

## **Ideas for Tasmania's energy strategy.**

The output of existing Hydro schemes is difficult to raise substantially by any means other than efficiency gains. There is however another method of enhancing existing infrastructure by adding large pump/generators to achieve large scale pump storage. This method is used worldwide and can offer significant income for Tasmania. In the present situation with aluminium refining possibly closing, it is expected that a similar amount of old coal fired generation may also retire. Hopefully this will restore the variable prices that will enable the following to flourish.

### **My background;**

I was employed by Hydro Tas as a Power Station/ Substation Operator and later as a Power System Coordinator with Transend System Operations. I have a detailed knowledge of the whole power system from rivers, lakes, power stations, transmission and distribution. I am now retired but I am aware there are many opportunities with some extra investment to enhance power system usage and make better use of what we already have.

The output of existing Hydro schemes is difficult to raise substantially by any means other than efficiency gains and these are being employed. Raising of some dam levels may give minor advantages. There is however another significant method of using existing infrastructure by adding large scale pump storage. Dinorwig in Wales is a good example of this process

[http://en.wikipedia.org/wiki/Dinorwig\\_Power\\_Station](http://en.wikipedia.org/wiki/Dinorwig_Power_Station).

Locally Jindabyne and Tumut 3 in the Snowy Mountains and Wivenhoe in Queensland

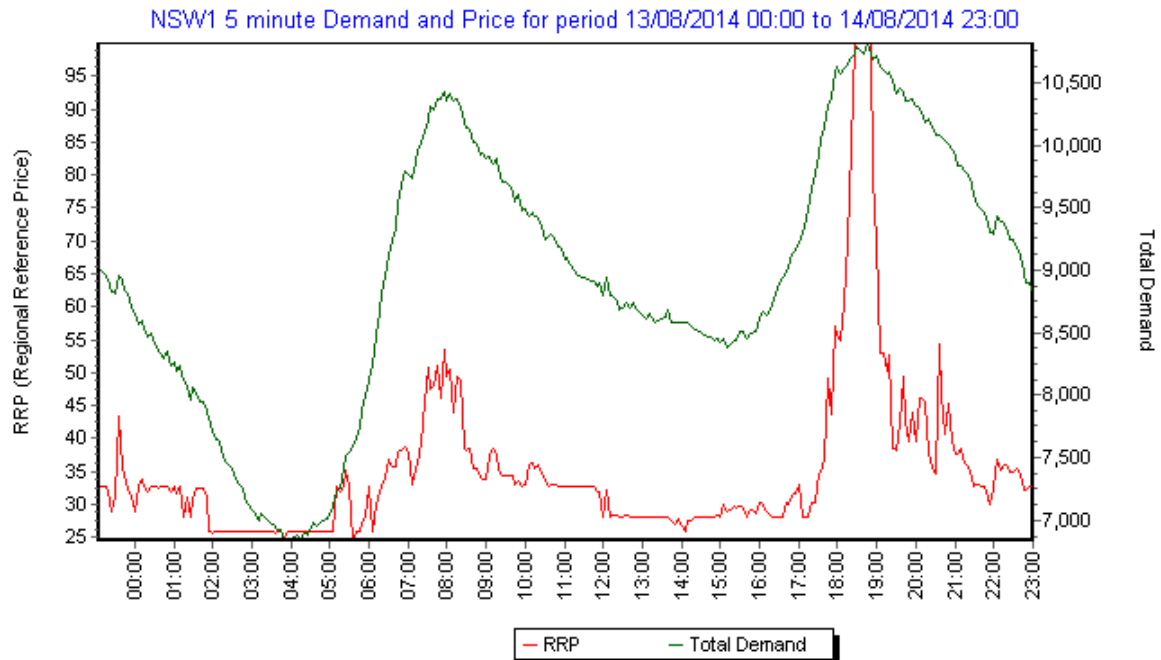
[http://en.wikipedia.org/wiki/Wivenhoe\\_Power\\_Station](http://en.wikipedia.org/wiki/Wivenhoe_Power_Station) are pump storage stations and they all offer vital support to the mainland power system. Tasmania's power system output per annum is double that of the Snowy Mountains and yet we are not fully utilising the structures that we have already installed.

**The following method if installed and used efficiently may offer substantial income** for government in doing what we have done well for a hundred years but with better tools.

The following may be achieved reasonably economically as generally transmission lines, dams, transformers, switchgear, remote control , communications, line protection and penstocks are already in place. With the addition of large pumps at the target sites, using the existing infrastructure, I believe we could achieve a relatively economical outcome. The recent upgrades of the Sheffield and George Town substations would enable this addition. Some of the infrastructure recently upgraded in these areas may never be fully realised with the possible loss of the aluminium smelter or Temco. This proposal may enhance our situation regardless of any heavy industry leaving or staying in the Bell Bay area. If better prices can be obtained by skilled trading this may give better returns to the government than the present situation.

As each day passes the price of power varies considerably and various opportunities arise where significant income can be earned buying or selling into this variation. Hydro Tasmania is already skilled and ideally placed to do this.

### Current Dispatch Interval Price and Demand Graph: NSW



From this graph it can be seen that the price (red) on this particular day varies from around \$27 /mWh to around \$100 /mWh and more and is potentially volatile which can be an advantage. Hydro output with respect to the market is complex but essentially they generate when the market price is desirable and allow import of mainland energy when the price is below a certain value. This method would broaden Hydro’s operation as it would still allow the above whilst also importing energy for storage at low price and releasing it when convenient. This could also make Tasmania one of the largest pump/generator sites in the World and it could not be duplicated anywhere in Australia. By this method it may also assist mainland generators to moderate their operations by allowing a more constant loading. Peak load export may achieve around 1600mW in favourable conditions.

By using the following method I believe another larger Basslink “pole” would be required to cope with the large flows in and out of Tasmania as we create our unique niche.

#### **Opportunities possibly exist to modify the following power stations for this new role;**

- |                      |       |
|----------------------|-------|
| 1. Devils Gate       | 100mW |
| 2. Cethana           | 100mW |
| 3. Wilmot            | 50mW  |
| 4. Lemonthyme        | 60mW  |
| 5. Bastyan           | 150mW |
| 6. Mackintosh        | 150mW |
| 7. Tribute (Anthony) | 50mW  |

**There are possible extra opportunities at the following locations for new structures;**

1. Totally replace the Arthurs Lake pump with perhaps 2 large pump/turbines of say 100mW each, tunnel to Great Lake and remove Tods Corner. Arthurs lake already has a dam and transmission on site. It has a small penstock which would need replacing. Efficient changes of loading both generation or pumping could also enhance the cost of running this scheme by generating for peaks and pumping off peak.
2. Create a new Pump Storage station between Lake Augusta and Great Lake and cable it's output across the Great lake to Arthurs Lake for connection to the system. This could be around 100mW, transmission is available at Arthurs Lake. A dam exists at Augusta but may need upgrading for this project. This whole project could be underground and under water. It may capture the annual peak runoff usually lost due to insufficient capacity of Liawenee and Monpeelyata canals. At peak times a significant quantity of water can only achieve Meadowbank value which is a significant loss to Hydro income.

**With the above alterations Tasmania could enhance the use of Basslink** by around 1000mW and take advantage of planned network additions such as Farrell to Burnie transmission lines, Farrell to Sheffield transmission lines, Sheffield to Burnie transmission lines and also installing the next step of higher voltage transmission at possibly 330kV or 500kV. Strengthening the network between Sheffield and George Town and Palmerston, Hadspen and George Town may be required. There is a looming advantage as Mainland coal fired power stations are retired in the Latrobe Valley this creates convenient transmission capacity path to Victorian load centres and major Eastern transmission trunk routes allowing for the extra capacity of Basslink. It may even negate lost transmission opportunities in Victoria which may be an opportunity for Tas Networks to purchase. With the technology of DC transmission displaying reliability and good local understanding, it may be in Tasmania's interests to purchase the second Basslink pole.

**Wind energy is difficult to schedule** and it is possibly not as reliable as the power system demand requires which can result in a lower value. The electrical output quality of wind farms has certain undesirable characteristics that can be corrected by running synchronous pump/generators as well. The pump storage process could purchase all wind power and refine it by time shifting or efficiently placing it into water storage at modified sites thus giving it a higher value as it then becomes reliable hydro power that can be scheduled in the normal way. Hydro could benefit from the margin.

**There are times of the year when the power system in the North West does need a generator** running, however due to cost etc they are generally shut down when water is not available presenting an unfavourable electrical situation. With pump storage it would be reasonable to expect either a pump or a generator to be on line in the new situation which would solve this problem. I believe if pump storage is found to be economical it would greatly enhance Tasmania's existing power system and create one of the largest, greenest and most efficient energy conversions in the world.

**The above would offer several advantages;**

1. An efficient method of storing mainland energy and returning it as higher value system peaking.
2. A better method of refining wind farm energy.
3. A second Basslink could be justified and both cables could be used more efficiently.

4. A second Basslink cable could have a much higher capacity than the existing one by the reverse use of the existing return cable.
5. Tasmania's power system would be strengthened as a by product.
6. North West area seasonal electrical problems may be solved.
7. By purchasing energy at low prices, Tasmania's system may benefit by "banking energy".
8. It would be reasonable to expect around 1000mW could be installed for this use.
9. Depending upon local loading it may allow around 2000mW to be peaked for export.
10. With the addition of the additional generator/pumps to existing lakes, it may solve future local generation needs and peaking capacity.

With the increased Hydro Tasmania output/input, we may be able to tap an opportunity and keep it without the possibility of any real competitor as virtually all significant hydro opportunities on the mainland have been developed. Also with the gradual introduction of electric cars we may be able to capture some of the market from the fossil fuel business; again if it is done well we may not have a serious competitor whilst servicing the overnight charging cycle.

**The following items would correct some significant losses for Hydro Tasmania;**

1. When Meadowbank Power Station shuts down a valve must be opened to maintain river flow. This flow is only to prevent salt water entering the intake of the Hobart water supply. If a small weir were constructed downstream of the water filtration plant to give vital storage, this valve would not need to be opened and energy could be retained.
2. Tarraleah power Station would be better placed underground closer to Lake King William. It could draw water directly from Lake King William and deliver it to the Nive River as at present. This may remove the need for the automatic Liapootah Dam and would raise the river level to the Tungatinah tailrace. This would gain many metres of head to a modified and enhanced Liapootah Power Station and thus much higher output and greater return for the amount of water. A new Tarraleah Power Station would gain massively with a greater output, higher efficiency and the solution of flood problems. Unused existing 220kV transmission is located close to the existing site and would need to be connected at Liapootah and extended to the new site. If a larger Liapootah dam were installed this whole scheme would be much more efficient and much greater long term output. This would also allow the removal of the restrictive Tarraleah canals and Derwent Pumps thus ongoing maintenance would be simpler. Tarraleah with an output of around 150mW may be possible, Butlers Gorge would virtually retire and Liapootah may be reconstructed to around 100mW or more. The Wayatinah bottleneck would need a solution. Old transmission ex Tarraleah could be retired and removed.
3. A tunnel at Lake King William could divert any surplus water to the upper Gordon River. Instead of spilling down the Derwent River.
4. With much greater wind generator capacity being installed, it might be better to use this energy directly for Hydro pumping. This may allow better time shifting until more desirable market opportunities present themselves.
5. Would it be possible to investigate a power scheme on the Huon River? 100mw may be a reasonable output from this area. This would solve some Southern load distribution problems and basic electrical problems such as better voltage control. Huonville flooding may be prevented by skilled operation.

6. An abstract idea; If a simple floating, rotating device like a large wheel with a vertical axle were constructed and placed in the upper reaches of the Tamar River, it might move the silt automatically with the flowing water. If this were of substantial construction it may be moved from time to time to shift significant mud. The rotation could be achieved by flowing water. As mud is brought into suspension, seasonal floods may assist this effort. It may be possible for it to move between the upper Tamar and the Trevallyn Power Station. If successful, it may be employed downstream of the Power Station and operated by tidal flows.
7. It has been proven that if Trevallyn Power Station peaks in synchronism with the tide, around 700,000 tons of silt can be moved annually. This should be re-employed.
8. Bronte Lagoon to Brady's Lake slalom course has been a remarkable success. Can it be enhanced by water driven chair lift to return the competitors back to the top, this may attract more tourists with its uniqueness. This course was for many years Australia's premier course. Accommodation nearby may help. Organised and well advertised meetings may also bring a good following with the area benefiting from the activity.
9. I believe the draining of Lake Pedder is still on the horizon for the Greens. Their process should be prevented from gaining international support by using valid and defensive plans now. There are disease free species such as platypus and species that have taken advantage of the larger lake. These would be threatened by draining. Create a team to prevent this process as soon as possible.
10. Restore Hydro, Transend and Aurora as one state owned business with strong management. The National Market has not resulted in a reduction in power price in fact it has been a demonstrated failure to the point of competing with food, heat, shelter and other fundamentals. With the ideas above, this organisation could earn a large income for the state if handled well and debt kept low.
11. The oil fired power station should be sold or scrapped.
12. Increase Catagunya dam level to enable the Catagunya lake to submerge the Wayatinah power station tailrace.
13. Re introduce Power Station tours at significant sites. Poatina, Trevallyn, Waddamana are interesting and could be part of an around Tassie guided tour.

**Ideas for Tourism and Inland Fishing reported by a keen fishing friend;**

1. Mossy Marsh gates are locked closed yet there is no equipment that needs protecting. Fishermen used to use this area for catching trophy fish. Is it possible to unlock this area? Advertise this area worldwide to enhance tourism.
2. The Derwent Pumps are another location for excellent fishing. This area is now locked. There is Hydro equipment in this area but it is fenced and locked. Is it possible to unlock this area?
3. Liapootah Lake is locked. The dam is fenced and used to be unlocked and part of the normal tourist wanderings. This is preventing fishermen from entering this area. Is it possible to unlock this?
4. The new lake below Poatina could be a good fishing spot. It is locked. Is it possible to unlock this? Organised tourist aimed occasions may assist tourism income.
5. The Monpeelyata Cascades are locked. Is it possible to unlock this?

6. The little Pine boom gates are locked. Is it possible to unlock this?
7. Fishing gear brought in from the mainland and overseas should be sterilised before use here to prevent disease and pests entering our pristine waterways.

Regards

William Fleming