CE Model
Hydro Generation

1 Introduction

This document details the methods used in the CE model to simulate generation by hydro power plants in the SERC region. It uses data generated by the MOSART model developed by PNNL.

MOSART [1]is a computer tool that simulate water flows in river systems that include dam systems. In our work it is combined with the VIC and RBM models to simulate stream flow temperatures in the rivers in the SERC system taking into account the existence of reservoirs in these rivers.

MOSART uses rule curves to estimate the water discharges in the reservoirs. When the reservoirs are also part of a hydro generation power plant we use these discharges to estimate the energy generated by the unit.

This document details the methods used for computing the energy from these hydro power plants.

2 Calculation of monthly generation

$$P_{y,m,i} = P_{m,i}^{base} \times \left(\frac{\sum_i q_{y,i}}{\sum_i q_{y,i}^{base}} \right) \tag{1}$$

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[1]More information at `https://www.pnnl.gov/science/highlights/highlight.asp?id=1332`

P	hydro generation
P^{base}	2011-2015 average generation
q	discharge
q^{base}	base period discharge (1985-2004)
y	year
m	month
i	hydro power plant index

1985-2004 average discharge is chosen as baseline flow mainly due to two reasons: (1) 20-year average is more appropriate as baseline from a hydrological perspective to include both dry and wet years; and (2) 2011-2015 flow simulation uses projected climate forcing and is not validated against observation

3 Calculation of daily generation

- CMU will get daily H20 releases from Nathalie WM which we will use instead of mid term coordination (monthly to daily) to constrain daily hydropower generation.

- Nathalie will give us daily water release (and CMU will convert it to maximum daily hydro generation). Our UC model will then control for maximum power generation using the capacity of each power plant.

CMU will convert daily release to (maximum) daily generation by:

$$P_{day}^{MAX} = P_{month}^{PNNL} \frac{q_{day}^{PNNL}}{\sum_{day \in month} q_{day}^{PNNL}}$$