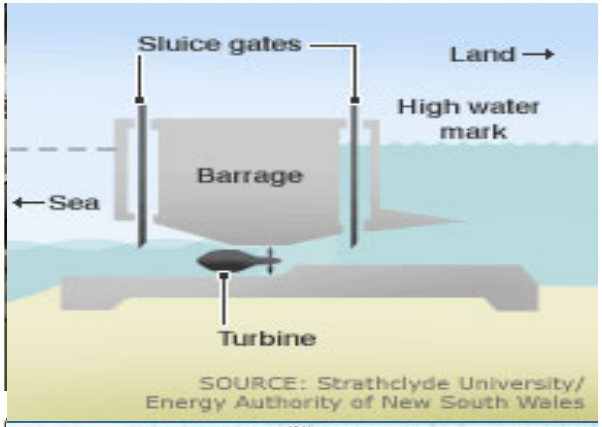
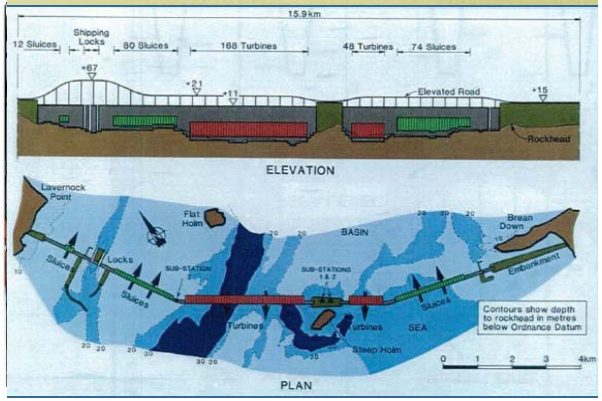
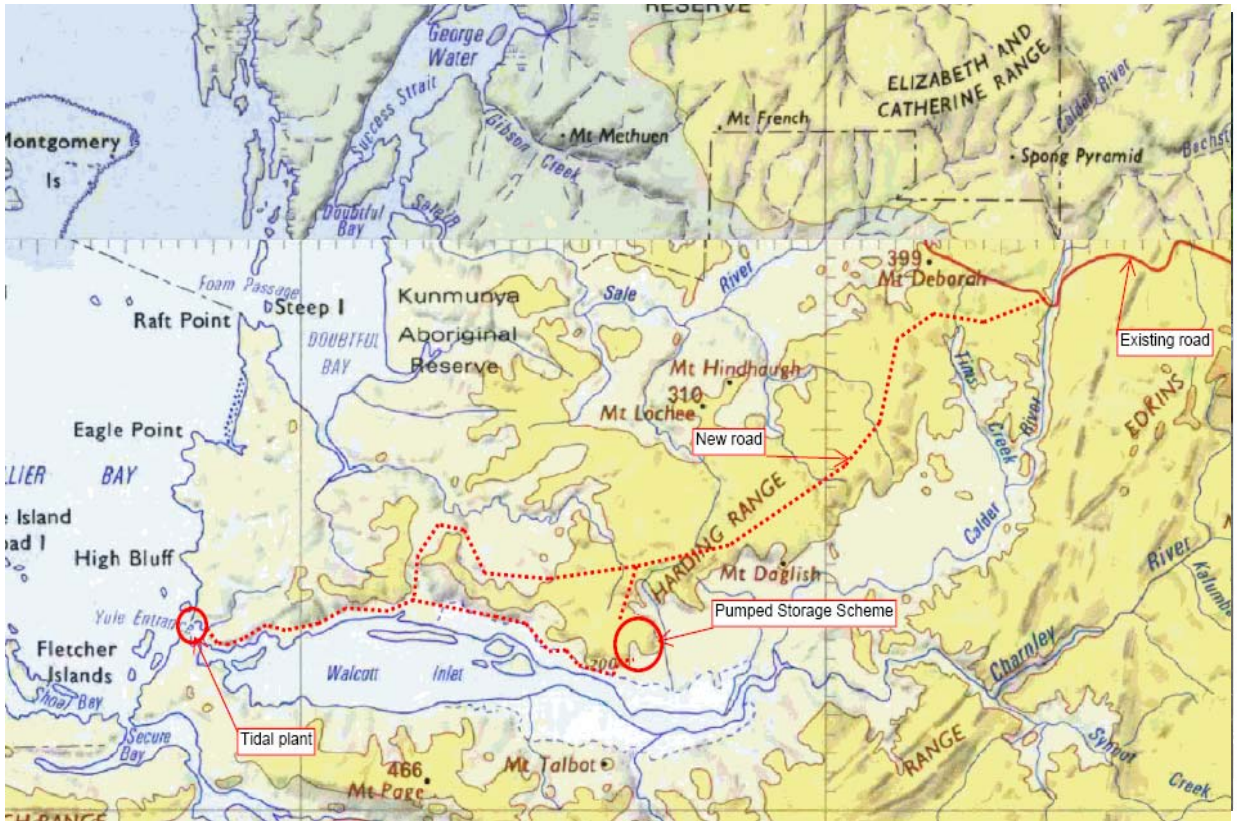






Clean Energy Expo Asia 2010 Conference

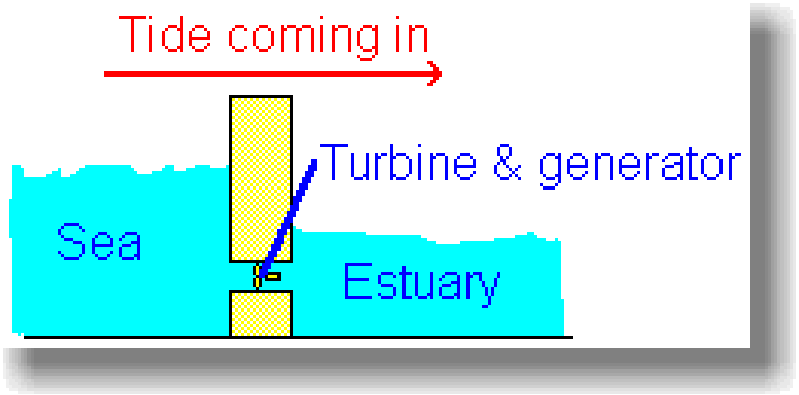
Tidal Barrage coupled with Pumped Storage Hydro Power – a novel concept for smoothing tidal power flows

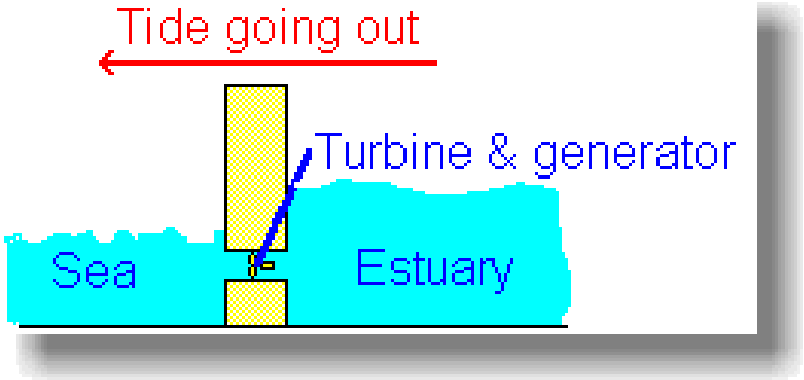
Eric Wolters
Executive, Renewable Generation

PB PARSONS BRINCKERHOFF
125 YEARS

Introduction to Tidal Generation

Barrage (tidal range)





Stream (tidal currents)

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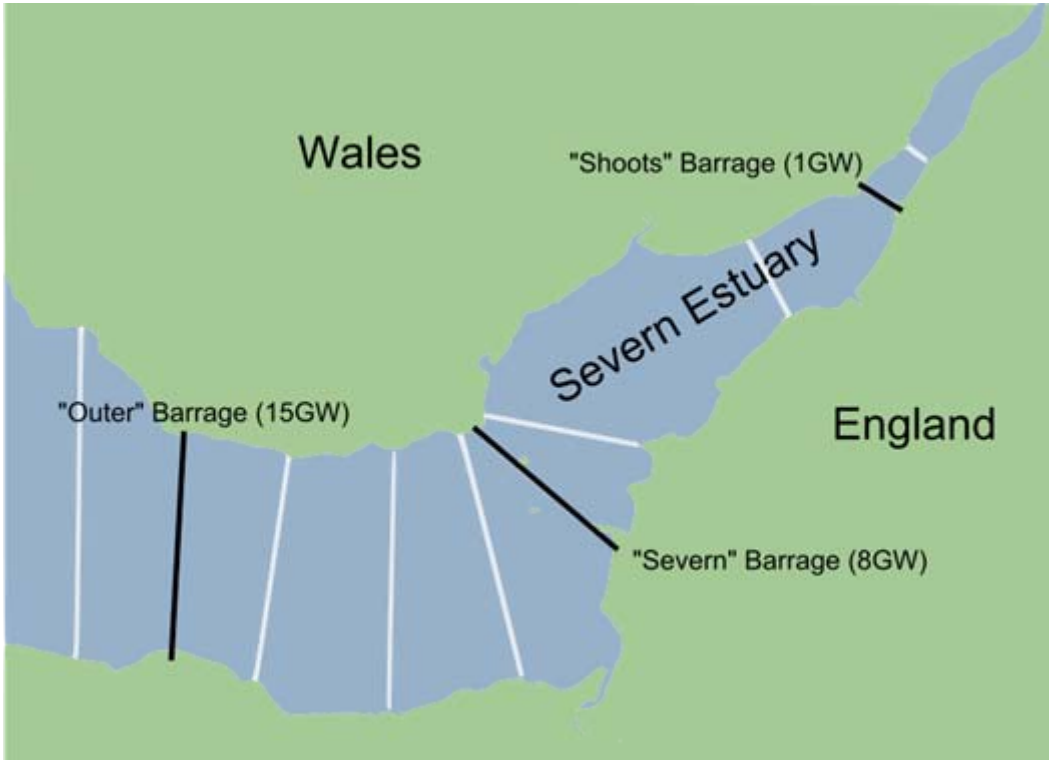
Severn Barrage Scheme



- Tidal amplitude 14.1m
- 2-year feasibility study commissioned by UK govt
- PB led a consortium of 10 specialist consultants
- 10 options 900MW-14,000MW

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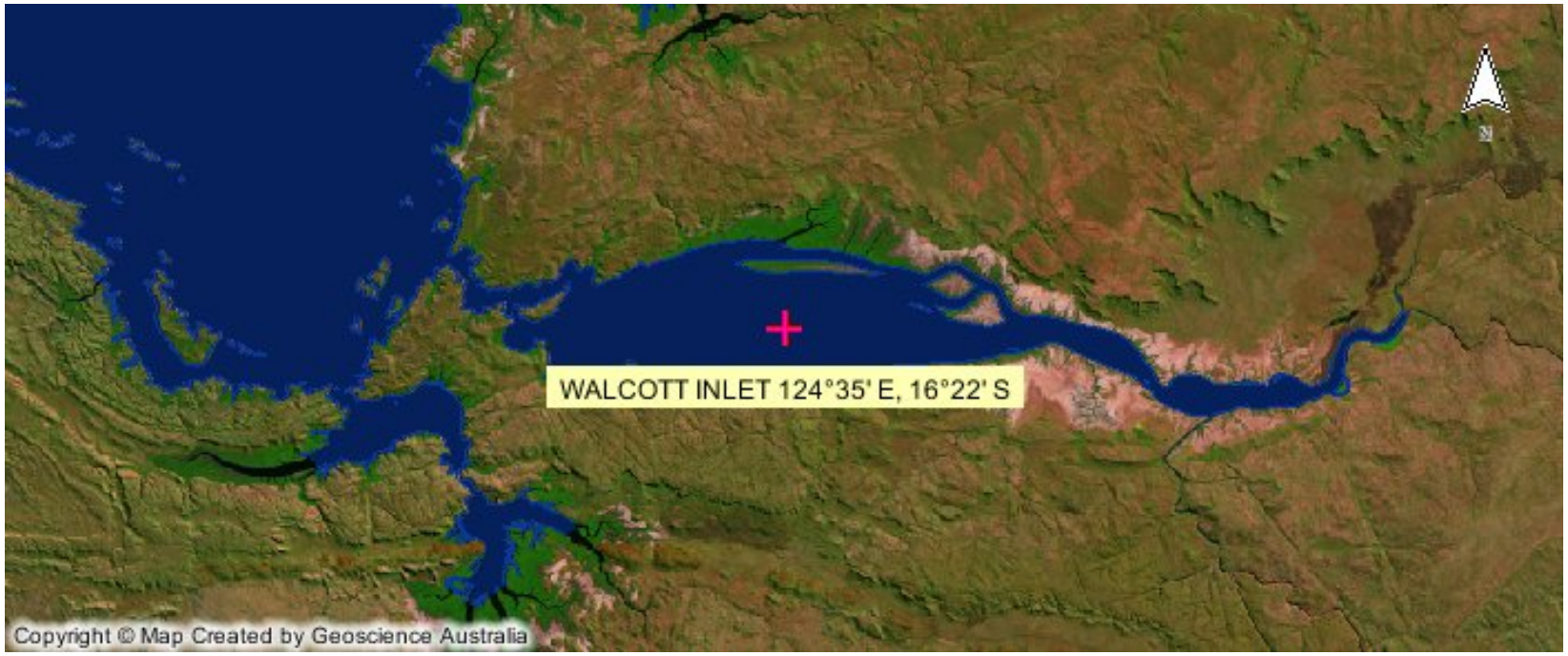
Walcott Inlet Scheme – a concept study



- 12.6m tides (among top 10 in world)
- 400m wide at estuary mouth
- 60 km long, 9 km at widest point

Study subsequently authorised and funded internally under PB's Business Initiatives Programme

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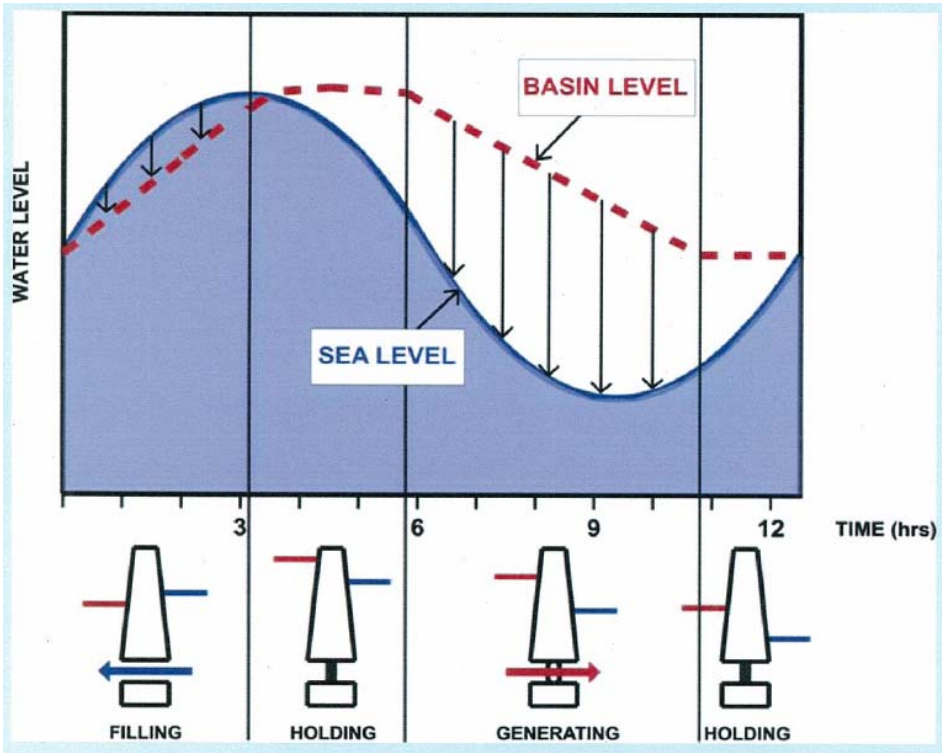
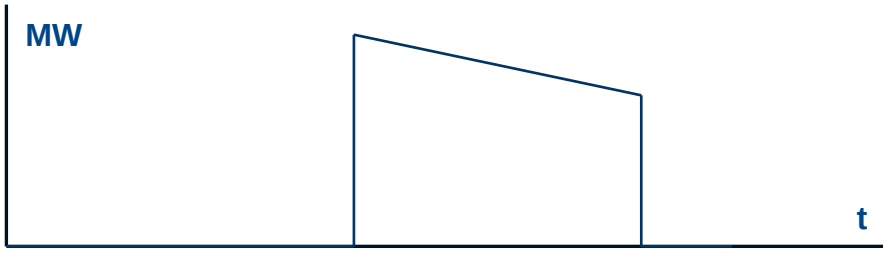
Delivery of power tied to timing of tides, not demand



(Showing ebb tide only)



How to smooth the power flow?

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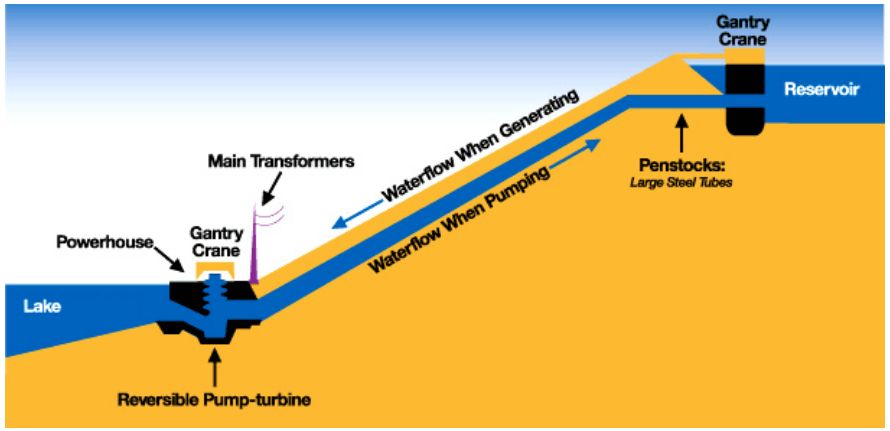
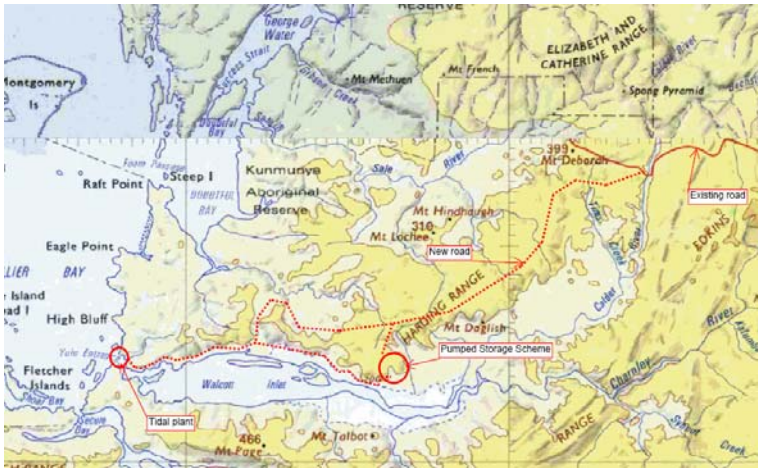
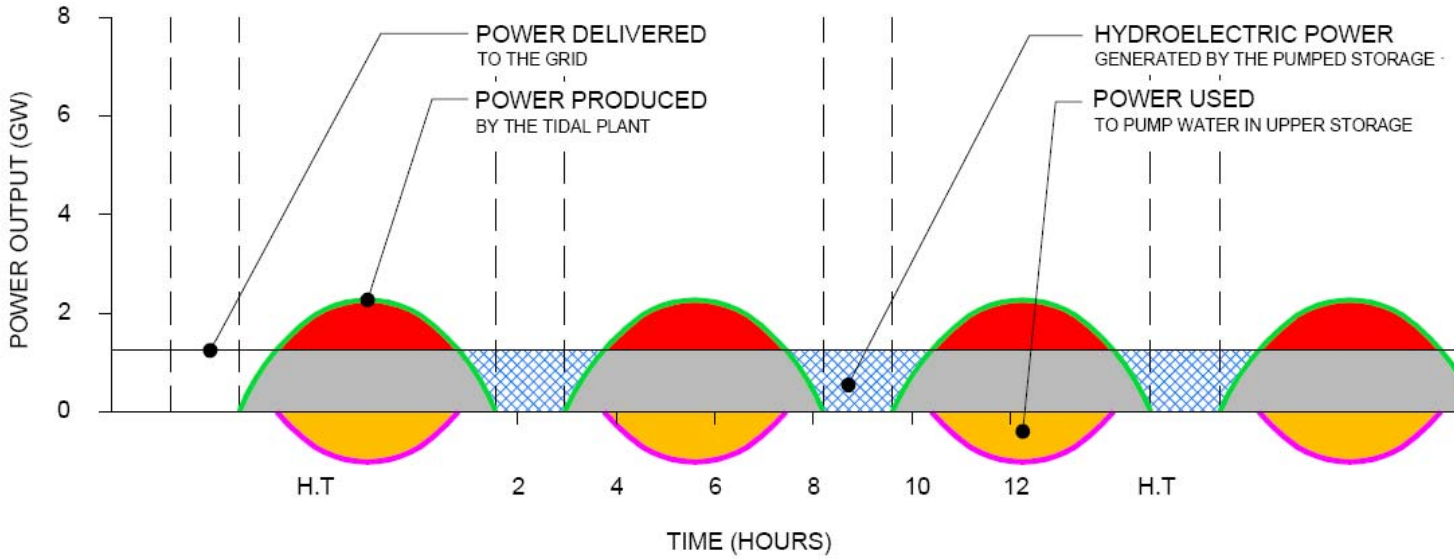
Supplemental Seawater Pumped Storage







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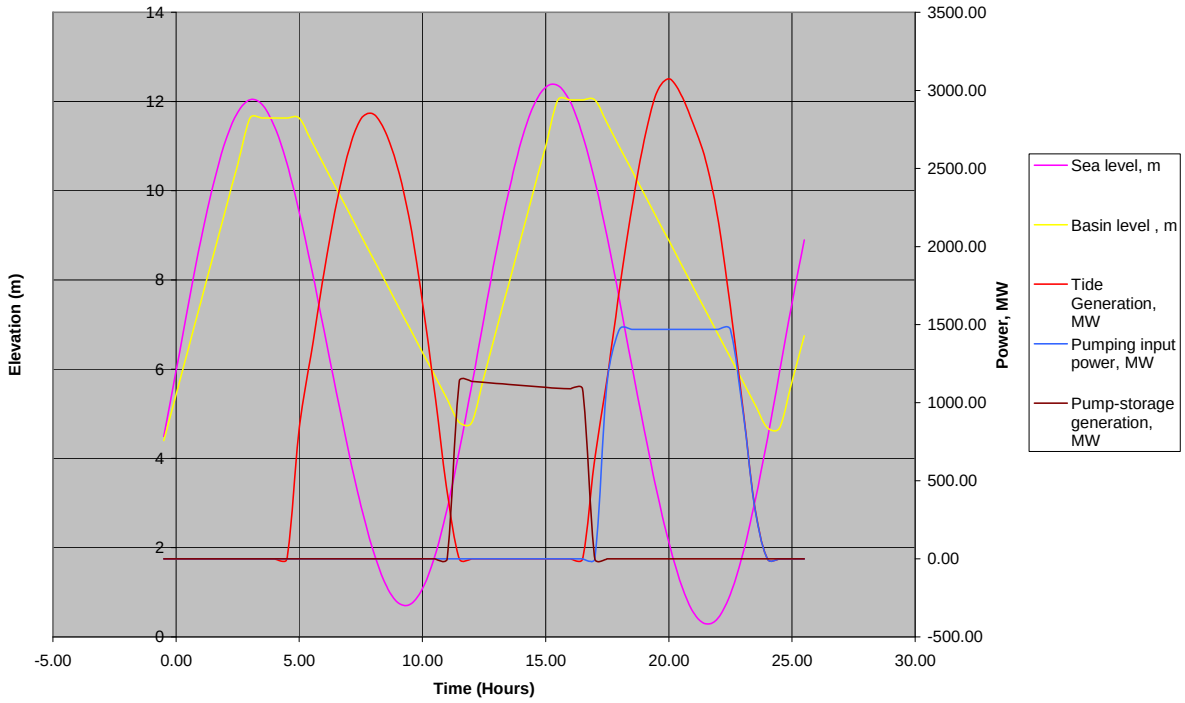
Energy Yield Calculations

- Sluice flow 144,000 cumecs
- Generation flow 75,000 cumecs
- Tidal head 1.5 - 7m
- Tidal power max capacity 4200 MW
- Pump storage capacity 1500 MW
- Constant delivered power 3000 MW
- Energy yield 4755 GWh p.a.



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Other aspects studied

- Site layout
- Site access - land, air, sea
- Civil works – barrage, geology, source of materials, upper reservoir, intake works, powerhouse, site infrastructure
- Generating plant
- Gates, screens, sluices
- Transmission
- Construction methodology
- Risks
- Environmental aspects
- Economics
- Market

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Est. Capital Costs (concept level accuracy only)

Component	Estimated Capital Cost (2008) $AU Billion	Capacity	Cost per installed kW $AU
Tidal Barrage	7.52	4200 MW	1,790
Pumped Storage Plant	1.56	1500 MW	1,040
Transmission lines (4000 km)	5.25	500 kV	
Indirect costs, risks, misc provisions	6.74		
Total	21.07		5,016 (on 4200 MW)

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For further study

- Model tidal stream technology coupled with seawater Pumped Storage
- Investigate alternative power evacuation options e.g. HVDC
- Review costs and business case sensitivities:
  - Fit the scheme to the market – e.g. what MW rating could be utilised in Perth?
  - What would make it viable in terms of $/ MW ?
  - Investigate opportunities to establish local industry to consume power in conjunction with deep water port at Derby - e.g. aluminium smelting or LNG processing

Thank you!

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