# 1\_br\_complete

Period: 07/01/2012 to 07/31/2012 (mm/dd/yyyy)

Input file names:

hydFile="../data/hydro/hydro\_data\_br\_1.csv",

hydFeather="../data/hydro/br\_shype\_hydro.feather",

windFeather="../data/wind/wind\_br.feather",

solarFeather="../data/solar/solar\_GAMS\_br.feather",

loadFeather="../data/load/load\_Br\_2014.feather",

transmissionCSV="../data/transmission/linesCapacities\_br\_1.csv", investCSV="../data/investOptions/investOpts\_br\_thermal.sources\_1.csv",

intermittentCSV="../data/investOptions/br\_intermittent\_opts\_1.csv"

This first run has presented an infeasibility in the minimum flow constraint on the region SE4. The original minimum flow should be 10503.26. I’ve put a slack variable and it’s presented values of 8500 approximately. So I’ve change the minimum flow of SE4 to 1500 and it worked.

# 2\_br\_complete

Changing investment costs of wind and solar to 10% of original values 🡪 the same results. Wind and solar don’t enter.

Coming back to original values of costs.

I’ve tried to change the WindPower column at wind\_br.feather file, but the result was the same: zero PV and wind.

Tomorrow: extremely high costs of thermal technologies in order to check if renewables will enter 🡪 same results

There was a mistake in GAMS formulation. Now we have some good results.

Now I’m producing results and comparing with ONS website.

# Yearly\_full\_run

Let’s verify if the model is running for an entire year. For that let’s make a run for 2012. This year was chosen because it is a kind of stable year in terms of inflows. The difference between 2\_BR\_COMPLETE and 2012\_RUN is that the variable costs are in millions of R$ of 2017 just like the investment costs. This change can affect the investment in intermittent renewables.

The input data was based in Newave deck of 2017, May.

Concerning the results, a strange one is that the model invests in thermal capacity in NE and N, but there is no thermal generation in this locations.

# validation\_2012

In order to validate our model, let’s make a run using the ONS deck of 2012 and zero investment costs. Let’s choose December of 2012. After that, we are able to access the following indicators:

* graphs that I already have;
* correlation between COPA time series and ONS time series;
* RMSE (Perhaps we will need a package to access it);
* point graphs to verify the differences between the time series.

## 25.09 – bounds on reservoirs

In our meeting, Johannes and I have implemented bounds on reservoirs to the first and last hour of 2012 year. First we have created two columns on file “hydro\_data\_br\_2012\_1.csv” containing initial and terminal levels of the reservoirs. This data was achieved from new ONS website.

After that, we went to “functions\_gdx\_transfer.R” and added the parameters names (initReservoir and termReservoir) to this file (lines 141 and 142) in order to apper on GDX file “input\_tr”.

After that, we have added these parameters on GAMS code (changing\_time\_resolution.gms, lines 50 and 51) and we have set the code to load the parameters (line 56).

The next step was to implement bounds of reservoir levels constraints (lines 251 to 265). We have also implemented a constraint regarding transmission to certify that all energy amount that goes to a certain region comes to this region (line 319).

The results, .gdx file, figures and statistical indicators table were saved in “COPA\runs\Validation\_2012” named “BASE CASE – HYDRO BOUNDS – 25.09”.

## Sensitivity to check thermal generation

This run is still under the umbrella of VALIDATION\_2012. We will change the constraint of “maximum hydropower production” in GAMS (changing\_time\_resolution of 25.9) to check when the model generates thermal power.

I`ve made many runs using the range of 71 to 50% of maximum hydro generation and I`ve verified that hydro correlation in SE/CO decreases and increases in N. The thermal generation increases while hydro generation decreases of course. Consequently the total system costs increases.

# baseline scenario draft

Period: 2012-01-01 01:00:00 to 2013-12-31 23:00:00

Input files:

1. hydro\_data\_br\_1.csv: initial and final reservoir levels are the same of 31th May 2017, accordingly ONS website (<http://www.ons.org.br/Paginas/resultados-da-operacao/historico-da-operacao/energia_armazenada.aspx>).
2. br\_shype\_hydro.feather
3. wind\_br.feather
4. lineCapacities\_br\_1.csv
5. solar\_GAMS\_br.feather
6. load\_br\_2014.feather
7. br\_intermittent\_opts.csv
8. investOpts\_br\_thermal.sources\_1.csv

It took 3h34min on IIASA PC to run.

Total Cost: 604.336839 million reais 2017

## Testing\_16years

Period: 1999-01-01 01:00:00 to 2014-12-31 23:00:00

Input files:

1. hydro\_data\_br\_1.csv: initial and final reservoir levels are the same of 31th May 2017, accordingly ONS website (<http://www.ons.org.br/Paginas/resultados-da-operacao/historico-da-operacao/energia_armazenada.aspx>).
2. lineCapacities\_br\_1.csv
3. br\_intermittent\_opts.csv
4. investOpts\_br\_thermal.sources\_1.csv
5. test\_load\_16years.feather
6. test\_shype\_hydro\_16years.feather
7. test\_solar\_16years.feather
8. test\_wind\_16years.feather