Response to Reviewer Comments

BPACS 2020 Submission Number: 2172

**Reviewer 1:**

1. **The last sentence in the first introduction paragraph needs revising.**

R: The sentence has been revised to:

“We demonstrate the measure on a single building model, exploring several configuration and control options. We then examine each design option’s impact on building energy efficiency, electrical load shifting, and ability to provide temporary load shedding or addition in response to a grid event.” (p. 2)

1. **"MIN SOC" in table 3 doesn’t appear to be defined anywhere, what is this term? Consider defining in the nomenclature section.**

R: SOC is now defined as “state of charge” earlier in the manuscript, at the bottom of the first column on page 3. Additionally, we explicitly described the minimum SOC metric in the paragraph preceding Table 3:

“The minimum annual ice tank SOC is checked to ensure thermal storage capacity is sufficient for all cases.” (p. 4)

1. **How is the ice made? With a chiller discharge temp of 44F, some other refrigeration equipment is needed to create the ice, how is this equipment modeled?**

R: The ice is made by the existing chiller during the nighttime charging hours by reducing its evaporator outlet setpoint to 25F. No additional cooling equipment is required in this type of ITS design. We realize that we failed to make this explicitly clear in the paper and have added a short paragraph describing the ice charging process:

“To charge the ice tank during the overnight hours, the primary loop is isolated from the building cooling coils and the chiller cools the working fluid to 25F (-3.9C). This results in a reduced chiller capacity equal to approximately 65% of the nominal capacity during ice charging.” (p. 4)

1. **It could be good to add some more information on the scripts that are used to give a better idea of all the inputs used to produce the results.**

R: Unfortunately, we are space constrained and have elected to demonstrate the measure parametrically rather than focus on the code in this paper. However, the measure is slated to become publicly available via the NREL OpenStudio Measures GitHub page. At that time, the script will be accessible in its entirety.

**Reviewer 2:**

1. **Please add more description of the chiller system on top of the screen shot of the Measure; including the HVAC systems for better understanding.**

R: We regret our lack of space to include a schematic of the chilled water plant loop. The measure allows modeling of ITS with most chiller configurations, so there is no single loop schematic that illustrates the measure functionality. However, for our example cases, we have added additional description of the chiller loop to ensure that this is clear to the reader:

“… (1) the building cooling is provided through a primary-secondary chilled water loop supplied by a single air-cooled chiller,” (p.3)

1. **In conclusion, I don't get this "Various hardware configurations and high-level control strategies may be rapidly generated and compared." I suggest revising this.**

R: We have revised this sentence to read:

“The measure allows users to explore various hardware configurations and high-level control strategies, and evaluate their performance through detailed building energy simulation.” (p. 8)

1. **On top of the saving from the shedding, do you have some comparison of total energy consumption of DR case and baseline? There might be more energy consumption / or the cost compensated by the demand charge saving.**

R: We believe that this question is of vital importance for considering ITS as a dynamic demand response asset, and is worthy of much more extensive analysis. However, further analysis requires knowledge of the purpose of the demand response signal. In our demonstration cases, the goal was to mitigate total facility maximum demand during the DR event. We provide those comparison values within the text. Other analysis could, and should, be conducted; and we hope it may be more readily performed in the future through the use of this open-source OpenStudio measure.

**Reviewer 3:**

1. **It is recommended that all the units in the tables should be removed from the second row and put them in the parenthesis at the first row beside the parameters.**

R: The units in all tables have been moved to be included in the top row underneath each column header.