Marinus and Battery of the Nation
A brilliant idea … or not?

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Victoria Energy Policy Centre

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Outline

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2. **TasNetworks' and AEMO's assessment of Marinus**
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What is BoTN and Marinus?

- Marinus: 2*750 MW DC cables (250km sub-sea, 90km underground, 220km in Tas) 220 kV converter stations in Tas, 500 kV converter stations in Vic.
- BoTN: Not yet clear but some combination of +400 MW hydro and +590 MW PHS. HydroTas say it will cost $2.25bn
- Wind: ~2,500 MW of additional wind, which AEMO says will cost about $2.4m/MW [~$6bn]

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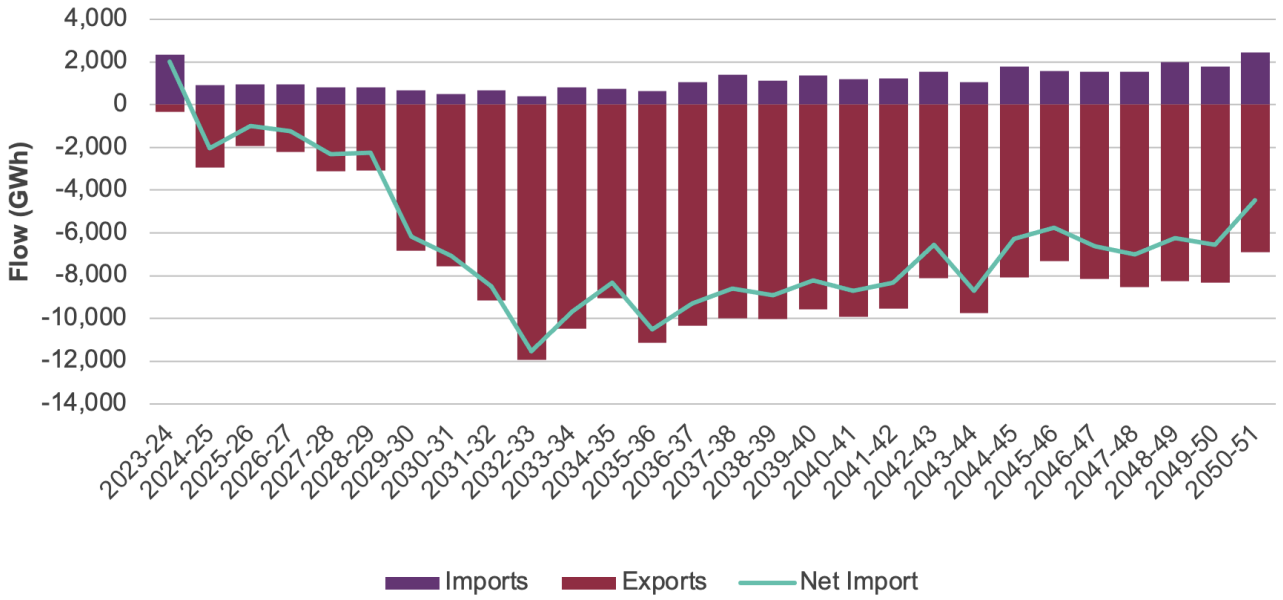
Here is what the Final ISP says on interconnector flow with Marinus + Basslink (step change scenario)



AEMO says that BoTN + Marinus creates a power system that substantially exports heavily to Vic for most of the time. Quite unlike Basslink now

Average annual northward flow 2032-2051	9,237	GWh
Average annual southward flow:	1,323	GWh
Average annual shipped:	10,560	GWh
Average annual shipped on Marinus (1,500MW/2000MW):	7,920	GWh

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TasNetworks and AEMO both say the benefits of Marinus exceed its costs. This is not credible.

- AEMO assumes, contrary to the Tas Government's instruction, that 1,900 MW of wind will be built in Tas even if Marinus is not built. They therefore exclude $4.7bn of capital outlay (+$33m pa fixed O&M) from the cost/benefit analysis. When accounting for this, the costs exceed the benefits for Marinus.

- TasNetworks (and AEMO) assumes that Tas wind displaces Vic gas. (Did they not notice the **legislated** emission reduction and renewable energy policy in Vic?) Of course wind in Tas will not displace gas in Vic.

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Our critique so far

- In 2020 report for Bob Brown Foundation 9BBF): 4-hour batteries half the cost of Marinus; even 8 hour batteries cheaper. So even before counting cost of BoTN, storage can be provided more cheaply than Marinus alone.
- In 2021 update to 2020 report for BBF: gap between batteries and Marinus/BoTN getting even bigger. There is likely to be demand for long duration (12 hour) storage but it is very small.
- In submission to AEMO Draft ISP: AEMO has incorrectly assumed that ~ 1,900 MW of additional wind will be built even if Marinus not built (**contrary to Tas Government's explicit statements**). Therefore, AEMO has greatly understated cost in their assessment of Marinus.

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What will Marinus TasHydro's share of BoTN cost + additional TAS wind cost ?

Marinus:	$4bn (note: $3.8bn in 2021 dollars, so more like $4bn in today's money)
TasHydro:	$2.25bn
Additional wind:	$6bn
Total capex:	$12.25bn

Annual charge to recover capital outlay of Marinus (6% real return, 40 year life)	= $266m
Annual O&M charge of Marinus (assume 1.5% of outlay)	= $60m
Total annual charge	= $326m

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So then, per MWh shipped, what will Marinus cost?

Average annual cost	$326m (slide 7)
Average annual electricity shipped on Marinus	7,920 GWh (slide 4)
Therefore average annual cost per MWh shipped	**$41/MWh**

Q: How does this compare to the average price ($/MWh) for transmission in the NEM in 2020?

A: TasNetworks ($11.4/MWh), AusNet ($11.7/MWh), Powerlink ($12.9/MWh), TransGrid ($7.3/MWh), ElectraNet ($20/MWh).

So, Marinus will cost ~ 4 times more, per MWh shipped, than TasNetworks charges in Tas or that AusNet charges in Vic.

TasNetworks says Tas consumers get ~6 % of benefit of Marinus Link, remaining 94% goes to generators and interstate consumers. In NEM, dominant model is customers (not producers) pay transmission. So, the relevant question: will customers in Vic be willing to pay $41/MWh on top of AusNet charge for electricity imported from Tas?

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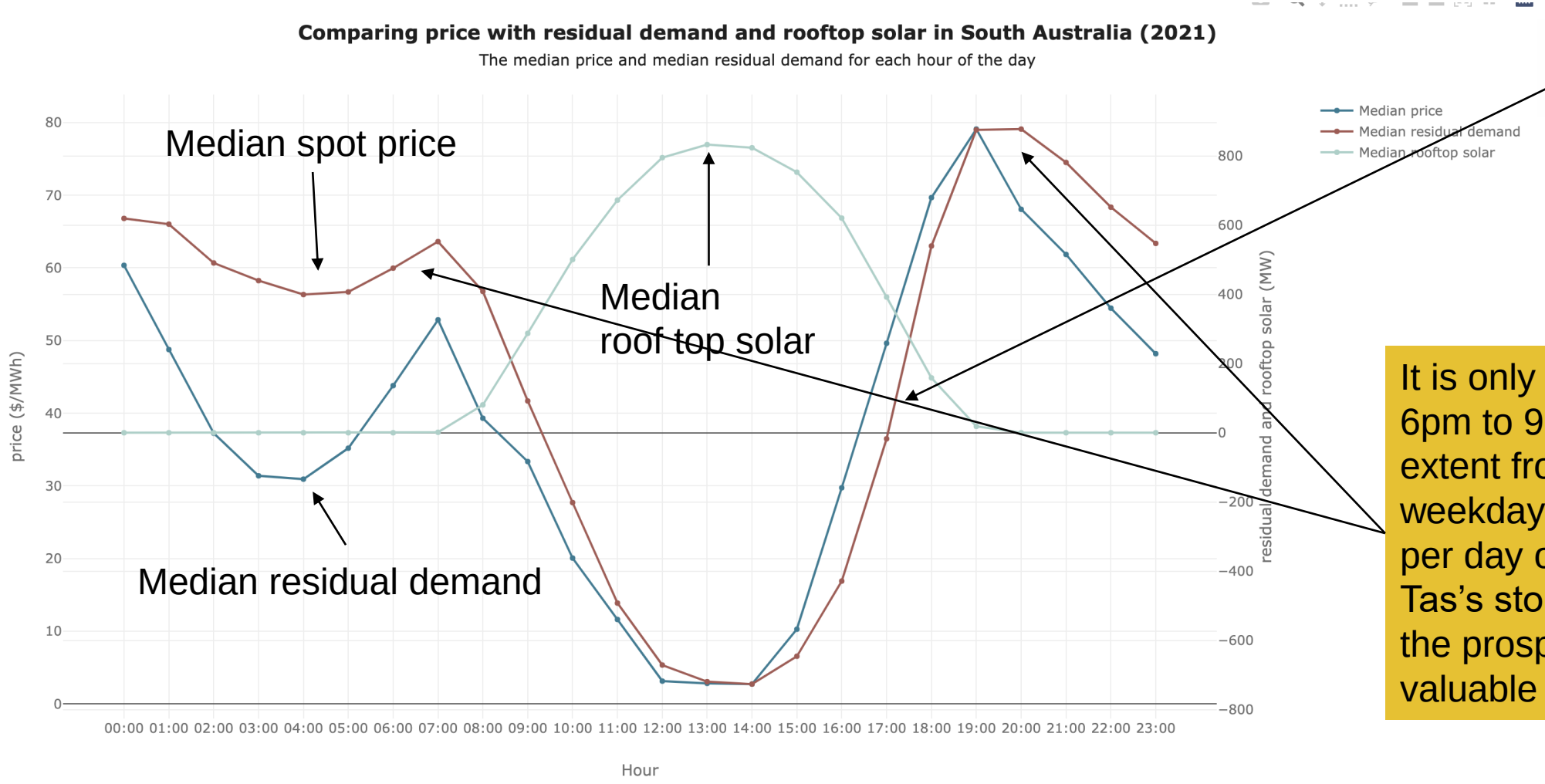
To be worth paying, the additional $41/MWh charge must be offset by energy from Tas that is is at least $41/MWh cheaper



Measured at median, Residual Demand is negative from 9am to 5 pm. Spot prices will be small at these times.

It is only in the window from 6pm to 9pm, and to a lesser extent from 6am to 8am on weekdays (i.e. max 5 hours per day on weekdays) that Tas's stored electricity has the prospect of being valuable in Vic.

So, in answer to the question of whether a $41/MWh inter-regional shipping charge is worth it …

- Electricity prices in Vic from 9am to 5pm on almost all days of the year will be much too low to mean supply from Tas plus a $41/MWh transmission charge will be competitive. It is only in the window from 6pm to 9pm on working weekdays that prices might be high enough to offer enough infra-marginal rent to cover the shipping charge from Tas.
- **But** BoTM means additional **capex** of $2.25bn for HydroTas: evidently considerable investment is needed to provide the "firming" service that the existing Tas power system is commonly understood to already have. And HydroTas will presumably also be obliged to enter into out-of-the-money long-term off-take contracts with the 3,060 MW of wind that AEMO envisages in TAS.
- **And** 4 hour batteries can already be built in Vic for about 1/2 price of HydroTas' share of BoTN (and by 2031 AEMO thinks they will cost about a ¼ price of HydroTas' share of BoTN).
- **And** batteries have much lower round trip losses.
- **And** production in Vic much lower transmission losses than from Tas.
- **So** how can it be plausible to conclude that Tas generation will be sufficiently competitive to defray TasHydro's additional $2.25bn, on their sales to Vic, let alone defray the $4bn + $60m per year needed for Marinus to get Tas production to the Vic market?

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What about entrepreneurial interconnectors ?

- HydroTas and other Tas generators have had plenty of time to run the numbers on an entrepreneurial interconnector.
- Basslink has failed, and Marinus will be much more expensive than Basslink.
- Zero chance of another entrepreneurial interconnector.

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In summary

1. Marinus+BoTN **does not deliver additional RE or storage** (to what would otherwise occur)
2. AEMO's and TasNetwork's conclusion that benefits>costs is not credible: it ignores more than half of the cost and also assumes that gas in Vic is displaced by wind in Tas. No, no, no!
3. Victorian customers would surely have no interest in paying 4 times what they currently pay for transmission (plus AusNet's charges) to buy Tasmania's electricity.
4. Nothing is stopping generators in Tas from pursuing an entrepreneurial interconnector. Why do you think they are not?
5. Its obvious that Marinus is not viable, this is no mystery. The mystery is why HydroTas possibly imagines that $2.25bn of more hydro and PHES + accepting 3 GW of out-of-the-money wind PPAs, will be attractive to it.
6. Marinus and BoTN will not get anywhere without great lashings of tax-payers' money. How can that possibly be justified?

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