



Solar and Wind Decommissioning Working Group

Report and Recommendations

August 2018

MPUC Docket No. E-999/M-17-123

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Abstract

Site permits for wind and solar facilities issued by the Minnesota Public Utilities Commission require permittees to file decommissioning plans prior to commercial operation. At this time none of the wind or solar facilities permitted by the Commission (or its predecessor, the Environmental Quality Board) has been decommissioned. As a growing number of older wind facilities enter the final portion of their power purchase agreements, it is important to ensure that adequate funding is available and accessible to ensure that facilities are properly decommissioned.

The Minnesota Department of Commerce solicited input from a diverse group of 12 stakeholders to recommend best practices for decommissioning of these facilities. Working group members reviewed background materials, draft reports, and met three times between April 2017 and January 2018 to discuss issues related to decommissioning of wind and solar generating facilities permitted by the Commission. Following the discussion, working group members recommended that decommissioning plans be:

- **Required:** Although the evolving nature of the industry makes it difficult to project what will happen in 20 to 30 years, a decommissioning plan helps to ensure planning for the end of the facility.
- **Detailed:** Decommissioning plans should state the goal for decommissioning and include details on anticipated tasks, costs, and financial assurances.
- **Adaptable:** In order to balance the need for standards and predictability with the reality of changing circumstances inherent in a 30-year permit, plans should be reviewed periodically and updated as needed.

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Background

Site permits issued by the Minnesota Public Utilities Commission (Commission) for wind and solar facilities require the permittees (facility owners) to file a decommissioning plan for each facility prior to commercial operation. These plans are required to ensure that sites are restored to their original condition at the end of the facility's useful life and that the cost of the restoration is borne by the facility's owner. Decommissioning plans describe:

- How the physical components will be removed.
- The estimated cost of decommissioning.
- How funds will be available at the end of the facility's life to accomplish decommissioning tasks.

As a growing number of older wind facilities enter into the final portion of their power purchase agreements, it is important to ensure that adequate funding is available and accessible to ensure that facilities are properly decommissioned.

The Minnesota Department of Commerce (Department), with the support of the Commission, solicited input from a diverse group of stakeholders to provide recommendations to the Commission on best practices for decommissioning of these facilities. The Department invited a small but broad stakeholder group representing facility developers and owners, local governments and utilities to participate in the Working Group. The following group members met three times between April 2017 and January 2018:

- Sarah Emery – Avangrid Renewables
- Jay Regnier- PRC Wind
- Dan Litchfield – Invenergy
- Patrick Smith – Geronimo
- Chris Kunkle, (succeeded by Peder Mewis) – Wind on the Wires
- Kyle Krier – Pipestone County
- Kurt Schneider – Chisago County
- David Green – Pope County
- Paul Drotos – Goodhue County
- Annette Fiedler – Southwest Regional Development Commission
- Brad Morrison – Xcel Energy
- Tom Donofrio – Minnesota Power

The Department, in consultation with Commission staff, identified five questions to guide the working group in its development of recommendations on the planning, funding, and execution of decommissioning activities.

- What are the essential elements of a decommissioning plan?
- Are there special considerations for different types of facilities (e.g. wind or solar) that should be addressed in a decommissioning plan?
- How frequently should decommissioning costs be reevaluated?

- What form should decommissioning security take to ensure that funds are available to accomplish decommissioning tasks?
- What is the appropriate timeframe (e.g. at permit issuance, prior to commercial operation, at the end of the power purchase agreement) for establishing financial security?

Decommissioning

Although not defined in Minnesota statute or rule, in this document the term decommissioning means “the planned and orderly removal of the physical components of a large electric wind or solar generating facility and restoration of the site.”

The useful life of a generation facility is influenced by a combination of factors – wear and tear on the physical plant, advances in technology, evolving policy, market conditions, and surrounding land use.

In cases where there is no longer need for the power, where repowering would be uneconomic, where the land is no longer available, or where policy or surrounding land use changes render the facility incompatible with current standards, the facility is likely to be decommissioned.

Major decommissioning activities include disconnecting the facility from the grid, removing all of the aboveground physical components of the facility, access road reclamation, removing belowground components to a certain depth, and restoring the site to allow for other uses.

In cases where the generation equipment is either unreliable or obsolete, but the land remains available (is owned by the facility’s owner or affiliate, or leases can be re-negotiated) and there is still a need for the power, it may make sense to repower the facility. Repowering may be accomplished with either replacement parts (often sold as repowering packages) or entirely new equipment. It is likely that repowering of a facility will require permit amendments or new permits or permissions; it is the responsibility of the facility’s owner to obtain any necessary permits or permissions.

Decommissioning Plans

Once a facility is permitted, owners are focused on getting the facility constructed and operational so that it can begin generating revenue. Understandably, the focus is on near- and mid-term goals, rather than on decommissioning the facility decades in the future. Leases with individual landowners typically include language on how the generation facilities will be removed. In the interest of ensuring sites are restored to their original condition at the end of the facility’s useful life and that the cost of the restoration is borne by the facility’s owner, the

Commission requires facility owners to develop a decommissioning plan for the entire facility prior to operation and update the plan every five years thereafter.¹

These decommissioning plans detail:

- How the physical components will be removed,
- The estimated costs of decommissioning, and
- How funds will be available at the end of the facility's life to accomplish decommissioning tasks.

Decommissioning Costs

Although decommissioning a facility is less expensive than its construction, it does require a considerable expenditure. Personnel and construction equipment must be engaged and mobilized to the site, and generation equipment must be broken down and transported from the site for resale, scrap, or disposal. Some of this cost can be offset through revenue from the scrap value of the facility components (e.g. steel towers and frames, copper wiring, concrete footings).²

Facility owners usually include decommissioning costs in a facility's financial model, and indications are that many owners do set aside funds to cover these costs. Recent decommissioning plans for Commission-permitted facilities estimate the net cost of decommissioning (total cost, less the salvage value) at approximately \$25,650 to \$145,000 per megawatt (MW) for wind facilities and \$21,700 to \$56,300 per MW for solar facilities. It is important to note that at this time the estimates are based on limited data, as experience with the actual decommissioning of large wind or solar facilities in Minnesota or elsewhere is quite limited. No large wind energy conversion or solar facilities have been decommissioned in Minnesota at the time of the report.³

¹ Recent permits issued by the Commission require updates of the plan every five years. Earlier permits do not specify the update schedule in the permit, but the plans themselves include a schedule for updates.

² Scrap metal prices are very volatile; making it is very difficult to accurately predict the scrap value of the facility decades in the future.

³ Lake Benton Power Partners II, LLC proposes to decommission the existing 137 turbines at the Lake Benton II Wind Farm in Pipestone County, and replace them with 44 larger turbines as part of its petition for the 100.2 MW Lake Benton II Repowering Project (Docket No. 18-179). The site permit application filed with the Commission on May 3, 2018 did not contain detailed information on the proposed decommissioning activities and costs, but committed to a separate filing on decommissioning activities in 2019.

Table 1 Sample Minnesota Wind and Solar Decommissioning Cost Estimates

Facility Name	Facility Size (MW)	Gross Cost per turbine	Net Cost per turbine (less scrap value)	Gross Cost per MW	Net Cost per MW
Wind Facilities					
Black Oak/Getty ⁴	78	\$144,100	109,100	72,050	54,550
Red Pine ⁵	200	142,500	75,600	71,250	35,625
Odell ⁶	200	129,300	51,300	64,650	25,650
Pleasant Valley ⁷	200	N/A	290,000	N/A	145,000
Solar Facilities					
Aurora Distributed Solar ⁸	100	N/A	N/A	\$185,316	43,900
North Star Solar ⁹	100	N/A	N/A	41,506	21,707
Marshall Solar ¹⁰	62.25	N/A	N/A	158,215	56,343

Financial Assurance

Over the course of a facility’s life cycle, issues arise that may affect availability of funds at the time of decommissioning. Cash flow and access to capital varies over the lifetime of a facility due to various factors including changes to projected facility costs, credit rating changes, and general market conditions. Additionally, it is common for the ownership of a facility to change hands; new owners may not be fully aware of their obligations or may not have the same access to capital. Prudent planning requires measures to ensure that landowners, ratepayers,

⁴ Black Oak Wind, LLC. Decommissioning Plan. October 3, 2016. eDocket ID: [201610-125365-02](#)

⁵ EDF Renewables. 142,500/75,600 (Red Pine, eDocket ID: [201712-137847-01](#)

⁶ Odell Wind Farm, LLC, Decommissioning Plan. February 1, 2016. eDocket ID: [20162-117887-01](#)

⁷ Xcel Energy, *Compliance Filing – Decommissioning/Restoration/Abandonment*. October 16, 2015. eDocket ID; [201510-114900-01](#).

⁸ Aurora Distributed Solar, *Decommissioning and Restoration Plan*. October 7, 2016. eDocket ID: [201610--25500-02](#)

⁹ North Star Solar PV, LLC, November 14, 2016. *Decommissioning Plan*. eDocket ID: [201611-126455-04](#)

¹⁰ Marshall Solar, LLC. *Decommissioning and Restoration Plan*. November 23, 2016. eDocket ID: [201611-126793-01](#)

and local taxpayers are protected from financial risk and that the burden of decommissioning is borne by the facility owner.

For regulated utilities, estimated decommissioning costs (anticipated cost of removing an asset at the end of its useful life less the anticipated salvage value), are included in the depreciation expense for each facility. The depreciated plant balance is included in the utility's rate base. Funds collected for removal and restoration are included in the depreciation reserve for the facility.¹¹ The Commission reviews these costs periodically to ensure that ratepayers are responsible only for reasonable and prudent costs.

Although some wind and solar facilities are owned by Minnesota-regulated utilities, independent power producers own most of the facilities in Minnesota. Currently, most large independently-owned wind and solar facilities operating in Minnesota sell their power through multi-year power purchase agreements. Power purchase agreements lay out the conditions of the transactions, including the assignment of liabilities, such as the non-deliverability of energy. Decommissioning typically remains the responsibility of the power producer, not the purchaser. For regulated utilities, the Commission reviews most, but not all, wind and solar power purchase agreements and generation acquisitions to ensure that ratepayers are protected from unreasonable or unknown future costs.

At present, only a few producers sell into the spot energy market, although that may become more common as existing power purchase agreements expire. The Generator Interconnection Agreement (GIA), which allows the facility to sell its energy onto the grid, does not address decommissioning.

In recognition of the general disincentive to set funds aside to cover future obligations, regulatory and permitting agencies often require facility owners to demonstrate the financial capability to respond to accidents and to restore the resource or site at the end of operation. Financial assurances for decommissioning are typically required for facilities in which the financial gains by the owner/operator are realized early in the facility life cycle and diminish over time, and/or require rising/long-term costs late in the facility life to restore or maintain the original facility area. Examples of such facilities include nuclear power plants, mining and mineral extraction facilities, solid and hazardous waste disposal facilities, and offshore leases for oil and mineral exploration. In a survey of Minnesota county planning and zoning officials, nearly 60 percent of respondents reported that their county required financial surety for projects such as mining, asphalt plants or certain types of lakeshore development.¹²

¹¹ Minnesota Rule 7825.0500

¹² Survey of Minnesota Planning and Zoning Administrators (see Appendix B)

Different options entail different costs and obligations for both the facility owner and to the beneficiary. As discussed above, decommissioning costs for facilities owned by regulated utilities are accounted for in the facility's depreciation reserve. The following are the most frequently used types of financial assurance for facilities that are not owned by regulated utilities:

- **Escrow/ Sinking Fund:** An escrow account or a sinking fund is a dedicated account where the facility owner sets aside discrete funds to pay for decommissioning. In order to ensure the funds are not used for other purposes, the funds are outside the administrative control of the facility owner or its affiliates. This type of surety can take different forms; it could require funding of the entire amount at the outset, or more typically, funds are deposited periodically according to a preset schedule. This option is likely to be the simplest to administer from the beneficiary's perspective, requiring periodic review of compliance filings to review updated cost information and ensure that the fund balances were progressing according to schedule. This is a high cost option for the facility's owner, and is unlikely to be used by developers with good credit and access to capital, but may be the only option for smaller developers with limited access to credit. Despite its cost, this is often included as an option in jurisdictions requiring financial assurance, such as Riley County, Kansas.¹³
- **Letter of Credit (LOC):** In this option, an issuing bank provides the owner/operator a letter of credit (LOC). The LOC outlines terms by which the issuing bank would payout a predetermined credit level to a designated beneficiary, if called upon by the designated beneficiary for a scenario outlined in the LOC terms. In this case, the LOC terms would include a scenario in which the facility owner is unable to fulfill its decommissioning obligation. A LOC is renewable annually, at a cost of one to three percent of the total value of the LOC payout. LOCs are generally included as an option in jurisdictions that require financial assurance. In some cases a LOC is a preferred options. Examples include:
 - The Minnesota Department of Natural Resources (DNR) Lands and Minerals division frequently requires a LOC to ensure funding for reclamation of mining sites it permits.¹⁴

¹³ Joshua Conaway, *Be Aggressive with Wind Energy: Blow Away the Decommissioning Fears*, 2 Oil & Gas, Natural Resources and Energy Journal 621, (March 2017)

¹⁴ Jennifer Engstrom, personal conversation, January 18, 2018.

- The Bureau of Land Management (BLM) accepts Letters of Credit as a surety instrument for wind developments on federal land.¹⁵
- The Vermont Public Utility Commission requires an irrevocable LOC identifying the Board as the sole beneficiary of the LOC, for non-utility owned electric generation and transmission assets.¹⁶
- **Bonds (Surety):** An insurance or bond company issues a bond that commits the issuer to cover the cost of decommissioning should the facility owner default on its decommissioning obligations. The owner pays an annual premium to the bond company. The cost of bonds is similar to letters of credit. Bonds are often identified as an option for financial assurance in both local and state (DNR, Oklahoma and North Dakota utilities commissions) decommissioning requirements.
- **Parent/corporate guaranty:** In this option, the parent company demonstrates its financial wherewithal to fund any future decommissioning costs. This option is only available to developers affiliated to parent companies with large and stable net worth. This type of financial assurance would require the beneficiary independently verify the financial wherewithal of the parent organization to pay for claims in the future.
- **Pooled fund:** As its name implies, a pooled fund aggregates contributions from owners of a category of facility (e.g. nuclear power plants, hazardous waste facilities). Contributors may draw from the fund to decommission their own facilities. These types of funds are generally statutorily mandated and used to provide assurances for proper decommissioning of nuclear plants, oil wells, and hazardous waste facilities. Because of the complexity of establishing and administering these types of funds, pooled funds are used in certain highly-regulated activities, such as the nuclear decommissioning trust fund. The Vermont Public Utilities Commission considered, but did not pursue, establishing a pooled decommissioning fund for non-utility-owned electric generation and transmission facilities in their rulemaking on decommissioning due to the complexities of establishing and administering such a fund.¹⁷

¹⁵ Danielle Changala, Michael Dworkin, Jay Apt, Paulina Jarmillo, *Comparative Analysis of Conventional Oil and Gas and Wind Project Decommissioning Regulation on Federal, State, and County Lands*, *The Electricity Journal* 25:1, January/February 2012.

¹⁶ CVR-30-5904, http://puc.vermont.gov/sites/psbnew/files/doc_library/proposed-decom-rule-for-sos.pdf

¹⁷ Vermont Department of Public Service, *Final Comments to the Vermont Department of Public Service regarding the Vermont Public Service Board's December 23, 2016 Proposed Decommissioning Rule 5.900*. http://puc.vermont.gov/sites/psbnew/files/doc_library/5.900%20-%202017.03.31%20PSD%20Final%20Comments.pdf . March 31, 2017.

As the permit requirements vary by jurisdiction, so do the decommissioning requirements, including financial assurance.

In a survey of Minnesota county planning and zoning officials, half of the respondents indicated their ordinances allowed the county to require a surety for wind or solar generating facilities permitted by the county. In the same survey, 30 percent of the total respondents said their county required a surety for decommissioning for county-permitted wind and solar facilities. Of those counties authorizing or requiring surety, most allow for a range of surety options, while some prescribe a particular type of surety (bond, letter of credit, or escrow). Of those counties requiring financial security, reported surety requirements vary greatly; some have flat fees of \$50,000; others a fee of \$25,000 to \$40,000 per MW. Some counties require surety amounts to increase as the facility ages, while others set a flat fee.¹⁸

The Oklahoma Wind Energy Development Act requires evidence of financial security to cover 125 percent of the estimated net total cost of decommissioning (total less the salvage value of equipment in the 5th year of operation).¹⁹ The statute allows the financial security to come in a variety of forms – surety bond, collateral bond, parent guaranty, cash, cashier’s check, certificate of deposit, bank joint custody receipt, or other approved negotiable instrument allowed by the Oklahoma Corporation Commission. Owners are subject to administrative penalties if proof of the security is not provided.²⁰

Under North Dakota administrative rules governing the decommissioning of wind facilities (North Dakota Administrative Code 69-09-09), the North Dakota Public Service Commission approves decommissioning plans at the time of operation. Plans must be updated 10 years following the initial plan, then every five years thereafter. Facility owners provide financial assurance to cover the anticipated decommissioning costs. Subject to Commission approval, the assurance may take a variety of forms, including, but not limited to - performance bond, surety bond, irrevocable letter of credit, self-guarantee, or parent guarantee. The Commission, at its discretion, may also accept an incremental bond schedule.

Although, not directly applicable to wind or solar generating facilities, the DNR requires that mine owners provide financial assurance to ensure that funds are available to restore the sites if the company were to fail to meet its permit obligations for any reason. Under Minnesota Rules 6132.1200, subpart 5, the financial assurance must meet the following criteria:

- Funds must be sufficient to cover estimated costs of restoration.

¹⁸ Survey of Minnesota Planning and Zoning Administrator(See Appendix B)

¹⁹ For facilities in operation before the end of 2016, proof of security must be supplied by year 15 following the beginning of commercial operation.

²⁰ 17 OK Stat § 17-160.15 (2017),

- Funds must be available and payable to the agency when needed.
- Funds must be fully valid, binding, and enforceable under state and federal law.
- Funds must not be dischargeable through bankruptcy.
- Terms and conditions of the assurance must be evaluated by professionals with experience in financial analysis, and are subject to approval by the DNR.

Group Recommendations

After a general discussion of the nature of wind and solar facilities, decommissioning, and the guiding questions, the group recommended that decommissioning plans be:

- **Required:** Although the evolving nature of the industry makes it difficult to project what will happen in 20 to 30 years, a decommissioning plan helps to ensure planning for the end of the facility.
- **Detailed:** Decommissioning Plans should state the goal for decommissioning and include details on anticipated tasks, costs, and financial assurances.
- **Adaptable:** In order to balance the need for standards and predictability with the reality of changing circumstances inherent in a 30-year permit, plans should be reviewed periodically and updated as needed.

Required

The relationship between decommissioning and repowering came up frequently in the group's discussions. Although the evolving nature of the industry makes it difficult to project what will happen in 20 to 30 years, it cannot be presumed that repowering will occur. Detailed plans will prove useful in cases where facilities are repowered, as certain decommissioning tasks may still be required.

An adaptive decommissioning plan helps to ensure facility owners are planning for the end of the facility and will ensure that funds are available in the event of an unforeseen circumstance. Group members recommended that decommissioning plans be required for all permitted facilities.

Detailed

Decommissioning Plans should include a detailed task list prepared by a knowledgeable authority. Although developing detailed plans would require up-front effort, detailed plans would actually allow for easier revisions over the lifetime of the facility and will be required to bid the work out prior to decommissioning. Additionally, detailed plans will allow differences between the types and locations of projects to be addressed, regardless of the generation technology (wind or solar). Decommissioning Plans should contain:

- A description of how the facility will be disconnected from the grid.
- A detailed description of how the physical components will be removed, transported off-site, and disposed of. The description should include the stepwise process of removal (e.g. how will the blades be removed, what components need to be broken down on site, what can be salvaged and what will be landfilled).
- If any of the land is leased, a description of decommissioning, abandonment, and removal conditions included in landowner leases (e.g. how is it decided whether roads remain).
- A statement of the restoration goal and a detailed description of how restoration will be accomplished.
- A detailed estimate of decommissioning costs (including turbine or solar array dismantling costs, foundation removal costs, access road removal costs, transportation costs, disposal fees, estimated scrap value). This estimate should also include a description of cost assumptions (e.g. major equipment needs, what type of disposal sites are required for component disposal, depth of removal).
- A plan for decommissioning security – including the type of instruments being considered, a timeline for funding of the assurance (e.g. 25 percent of estimated cost in year 10, 25 percent in year 15), a description of how the amount of money available will be reconciled with the changing cost estimates, and the proposed beneficiary of the security.

Group members discussed the differences in decommissioning for wind and solar facilities and did not recommend that decommissioning guidance differ between technologies, believing that any differences would come through in the detailed plans, rather than through prescriptive measures.

Following a discussion of the relative merits of the different financial assurance instruments, group members recommended that a broad range of alternatives be available to owners. Recognizing that each owner is unique in its access to capital, group members declined to recommend a particular form of financial assurance.

Group members discussed at what point financial assurances should be required. Following discussion, group members agreed that a surety is probably not necessary at the outset. Even if the facility's owner were to become insolvent within the early (first 10 years), the value of the facility would likely make it an attractive asset for another owner. Group members recommended that assurances be implemented in a step-wise way, beginning with initial payments in approximately year 10 and stepping up to ensure full funding no later than the end of the power purchase agreement.

Adaptable

Group members recommended that standards for decommissioning plans should not be overly prescriptive and should allow for adaptation as technologies, best practices, and regulations evolve. In order to balance the need for standards and predictability with the reality of changing circumstances inherent in a 30-year permit, plans should be reviewed periodically and updated as needed. Group members did not recommend changing the review schedule from the five year intervals required under recently issued site permits by the Commission. Group members also noted that changes in facility ownership would also be an appropriate time to ensure that new owners were aware of their decommissioning obligations.

Group members discussed whether it may be more appropriate to allow plans to cite a goal of restoration to a more neutral land use following decommissioning (versus restoration to original land conditions that existed prior to any development), but ultimately thought this type of change would be more appropriate as the facility matures and moves closer to decommissioning.²¹

Recognizing that each owner is unique in its access to capital, group members declined to recommend a particular form of financial assurance and recommended that guidelines identify a range of options. Group members also recommended that county or state governments, rather than individual landowners, be designated as beneficiaries of any financial surety.

²¹ Such a change would require a change to the terms of the permits issued by the Commission, and would also require amendments to the existing permits.

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Appendix A

Meeting Notes

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Wind and Solar Decommissioning Working Group

Meeting Summary

April 12, 2017

Attendees

Sarah Emery (AvanGrid);	Kurt Schneider (Chisago County);
Jay Regnier (PRC Wind);	David Green (Pope County);
Dan Litchfield (Invenergy);	Nettie Fiedler (SWRDC);
Patrick Smith (Geronimo);	Paul Drotos (Goodhue County);
Chris Kunkle (Wind on the Wires);	Brad Morrison (Xcel Energy);
Kyle Krier (Pipestone County);	Tom Donofrio (Minnesota Power);
Tricia DeBleeckere (Public Utilities Commission)	Adam Sokolski (Avangrid);
Suzanne Steinhauer (Commerce)	John Wachtler (Commerce)
John Tuma (Public Utilities Commission)	Louise Miltich (Commerce)

Meeting Discussion

Group Goals and Structure:

Commissioner John Tuma welcomed the group. Suzanne Steinhauer summarized the group's charge, timeline and rules of play.

Following the introductions, participants identified issues and concerns related to decommissioning and repowering

Decommissioning and Repowering

The relationship between decommissioning and repowering came up several times during the discussion.

Participants discussed the rapid technology changes that affect projects. Since the advent of wind permitting in Minnesota, wind turbines have gotten larger and technological changes allow projects to be economic even in areas with less desirable wind resources. Given the rapid advances in solar that have recently made utility-scale solar a reality in Minnesota, participants expected continued advances in solar also. There is room for increased efficiencies in solar panels and inverters.

From the developer's perspective, the value of older wind sites in terms of the wind resources and transmission access means they are likely to be repowered rather than decommissioned and abandoned. Other participants pointed out that may be true for many, but not all projects, particularly for smaller projects

Participants discussed whether site changes would be required to accommodate repowering. Although a site may still have excellent wind resources and transmission access, turbine locations may need to change to accommodate larger turbines. Participants discussed partial repowering scenarios where existing towers and foundations would remain, but blades, and possibly nacelles, would be replaced. Some participants expressed concern about structural fatigue on the existing towers and the loss of efficiency that may result from effectively reducing the internal spacing. It is also unclear whether the existing transmission infrastructure would support repowering of all projects.

Participants discussed whether wind and solar projects should be considered a permanent land use change at the time of the permit request. Participants discussed differences in scale of solar projects, positing that small community solar should be considered a temporary land use, as their relatively small scale would make them more susceptible to local development pressures at the end of the project's lifespan. Large solar projects, on the other hand, are likely to remain in place for the foreseeable future due to the scale of development and investment as well as transmission access.

Decommissioning Plans and standards in Minnesota and elsewhere

There is limited decommissioning experience with Minnesota projects currently available. Some of the older projects, like the Buffalo Ridge project in Lincoln County, are, or soon will be, in the process of decommissioning.

North Dakota has addressed decommissioning in new rules.

Local governments handle the financial security aspect differently. Pope County negotiates with each project for a bond or secured bank deposit and held by the county. The amount of the bond is evaluated periodically. Smaller developers may have more difficulty in getting bonds.

There was general agreement that decommissioning plans need to be reviewed periodically as the industry evolves, components age, and a project's revenue stream changes; no particular schedule was recommended.

Participants generally agreed that there is a need for a common framework that everyone can work with. The framework should have flexibility to address projects of various ages and scales. Based on past experience, local governments are likely to base their decommissioning requirements on whatever the state adopts.

Any standards adopted by the Commission are likely to be implemented somewhat differently for older projects than for new projects. It is assumed that consistency with the adopted best practices will be expected for newer projects, while the standards may need to be adapted to meet the particular characteristics of older projects.

Land should be restored and returned to production. Some local governments expressed concern over the use of prime farmland for solar facilities, particularly given the long lifespan of the facility amount that appears to represent a conversion, rather than a temporary use.

Several participants expressed the opinion that decommissioning plans and costs should be factored into projects early in the design phase. It was unclear to what extent decommissioning costs have been factored into the economics of existing projects.

Difference between Wind and Solar

Participants discussed the differences between the decommissioning of solar and wind facilities. There was general agreement that the tasks required for the decommissioning of wind were more involved than for solar due to the size of the turbines and the breadth and depth of the foundations. While solar decommissioning requires smaller equipment and less excavation, decommissioning activities would occur over a larger area.

Participants posited that the scrap value of wind components may be higher than for solar. The secondary market for solar panels is unknown at this time. There is some resale of wind turbines in MN, although the market at this time appears to be limited to smaller turbines, many from California. There is a company in SD that focuses on refurbishment

and resale of turbines. Blades degrade and can't really be refurbished or reused, rate of degradation depends somewhat upon maintenance.

Staff brought up the case of arrangements where an affiliate of the developer or project owner is the landowner, has been the model in recent solar projects. Turbines for wind projects are typically located on leased lands.

Level of Regulation

Participants exchanged views on the appropriate role of regulation and the level of specificity that should be required in decommissioning plans. There was general agreement that onerous regulation should be avoided, but no real agreement about what exactly was onerous. In general, representatives from the development community were wary of increased regulation and full funding of decommissioning costs early in a project's lifespan. Developers generally favored a delay in funding decommissioning. Developers hypothesized that "excess" regulation may push wind and solar development into other states with less stringent regulations.

Decommissioning Costs and cost-sharing

The distribution and burden of decommissioning costs was a major topic of conversation.

Participants agreed that decommissioning costs can be substantial. Wind and solar projects are heavily capitalized. Developers expressed concern that decommissioning costs have the potential to compromise a Project's financial viability, and that smaller projects would be more susceptible to financing difficulties. It is unclear how decommissioning obligations may affect a developer's credit-worthiness.

Due to the lack of experience, participants were uncertain about the level of costs. Participants generally agreed that having more certainty about the level of cost, and building that cost into a projects financial model early in the process would be best practice.

There were questions about how decommissioning costs are handled for utility facilities and why there are no decommissioning requirements for other types of structures (e.g. office or retail buildings).

It is not unusual for projects to change hands one or more times over the life of a project. Some participants questions what incentives project developers and owners have for not walking away as projects age or become more costly.

Utilities expressed concern about cost certainty for ratepayers, and ratepayer protection from decommissioning costs.

Local government representatives expressed the need to ensure that landowners and local governments do not end up bearing decommissioning costs. There was discussion about what type of landowner protection was typically included in leases.

Leases provide some legal recourse to landowners. In situations where the project owner/permittee is also the landowner of the underlying land it is less clear what the recourse would be. What happens if the owner goes bankrupt? Developers argued that a bankrupt project would most likely be purchased by another entity that would assume operation of the project.

Participants had questions about how project insurance addresses decommissioning. Does it change over time? Participants also had questions about whether equipment warranties would be a factor in decommissioning.

The scrap value of decommissioned components included in the cost estimates in decommissioning plans filed with the Commission include vary widely between projects. Because scrap value will vary over time, it will be important to periodically revisit cost estimates over time.

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Wind and Solar Decommissioning Working Group

Meeting Summary

July 19, 2017

Attendees

Jay Regnier (PRC Wind)

Nettie Fiedler (SWRDC)

Dan Litchfield (Invenergy)

Paul Drotos (Goodhue County)

Patrick Smith (Geronimo)

Brad Morrison (Xcel Energy)

Chris Kunkle (Wind on the Wires)

Tom Donofrio (Minnesota Power)

Kyle Krier (Pipestone County)

Tricia DeBleeckere (Public Utilities Commission)

Kurt Schneider (Chisago County)

Suzanne Steinhauer (Commerce)

David Green (Pope County)

Meeting Discussion

Meeting Overview:

Participants reviewed the draft notes from the April meeting and made no changes. The remainder of the meeting centered around discussion of the essential elements for decommissioning plans, differences between solar and wind decommissioning, and information gaps required to address financial assurances.

Essential Elements of Decommissioning Plan

Permittees develop decommissioning plans based on the guidelines set out in Minn. Rule 7854, application filing requirements, and the permit issued. The level of detail in decommissioning plans has varied from plan to plan, with more recent plans generally providing a greater level of detail.

Participants generally agreed that a detailed cost estimate, prepared by a contractor or other reputable third party with construction and/or decommissioning experience, should be the standard. Participants reasoned that if things are itemized at the outset, it will be easier to adjust the costs for each item as the Project ages. In addition, this approach is better able to accommodate changes in technology, best practices, and agency rules. Finally, an itemized list makes it easier to send out for bid. Participants discussed the level of itemization, noting that it is important that the itemization not be too burdensome.

Participants discussed the interplay between repowering and decommissioning. It has generally been expected that permittees would make a decision about whether to fully decommission or repower a facility as the project neared the end of its site permit (roughly coincident with the anticipated mechanical lifespan). Recently, permittees are weighing repowering wind projects earlier in the project's life (perhaps year 10) in order to qualify for Production Tax Credits. Repowering may require only a swap out of parts, and thus avoid decommissioning activities, or may require either partial or full decommissioning of the project prior to installation of the new equipment.

Participants noted that agency rules and guidelines, technology, and best practices, are likely to change over the course of the decommissioning plans, pointing to a need to review the plans periodically.

Difference between Wind and Solar

Participants discussed whether the differences between wind and solar facilities require different decommissioning requirements. Participants agreed that regardless of the type of facility, detailed plans would allow for the type of granularity required to adequately address decommissioning tasks.

Level of Restoration Required

Currently, rules require that the site be restored to the use that existed before it was developed for an energy facility. Staff asked participants views on whether that standard was appropriate, or whether a more "neutral" restoration standard should be adopted. Staff noted that any change would require a revision to Minnesota Rules. Participants discussed the relative merits of the different restoration standards.

Restoration to pre-existing use creates certainty for the developer and community; on the other hand, evolving land use around the Project may make restoration to pre-existing standard out of place with surrounding land uses or zoning.

Restoration to “neutral” use can be adaptive to changing land use; on the other hand, it creates uncertainty for developers, neighbors, and local governments.

Participants also noted that any restoration of solar sites is likely to either destroy or heavily impact any native or pollinator habitat established at the site.

Participants recommended that periodic review by the Commission would allow for an evaluation of the appropriate use of the site as it neared the end of its useful life.

Periodic Review

Participants discussed what type of review schedule would be appropriate. Current decommissioning plans call for a review in year 15 for wind and year 10 for solar.

Participants discussed various timelines in relation to the financial structure/partnership of the projects. Although there was no clear agreement on a particular timeframe, some participants felt that a 10-year review schedule was appropriate, as that is generally the point where the tax equity partner steps out.

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Wind and Solar Decommissioning Working Group

Meeting Summary

January 10, 2018

Attendees

Jay Regnier (PRC Wind)

Tricia DeBleeckere (PUC)

Dan Litchfield (Invenergy)

Suzanne Steinhauer (Commerce)

Peder Mewis (Wind on the Wires)

Brian Meloy (Stinson, Leonard, Street)

Kyle Krier (Pipestone County)

Bret Eknes (PUC)

David Green (Pope County)

John Wachtler (Commerce)

Netty Fiedler (SWRDC)

Jamie Macalister (Commerce)

Tom Donofrio (Minnesota Power)

Kimberly Dickey (Next Era)

Meeting Discussion

Meeting Overview:

Participants reviewed the draft notes from the July meeting and made no changes. Following a presentation of information on the different types of financial assurances, participants discussed the relative merits of different financial assurance options and the timing for the options.

Financial Assurances

Brian Meloy (Stinson, Leonard, Street) presented information on financial assurance instruments and their relative merits. Financial assurances are not intended to pay directly for decommissioning, but rather to provide insurance that, another party (the countersigner) will be able to draw on the financial instrument to ensure that the project is decommissioned properly if a permittee is unable to fulfill their decommissioning obligations.

Key factors in determining the appropriate type of financial assurance include:

- Amount of the security
- Cost of the security
- Duration of the obligation

Security fund options discussed included:

- **Cash (escrow):** the project owner puts aside cash in a dedicated account managed by an independent entity. High cost for the permittee, but certainty that funds will be available. These accounts could require the entire amount be funded at the outset, or allow for periodic payments. Because of the high cost, this option is unlikely to be used by developers with good credit and access to capital, but may be the only option for smaller developers with limited access to credit.
- **Letter of Credit (LOC):** Renewable annually, cost 1-3% of LOC. The issuing bank pays on demand, no inquiry as to whether there is default. The developer bears the risk if a wrongful claim made. While cash and LOC provide funds, they don't ensure the quality of the work.
- **Bonds (Surety):** An insurance or bond company issues a bond that provides assurances that decommissioning will be performed to standard. A demand bond tends to be an expensive option.
- **Parent/corporate guaranty:** Parent company demonstrates the financial wherewithal to deal with any problems. The beneficiary must consider a variety of factors (e.g. asset to liability ratio, net worth) when accepting.
- **Pooled fund:** Under this option, a variety of different owners of the same type of project (e.g. nuclear power plants) contribute to a managed fund to cover decommissioning costs. The fund requires active and knowledgeable administration to address the payments, investment options, maintenance, and protocols for withdrawal from the fund. Although this option generates interest, it is currently only used in heavily regulated areas like nuclear power plants due to the high administrative costs and burdens.

Securities are most likely to be provided by banks or and insurance surety companies, although credit-worthy third parties may also offer certain types of securities such as corporate guarantees.

Mr. Meloy presented information on decommissioning requirements for wind projects in Oklahoma and North Dakota.

Following a discussion of the relative merits of the different instruments, participants recommended that a broad range of alternative be available to permittees. Recognizing that

each permittee is unique in its access to capital, participants declined to recommend a particular form of financial assurance.

Timing of Assurances

Participants discussed at what point financial assurances should be required. Following discussion, participants agreed that a surety is probably not necessary at the outset of the Project. Even if the entity were to become insolvent within the early (first 10 years) of the Project, the value of the Project would likely make it an attractive asset for some other owner.

Participants recommended that assurances be implemented in a step-wise way, beginning with initial payments in approximately year 10 and stepping up to ensure full funding no later than the end of the power purchase agreement.

Beneficiary of the Assurances

After a brief discussion, participants recommend that county governments or the Commission be designated as beneficiary of the financial assurance. Because projects, particularly wind projects, often involve multiple landowners, participants believed that the designation of governmental units rather than landowners would be simpler to administer and monitor.

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Appendix B

Survey of Minnesota Planning and Zoning Administrators

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From: [Kyle Krier](#)
To: [Steinhauer, Suzanne \(COMM\)](#)
Subject: FW: New Survey on Wind/Solar Projects Decommissioning
Date: Wednesday, August 23, 2017 1:18:51 PM

Suzanne, here is summary results of survey.

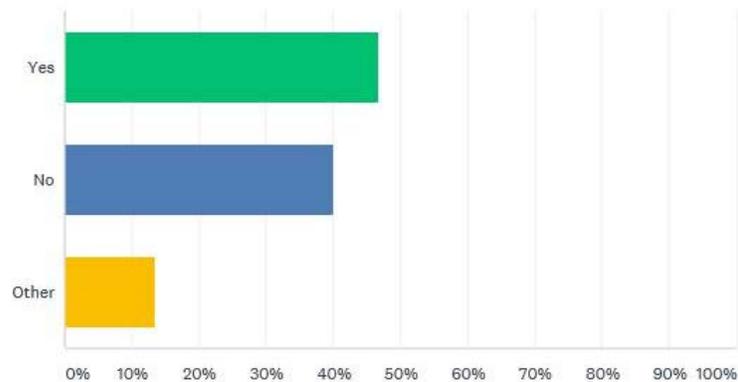
In Summary of the 30 responses 50% allow for Surety of wind and/or solar, of which 30% have required it. Surety amounts range from 10,000 to 25,000 per megawatt. 60% require surety for other types of permits (mostly to ensure roads are maintained). There were a few other questions asked but not able to summarize data due to answers being specific to County. If you think data would be needed I could try and put it together. Kyle

Here are the results of the latest survey on Wind/Solar Project Decommissioning:

There were 30 responses

Does your Ordinance allow for surety as a mechanism to ensure proper decommissioning?

Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	46.67% 14
No	40.00% 12
Other	13.33% 4
TOTAL	30

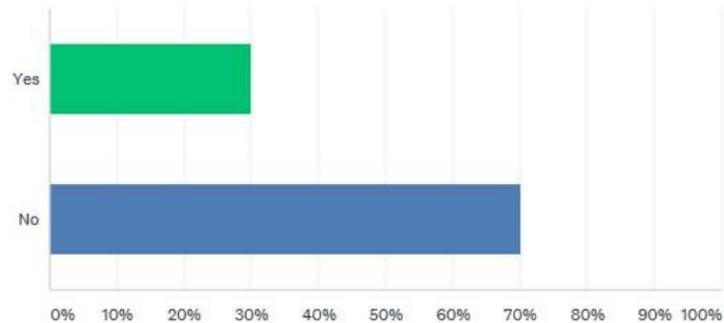
[Comments \(10\)](#)

Response Comments:

1. bond, letter of credit, other financial surety acceptable to the county
 2. ordinance says the Board "may require a bond in an amount adequate to reclaim the land..."
 3. yes for the solar farms. No for the wind farm, as we were not permitted authority
 4. Does not address.
 5. A decommissioning plan shall be required to ensure that facilities are properly removed after their useful life. Decommissioning of solar panels must occur in the event they are not in use for 12 consecutive months. The plan shall include provisions for removal of all structures and foundations, restoration of soil and vegetation and a plan ensuring financial resources will be available to fully decommission the site. Disposal of structures and/or foundations shall meet the provisions of the Murray County Solid Waste Ordinance; or successor ordinance. The Board may require the posting of a bond, letter of credit or the establishment of an escrow account to ensure proper decommissioning.
 6. The ordinance does not specify the use of surety as a guarantee of performance
 7. Bond, Letter of Credit, etc
 8. WECS - a minimum of \$50,000 Solar - May be required by the Board
 9. Yes for cell towers - No for Wind Energy Conversion Systems
 10. 10. "The Board may require the posting of a bond, letter of credit, or the establishment of an 971 escrow account to ensure proper decommissioning."
-

Has your county actually required surety for the decommission of any wind or solar projects?

Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	30.00% 9
No	70.00% 21
TOTAL	30

If you answered "yes" in the previous question, please describe when the surety was required, what type of surety was acceptable, and what was used to determine the amount of the surety:

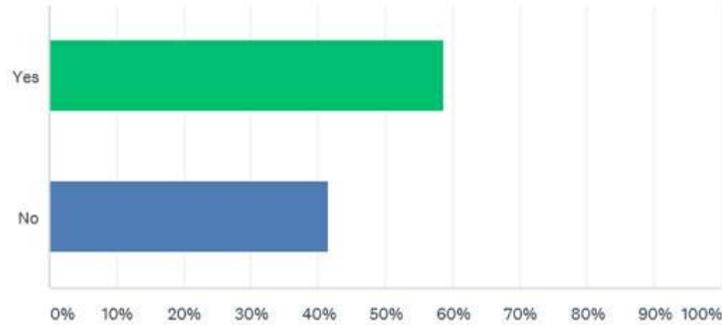
Answered: 11 Skipped: 19

Response Comments:

- 1 year after non operation
- na
- We require the surety at the time of issuing the building/construction permit; surety formula has developed at \$25,000 per MW; surety is amortized/increased as the project ages such that maximum surety is required at year 20.
- it's been required for each of the solar farms. We have required a letter of credit meeting the county's LOC requirements. \$50,000 for a 5 MW project and \$20,000 for the 1 MW projects. Applicants are required to estimate the amount needed. We do not allow them to factor in recyclable value. Also require a separate LOC for the initial veg pollinator friendly establishment.
- Generally, a bond in favor of the landowner & county pursuant to Zoning Code & CUP condition. Application and landowner lease used to determine amount
- An escrow account held by the County in the amount of \$25,000 per MW (solar).
- Because the project required a Conditional Use Permit, surety was a condition. We used en engineers estimate of value of materials and cost to disassemble.
- Generally it has been a \$50,000 bond
- The timing of a suggested bond has been hotly debated in our County. Some board members felt later in the life period of the project covered a potential decommission, while some feel the whole amount should be from the start-up point of the project. Debate is still occurring.
- Escrow account established or bond prior to issuance of the Zoning Permit. Net cost of decommissioning was used and is adjusted through time.
- \$10,000.00 per megawatt. Whoever decommissions the facility would keep the receipts from recycling of all project materials.

Does your county require surety for any other permits?

Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES
Yes	58.62% 17
No	41.38% 12
TOTAL	29

If you answered "Yes" to the previous question, please describe what types of permits surety is required for, and if it is the same type of process for the wind/solar projects or if it's different:

Answered: 18 Skipped: 12

1. N/A
2. certain lakeshore CUPS
3. gravel pit/operations; demolition projects; temporary mobile homes. These projects require full surety up front, solar is allowed to amortize/increase surety as the project ages.
4. Gravel Pits - same language, the Board "may require a bond adequate to reclaim the land..."
5. Same process. Interim Uses such as gravel mining, asphalt plants, secondary mobile homes on farms, stormwater management.
6. mining
7. mine reclamation
8. Plats
9. WMO requires sureties for stormwater management approval. Direct deposit is required.
10. Gravel pits and temporary projects like asphalt plants. It has been a bond or other financial surety
11. We require a surety bond for mining operations that require an IUP or CUP.
12. Gravel Pits and Solid Waste Haulers
13. mining IF the County Board elects to, which they haven't yet.
14. Reclamation for mines- same type
15. Shoreline Buffers and SSTS
16. Reclamation bonds for mining and extraction
17. Bonds for gravel mining are collected for maintenance or repair of road damage and for reclamation of the pit area.
18. Some permits allow county to require a performance bond.

Please provide any follow up comments that might clarify the use of surety in your county for any permitted activities:

Answered: 7 Skipped: 23

1. N/A
2. na
3. The current \$25,000 per MW surety amount was jointly identified with an early solar developer on a five MW project i.e. total surety on hand would be \$125,000 at year 20+. We trusted this number to be reasonable at that time but have seen other project surety scenarios such as Aurora with more site specific engineers estimate on decommissioning that may give cause to revisit and increase surety requirements.

4. For most projects surety has been for road repair due to damage from the site and for site restoration upon completion of use.
5. The previous wind farm was before my time as ZA. I will propose that the Board requires surety for any upcoming projects. I think it's in your best interest and quite common.
6. Never use a letter of credit. it does nothing for you
7. Nothing is required for permitted uses.