RESIDENTIAL MICROGRID DATA FORMAT SPECIFICATION

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1. Introduction

This document describes the format of the residential microgrid data set as well as relevant comments and information about the data. The data set is the basis for the analyses presented in [KS12]. It is provided as a comma-separated values file (file name: `ResidentialMicrogridDataSet.csv`).

2. File Description

We give a detailed description of the data format. For each column in the comma-separated values file `ResidentialMicrogridDataSet.csv`, the column header, its type, and a brief description of its contents are specified in Table 1. The header names either, if possible, match the corresponding parameter names in [KS12] or are a textual description of the columns' content.

3. Additional Information

In this section, we list, in no particular order, relevant issues and clarifying points relating to the data.

- The data set in `ResidentialMicrogridDataSet.csv` provides the relevant parameter time series as listed in Table 2 in [KS12] plus weather related data such as global solar irradiance and ambient air temperature. All other parameter values are provided in the appendix of [KS12].
- The numbers for total generation and total requirement as given in Table 3 in [KS12] can be verified by summing up the corresponding numbers in `ResidentialMicrogridDataSet.csv` between 38838 $\leq$ Date and Time $\leq$ 39202.36458.

4. Errata Corrige

- The correct formulation of constraint (28) is the following:

$$\sum_{\substack{s \in T : s \geq \max\{1, t - L^{dsw} + 1\} \\ \wedge s \leq \min\{t, n - L^{dsw} + 1\}}} v_s^{dsw} P^{dsw,eex} = p_t^{dsw,eex} \quad \forall t \in T$$

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Table 1. Description of the data set in `ResidentialMicrogridDataSet.csv`

Field Name	Type	Remark
Date and Time	Float	Time step t, i.e. the beginning of time intervarl $[t, t+1)$. The serial number is the date-time code used by Microsoft Excel for date and time calculations. Formaitting the cell as a date will make the date and time human-readable. Excel stores dates as sequential serial numbers so they can be used in calculations. By default, January 1, 1900 is serial number 1, and January 1, 2008 is serial number 39448 because it is 39,448 days after January 1, 1900. Microsoft Excel for the Macintosh uses a different date system as its default. Source: `http://office.microsoft.com/en-us/excel-help/today-HP005209318.aspx?CTT=1`
Weekday	String	Current weekday.
Global Solar Irradiance	Float	Global solar irradiance in $[t, t+1)$ in Watt.
Ambient Air Temperature	Float	Ambient air temperature in $[t, t+1)$ in degree Celsius.
C^mgd_t (CH)	Float	Electricity rate in $[t, t+1)$ in $\frac{\text{Swiss Franc}\cdot 10^{-2}}{\text{Watt Hour}}$. Scenario: "CH electric rate".
C^mgd_t (SE)	Float	Electricity rate in $[t, t+1)$ in $\frac{\text{Swiss Franc}\cdot 10^{-2}}{\text{Watt Hour}}$. Scenario: "SE electric rate".
C^mgd_t (WDK)	Float	Electricity rate in $[t, t+1)$ in $\frac{\text{Swiss Franc}\cdot 10^{-2}}{\text{Watt Hour}}$. Scenario: "WDK electric rate".
C^ngs_t	Float	Natural gas rate in $[t, t+1)$ in $\frac{\text{Swiss Franc}\cdot 10^{-2}}{\text{Watt Hour}}$.
P^{esp,eim}_t	Float	Electric power supply from the electrical solar panel in $[t, t+1)$ in Watt.
P^{tsp,tim}_t	Float	Thermal power supply from the thermal solar panel in $[t, t+1)$ in Watt.
P^{ael,eex}_t	Float	Aggregate electrical load of a single family household in $[t, t+1)$ in Watt.
Allowed Operating Time Dishwasher 1	Binary	"1" if it is allowed to run the dishwasher in $[t, t+1)$, "0" otherwise. (To avoid modeling problems caused by more than one dishwashing job within the prediction horizon, the dishwashing jobs are divided into two columns, i.e. Allowed Operating Time Dishwasher 1 and Allowed Operating Time Dishwasher 2.)
Allowed Operating Time Dishwasher 2	Binary	"1" if it is allowed to run the dishwasher in $[t, t+1)$, "0" otherwise.
K^evh_t	Binary	First "1" in sequence indicates the time of connection of the electric vehicle to the microgrid, i.e. t^{evh,rel}. Second "1" in sequence indicates the time of disconnection of the electric vehicle from the microgrid, i.e. t^{evh,due}. Third "1" in sequence indicates the time of connection of the electric vehicle to the microgrid, i.e. t^{evh,rel}. And so on.
E^{evh,ub}_t	Float	Upper bound for the state of charge of the electric vehicle in $[t, t+1)$ in Watt Hours.
E^{evh,lb}_t	Float	Lower bound for the state of charge of the electric vehicle in $[t, t+1)$ in Watt Hours.
P^{hhw,tex}_t	Float	Thermal power requirement for heating and hot water preparation in $[t, t+1)$ in Watt.
U^fri_t	Binary	The refrigerator's original operating schedule in terms of on (="1") and off (="0") status in $[t, t+1)$.

References

[KS12] Phillip Oliver Kriett and Matteo Salani. Optimal control of a residential microgrid. *Energy*, 42(1):321 – 330, 2012.

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