Verification and Validation Plan for Solar Water Heating Systems Incorporating Phase Change Material

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1 General Information

The following section provides an overview of the Verification and Validation (V&V) Plan for a solar water heating systems incorporating phase change material simulator. This section explains the purpose of this document, the scope of the system, common definitions, acronyms and abbreviations that are used in the document, and an overview of the following sections

1.1 Purpose

The main purpose of this document is to describe the verification and validation process that will be used to test a simulation for solar water heating systems incorporating PCM. This document is indented to be used as a reference for all future testing and will be used to increase confidence in the software implementation.

This document will be used as a starting point for the verification and validation report. The test cases presented within this document will be executed and the output will be analyzed to determine if the software is implemented correctly.

1.2 Scope

1.3 Acronyms, Abbreviations, and Symbols

symbol	description
QA	Quality assurance
SRS	Software requirements specification
V&V	Verification and validation
V&VP	Verification and validation plan
V&VR	Verification and validation report
PCM	Phase change material
SWHS	Solar Water Heating System
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1.4 Overview of Document

The following sections provide more detail about the V&V of a solar water heating simulator. Information about the testing process is provided, and the software specifications that were discussed in the SRS document are stated. The evaluation process that will be followed during testing is outlined, and test cases for both the system testing and unit testing are provided

2 Plan

This section provides a description of the software that is being tested, the team that will perform the testing, the milestones for the testing phase, and the budget allocated to the testing.

2.1 Software Description

The software being tested is a simulator for a SWHS incorporating PCM. Given the physical parameters of the system, including dimensions, properties of the water and PCM,and relevant physical constants, the simulator calculates the changes in temperature and energy of the water and PCM over time.

2.2 Test Team

The team that will execute the test cases, write and review the V&VR consists of:

- Maya Grab

- Dr. Spencer Smith
- Thulasi Jegatheesan

2.3 Milestones

2.3.1 Location

The location where the testing will be performed is Hamilton Ontario. The institution that will be performing the testing is McMaster University.

2.3.2 Dates and Deadlines

Test Case:
The creation of the test cases for both system testing and unit testing is scheduled to begin June 1st 2015. The deadline for the creation of the test cases is June 15th 2015.

Test Case Implementation:
Implementing code for the automation of the unit testing is scheduled to being June 15th 2015. The implementation period is expected to last approximately two weeks and has a deadline of June 30th 2015.

Verification and Validation Report:
The writting of the V&VR is scheduled to begin July 1st 2015 and end on July 15th 2015.

2.4 Budget

The budget for the testing of this system is being funded by McMaster University and NSERC.

3 Software Specification

This section provides the functional requirements, the business tasks that the software is expected to complete, and the nonfunctional requirements, the qualities that the software is expected to exhibit.

3.1 Functional Requirements

- Input the physical constants, properties and initial temperatures of water and PCM, and dimensions of the tank
- Verify that the inputs satisfy the required physical constraints

- Compute the calculated values required to solve the governing differential equations
- Calculate the temperatures and energy of water and PCM over time.

3.2 Nonfunctional Requirements

Priority nonfunctional requirements are correctness, understandability, reliability, and maintainability.

4 Evaluation

This section first presents the methods and constraints that are to be used during the evaluation process. This is followed by how the data obtained by the testing will be evaluated, which includes: how the data will be recorded, how to move from one test to the next, and how to determine if the test was successful.