

# APPENDIX A: Template Scope of Work for Net Zero PV Design and Installation Best Practices

## Background and Objectives

[ -- insert name of builder here -- ] is planning to design and build residential homes which will be labelled according to the Canadian Home Builders' Association (CHBA) Net Zero Home Labelling Program.

To ensure that solar PV technology can be integrated into the overall design and construction of these homes as seamlessly as possible, we require the services of a solar PV consultant to assist with the following phase(s) of the project. (*check all that apply*).

- Phase 1: Net Zero Ready Solar PV Consulting and Design Services**
- Phase 2: Net Zero Solar PV Installation Services**

Specific requirements for each of these project phases are provided in the following sections.

## TASKS - Phase 1: Net-Zero Ready Consulting and Design Services

The following services are required during the design phase of the project.

### Task 1.1: Pre-Design Reviews

- Review energy modelling and projected annual energy consumption of the home with the builder's certified energy advisor.
- Review architectural drawings and site plans, to identify possible locations for PV array installations.
- Contact the local distribution wires owner to identify connection requirements and any capacity constraints for grid-connected PV systems at the build site\*.

### Task 1.2: Solar PV System Specification, Performance Modelling and Design

- Complete a site analysis to determine solar access quality and identify any shading constraints\*.
- Specify a grid-connected PV system capacity based on:
  - *Preferred array locations and placement,*
  - *Modelling of locally expected PV system performance,*
  - *Required annual electrical energy harvest for a Net-Zero target, and*
  - *Client preferences (e.g., complete the Solar PV System Integration Worksheet [1]).*
- Prepare a grid-connected PV system design, including:
  - *Panel location drawn onto builder provided plans*
  - *Specify racking and attachment method, which builder can use to consult truss manufacturer*
  - *Equipment specifications and list of materials needed.*
    - *Solar panels*
    - *Inverter type*
    - *Racking and attachment method*

- *Conduit*
- *Grid shut off*
- *Energy monitoring system*
- *Preparation of an electrical single line drawing of the system*
- *Area required to accommodate PV system requirements in utility room, and*
- *Projected annual solar energy harvests by the proposed system.*
- Provide solar PV system installed cost estimates for budgeting purposes, including PV system monitoring required for CHBA Net Zero Home labelling.

### **Task 1.3: Solar PV System Integration Considerations**

- Provide advice to the builder and their construction teams on:
  - *Any modifications and / or restrictions to roof surface areas to be used for solar panel installations (e.g., Keeping specific roof areas free of vents, plumbing stacks, etc.)*
  - *Any solar related structural or roof membrane impacts,*
  - *Any utility export constraints and possible mitigation strategies (e.g., on-site energy storage options), and*
  - *Any electrical service component and service area requirements needed to accommodate the planned solar PV system installation in the future.*

### **Task 1.4: Solar Ready Rough-in**

- Collaborate with the builder to plan the electrical rough-in required for the planned solar PV system. For compliance with the PV Ready Checklists [2] in the CHBA Net Zero Home Labelling Program, this may include:
  - *Installation and termination of PV and utility connection conduits*
    - *Conduit from attic or roof space to the electrical room location, sealed and capped (roof terminations also require flashing)*
    - *Conduit from electrical room to the PV disconnect location, sealed and capped*
    - *Conduit from PV disconnect location to the house electrical service, sealed and capped*
    - *To eliminate the need for future building envelop penetrations, conduits should be installed entirely within the building envelope (except for sections terminating above the roof if applicable)*
  - *Electrical Panel Readiness*
    - *Electrical panel sized to accommodate a PV supply breaker of sufficient ampere rating*
    - *Available double-pole slot at bottom panel for PV breaker*
  - *Wired Network Communications Availability*
    - *Network jack provided at designated PV wall space in electrical room location*

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\* Recommended best practices; Not specifically required by CHBA NZ Program.

## TASKS - Phase 2: Net-Zero PV Installation Services

The following services are required during the installation phase of the project.

### Task 2.1: Solar Approvals and Permits

- Prepare and apply all approvals and permits required for the planned solar PV system, including:
  - Offer to connect application with the local distribution wires owner,
  - Electrical, building, development permits and any other approvals required by the authorities having jurisdiction (AHJs).
  - Confirm installation schedule with builder and site supervisor
    - Solar Rough-in
    - System installation and connection
    - Approvals and permitting
    - Final Grid connection

### Task 2.2: Solar PV equipment procurement

- Confirm the list of materials with the builder
- Order all required PV system components as specified in the final design to meet the Net Zero Home requirements

### Task 2.3: Complete the Solar Rough-in

- Complete the electrical rough-in required for the planned solar PV system. Depending on design details and technology selected, this could include:
  - One or more roof penetrations, flashed and sealed, and installation of PV array wiring (e.g., one roof penetration per sub-array if more than one roof face is used)
  - Wiring from the attic (or roof) to the electrical room location
  - Wiring from electrical room to the PV disconnect location
  - Wiring from the PV disconnect to the house electrical service.

**Note: To facilitate attic installations, solar rough-ins should be scheduled in the building cycle before the installation of drywall and attic insulation.**

### Task 2.4: Solar PV Equipment Installation and Commissioning

- Install the Solar PV System
- Install the Solar PV monitoring system
- Commission the system and verify proper operation of all components
- Complete the CHBA Net Zero PV Commissioning Report provided by the builder [2]

### Task 2.5: Final approvals and PV system connection to grid

- Facilitate submission of the declaration of compliance / electrical inspection request for the PV system.
- Follow up with the AHJs and the builder and/or homeowner as required to obtain final connection authorization and arrange installation of a bi-directional utility meter.
- Connection of the Solar PV system to the grid.

## Deliverables

### Phase 1 – Net Zero Ready Home Deliverables

#### CHBA Net Zero Ready Home Labelling Requirements:

1. Appropriate PV Ready Checklist (i.e., for roof or ground array) completed for CHBA Net Zero Home Labelling [2].
2. Drawings showing the array layout for the planned PV installation.
3. Solar electricity generation model for the planned PV system.

#### Additional Best Practices:

*(Optional, but recommended for NZr installations; Required prerequisites for NZ installations)*

1. List of materials needed for the planned PV installation
2. Racking and attachment methods and component specifications
3. Electrical single-line drawings of the planned PV system.
4. Estimated installed cost of the planned PV system.
5. Advice on key design and construction details required to facilitate installation of the planned PV system in the Net Zero Ready home.

### Phase 2 – Net Zero Home Deliverables

1. All necessary permits and approvals needed from the AHJs for the installation of the solar PV system.
2. Delivery of all system components and materials need to complete the solar PV system installation at the build location.
3. Completion of the solar rough-in to allow the wiring of all components of the solar PV system.
4. Installation, commissioning and facilitating inspection of all solar PV system components.
5. Installation of the PV monitoring system.
6. Completion of CHBA Net Zero PV Commissioning Report [2].
7. Final connection authorization and connection of the solar PV system to the utility grid.

## Location and Schedule

**Build Location:** \_\_\_\_\_ (enter location)

**Phase 1 Deliverables Required:** \_\_\_\_\_ (enter date)

**Phase 2 Deliverables Required:** \_\_\_\_\_ (enter date) or  **NOT REQUIRED**

## Builder Contact Information

**Builder Contact:** \_\_\_\_\_ (enter name)

**Phone:** \_\_\_\_\_ (enter number)

**Email:** \_\_\_\_\_ (enter email address)

## References

1. **“Planning & Decision Guide for Solar PV Systems, procedure for solar designers, builders and their design teams to quickly define solar PV requirements”**, NRCan, CanmetENERGY, LEEP Team.  
Cat. No. M154-135/2020E-PDF  
[https://www.nrcan.gc.ca/sites/nrcan/files/canmetenergy/files/Planning\\_and\\_Decision\\_Guide\\_for\\_Solar\\_PV\\_systems\\_PDF.pdf](https://www.nrcan.gc.ca/sites/nrcan/files/canmetenergy/files/Planning_and_Decision_Guide_for_Solar_PV_systems_PDF.pdf)
2. **“Canadian Home Builders’ Association Net-Zero Home Labelling Program – Version 1.x Administrative Requirements”**, Project Registration Workbook, 2020.  
- PDF document and Excel workbook available from CHBA.