APPENDIX 16C:
DECOMMISSIONING PLAN

SUMMARY OF WORK

SOLAR PV DECOMMISSIONING

Section 1: Background

Solar Photovoltaic ("PV") facility decommissioning is generally described as the removal of system components and the rehabilitation of the site to pre-construction conditions. The typical goal of project decommissioning and reclamation is to remove the installed power generation equipment and return the site to a condition as close to a pre-construction state as feasible.

Properly maintained solar panels have an expected life of thirty (30) years. The decommissioning process will initiate upon the completion of the project's useful life or the end of the property lease term.

Deconstruction procedures are designed to ensure public health and safety, environmental protection, and compliance with applicable regulations. Typical activities during a solar energy facility decommissioning and site reclamation phase include the following:

- Facility de-energization
- PV module removal
- Dismantling and demolition of above grade electrical structures
- Dismantling and removal of aboveground and belowground utilities to a depth of 36"
- Debris management including hauling and disposal
- Temporary erosion control
- Removal of security fencing
- Revegetation disturbed areas as needed

Much of the solid material waste can be recycled or sold as scrap, however, it is noted that salvage or scrap value is not included in the decommissioning opinion of probable cost. A detailed opinion of probable costs to remove the system is included as part of the decommissioning plan.

Section 2: Facility Materials

PV facilities are constructed using the same basic materials and methods of installation common to their application. Materials include:

Metals: Steel from pier foundations, racking, conduits, electrical enclosures, and fencing,; aluminum from racking, module frames, electrical wire, and transformers; stainless steel from fasteners, electrical enclosures, and racking; copper from electrical wire, transformers, and inverters.

Concrete: Equipment pads and footings.

PV Cells: PV Modules are typically constructed of glass front sheets (some use glass back sheets as well), plastic back sheets and laminates, semiconductor rigid or thin film silicon cells, internal electrical conductors (aluminum or copper), silver solder, plus a variety of micro materials. The semiconductor PV cell materials represent a very small part of a PV module's weight, between 1 and 2%. As manufacturers pursue lower cost modules, thinner layers of semiconductor materials are used which reduces this percentage. The most commonly used semiconductor material for the construction of PV modules is silicon. Glass, aluminum, and copper are easily recyclable materials, and silicon can be recycled by specialty electronics recyclers.

Glass: Most PV modules are approximately 80% glass by weight. There are certain modules, which use plastic and/or metal sheets for their foundations, however these are very specialized in their application and are generally not used for ground-mounted projects.

Plastics: A limited amount of plastic materials are used in PV systems due to a system's continuous exposure to the elements and long operational lifetime. Plastics typically are found in PV facilities as wire insulation, electrical enclosures, control and monitoring equipment, and inverter components. Additionally, plastic laminate films are used in most PV module assemblies.

Section 3: Project Decommissioning Plan

The Project owner shall:

- Be responsible for all decommissioning costs. A Financial Assurance Mechanism (FAM) in the form of an irrevocable standby letter of credit, performance bond, surety bond, or unconditional payment guaranty executed by a parent company will be established prior to construction;
- Obtain any additional permits required for the decommissioning, removal and legal disposal of Project components prior to commencement of decommissioning activities;
- Complete decommissioning, including component removal and disposal, grading and re-vegetation in accordance with permits and in compliance with all applicable rules and regulations then in effect governing the disposal thereof; and
- Remove all hazardous materials and transport them to be disposed of by licensed contractors at an appropriate facility in accordance with rules and regulations governing the disposal of such materials.

The following sequence for the removal of the components will be used:

PV Site

- Disconnect PV facility from the utility power grid
- Disconnect all aboveground wirings, cables and electrical interconnections and recycle offsite by an approved recycling facility
- Remove concrete foundations (if required) will be removed and recycled off-site by a concrete recycler
- Remove PV modules and ship to recycling facilities for recycling and material reuse.
- Remove all waste
- Remove the perimeter fence and recycle off-site by an approved metal recycler

Inverters/Transformer

- Disconnect all electrical equipment
- Remove all on site inverters, transformers, meters, fans, and other electrical components and recycle off-site by an approved recycler
- Remove all waste

Access Road

- The access roads built on the project, and associated drainage infrastructure (culverts, etc.) will remain as a means to access the site in the future.

Below-Ground Structure Decommissioning

- Disconnect and remove all underground cables and transmission lines to a depth of 36" below grade and recycle off-site by an approved recycling facility
- Removal of steel rack foundations.

Section 4: Site Restoration

Once the on-site equipment is removed, it is expected that the site will be returned to its existing condition. Some minor site grading may be required. Site restoration activities will be undertaken with the input of the Town of Fitzwilliam.

At the request of Project Site owners, landscaping/ visual screening will be removed at the end of the project's useful life or the end of the property lease term.

Section 5: Decommissioning Conditions and Timeframe

The solar facility and all components described above shall be physically removed from the site no later than 2 years following the discontinuation of operations.

This decommissioning plan is based on current procedures and experience. These procedures may be subject to revision based on new experiences and requirements over time.

Tighe&Bond
Engineers | Environmental Specialists

CHINOOK SOLAR DECOMMISSIONING OPINION OF PROBABLE COST

Tighe & Bond has prepared an opinion of probable cost for the decommissioning of an approximately 47.98 MW_{DC} (30.00 MW_{AC}) ground-mounted solar project proposed in Fitzwilliam, NH. The opinion of probable cost is summarized in the following table.

Below is a breakdown of each expected task required to decommission the 47.89 MW_{DC} ground-mounted solar array. The site is approximately 150 acres including 1 substation along with other equipments mentioned below. Key assumptions including the fact that the fencing, electrical cabinetry, solar racking, solar modules, wiring and all other equipment is recyclable. Therefore, the primary cost of the decommissioning is the labor associated with dismantling and loading the equipment to be transported for disposal.

The following items from the array will be recycled:

- 15 inverters,
- 2,126 full racks and 307 half racks,
- 118,482 solar modules
- Utility substation equipment
- Chain link fencing
- All electrical wiring, conductors, conduits, and associated hardware

The Opinion of Probable Cost is based on the following labor rates:

- $75 per hour for electricians
- $80 per hour for equipment operators
- $58 per hour for general demolition laborers
- $5 per mile for trucking
- $660 per week for skid steer rental
- $1,500 per day for excavator rental

To provide a conservative cost, we have assumed that trucking, loading, and hauling of this material will reduce the market value to zero and therefore has not been assumed to offset the cost to remove the system.

TABLE 1
Opinion of Current Probable Costs – Decommissioning

Item	Cost
Dismantle & Load Racking, Modules & Wiring (2,280 racks) x (4 racks/hour) = 570 hours (2 Laborers) x ($58/hour) x (570 hours) = $66,120 (2 Operator) x ($80/hour) x (570 hours) = $91,200 (1 Excavator) x ($1,500/day) x (71 days) = $106,500 (1 skid steer) x ($660/week) x (14.5 weeks) = $9,657	$273,477
Remove Electrical Equipment (10 hour/unit) x (15 units) = 150 hours (2 Electricians) x ($75/hour) x (150 hours) = $22,500	$22,500

Removal of Substation (5 Electricians) x ($75/Hour) x (100 Hours) **=** $56,250 (1 Operator) x ($80/hour) x (5 days) = $3,200 (1 Excavator) x ($1,500/day) x (5 day) = $7,500	$66,950
Break Up Equipment Pads (15 Pad) x (4 Hours) = 60 hours (1 Operator) x ($80/hour) x (60 hours) = $4,800 (1 Excavator) x ($1,500/day) x (7.5 day) = $11,250	$16,050
Site Restoration Total Area = 150 acres (10%) x (150 acres) = 15 acres ($5,000/acre) x (15 acres) = $75,000	$75,000
Removal of Fence ($2/lf) x (34,700 lf) = $69,400	$69,400
Solar Decommissioning Total	**$ 523,377**

This opinion of probable cost was adjusted to account for a cost of living increase assuming a rate of 2.75%. Therefore, the current decommissioning cost was escalated by 2.75% over the project design life, 20 years.

TABLE 2
Escalation of Current Probable Costs – Decommissioning

Item	Cost
Base Decommissioning Payment	$ 532,377
Assumed Rate of Change Increase	2.75%
Project Design Life	20 years
Solar Escalated Decommissioning Total	**$900,432**
Cost per MW with no recycled value	**$18,767**