Exhibit G

Materials Analysis

Nolin Hills Wind Power Project

~~February~~ November 2020

Prepared for

d/b/a Nolin Hills Wind, LLC

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Acronyms and Abbreviations

Applicant	Nolin Hills Wind, LLC
BESS	battery energy storage system
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
GE	General Electric
kV	kilovolt
met tower	meteorological tower
MW	megawatt
O&M	operations and maintenance
Project	Nolin Hills Wind Power Project
SPCC	Spill Prevention, Control, and Countermeasure
UPS	uninterruptible power supply
USDOT	U.S. Department of Transportation

1.0 Introduction

Exhibit G provides an analysis of construction materials for the Nolin Hills Wind Power Project (Project), as required to meet the submittal requirements of Oregon Administrative Rule (OAR) 345-021-0010(1)(g) paragraphs (A) through (C). OAR 345 Division 22 does not provide an approval standard specific to Exhibit G.

2.0 Materials Inventory – OAR 345-021-0010(1)(g)(A)

OAR 345-021-0010(1)(g) A materials analysis including:

OAR 345-021-0010(1)(g)(A) An inventory of substantial quantities of industrial materials flowing into and out of the proposed facility during construction and operation;

2.1 Construction Materials Inventory

The primary raw materials needed for construction of the Project are rock, gravel, sand, water, cement, and steel rebar. Substantial amounts of steel reinforcing bar and concrete are required for ~~wind turbine~~ foundations (e.g., wind turbines, substations, Operations and Maintenance [O&M] Building, solar array tracking, battery container slabs); making concrete requires gravel, sand, water and cement. Rock and aggregate materials will also be needed for access road construction and for other permanent and temporary gravel-surfaced areas. Aggregate suppliers in the vicinity of the Project will be determined by the construction contractor. Additional materials include the turbine and meteorological tower (met tower) components, solar array components, battery system components, substations and other electrical equipment, conductor wires, fiber optic communications cables, transmission line support poles for the transmission line, and insulators and connecting hardware.

The following items were considered when developing this materials inventory:

- Steel and concrete for turbine foundations;
- Solar array, including the modules, racking system, posts, cabling, and inverters and transformers;
- Battery energy storage system (BESS);
- Conductor wires;
- Insulators and hardware;
- Fiber optic communications lines;
- Two meteorological towers;
- Substation steel structures and foundations;

- Substation foundation;
- O&M Building and foundation;
- Access road construction; and
- Surface materials for substation, O&M Building, and temporary construction yards.

Volumes of water are discussed in Exhibit O.

Most construction materials will enter the Project area via one of the construction yards. The locations of the construction yards are shown in Exhibit C, Figure C-4.16. Some materials, particularly turbine components and solar components, will be delivered directly to the location at which they will be used. Material quantities evaluated in this exhibit are for Option 2 consisting of 1162 General Electric (GE) 3.03-megawatt (MW) turbines because this results in conservative estimates of the greatest quantities expected.

Table G-1 provides an inventory of industrial materials that will be used within the Project area in substantial quantities during construction of the Option 2 layout, a conservative estimate.

Table G-1. Inventory of Construction Materials

Material	Quantity/Units	Ultimate Disposition
Aggregate (rock/gravel)	260,000312,889 cubic yards for up to approximately 802 miles of private access road (approximately 62613 miles of new road, and 19 miles of existing road improvement). 87,534 cubic yards cubic yards for approximately 4865 acres of graveled areas associated with the Operations and Maintenance (O&M) Building, substations, BESS, and construction yards and laydown areas.	Maintained as on-site roadbed or graveled area associated with the O&M Building, and collector substations, and BESS.
Concrete in cubic yards per turbine foundation (590 cubic yards per GE 3.03-MW turbine; 1,020 cubic yards per Siemens-Gamesa 6.0-MW turbine)	Per turbine foundation: • 540 936 tons of aggregate; • 315 546 tons of sand; • 160 270 tons of Portland cement; • 50 95 tons of steel reinforcing bar; and • 18,000 to 31,500 gallons of water.	Incorporated into turbine tower foundations.
Concrete for substation foundations – per each (392 cubic yards)	Per foundation: • 325 tons of aggregate ; • 240 tons of sand; • 100 tons of Portland cement; • 35 tons of steel reinforcing bar; and • 12,000 gallons of water.	Incorporated into the substation foundations.

Material	Quantity/Units	Ultimate Disposition
Concrete for O&M Building foundation (320 cubic yards)	• 270 tons of aggregate ; • 200 tons of sand; • 85 tons of Portland cement; • 27 tons of steel reinforcing bar; and • 10,000 gallons of water.	Incorporated into the O&M Building foundation.
Concrete for BESS container foundations (2,136 yd^3 [8.9 yd^3 per pad; 240 pads])	• 1,800 tons of aggregate; • 1,340 tons of sand; • 570 tons of Portland cement; • 180 tons of steel reinforcing bar; and • 65,000 gallons of water.	Incorporated into BESS Ffoundations
Concrete for solar array racking posts (24,900 yd^3 [0.3 yd^3 per racking post])	• 21,000 tons of aggregate • 15,600 tons of sand; • 6,600 tons of Portland cement; and • 77,000 gallons of water	Incorporated into racking post Ffoundations
Concrete for solar array inverters/transformers foundations (160 yd^3 [98 foundations])	• 136 tons of aggregate; • 100 tons of sand; • 43 tons of Portland cement; • 86 tons of steel reinforcing bar; and • 5,120 gallons of water.	Incorporated into inverters/transformers Ffoundations
Wind turbine components	Up to 1126 turbines, each comprising approximately: • 200 121 tons of steel; • 200 121 tons of iron; • 60 49 tons of fiberglass/carbon fiber; and • 33 20 tons of other material.	Incorporated into turbine towers, nacelles, and other internal components.
Meteorological (met) towers	Up to 3 units; approximately 8 tons of steel per met tower.	Aboveground structure.
Solar modules / solar modules per string / strings	1,117,591 modules / 27 modules per string / 41,393 strings	Throughout each solar module string
Steel solar module rack posts	83,080 -posts, 6,231 -tons steel (150 pounds per post)	Throughout each solar module string
Steel battery containers	240 containers (lithium-ion BESS) 12 containers (flow BESS)	BESS
Lithium-ion battery racks	1,440 racks (6 racks per container)	Inside steel battery containers
Combiner boxes	41,393 boxes	Aboveground throughout solar array
Inverters/transformers	98 stations	Aboveground throughout solar array
Fencing	90,963 feet (17.2 miles)	Will remain around solar area
34.5-kilovolt (kV) electrical collector lines/conductor cable (overhead)[1/]	Up to approximately 9.1 miles of conductor cable; 15.6 for Option 1 wind and up to 10.8 for solar (wind).	Aboveground structure.

Material	Quantity/Units	Ultimate Disposition
	Up to approximately 5.5 miles of conductor cable (solar).	
34.5-kV electrical collector lines/conductor cable (underground)	Up to approximately 90239 miles of conductor cable (wind); 239 miles for Option 2 wind and 108 miles for solar. Up to approximately 144 miles of conductor cable (solar).	Buried underground[1]
34.5-kV electrical collector poles	Up to approximately 347210 structures, single-pole wood.	Aboveground structures.
230-kV transmission line	Up to approximately 24.925.3 miles of conductor cable (Cottonwood Route). Up to approximately 6.8 miles of conductor cable (between substations).	Aboveground structure.
230-kV transmission line structures	Up to approximately 283 monopole structures (60 structures between substations; 223 structures for Cottonwood Route)., and uUp to 60 structures that may be either H-frames or monopoles, likely wood or steel.	Aboveground structures.
Fiber optic and copper communication lines	Up to approximately 99.1153 miles of fiber optic cable.	Strung or buried with collector lines.
Generator step-up (GSU) electrical transformers	Up to 1162 GSU transformers.	Mounted on concrete pad adjacent to turbine tower
Substation transformers	Up to 2 transformers, the largest of which would be 222 300 megavolt amperes.	Within substation footprint.
O&M Building	One O&M building approximately 6,000 square feet.	Aboveground structure and graveled parking area

1. The Applicant does not anticipate having to run the 34.5-kV electrical collection system aboveground. However, should site conditions present a situation where burying the electrical collection is infeasible, up to approximately 9.114.6 miles of the electrical collection system may be run aboveground in a manner similar to the 230-kV transmission line. See Exhibit B for additional description of the 34.5-kV collection system.

2.2 Operational Materials Inventory

Industrial materials will be stored on the Project during operations. Up to two 55-gallon drums each of hydraulic oil and gearbox oil may be kept on site for periodic maintenance activities; these would be stored within the O&M Building. Lubricating and dielectric mineral oils and antifreeze solutions will be present at the Project, and will be fully contained within the turbines and electrical transformers. Transformer dielectric oils are not normally replaced. Lubricating oils and antifreeze are drained and replaced periodically; new oil will be brought in on an as-needed basis and the old oil removed for recycling. These maintenance activities will utilize specialized vehicles and equipment designed to prevent spills. If heavy equipment is necessary for major maintenance issues, such as the replacement of a turbine gearbox or generator, its use would be similar to the construction stage. Fuel or oils needed for maintenance will be delivered by a licensed maintenance contractor on an as-needed basis, and no substantial quantities will be stored on site. As described in Exhibit B, during operations, chemical storage will include up to ~~10~~ 120 lead-acid batteries in the control room within the O&M Building as a backup uninterruptible power supply (UPS) system. In addition, up to sixty 300-amp-hour lead-acid batteries in sealed containers and held in a wall rack will be located inside the substation power control building. These batteries will be used as the main source of station service to operate all substation equipment. The final number and size of batteries will be determined during final design.

It is possible that major turbine, solar module, or electrical components may need to be replaced during the lifetime of the Project. Major maintenance issues may require the replacement of turbine gearboxes, generators, blades, or other components or the replacement of solar modules; however, due to the unpredictable nature of major maintenance problems, no estimate has been provided for the amount of major components that may be needed. Minor maintenance may also require the replacement and removal of smaller components, which are not expected to constitute substantial amounts of industrial materials. Minor and potentially hazardous materials could include oily rags or similar materials related to turbine lubrication and other maintenance.

Small quantities of lubricating and dielectric oils, cleaners, antifreeze, or herbicides and pesticides may be stored in the O&M Building for use during Project operations. None will be present in substantial reportable quantities; the amounts present (if any) will be no greater than household quantities.

Solar modules may require periodic washing to minimize the effects of solar module dust and dirt on energy production (referred to as soiling). For the purpose of this analysis, it is assumed that all modules will be washed once per year and require one gallon per solar module, for a total of approximately 1,120,000 gallons per year. Water will be applied via robotic panel cleaners and will not have any cleaning solvents in it. Washwater will be discharged by evaporation and seepage into the ground. See Exhibit O for further information.

For the BESS, a lithium-ion system will require regular change out of batteries, as they degrade over time, whereas a flow battery system will need infrequent maintenance.

If a lithium-ion system is used, the batteries will be replenished at a rate depending on usage. For example, a battery that is cycled more often will degrade faster than one that is used less often. For this analysis, it is assumed that the battery will be fully discharged each day and that all batteries will need to be replaced every 10 years, or three times over the life of the Project (30 years). This assumption likely overestimates the number of batteries that will be replaced over the life of the Project, because not all batteries will be replaced during each replenishment cycle (e.g., fewer batteries will need replacing early in the Project life). A group of lithium-ion battery cells will comprise a "rack." Approximately 1,440 battery racks will be needed for the 120-MW storage system.

Lithium-ion battery systems typically are air cooled, and do not have a liquid component. However, some lithium-ion battery systems are liquid cooled, such as the Tesla Powerpack, which uses coolant similar to automotive antifreeze. The coolant, if used, is recirculated through a closed system to cool the batteries.

If a flow battery system is used, it will require infrequent replacement of the electrolyte solutions because there is negligible degradation of the battery (i.e., electrolyte solutions) over time. This analysis assumes an energy density of 25 watt-hours per liter for a total flow BESS of 600 million watt-hours, which translates to 24 million liters, or approximately 6.3 million gallons- of electrolyte solution on site over the life of the Project (30 years).

Table G-2 provides an inventory of industrial materials to be used within the Project area during operations.

Table G-2. Inventory of Operational Materials

Material	Quantity/Units	Ultimate Disposition
Mineral oils (turbine lubricant and transformer coolant)	348 gallons (3 gallons per turbine) per year.	Full oil change done as-needed by a specialized contractor and used oils removed for recycling.
Synthetic oils (turbine lubricant, gear oil)	1,116 gallons (10 gallons per turbine) per year.	Full oil change done as-needed by a specialized contractor and used oils removed for recycling.
Lead-acid batteries	122~~10~~ batteries (300-amp hour)	Up to ~~10~~ 2 batteries within secondary containment inside the control room within the O&M Building. Up to 120 batteries in sealed containers in the power and control building at the substations.
Lithium-ion batteries	2,640 batteries	Disposed of at approved facility.
Electrolyte solution (flow batteries)	6.3 million gallons	Disposed of at approved facility.
Transformer oil	Substation transformers: 28,000 gallons (14,000 gallons each) Solar array transformers: 49,000 gallons (500 gallons per station)	Within transformer boxes for cooling. (No extra oil stored outside of transformers. Additional oil only required due to failure, provided on an as-needed basis.)
Simple Green (general cleaner)	348 gallons (3 gallons per turbine) per year.	Up to 5 gallons stored in O&M Building for minor maintenance.
WD-40; grease (general lubricant)	580 gallons (5 gallons per turbine) per two years.	Up to 55 gallons stored in O&M Building for minor maintenance.
Ethylene glycol (anti-freeze)	348 gallons (3 gallons per turbine) per year.	Up to 55 gallons stored in O&M Building for minor maintenance.
Round-up and 2,4-D (weed control)	2 gallons for spot weed control; subcontract out for major weed control per year.	Up to 2 gallons stored in O&M Building.

3.0 Hazardous Materials Handling and Management – OAR 345-021-0010(1)(g)(B)

OAR 345-021-0010(1)(g)(B) The applicant's plans to manage hazardous substances during construction and operation, including measures to prevent and contain spills;

3.1 Construction Materials

Hazardous materials that will be used at the Project include fuels, lubricating oils, cleaners, and pesticides, as shown in Tables G-1 and G-2. These materials will be used primarily during operations but potentially during construction as well.

During construction of the Project, small quantities of a few hazardous materials may be utilized or stored in the construction yards. Such materials may include cleaners, insecticides or herbicides, paint, or solvents. None will be present in substantial, reportable quantities[1]; the amounts present (if any) will be no greater than household quantities[2] of up to a few gallons each. When not in use these would be stored in a secure location within the construction yards.

Fuels will be the only hazardous material that may be stored in substantial quantities on site during construction; the Applicant anticipates that up to 500 gallons of diesel fuel and 200 gallons of gasoline may be kept on site for fueling of construction equipment. These will both be stored in temporary above-ground tanks in the construction yard(s), within an area that provides for secondary containment. Most fuel will be delivered to the construction yard by a licensed specialized tanker vehicle on an as-needed basis. There will be no substantial quantities of lubricating oils, hydraulic fluid for construction equipment, or other hazardous materials maintained on site during construction. Lubricating oil or hydraulic fluids for construction equipment would similarly be brought in on an as-needed basis for equipment maintenance by a licensed contractor using a specialized vehicle, and waste oils removed by the same maintenance contractor. Hydraulic oils for the turbines and dielectric oils for the transformers will similarly arrive on an as-needed basis and be transferred into the receiving components; none will be stored on site.

Hazardous materials will be used in a manner that is protective of human health and the environment and will comply with all applicable local, state, and federal environmental laws and regulations. Due to the potential quantities of hazardous materials that may be present during construction, the construction contractor will be required to develop a Spill Prevention, Control, and Countermeasure (SPCC) Plan prior to beginning construction of the Project. Accidental releases

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[1] "Reportable quantity" refers to the amount of hazardous substance that has to be released into the environment before the EPA requires notification of the release to the National Response Center pursuant to the Comprehensive Environmental Release, Compensation, and Liability Act, also known as Superfund. These numerical designations are listed under 49 CFR 172.101 Appendix A, Table 1 and Table 2.

[2] "Household quantity" refers to container sizes designed for consumer use, which are sized such that each container would hold less than a reportable quantity of any constituent hazardous chemical.

of hazardous materials will be prevented or minimized through proper containment of these substances during use and transportation to the Project site, and observance of appropriate handling procedures during transfer from the delivery vehicle to the equipment being filled.

Equipment oil-filling, fueling, or maintenance activities will take place a substantial distance from waterways or wetlands to prevent water quality impacts in the event of an accidental release. Any oily waste, rags, or dirty or hazardous solid waste will be collected in sealable drums at the construction yards, to be removed for recycling or disposal by a licensed contractor.

In the unlikely event of an accidental hazardous materials release, any spill or release will be cleaned up and the contaminated soil or other materials disposed of and treated according to applicable regulations. See Exhibit CC for a listing of applicable regulations. Spill kits containing items such as absorbent pads will be located on equipment and in on site temporary storage facilities to respond to accidental spills, if any were to occur. Employees handling hazardous materials will be instructed in the proper handling and storage of these materials, as well as to the locations of spill kits.

The following list provides a summary of typical measures that will be implemented during Project construction to ensure safe handling, transport, use and disposal of hazardous materials:

- The general contractor will be responsible for preparing an SPCC Plan prior to the start of construction and maintaining the program through the duration of construction activities. The SPCC Plan will be revised for the operational period of the Project.

Preventative Procedures to Avoid Spills

- Chemical Storage: All hazardous chemicals will be stored in a manner that provides secondary containment. This will be accomplished via double-wall containers, lined ground storage sites including dikes and berms, or other vessels. Chemical storage areas will be located at least 100 feet from the edge of perennial and intermittent streams and wetlands.
- Chemical Transfer: When space provides, hazardous chemical transfer will occur within the secondary containment. In the event this is not possible, sorbent pads or materials will be strategically placed at the transfer point to capture any possible leak. Transfer of materials from large to small containers will be performed using appropriate equipment, including pumps, hoses, and safety equipment; hand pouring techniques will not be utilized.
- Transportation: Procedures for loading and transporting fuels and other hazardous materials will meet the minimum requirements established by the U.S. Department of Transportation (USDOT) and the Oregon Department of Transportation and other pertinent regulations. At all times, all hazardous materials used for the Project will be properly stored in approved USDOT containers and labeled, including during transportation. Smaller containers will be used on site to transport needed amounts of hazardous materials to a specific location.
- Fueling and Servicing: Construction vehicles (trucks, bulldozers, etc.) and equipment (pumps, generators, etc.) will be fueled and serviced in designated areas at least 300 feet

from flowing streams wetlands and other water bodies (e.g., lakes ponds, reservoirs). Refueling locations should be flat to minimize the chance of a spilled substance reaching a stream. Fuel/service vehicles will carry a suitable absorbent material to collect approximately 20 gallons of spilled materials.

- Training and Education: All site personnel will be informed of the various hazardous chemicals stored on site. Training and education will include information on the proper handling, use, storage, and cleanup of hazardous chemicals found on site.

Clean-up Procedures

- In the event of a leak or spill of a hazardous substance, the Chemical Safety Supervisor is to be immediately notified. He/she will be notified immediately following emergency mitigation / containment activities.
- All spills exceeding established U.S. Environmental Protection Agency (EPA) reportable quantities will be reported to both the Oregon State Emergency Spill Hotline and to the National Response Center. EPA reportable quantities can be found in 40 Code of Federal Regulations (CFR) 302.2, Designation, Reportable Quantities and Notification. Links to the reporting requirements can be found at www.epa.gov/ceppo/pubs/title3.pdf.
- Sorbent pads will be stocked on site to mitigate spills and leaks. In the event that a piece of equipment cannot be moved or immediately taken out of service, sorbent pads will be used to collect fluids and prevent the pollution of surrounding soil. This operation, should it arise, will be personally monitored by the project Superintendent and project Safety Coordinator.
- Soil cleanup will occur using designated and appropriately labeled barrels to contain any excavated contaminated soil. Cleanup will include a significant margin to ensure that all contaminants have been removed from the area.
- Equipment that is found to be the source of any leak or spill will be repaired immediately if possible. If immediate repair is not possible, the spill or leak will be contained and controlled using any approved and necessary means. Leaking equipment once removed from service will not be allowed to return to service until repairs have been made and demonstrated.

Storage Procedures

- Storage and containment of all chemicals and combustibles on site will be accomplished in compliance with all local, state, and federal regulations. All chemicals and combustibles will be stored in properly labeled and approved containers.
- Flammable storage cabinets will be obtained as necessary. Flammable and combustible liquids will be stored 25 feet from other construction operations. Material Safety Data Sheets for all materials on site will be available in the project Superintendent's office.
- Paint used on site will be stored per local, state, federal, and manufacturer requirements.
- Fuel tanks will be designed with double containment system protection.

- Portable gas cans shall be stored in designated areas that are protected with a secondary containment to avoid leakage or spillage onto the soil. A standard cattle trough is a good example of a secondary containment protection that can be easily installed.
- Compressed gas cylinders will be secured when in use and when stored will require a minimum 20-foot separation between oxygen and acetylene cylinders.

Spill Reporting Procedures

In the event of a spill involving a hazardous material the following procedure shall be implemented:

1. Notify the site Project Manager.
2. Notify the site Safety Engineer.
3. In the event the spill exceeds 10 gallons, notify the Operating Group Vice President and Safety Director.
4. Consult the reporting limits for the specific material spilled by reviewing the EPA Office of Chemical Emergency Preparedness Document 550-B-01-003, available online at: www.epa.gov/ceppo/pubs/title3.pdf. In the event the spill meets the reporting limits as established by EPA Document 550-B-01-003, follow the prescribed reporting procedure by calling the National Response Center at 1.800.424.8802.
5. Consult the reporting requirements for Oregon, and follow the prescribed reporting procedure.

3.2 Operational Materials

During operations, there will be no substantial quantities of fuels, oils, or chemicals on site, except as contained in qualified oil-filled equipment, including the turbine gearboxes, ~~and~~ substation transformers, and inverter station transformers within the solar array, and the sulfuric acid contained in the lead-acid batteries. Lubricating oil (5 gallons per turbine per year) will be brought in as needed for periodic oil changes in the turbine gearboxes by a maintenance contractor using a specialized vehicle, and waste oils will be removed in the same way. Small quantities of gear oil will likely be maintained on site for occasional top-offs; it is anticipated that less than 10 gallons will be stored in the O&M Building at any given time. A full gear oil change will be done as-needed by a specialized contractor and used oils will be removed for recycling. Small quantities (2 to 3 gallons) of pesticides or herbicides, paint, solvents, or cleaners may also be kept on site; when not in use, these will be stored in the O&M Building. Given the nature of the materials, no secondary containment systems are planned for the O&M Building for these materials. However, sorbent materials will be maintained on site to capture any small spills that may occur.

As described above and in Exhibit B, chemical storage will include up to ~~10~~ two lead-acid batteries in the control room within the O&M Building. In addition, up to sixty 300 amp-hour lead-acid batteries in sealed containers will be held in a wall rack located inside both the northern and southern substation power control buildings, for a total of up to 120 lead-acid batteries. These batteries will be used as the main source of station service to operate all substation equipment. The final number and size of batteries will be determined during final design. Each ~~battery weighs 56 kilograms and~~ battery contains sulfuric acid within its maintenance-free sealed leakproof exterior. Sulfuric acid is considered an extremely hazardous material by the EPA under 40 CFR §355. As required by regulation, secondary containment will be employed, and the Applicant will include sulfuric acid as part of its annual Emergency Planning and Community Right-to-Know Act report to local emergency responders. The batteries will be replaced at least every 5 years, if not earlier, as indicated by UPS system controls. Replacement of batteries will be handled by a qualified contractor and adhere to applicable regulations for transport and disposal, including but not limited to 49 CFR §173.159.

Secondary containment is optional for the transformers and for the turbine gearboxes, as these are classified as qualified oil-filled operational equipment under the EPA's Amended Spill Prevention, Control, and Countermeasure Rule issued in 2006 (EPA-550-F-06-008). Per this amended rule, instead of providing secondary containment for qualified oil-filled operational equipment, an owner or operator may prepare an oil spill contingency plan and a written commitment of manpower, equipment, and materials to quickly control and remove discharged oil; the plan must include an inspection or monitoring program for the equipment to detect a failure and/or discharge. Alternatively, the transformers may be installed on foundations that provide secondary containment, or sorbent materials may be kept on-hand to capture minor leaks. The Applicant plans to install secondary containment for the substation transformers, and the specific design will be determined prior to construction of the substations. The nacelles and turbine foundation will effectively function as secondary containment for the turbine gearboxes, such that no additional secondary containment systems are needed for the turbines.

The BESS may include hazardous substances within internal battery components; however, batteries are considered non-hazardous equipment when used according to the recommendations of the manufacturer and as long as their integrity is maintained (not damaged and internal seal is intact). While lithium-ion batteries can present a flammability hazard and require cooling systems to prevent overheating, flow batteries use an electrolyte solution that is nonflammable and nonexplosive, and do not require an associated cooling system. The battery storage system, regardless of type, will have intergrated safety systems that monitor battery performance to detect malfunctions and implement response measures (such as notifying operators, depowering the system, or deploying fire suppression devices). Batteries will be housed in leak-proof containers to prevent inadvertent releases of hazardous materials. O&M staff will conduct periodic inspections of the battery cells for damage.

For the replacement of batteries during operation, the Applicant will follow the handling guidelines of 49 CFR 173.185 – Department of Transportation Pipeline and Hazardous Material Administration related to the shipment of lithium-ion batteries. The regulations include requirements for prevention of a dangerous evolution of heat, prevention of short circuits, and prevention of damage to the terminals. They also require that no battery will come into contact with other batteries or conductive materials. Licensed third-party battery suppliers will be responsible for transporting batteries to and from the Project in accordance with applicable regulations.

Adherence to the requirements and regulations (including personnel training, safe interim storage, and segregation from other potential waste streams) will minimize safety hazards related to transport, use, or disposal of batteries.

Hazardous materials will be used in a manner that is protective of human health and the environment, and will comply with all applicable local, state, and federal environmental laws and regulations. The transformers in the substation yard will have polychlorinated biphenyls –free insulating oil inside the units, which have their own oil containment systems; at no time will oil be able to discharge from the proposed oil containment system. Due to the quantity of oil in the transformers (see Table G-2), the Applicant will maintain an SPCC Plan for the substation operations.

4.0 Non-Hazardous Waste Management – OAR 345-021-0010(1)(g)(C)

OAR 345-021-0010(1)(g)(C) The applicant's plans to manage non-hazardous waste materials during construction and operation.

The Applicant will fully comply with all applicable waste handling and disposal regulations on all lands associated with the Project, during both construction and operation. Solid waste will be stored in a manner that does not constitute a fire, health, or safety hazard until such time as it can be hauled off for recycling or disposal, as appropriate. Exhibit V provides details on the types and amounts of waste, and procedures and systems for the handling and disposal of waste materials.

Solid waste materials, such as excess construction materials or scrap steel, will be generated during construction. When feasible, the waste generated during construction will be recycled. Steel scraps from turbine foundations will be separated and recycled to the extent feasible. Wood from concrete forms will be reused when possible and then recycled. Excess excavated material will be used to restore ground contours after construction.

The only material that has the potential to be disposed of on site will be waste concrete generated during construction. Waste concrete will consist of concrete solids contained in the concrete chute washout water. Concrete solids and washout water will be contained within a confined area of the foundation excavation. The washout water and any solids will be buried as part of backfilling the turbine foundation. Batches of concrete that do not meet specification will be sent back to the concrete plant. Any excess concrete will be incorporated into the foundation, rather than disposed of.

There will be no disposal of hardened waste concrete on site other than as described here. Packaging waste (such as paper and cardboard) and refuse will be separated, accumulated in dumpsters, and periodically removed for recycling or disposal at the Finley Butte Landfill or the Columbia Ridge Landfill (see Exhibit U). Portable toilets will be provided for on-site sewage handling during construction and will be pumped and cleaned regularly by the construction contractor.

During operations, little solid waste will be generated by the Project. The solar array and BESS will rely on the O&M Building for sanitation. Therefore, it will not generate any additional sewage streams. Administrative activities related to the solar array and BESS will be conducted at the O&M Building. Office waste generated at the O&M Building will be separated and periodically removed for recycling or disposal at the Finley Butte Landfill. Sewage from the O&M Building will be disposed of on site with a septic system (see Exhibit U).

Washing of solar panels will be conducted, but this limited quantity of washwater will evaporate or will infiltrate into the ground near the point of use (see Exhibit V). No additional industrial wastewater streams will be generated at the solar array.

If the flow battery system is selected, operation of the system will require infrequent replacement of the electrolyte solution. Based on manufacturer descriptions, spent electrolyte fluid is nonhazardous, and can be treated and disposed of at a licensed facility.

5.0 Conclusion

Based on the information presented in this exhibit, the Applicant has satisfied the requirements of OAR 345-021-0010(1)(g).

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