

## Problem 1: FMU States Initialization error

Scenario 1:

```
model.set('hot_PCM.T_start', 273.15 + 47.1)
model.set('cold_PCM.T_start', 273.15 + 10)
model.set('RoomModel.roo.T_start', 273.15 + 20)
```

Indoor Temp	Schedule Input	PCM Cold SOC	PCM Hot SOC
293.150000	3.0	1.0	0.051742
293.150000	3.0	1.0	0.051721
293.150000	3.0	1.0	0.051343
293.150000	3.0	1.0	0.050207
293.150002	3.0	1.0	0.048329
...	...	...	...
293.442882	3.0	1.0	-0.090855
293.441086	3.0	1.0	-0.090279
293.439161	3.0	1.0	-0.089686
293.437112	3.0	1.0	-0.089075
293.434943	3.0	1.0	-0.088448

(This is fine although I am not sure why PCM hot SOC is allowed to go below 0 in Modelica, we should add a self-correcting control where if PCM hot is empty, even the MPC tells the Modelica to discharge PCM hot based on zonal temperature, it should not allow the SOC to go below 0)

Scenario 2:

```
model.set('hot_PCM.T_start', 273.15 + 47.1)
model.set('cold_PCM.T_start', 273.15 + 10)
model.set('RoomModel.roo.T_start', 273.15 + 21)
```

```
pyfmi.fmi.FMUException: Exit Initialize returned with an error. Check the log for information (model.get_log).
```

The FMU can't be initialized with these states. If the room temperature is initialized above 20 C, then the lowest hot PCM temperature allowed is 48.9 C, and therefore the lowest possible starting SOC of PCM hot is 0.983 (shown in scenario 3), and the highest SOC can go above 1 (shown in scenario 4).

Scenario 3:

```
model.set('hot_PCM.T_start', 273.15 + 48.9)
model.set('cold_PCM.T_start', 273.15 + 10)
model.set('RoomModel.roo.T_start', 273.15 + 21)
```

Indoor Temp	Schedule	Input	PCM Cold SOC	PCM Hot SOC
294.150000		3.0	1.0	0.983103
294.150000		3.0	1.0	0.983103
294.150000		3.0	1.0	0.983103
294.150000		3.0	1.0	0.983103
294.149999		3.0	1.0	0.983103
...		...	...	...
294.094754		3.0	1.0	0.983103
294.093130		3.0	1.0	0.983103
294.091481		3.0	1.0	0.983103
294.089807		3.0	1.0	0.983103
294.088107		3.0	1.0	0.983103

Scenario 4:

```
model.set('hot_PCM.T_start', 273.15 + 55)
model.set('cold_PCM.T_start', 273.15 + 10)
model.set('RoomModel.roo.T_start', 273.15 + 21)
```

Indoor Temp	Schedule	Input	PCM Cold SOC	PCM Hot SOC
294.150000		3.0	1.0	1.139381
294.150000		3.0	1.0	1.139381
294.150000		3.0	1.0	1.139381
294.150000		3.0	1.0	1.139381
294.149999		3.0	1.0	1.139381
...		...	...	...
294.094754		3.0	1.0	1.139381
294.093130		3.0	1.0	1.139381
294.091481		3.0	1.0	1.139381
294.089807		3.0	1.0	1.139381
294.088107		3.0	1.0	1.139381

Problem 2: FMU Simulation doesn't run at iteration = 2

```
# Run the simulation from start_time to final_time with specified inputs and options
res = model.simulate(start_time=time_points[0], final_time=time_points[-1], input=input_data, options=opts)
```

The input\_data for the FMU model in Closed\_loop\_simulation.ipynb

```
(['schedule_input', 'mpc_enable'], array([[0.000e+00, 2.000e+00, 0.000e+00],
      [4.320e+03, 2.000e+00, 0.000e+00],
      [4.320e+03, 0.000e+00, 0.000e+00],
      [1.296e+04, 0.000e+00, 0.000e+00],
      [1.296e+04, 3.000e+00, 0.000e+00],
      [2.160e+04, 3.000e+00, 0.000e+00],
      [2.160e+04, 2.000e+00, 0.000e+00]]))
```

The input\_data for the FMU model in the MPC integration in iteration = 1 (works fine)

```
Start time: 0.0
Final time: 3600.0
Input data is:
(['schedule_input', 'mpc_enable'], array([[0.0e+00, 3.0e+00, 1.0e+00],
      [3.6e+03, 3.0e+00, 1.0e+00]]))
Simulation options: {'solver': 'Cvode', 'ncp': 2, 'initialize': True, 's
andler': None, 'return_result': True, 'result_store_variable_descriptio
', 'external_event_detection': False}, 'Radau5ODE_options': {'atol': 'D
RodasODE_options': {'atol': 'Default', 'rtol': 'Default', 'maxh': 'Defa
```

The input\_data for the FMU model in the MPC integration in iteration = 2 (Error)

```
Start time: 3600.0
Final time: 7200.0
Input data is:
(['schedule_input', 'mpc_enable'], array([[3.6e+03, 0.0e+00, 1.0e+00],
      [7.2e+03, 0.0e+00, 1.0e+00]]))
Simulation options: {'solver': 'Cvode', 'ncp': 2, 'initialize': False, 's
handler': None, 'return_result': True, 'result_store_variable_descriptio
t', 'external_event_detection': False}, 'Radau5ODE_options': {'atol': 'De
RodasODE_options': {'atol': 'Default', 'rtol': 'Default', 'maxh': 'Defa
An error occurred: Failed to get the Real values.
ERROR: PyCall.PyError("$$(Expr(:escape, :ccall(#= C:\Users\Fred\juli
```

The error says "Failed to get the Real values"