lot of residents
Co-op: own their own electricity, small coop, everybody owns the energy in and out
Member of national rule rule association. Walker wit is general manager
8000 rural/sub members
10000 other members
18000 total members
Would most likely be providing for more people
Need to know about the cooperative and know where the power is coming from
National coop energy is a network of 46 states. Cooperatives would prob make it a little harder
Reach out to Tom again to have a follow up
Reach out to Karin for coop and see if she can possibly help with the coops
Understand more of the area
Is appropriate to put energy to different areas, and other coops, excel energy – largest utility in area (CO, NE, AK area) biggest on wind energy (texas to dakotas)
Tiny coops newfacilities may not be able to buy the electricity
Going to get hairy and need to work through details
Need to know which turbines are available, where are they manufactured, will it be able to get there, hope that turbines are manufactured near west SD
Couple of vestas plants in the US
Easier to stick with one turbine and better for manufacturing, wind energy techs people would have it easier to be trained on one unit, a lot of power plants are like this
<https://eerscmap.usgs.gov/uswtodb/viewer/#9.56/35.085/-118.4426> is good to look at for already established turbines (easier to use one turbine regardless of where it is being installed. Most likely going to be used for the same height, and others)
What is manufactured and what power plant?
Brighten factory CO, 2 different factories, blade and necel
Tower would come out of pueblo CO
Blades from winds or brighten
Necel from brighten
What are they currently making? And what is available at plant?
Pason electric is good and looks like they would be a potential customer, a lot in north dakota and south dakota, has power purchase agreements
Consolidate at Edison and Cornbelt coop
Tradewind? NextEra energy
NextEra energy resources FL, largest wind energy developer, sells wind energy, NextEra would be developing (sell or compete?)
Sell? Would not have a power purchase agreement, ask Karin some of these questions and NextEra
Handling fees in cooperatives? Fees or being dealt with

US Wind turbine data base, electric service base
Could go back to Pason electric and look up the projects
Developer is Pattern Energy
Use parcel viewer to see who owns the land
Wind easement will be used for south dakota
Need to get in contact with the county people and maybe the land owners
May need to get another map
Parcels usually mile by mile
Leasing government land – ask karin, lease agreement with the state? Tribal land? Other land?
Depending on wake and wind direction, 7- 8 rotor diameters front and behind is different, determine wake loss and change wake loss and save on land lease along with decrease of roads and transmission lines
Transmission is approx a million a mile
Do we need a central hub? Yes need a substation. How much would each substation cost? influence power plant layout
Voltage of turbines?, costs is influenced by current
2230-287 kV range, western power administration, whats the true kV of the substation
Is there a capacity on the transmission line?
Most transmission lines do not have much space. Each trans line didn't have a US plan
Need is with outages, may not be capacity, are there outages that the company experiences, SDREA
Useful information for having a bankable energy plant
Need to get information from different people and make it bankable/viable
Sound like you know what is being talked about
HAVE A NARRATIVE
Not In My Back Yard – neighbor stuff
<https://lizwalls99.wixsite.com/mysite-1/tutorials> Continuum tutorials and other stuff

[1/29/21]

Siting Team Client Contact Meeting

- Final site
- Site simulation
- Still waiting to hear back from Vestas about Turbines
- Sent email out to korokonkiz about evaluating the land
- Continuum Update
- Windographer is a software
- Alex reached out to the counties and penington and meade were able to get back to Alex
- Aaron has been able to get more information with regards to site selection
- Located the substation at the corner of the transmission
- Call more of the WAPA people
- It is ok if the substation is located in another county
- Connect to the transmission system at the substation and get the ordinances for them
- South dakota public utilities comission is the main people that we need to get involved with (Aaron is going to get into contact with them)

- Need to get approval from the utility commission maybe they own lower kV lines and maybe we can talk to them about it
- If you cant get a hold of the govt people get a hold of their offices
- Routine business -> consumer affairs -> staff email directory
- Public utility mailing list
- Usually file with the utility commission and contact the PUC (diff phone number)
- Target staff email directory
- Utility analysts – know about utilities in the state and run scenarios to improve transmission line, retiring old units, adding new units, and what it would do to the state and probably WAPA
- Eric Paulson?
- Get in contact with the county first
- North of 212 and of lake
- Can tell the kV by looking at the tower and made it universal in the utilities
- Can make another substation and need to know the costs to know about the substation needed to get hooked up
- Next step is to see what is needed to build the substation and voltage, capacity, and other stuff for the substation, (ABB, Synder Electric, Easton)
- Medias relation
- Reach out to the banks
 - o Larger banks are better
 - o Ask alana to see who they go to with regards to who they go to for the banks
- Karins husband is a financial person for wind powers and looking for financials
 - o Def not an engineer but a good person to talk to (conflicts of interest may happen)
 - o Works at NextEra
- Alex
 - o Perkins county calling
 - o Try to reach out to more people
 - Reached out to equalization department
- Reach out to the substation companies and ask about the insurance

-Aaron

- o Perkins county calling
- o Inquire about the info about the county first

[2/5/2021]

Vestas is one of the companies that is from Europe

Semmins GAMSAs and GE Wind (try GE wind)

Could look at last year's and see what they picked out for the wind plant

Babbit person works for NEXTERA (developer conversation and see if we can get anything answered on her part manager Wardal Abasi – email a response to her to see availability for next week)

Try Vestas one more time if not call GE if not, use last year's turbine

Alex reached out to solomon cop for substation stuff

Tried to reach out for information

Installs stuff

Just selling components

Trouble with Continuum

Could sub contract things out. See if theres any substation design companies. Power company that is trying to build something. PGEs out there. Definitely substation design out there

Need to know the turbines, how many we have, expected voltage, tranmission line and that voltage, substation information as well will be helpful

For substation, need voltage, current of power plant and get some rough estimates of things and maybe not need modeling

Aaron hopes that we don't have to make a substation ideally

Not sure if we could get into the substation

Need a dedicated substation so that we don't have to go across counties

Maybe have the address but not 100% certain for county stuff

What kind of information we need from transmission line owner:

Capacity

Voltage confirmation

Give them more info about project and see if they have any advice. Are there specific substation companies they like

Substations are owned by either transmission lines or utilities

Is there room from capacity stand point for the transmission lines?:

Is there subcontractor?

Is there any advice with regards from transmission owner standpoint

Need to connect to it so it helpful

New Siting Team meetings

Lease vs. Easment and how to go about with writing everything

Difference between both and what would be best for current landowners

Thinks the contact at orsted is on the student alumni board

Need to fill out demographic polls and get engaged with linkedin jobs

She is fantastic to reach out to for contact information

Orsted bought out the company of the other wind plant that is near the final destination

Same list for warda

Remind willy that we want to take a field trip out to the local power plants

Incentives it maybe good/bad

NAU ppt for siting team has a lot of info

Productive Tax Credit program

Incentives may have a bigger deal

Design reports and other stuff within the general CWC20 deliverables

Production tax credit is probably the best

Take advantage of reading into the incentives

Endangered birds in the area

Endangered species act that needs to be looked out for

Do not need to worry about insurance yet

Make sure to share files with continuum

Hit a road block for everyone to discuss

Build your own tutorial that the official tutorials are missing

[2/17/2021]

Who is taking on the main role of SAM?

- Naveen
- Alex (lead?)

Who is using JEDI?

- Natalie Lead

Make a complete list/flow chart of what is needed to develop a wind farm

- Natalie
 - o Aaron is getting more information with regards to the studies and so forth

Are there 3 areas where we want to focus a majority of our time into?

- Incentives
 -
- Power output analysis
 -
- Environmental policies
 -

Weekly updates?

Naveen found tax credits, and financial stuff -> natalie

Aaron -> meeting with WAPA for good immigration

Natalie -> not a lot of siting at the beginning of this week, need a gnat chart

Alex -> trying to refine SAM model

Does anyone need help with current tasks?