Reading Hydro CBS

Update on recent activities

Jeremy Thake: Electricity generation + why we use Archimedes screws

Juliet Hanfling: Volunteering at Reading Hydro

Anne Wheldon & Austin Jacobs: Innovation – where do we go next

Electricity generation update

Jeremy Thake, Operations director

Power generated since we started

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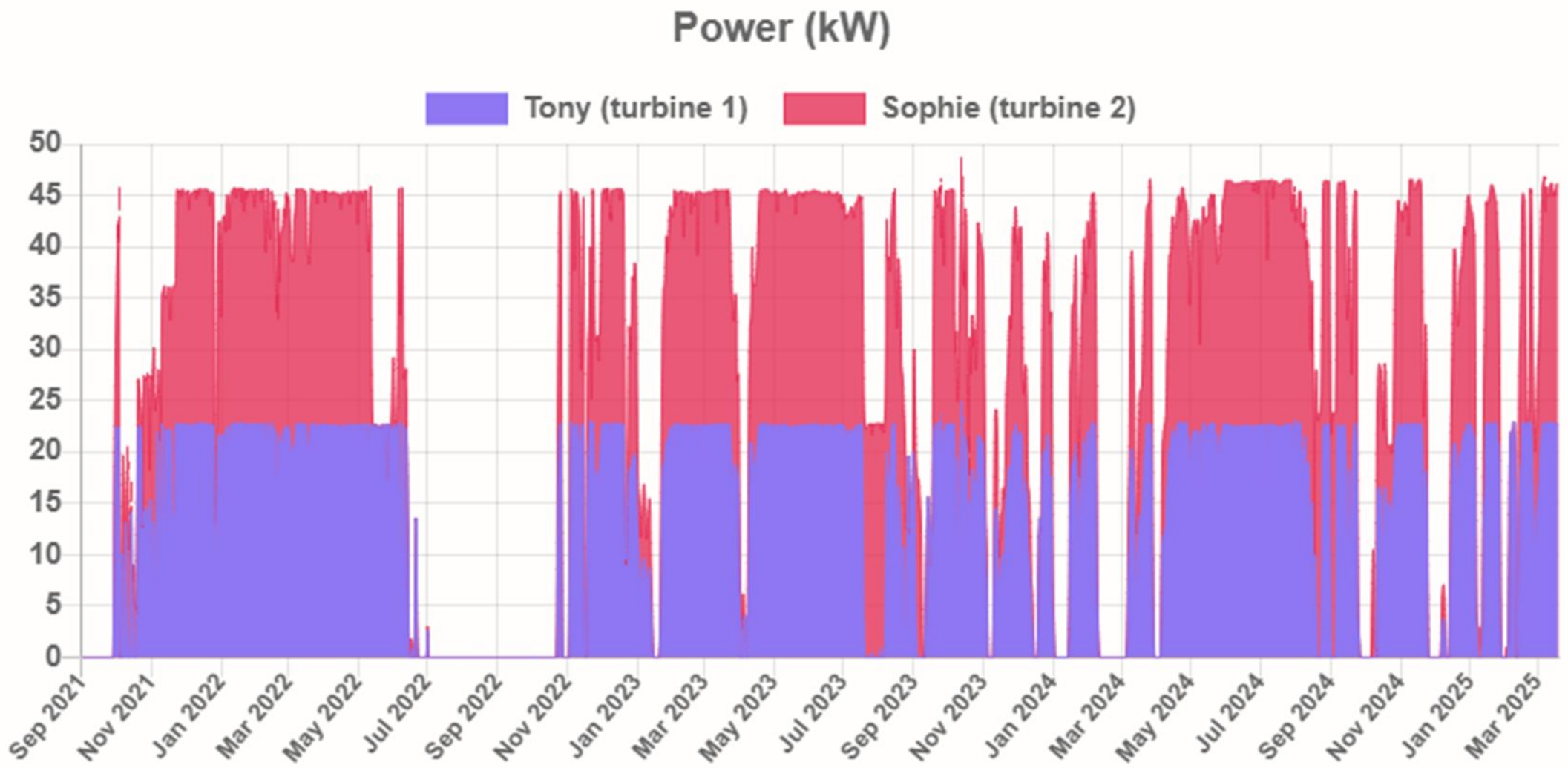
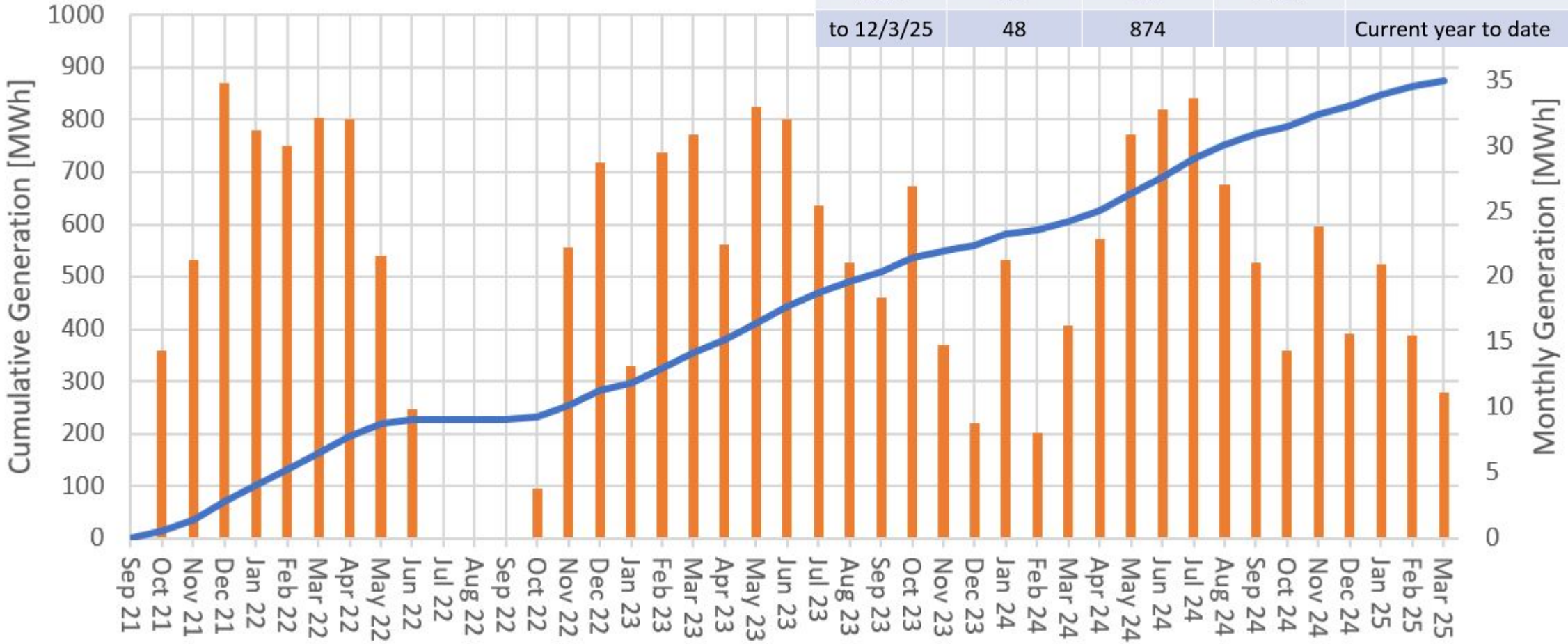


Energy generated since we started

Year	Generation MWh	Cumulative Generation MWH	Capacity Factor	Notes
2021	71	71		Part year, 1st year of operation
2022	211	282	52.5%	
2023	285	568	70.8%	
2024	259	826	64.0%	
to 12/3/25	48	874		Current year to date



Why do we use Archimedes screw turbines?

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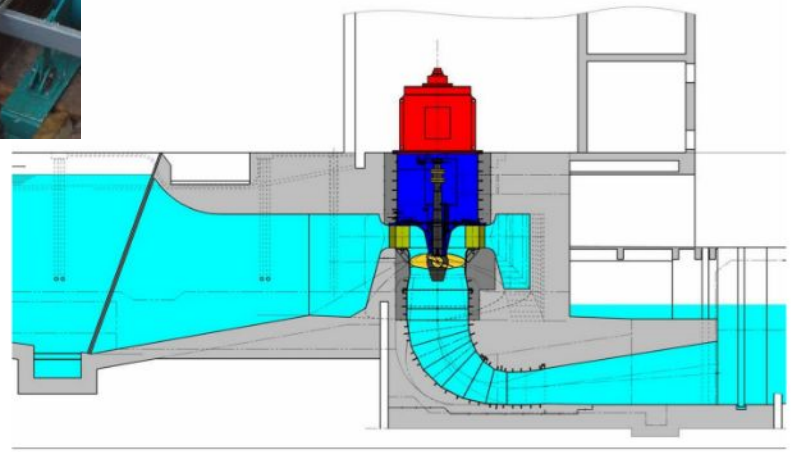
Jeremy Thake, Operations Director

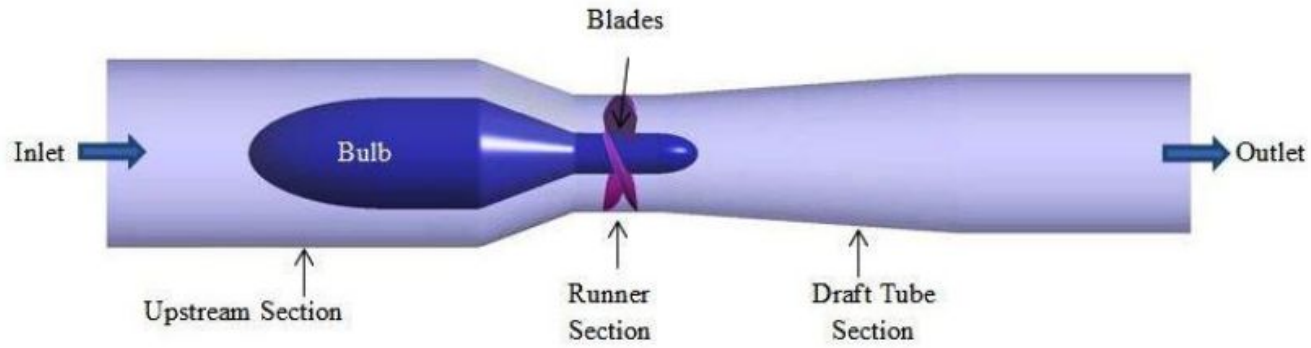
There are lots of different types of turbines, many of them smaller and more efficient.

So why did we end up with Archimedes Screws?

Types of turbines

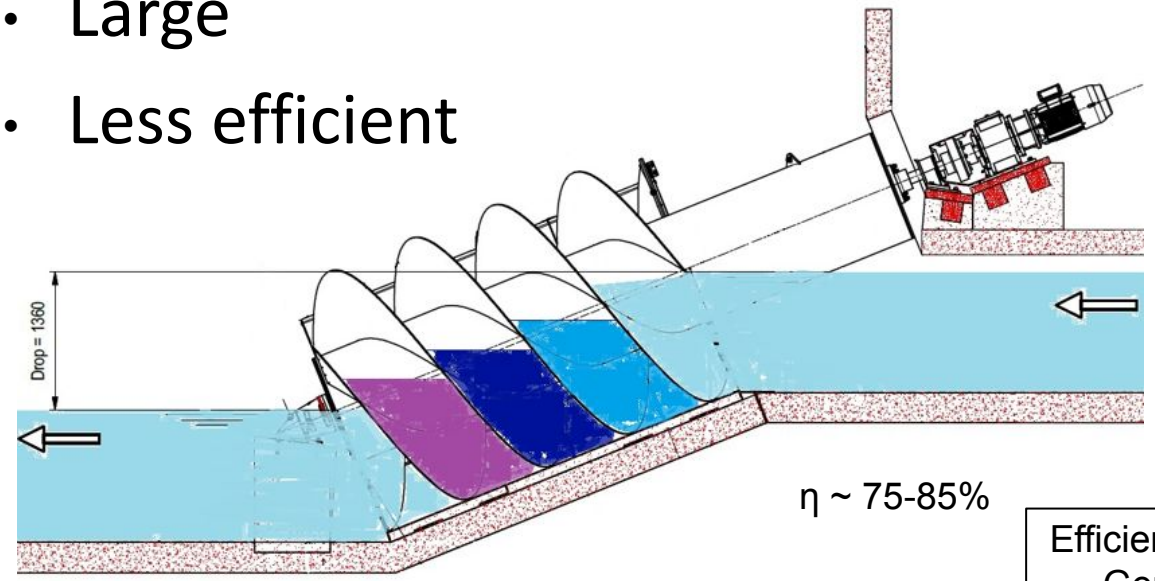
- Gravity turbines:
  - Water Wheels, Archimedes Screw
- Reaction turbines:
  - Propeller, Kaplan, Bulb, Francis
- Impulse turbines:
  - Pelton, Turgo, Crossflow
- Other weird and wonderful:
  - VerdErg VETT, Darrieus, Savonius





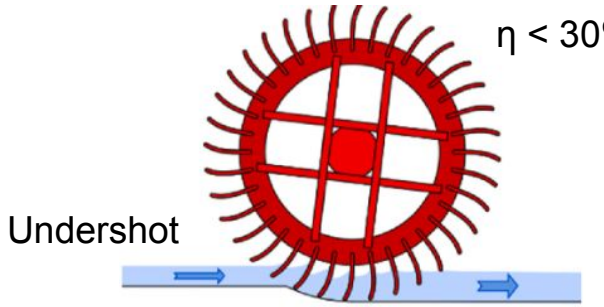
Gravity turbines

- Water wheels, Archimedes Screws
- Energy extracted from lowering ‘buckets’ of water
- Slow moving
- Large
- Less efficient



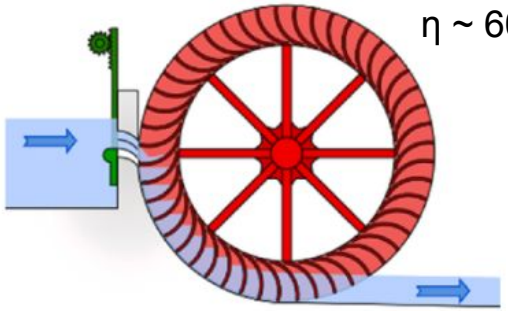
η ~ 75-85%

Archimedes Screw (Reading Hydro)



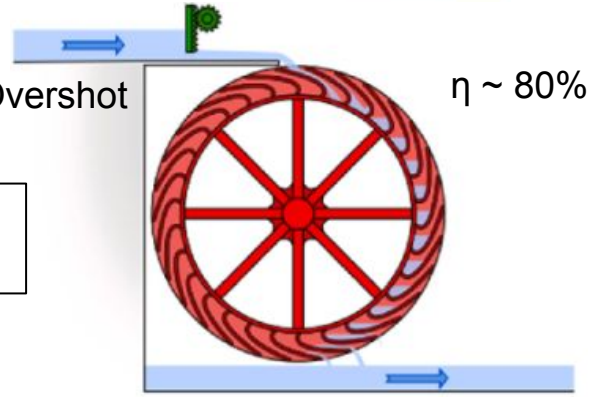
η < 30%

Undershot



η ~ 60%

Breastshot



Overshot

η ~ 80%

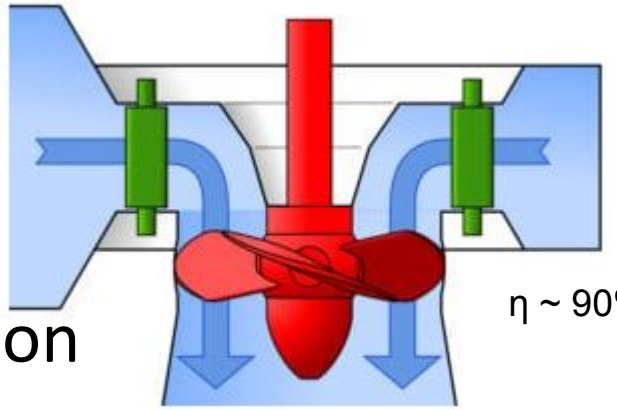
Efficiencies, η, are for the turbines only.
Generator efficiencies are ~ 85%

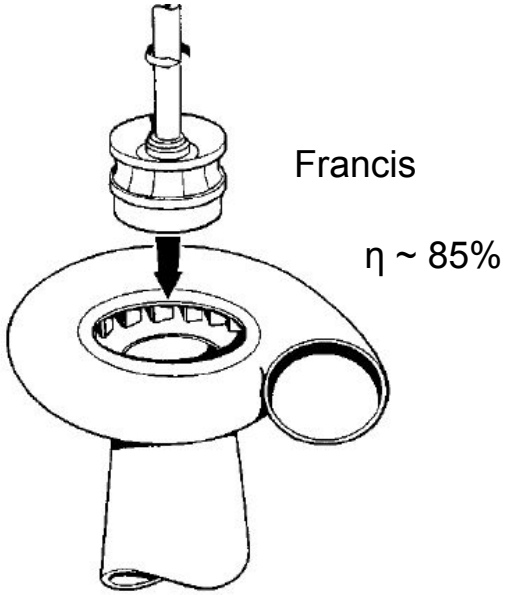
Reaction turbines

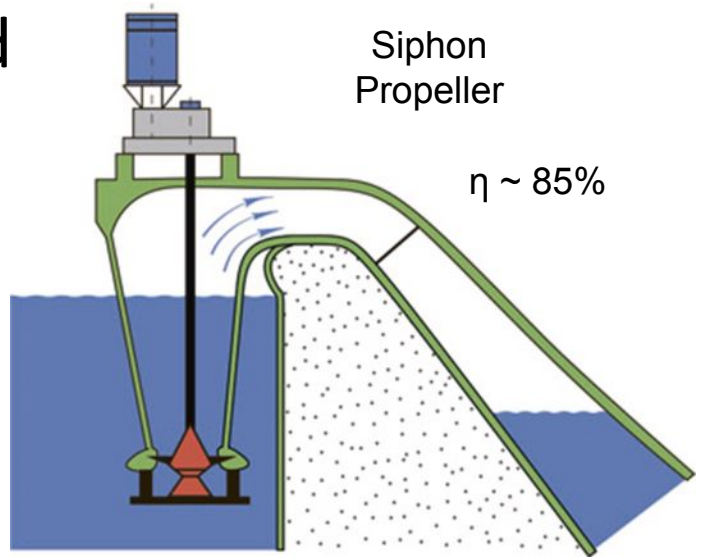
- Propeller: Kaplan, Bulb, Francis, Siphon
- Lots of variants
- Pressure and flow causes a rotor to rotate
- Good efficiency, η
  (η are very approximate, and for small hydro turbines)

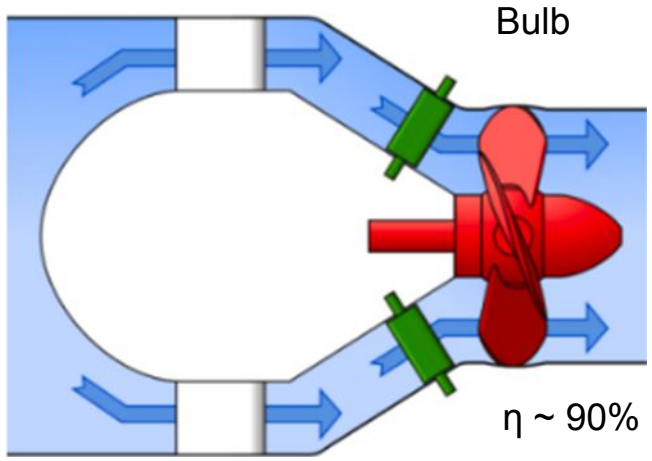
Efficiencies are for small hydro, and are very approximate.

Note: siphon turbine can be built over a weir, and does not need excavation. ✔
But needs priming. □





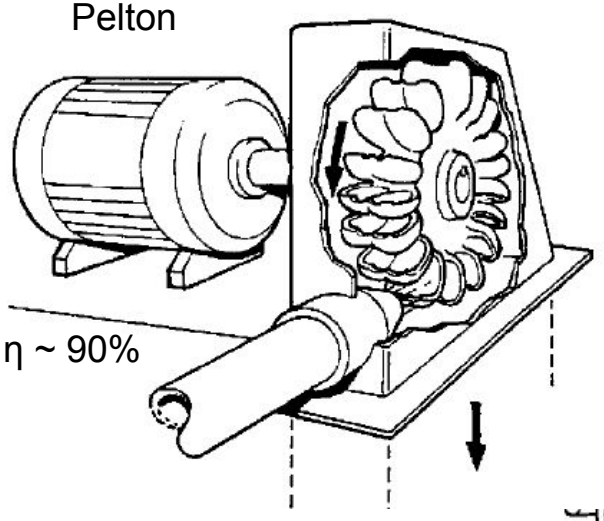




Impulse turbines

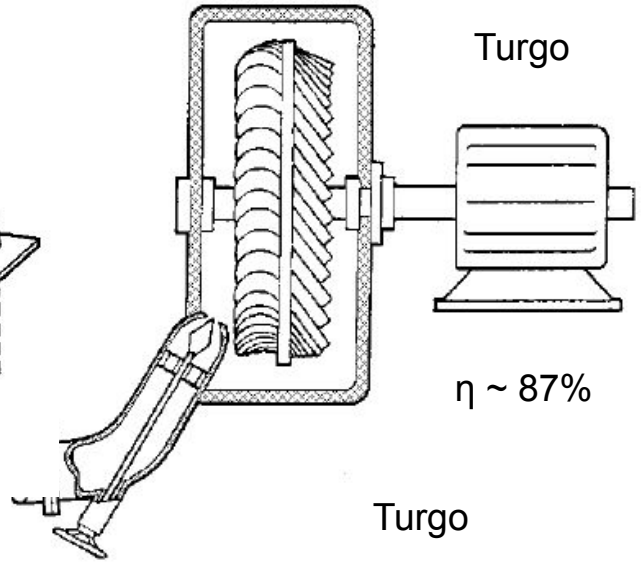
- Pelton, Turgo, Crossflow
- Water is jetted onto a wheel
- Needs quite a high head to work
- Good efficiency
- Small
- Generally unsuitable for low-head weirs (Crossflow borderline)

Pelton



η ~ 90%

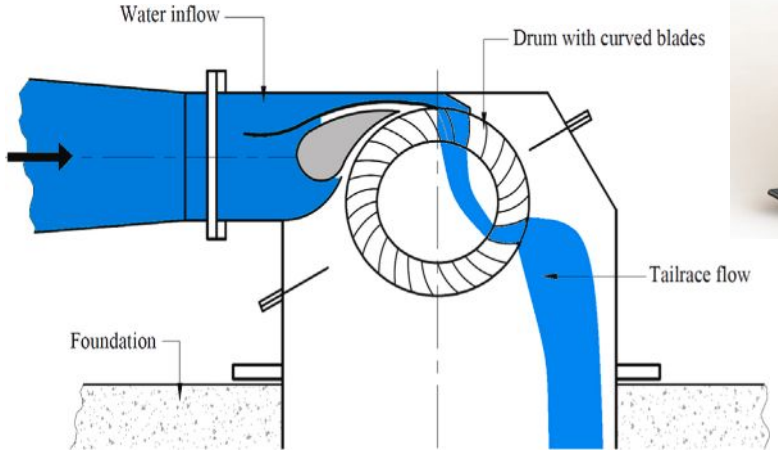
Turgo

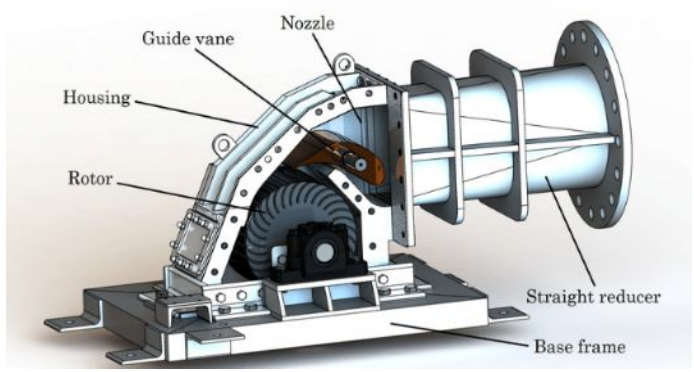


η ~ 87%

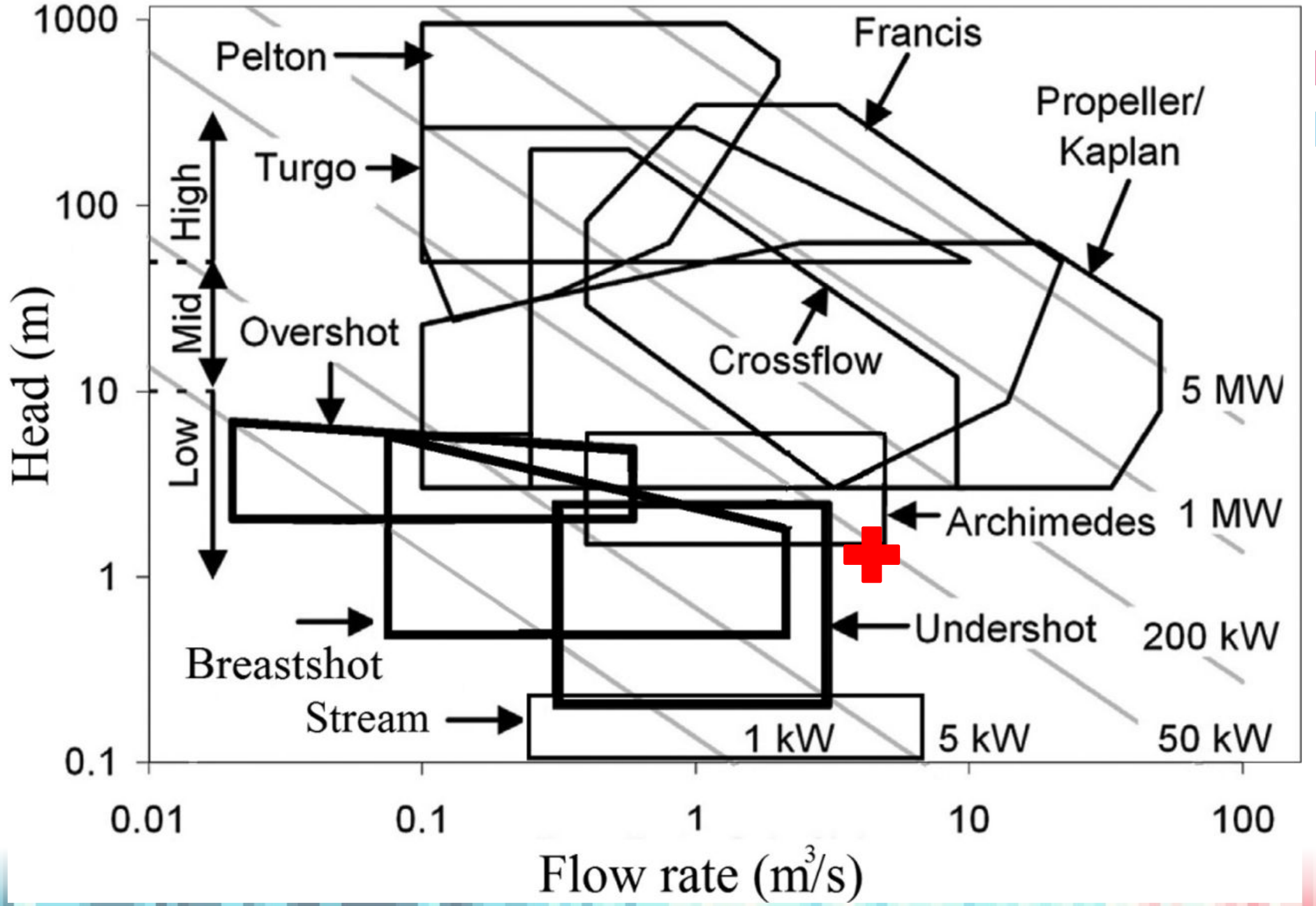
Turgo

Crossflow





η ~ 80%



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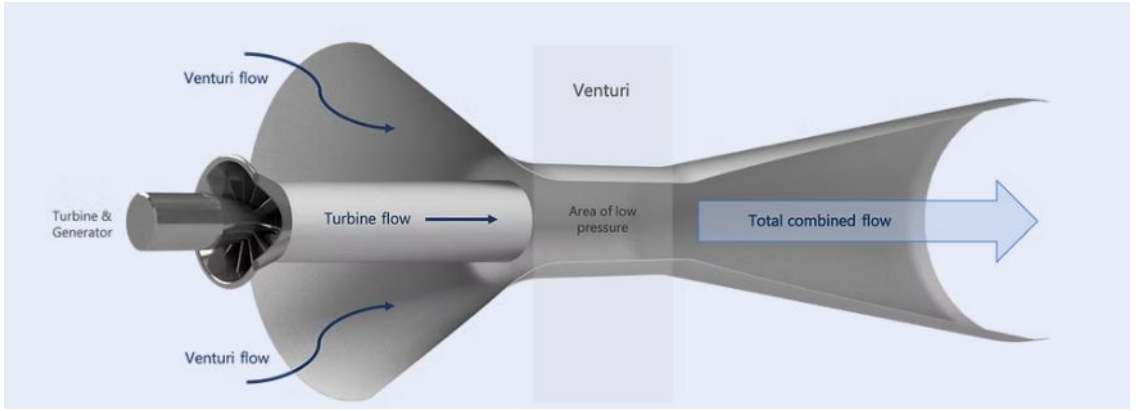
Other turbines

- VerdErg VETT, Darrieus, Savonius, Free Stream
- Often variants or hybrids of the main types above
- Reinventing the (water) wheel
- Weird and wonderful
- May overcome some problems (e.g. ease of installation) but have other drawbacks
- Generally not well proven

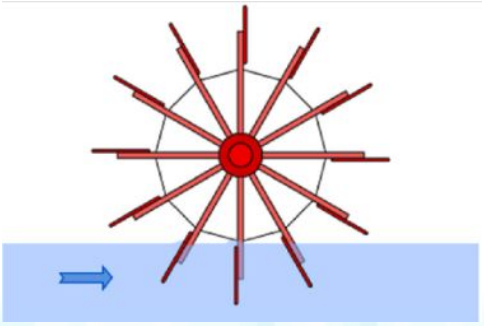
VETT



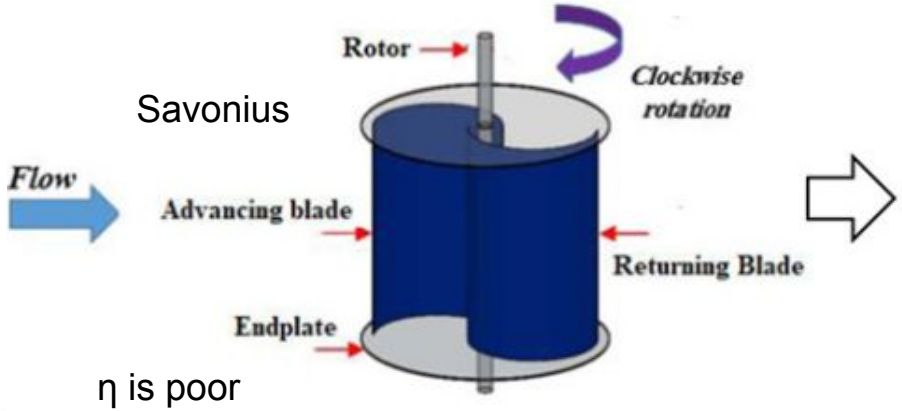
Darrieus

η ~40%

Free Stream



Savonius



η is poor

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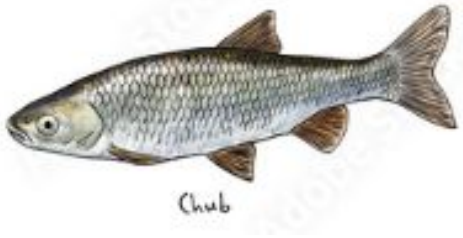
So, you can get turbines that are smaller, easier to install, and more efficient.

Why would you choose an Archimedes screw?

Why would you choose an Archimedes screw?

The answer is

FISH



The Archimedes screw

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- Not invented by Archimedes. He described screws used to lift water after a visit to Egypt around 234 BC, but they were used at least 100 years before, maybe even in the 7th century BC.
- Until about 30 years ago, almost solely used for lifting water, not as a turbine.
- Still widely used as a pump in sewage plants
- Not a particularly efficient turbine, but OK. (We might increase from 46 to 52kW for the same flow with a more efficient turbine)
- Quite a large, heavy structure for the amount of power it produces
- BUT fish friendly

Archimedes screw turbines

- Fish friendly
- Slow rotation (29rpm)
- Rubber buffers fitted to leading edge
- Fish can swim through them
- The Environment Agency is likely to refuse permission for any other low head type of turbine
- For other turbines, you would need a small mesh screen, which blocks easily

Volunteering at Reading Hydro

Juliet Hanfling, People director

If you're interested in volunteering…

Reading Hydro CBS

Check our website:

https://readinghydro.org/about-our-hydro/get-involved/

Email:

volunteer@readinghydro.org

Innovation - where do we go next?

Anne Wheldon, Communications director

Austin Jacobs, Innovation director

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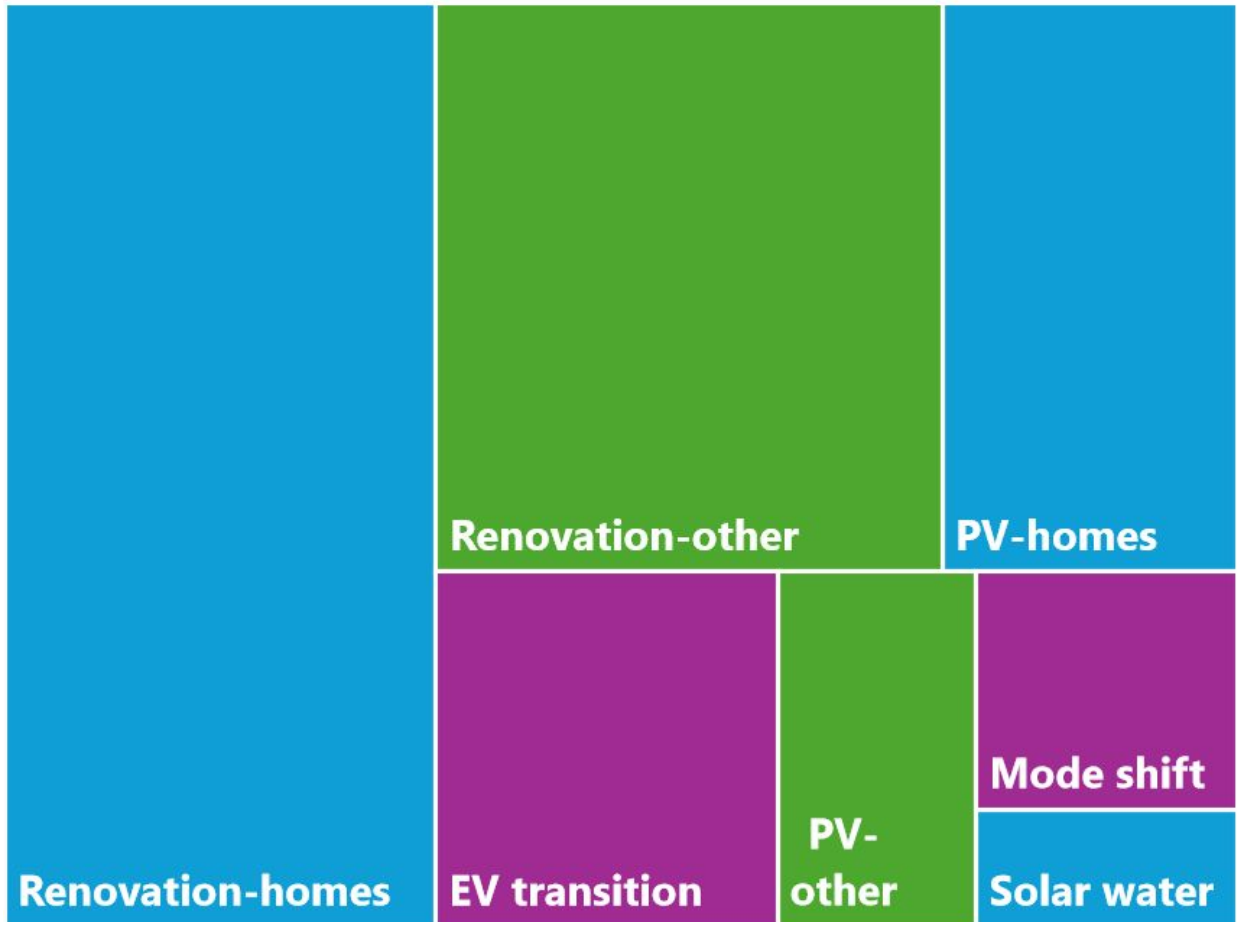
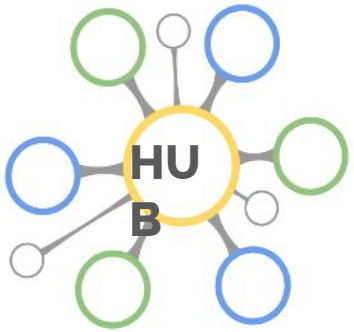
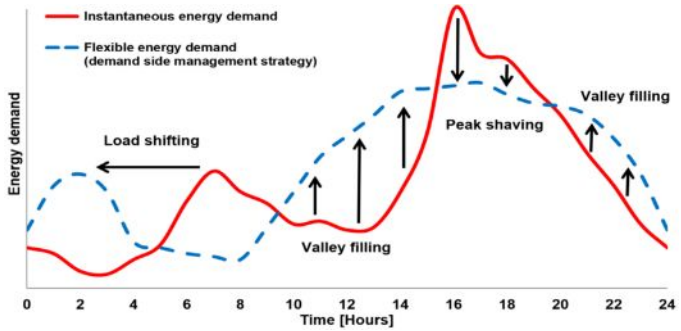
Main opportunities to cut CO2 emissions in the Reading Borough Council area



Area represents 236 kt CO_2/year, 52% of 2021 baseline emissions

Where to go next?





What we concluded

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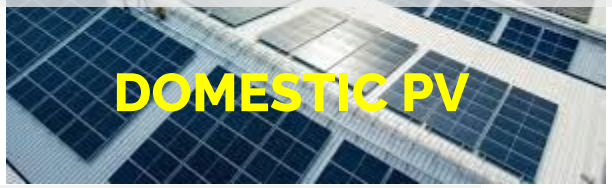
BIG ROOF PV DUPLICATION



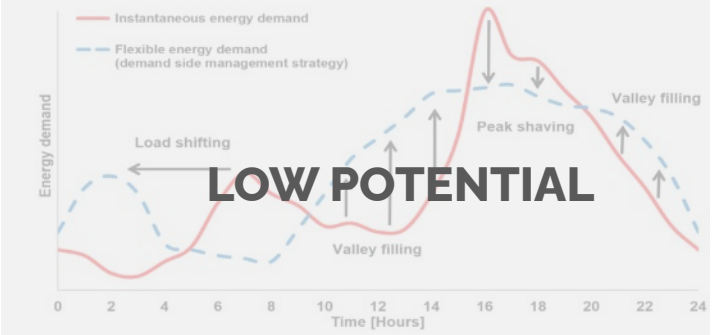
DOMESTIC PV

PUBLIC CHARGING DUPLICATION

LOW POTENTIAL

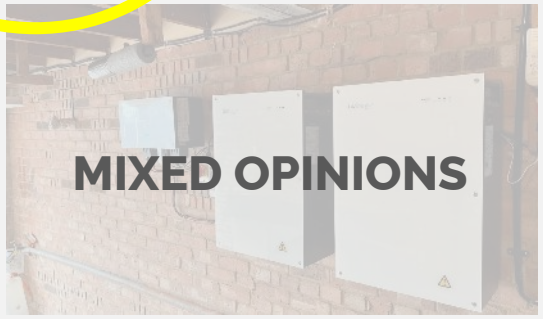
TOO TRICKY UNECONOMIC

HUB



LOW POTENTIAL

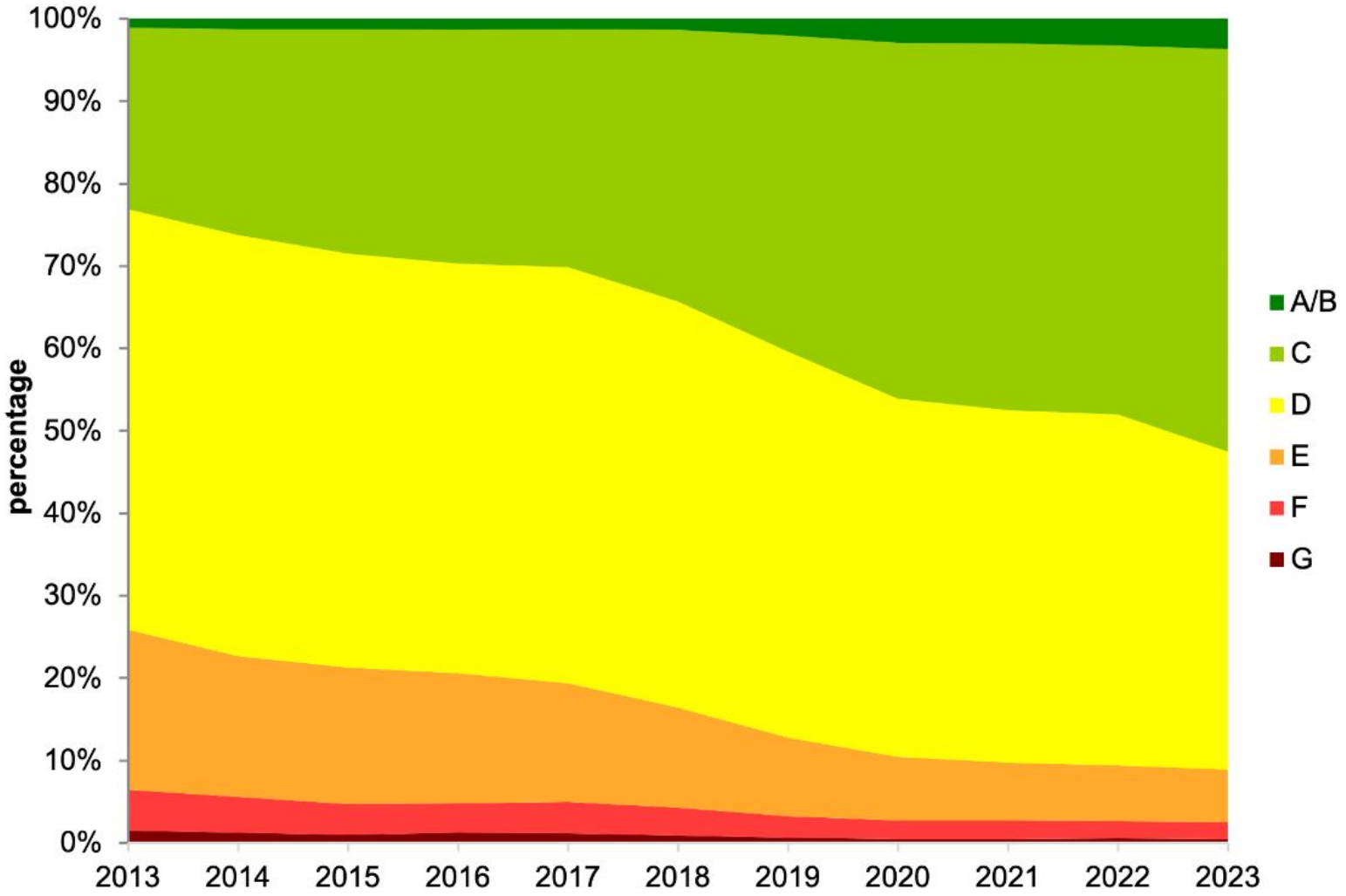
DEMAND REDUCTION



MIXED OPINIONS

LOW POTENTIAL

State of English housing



Energy efficiency rating bands, 2013 – 2023, England

State of Community energy

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PIPELINE

CONTINUED SECTOR DIVERSIFICATION IN 2024

72 new energy advice and energy efficiency services

FORECAST FINANCES IN 2024

£157 million planned investment to be secured for renewable energy

STALLED RENEWABLE ENERGY

79 stalled projects with **270** MW capacity

that communities want to deliver

Produced by

Community Energy Scotland — Empowering Communities

Community Energy England

Ynni Cymunedol Cymru Community Energy Wales

Non-profits delivering retrofit in England

Why we think retrofit is right

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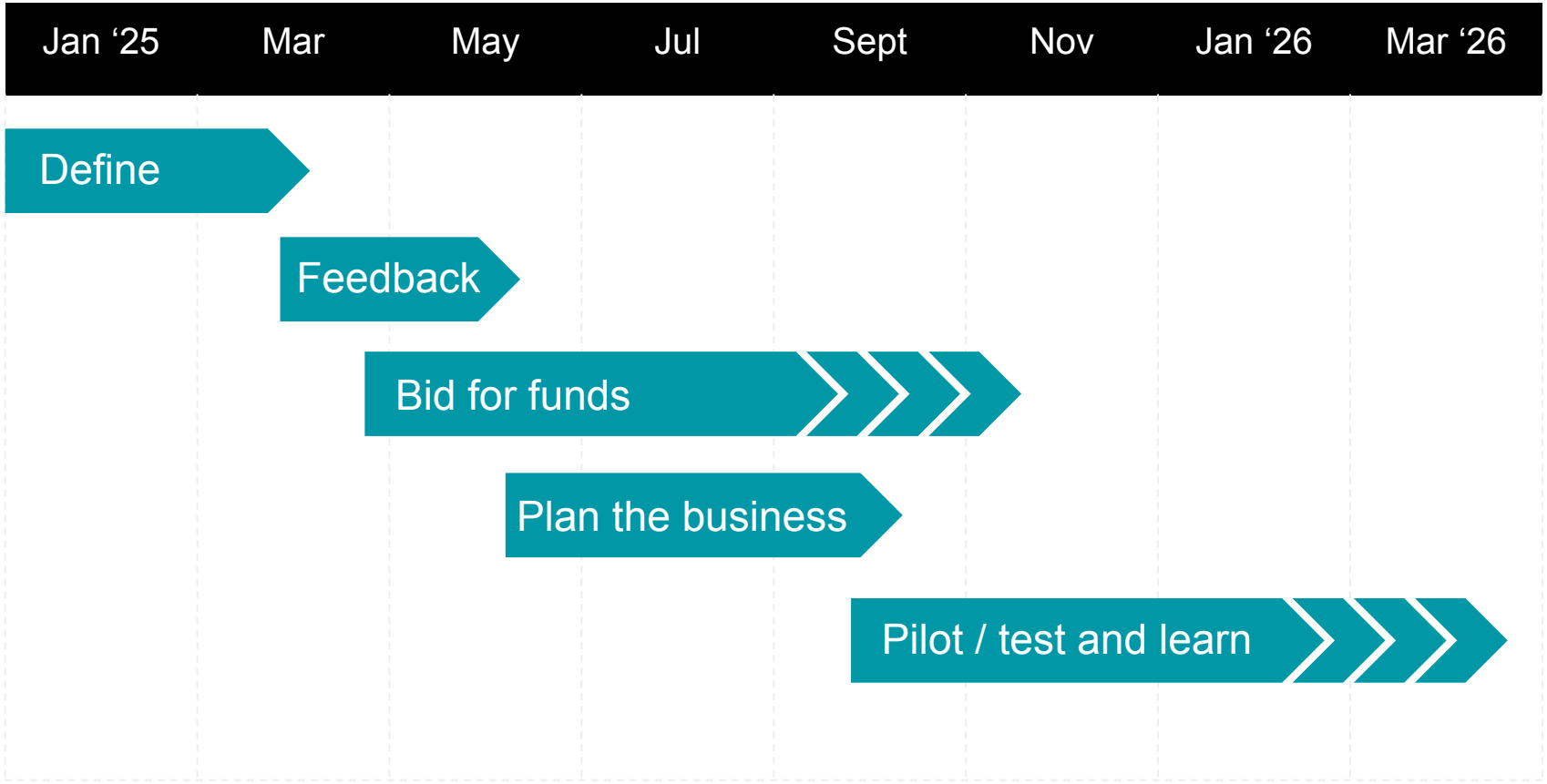
1. Decarbonisation pathway
2. Make it easier!
3. For health, sustainable finances, climate mitigation, climate adaptation
4. Fair and just
5. Community together

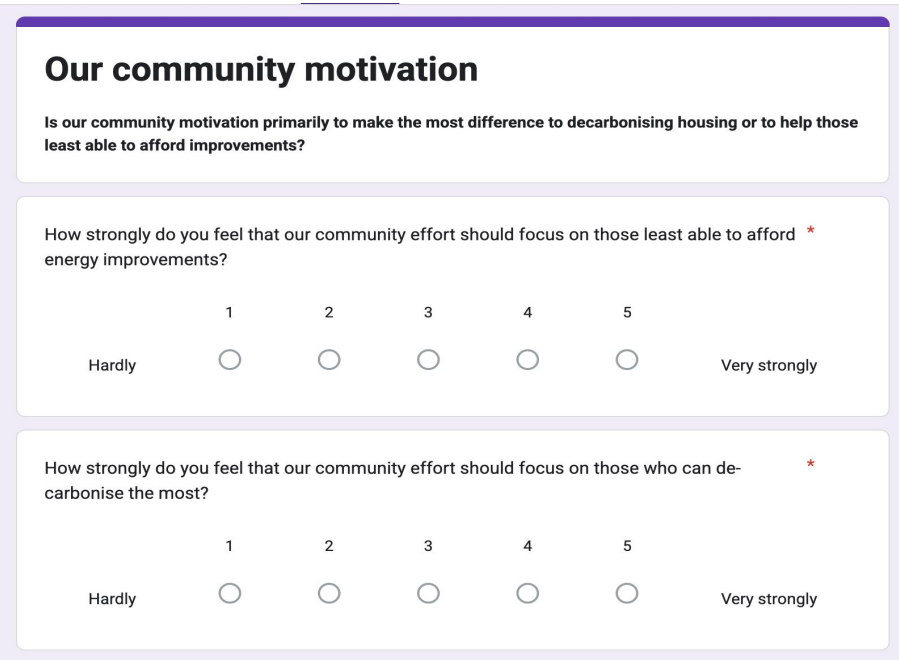
Plan for 2025 -26



Question of the month

Reading Hydro CBS

Is our community motivation primarily to make the most difference to decarbonising housing, or to help those least able to afford improvements?



Our community motivation

Is our community motivation primarily to make the most difference to decarbonising housing or to help those least able to afford improvements?

How strongly do you feel that our community effort should focus on those least able to afford energy improvements? *

	1	2	3	4	5	
Hardly	○	○	○	○	○	Very strongly

How strongly do you feel that our community effort should focus on those who can de-carbonise the most? *

	1	2	3	4	5	
Hardly	○	○	○	○	○	Very strongly

Join our ‘Question of the Month’ mailing list

With thanks to

Andrew H-N, Anne W, Ben B, Dan F, Dave S, Erica P, Graham R, Gudrun F, John B, Kit E, Mike B, Paul D, Rupert W, Sarah K, Simanand G J, Simon B, Stephen W, Tanith W, Tony C, Tracey R C, Trish M
Community Energy England
School for Social Entrepreneurs

How you can help now

Volunteer your time as a:

- Bid writer
- Proof reader
- Procurement lead
- Product and pricing lead
- Referrals lead

Join our 'Question of the Month' mailing list:

- Look out for a link with the AGM minutes
- Or contact Austin at reading.hydro.innovation@gmail.com

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Answers to questions