

Energy Revolution or Energy Depression **The numbers do not add up**

The current power crisis of Venezuela continues to heat up, and for the first time you start seeing an increasing influx from a number of silenced voices sending desperate “SOS Signals” on the internet many under disguised names since there is great peril for simply communicating the facts even if professionally and constructively stated, to written press and audiovisual media.

That we have an acute power shortage in Venezuela it should not be a surprise, quite frankly it is very well documented fact, that highly respected engineers and electrical sector’s experts have been speaking about this since as far back as 2000, when these professionals sounded the alarm based on analytical thinking and serious technical, and forward thinking planning work about the need to reinforce Venezuelan’s Power Grid, only to fall on the deaf ears of the political leadership whose responsibility, accountability, privilege and stewardship is to serve the People of Venezuela.

In the mean time, the suffering of Venezuela’s population especially in the country’s interior continues to escalate, since Caracas is “untouchable” for application of the rotating power brown outs option and sadly as this article would demonstrate *what is a bad situation could is approaching a high likelihood of getting worse* and has to potential to materialize as one of the deepest crisis the South American nation has faced in her last 52 years, racking up a monumental tally in terms of unimaginable human suffering and unthinkable tangible great financial costs in a nation blessed with so much natural resources in the midst of the 21 Century defies common sense.

The numbers do not add up, the reasons for the acute drop as of late are quite simple:

1. **More generation, not less** from the Gurí Dam and Lower Caroní Chain (Cadena del Bajo Caroní) shown in Figure 1, keeps being demanded, which in turn requires more water flow in a diminishing approximately conical shape reservoir, aggravated by heat on a smaller lake with increased evaporation losses as a percentage of remaining volume (e.g. water that cannot be turbinated to generate power/MW.)

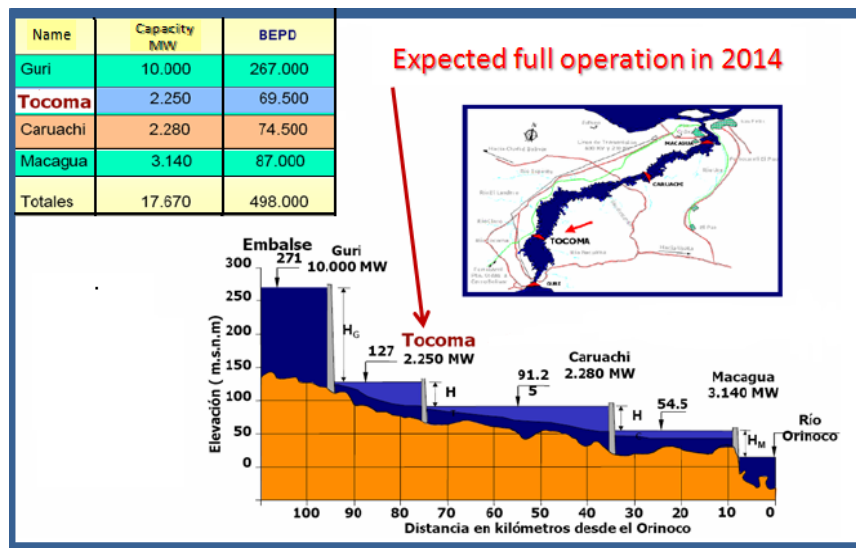


Figure 1, Gurí and Lower Caroní Plants – Current installed capacity is 15.420 MW or equivalent to 428.500 Oil Barrels Per Day

2. Why more generation and not less are being demanded from such a National Treasure and Referential Engineering World Class Power houses?

Several reasons:

2.1 It is a matter of physics:

Height of the water column \times Gravity force \times Water flow (inflow of the river) \times Turbine Efficiency (of the individual turbines being used) helps us calculate the power that can be produced.

The less water column (pressure head) you have the more water you need to make the same amount of MW.

2.2 Real life:

The reality of why more power is being demanded is a no brainer, plain and simple:

POLITICS for the here and now and forget the long term consequences.

The simple matter is that the thermoelectric fleet that has to show up and be counted on at this critical time is in great state of disrepair.

Most remaining units do not have the required availability and reliability to be counted on (in sufficient numbers), then the Gurí and Lower Caroní plants (Guri, Caruachi, Macagua I, II and III) need to generate more power or there would be more power rationing ***on a very short calendar year, which is politically incorrect.***

The predicament also is that in fairness, Government officials have the obligation to serve the MW load and as of late they are trying, given that this article is not politically motivated, let us wish upon them God's Speed for the good of the nation and minimization of world energy market adverse impact.

2.3 Short year:

This is a technical problem but the POLITICS for the here and now and forgets the long term consequences, requires clarification: *The year 2010 for Venezuela does not end on December 31, 2010, but rather on September 26, 2010;* (date of critical legislative power election) it would appear that it does not let capable engineers deal with the facts.

2.4 Show me the MW

The numbers do not add up "516 of New MW" since Jan 1, 2010, list them and show them to the nation. At best only 145 MW new MW can be accounted for or then tell the nation and demonstrate beyond any reasonable doubt that the OPSIS daily reports are wrong.

Do not confuse activity with accomplishments, do not misrepresent the facts though a plant "may be inaugurated" it is probably far from being properly released for reliable commercial operation. Be more honest with the Nation.

Several units are late and the state of the pre-operating trails is showing unexpected problems like Planta Centro Unit 1, this is normal and their engineers and workers need to be applauded by doing a responsible commissioning.

2.5 Respect

Show more respect and appreciation for the Venezuelan workers in the electrical plants and the engineers that know their units, value them, and listen to them.

Venezuela, needs big chunks of power fast from the thermoelectric plants in short order, 11 or 30 MW at a time helps but the pace is not fast enough.

Planta Centro needs to be recuperated as soon as possible and be repowered but even though practical proposals have been given no one in a position of accountability has the will to do anything about it. The ironic thing is that most of the parts are in the country but “other priorities and agendas” of personal reason or gain win over the legitimate right of the people to have safe, reliable and efficient electricity.

3.0 Before I forget; when will the water level get to the 240 MASL water-line?

That is a complex problem that takes many variables difficult to control, which therefore; requires a mathematical model to predict hard to control variables:

3.1 The weather (when will it start raining and how much),

3.2 The availability/reliability of the Lower Caroni plants, especially that of the older Units in Guri’s Powerhouse 1: Units 1 to 10, their time is coming to carry the nation once again like they did from 1968 to 1980.

But remember, this Grand Old Lady (The original Guri Powerhouse) is only capable of 2770 MW and only about 3.200 cubic meters per second, which would severely limit the MW production downstream plants: Caruachi, Macagua I, II and III.

3.3 The availability/reliability of the thermoelectric plant fleet

3.4 The up to date volumetric capacity curves of each of the segments of the entire reservoir segments e.g. useful volume:

3.4.1 – Zone A (Top and largest water tank, built for Guri’s Power house II); from 271 MASL to 240 MASL, providing a flooded area of 3.911 Km² or approximately 26.350 GWH of stored energy when full.

3.4.2 – Zone B (Middle and second largest water tank); from 240 to 215 MASL.
A water tank that is more of a factor for Units: 1 to 10 than for Units 11 to 20. At 240 MASL we can only use 2 units from Powerhouse II. From 240 to 235 MASL, we have to throttle back to ½ the output of Powerhouse II and at 235 MASL; we have to shut down all of the largest turbines to avoid mechanical structural damage.

3.4.3 – Zone C (Lower and smallest water tank); from 215 MASL to about 200 MASL, the water intake of Units 1 to 10 is reported at 196.5 MASL. At that point the reservoir is much smaller less than 800 Km² approximately 13.050 GWH of stored energy. Below 200 MASL you cannot use this water to make power; it is the **dead volume** of the reservoir.

3.5 How much power rationing the Politicians can stomach in light of the great hardship put on the people of the interior of Venezuela, since Caracas is off the power rationing options. “Caracas es Caracas lo demás es monte y culebra...” It rings true again. This is not about “regionalism” this is about reality.

Because of the complexity, it is hard to predict, **at best the answer has to be given in probabilistic terms**, but one thing is for sure, if we keep the strenuous MW generating pace of the Gurí and Lower Caroní Plants:

It is not on April 6, 2010 as reported once on some local newspapers (unless that expert has the volumetric curves) and it is not on the 3rd week of June 2010 (as reported by the President himself on National TV).

The Conical shape of the reservoir would not allow for that, it is more like Mid-May or the third week of May 2010, again simple physics:

At 271 MASL we have a lake that is 3.911 Square KM, the lake is getting smaller by the day and there is less water in it. Be honest with the people you have a lot of meters left but these meters do not equate to the same volume of useful "turbinable water".

The crisis is so potentially grave that there is no need to stretch reality, be honest:

Caruachi and Macagua I, II and III need to receive 6.000 m³/sec, to reach their Max. Power output, *if Guri cannot give that turbinated volume the Chain cannot make the power (MW).*

Also the above plants have reservoirs, but these reservoirs cannot be used as the Guri's Dam reservoir, these have smaller useful volume and the lower height of their dams require a lot of water flow to make the power due to the conversion factor of their installed units.

I am not a politician, and my comment is not politically motivated, the crisis is neither of the right or the left, it affects a whole nation that deserves much better than current results.

I write as a concerned engineering professional which only politics is to produce results for the benefit of mankind.

You can decree a National Electrical Emergency, you cannot decree: Integrity, Technical Competence, Transparency and Planning.

Also do not forget Time, Money and Bureaucracy, the latter is the craving of the second which in turn work against the first to get anything done in a timely manner. Time is not on the side of Venezuela.

May be start with "Moral y Luces son Nuestras Primeras Necesidades", and know the difference between Responsibility and Accountability. The world is watching, it is time for action because "What you do speaks so loud I cannot hear what you say". The MW the numbers are not there and time is running out very fast.