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**DIRECTIVE 1B-2**

Issue date: July 2018

## Net Zero Carbon New Buildings and Deep Energy Retrofits of Existing Buildings

### **Background**

The purpose of this Directive is to define and identify goals for Net Zero Carbon (NZC) new buildings and Deep Energy Retrofits (DER) of existing buildings. In support of SUNY's energy and carbon use reduction goals, this Directive outlines the project target goals and provides direction for project designs.

The U.S. Department of Energy defines a Zero Energy Building as: "an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy."

NZC and DER projects have evolving targets for building design and performance for which there are multiple but similar definitions. As such, some of the guidance provided in this Directive may not be universally accepted, but the overarching goal is to design and construct highly energy efficient buildings which significantly reduce energy consumed below an energy code standard for new buildings or energy usage for an existing building.

This Directive uses Site Energy as the measure of performance and energy consumption. This approach is in keeping with an evolving recognition that the source to site energy factor is continuing to adjust downward with time and that site energy is the most direct indicator of building energy usage.

### **1. Net Zero Carbon New Buildings**

Design all new construction building projects to achieve SUNY's goals of NZC buildings. It is recognized that project funding may not be able to include supplying the full energy usage of the building from non-carbon renewable energy sources. In those cases, the design goal will be to design the building as NZC "capable" where the design achieves the energy use intensity (EUI) limit using HVAC equipment and systems that can be electrically powered from renewable energy sources such as ground and air source heat pumps and variable refrigerant flow systems.

#### **Performance goals:**

Site Energy Use Intensity (EUI) limits

- Classroom building – 50 kBTU/ft<sup>2</sup>/year
- Office building – 50 kBTU/ft<sup>2</sup>/year
- Laboratory building – 150 kBTU/ft<sup>2</sup>/year
- Residence Hall – 32 kBTU/ft<sup>2</sup>/year

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## 2. **Deep Energy Retrofits of Existing Buildings**

Design existing building projects, which are identified as full building major renovations or gut rehabilitations (single or multi-phased) to achieve SUNY's goal for DER. Some building types i.e. historic buildings may not be suitable for DER due to limitations on the type of work that is possible or appropriate to be performed on these buildings.

A holistic building design approach and analysis is critical to maximizing the reduction of energy used and strong consideration should be given to combining replacement of multiple building systems (including building envelope) in order to achieve greater energy use reduction in a more cost effective manner.

Ideally, current energy use should be determined from existing metered building data. When this data is not available, current energy use can be estimated using existing building or campus level utility invoices. System level energy use can be estimated using benchmarking tools such as New Building's Institute's FirstView. Additionally, many campus buildings have existing ASHRAE Level 2 Energy Audits, which provide system level energy use, recommended energy conservation measures and simple payback analysis.

### Performance goal:

- 50% reduction of the building's current annual site energy consumption.
- 25% reduction of the building's current annual site carbon consumption.

## 3. **Partial Buildings Renovations or System/Component Replacements**

When the project scope does not include a full building rehabilitation or renovation, evaluation and selection of new equipment and systems should take into consideration their contribution to the overall reduction of project-related and future building energy use.

As with deep energy retrofits, a holistic design and analysis approach is critical to maximizing the reduction of energy used in a building when doing partial renovations or component/system replacements. Where program priorities or degraded equipment conditions dictate a less than optimum sequencing of the work scope, system/equipment selections must include efficiency output turndown capability. This could include chillers with multiple variable speed compressors or multiple smaller condensing boilers. This allows the selected system/equipment to serve an existing load to be operated efficiently when future building project work, such as envelope improvements or building use changes, reduces the building's load.

### Performance goal:

- Include in project design all energy efficiency measures found to have a simple payback of 10 years or less.

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