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Dŵr Uisce | Energy Recovery in Water Services
Adennill Ynni yn y Diwydiant Dŵr

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Distributing our Water Resources: Utilising Integrated Smart & low-Carbon Energy.

Blackstairs Hydropower Demonstration Plant

Official Opening

Rathnure
2nd May 2019

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Blackstairs Hydropower Demonstration Plant

From Concept to Completion

In collaboration with:

BGWS
Blackstairs Group Water Scheme

eps

National Federation of Group Water Schemes

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	Time	Speaker
	10.00 – 10.30	Registration & Coffee
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Blackstairs Hydropower Demonstration Plant

A day for Celebration !

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Introduction to Dŵr Uisce

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- Significant scope to improve the energy efficiency of the distribution of water resources.

- The Dŵr Uisce project aims to quantify and demonstrate this scope using:
  1. Smart and low-carbon technology.
  2. Cross-sectoral & cross-border benchmarking, and economical and environmental impact assessment
  3. Networking, dissemination, knowledge exchange, brokerage events, demonstrations.

- The project will deliver improved efficiency of the water-energy nexus, benefitting two key stakeholders groups: **water suppliers** and **water consumers**

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The challenge today

Energy, Environment, Economy

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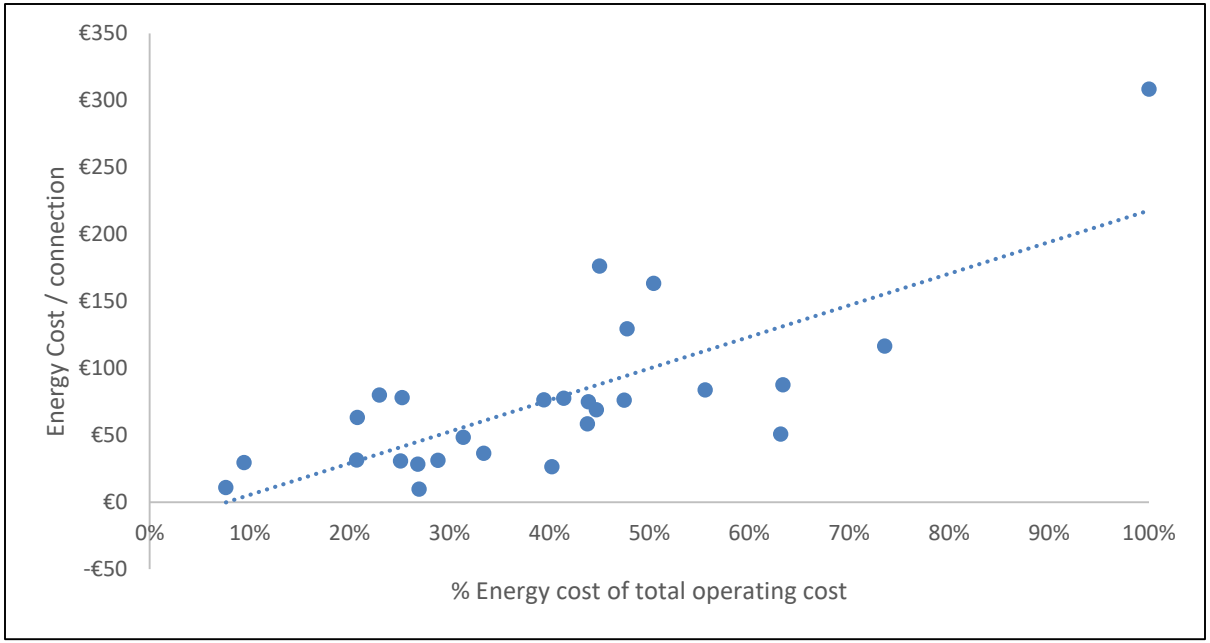
- The supply and treatment of water is an energy intensive and unsustainable process in its current form.

- In the rural water sector in Leinster 40% of the annual operating cost is associated with electricity bills
  - 40% on average ± 20%
  - Ranging from 8% to 100% across schemes in Leinster
  - Costing €76 per connection on average (ranging €11 to €308 per annum)
  - 1150 connections in Blackstairs GWS



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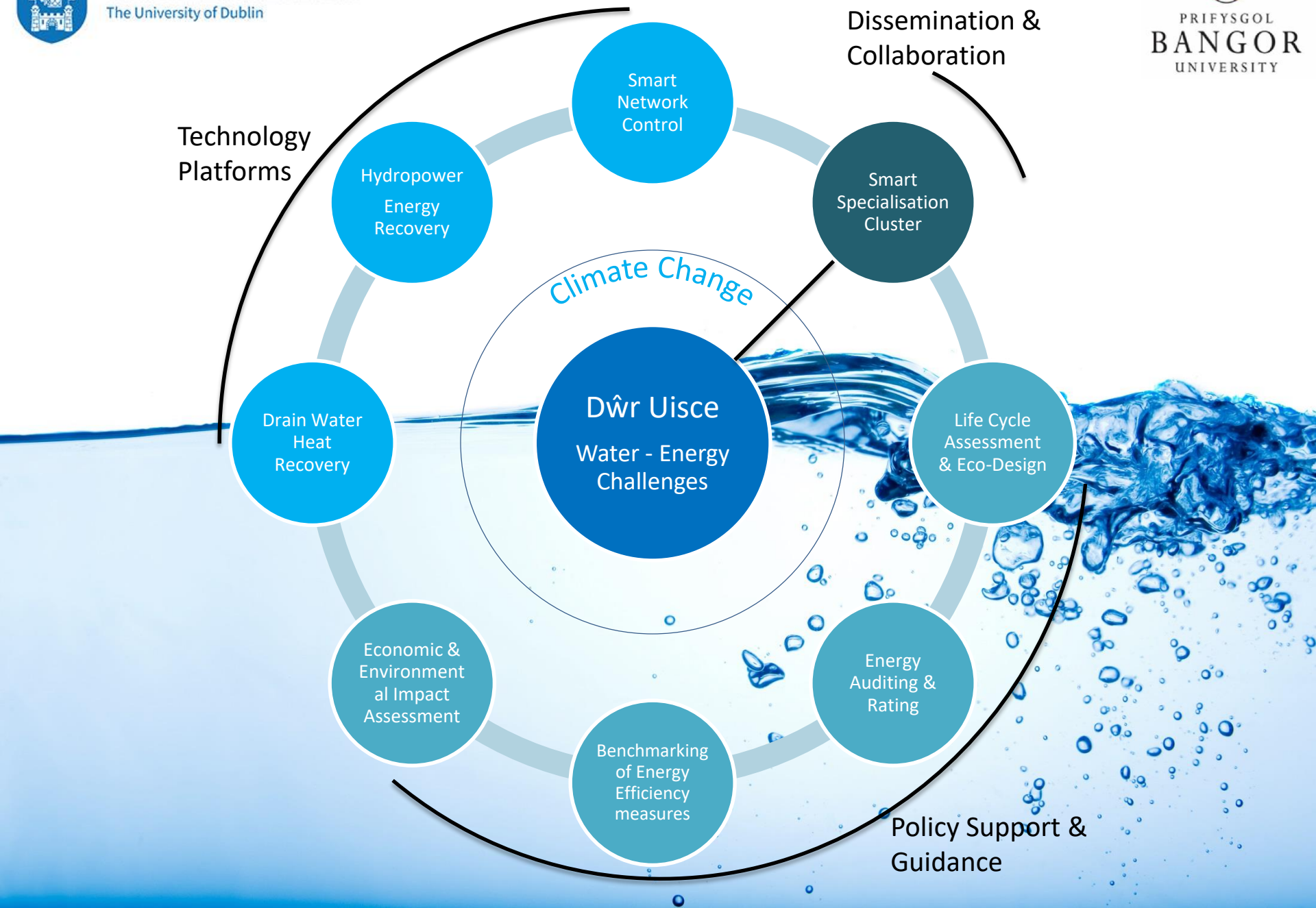
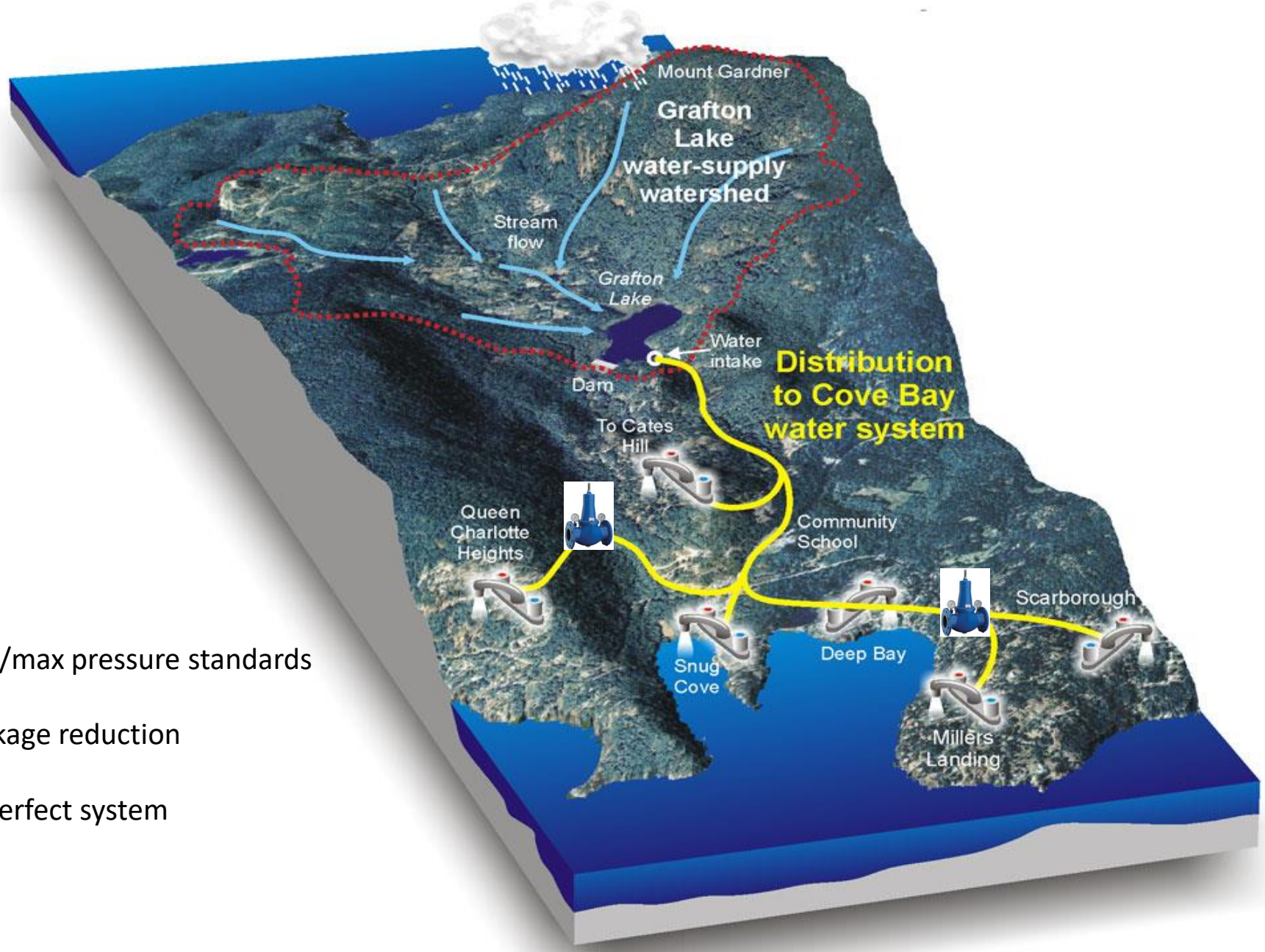


Hydropower Energy Recovery

Water Supply Networks

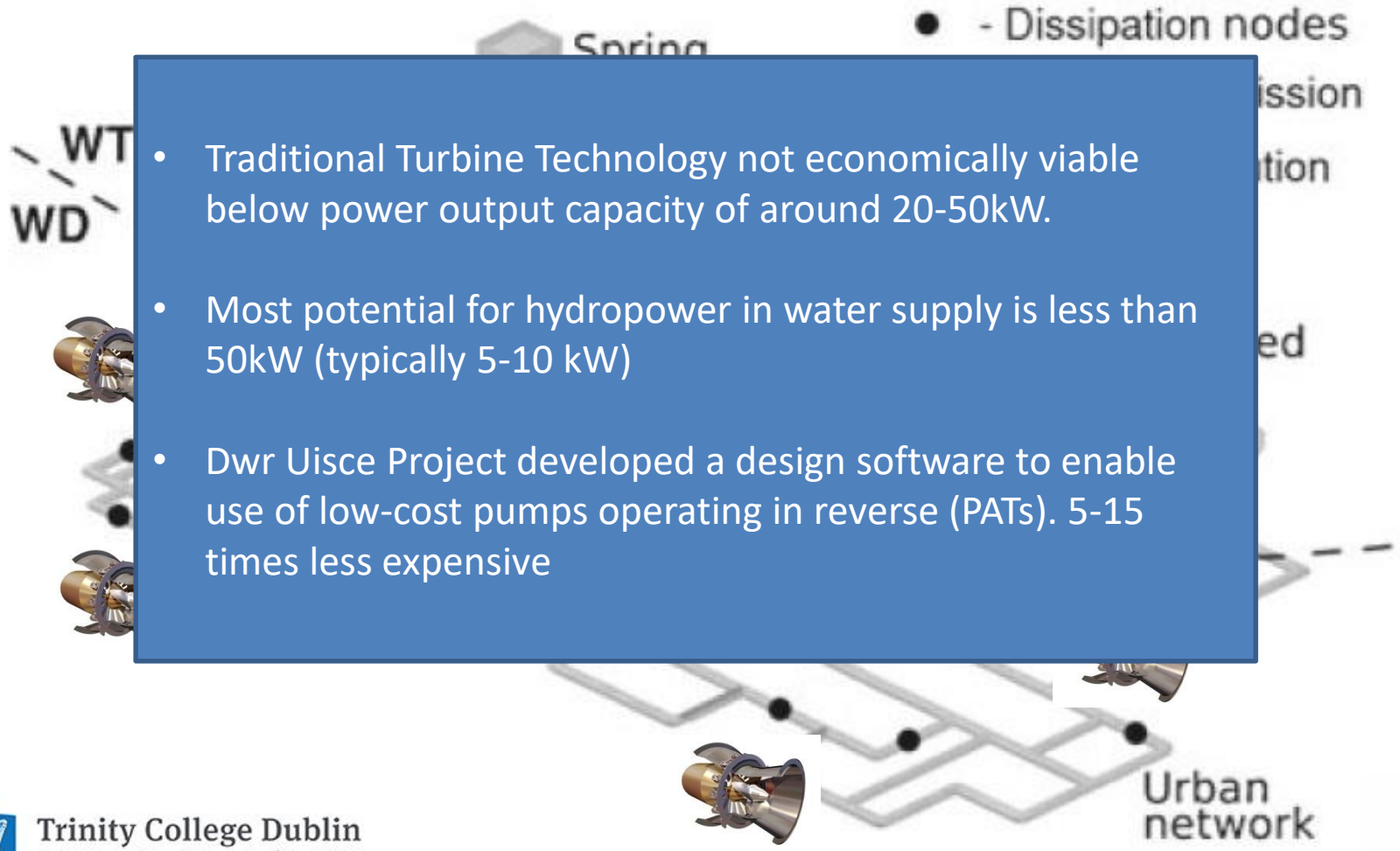


- Min/max pressure standards
- Leakage reduction
- Imperfect system

Hydropower Energy Recovery

Water Transmission & Water Distribution

Recovering energy from flowing water in network infrastructure at points of excess pressure



- Traditional Turbine Technology not economically viable below power output capacity of around 20-50kW.
- Most potential for hydropower in water supply is less than 50kW (typically 5-10 kW)
- Dwr Uisce Project developed a design software to enable use of low-cost pumps operating in reverse (PATs). 5-15 times less expensive

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Planting the seed…

Hydropower in Rural Water Networks

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National Federation of Group Water Schemes

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Assessing Hydropower Potential

Hydropower in Rural Water Networks

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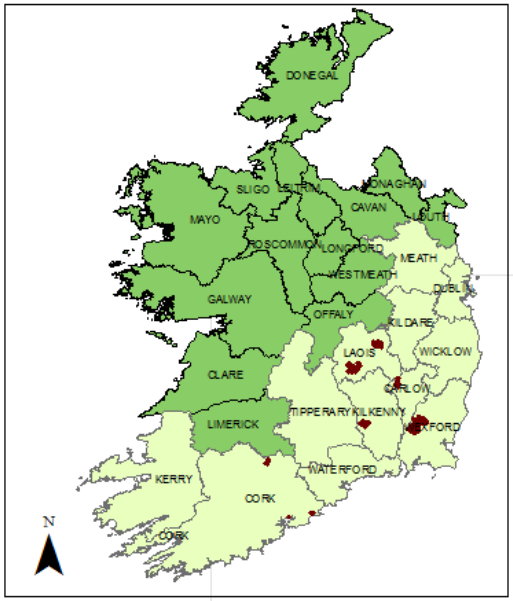
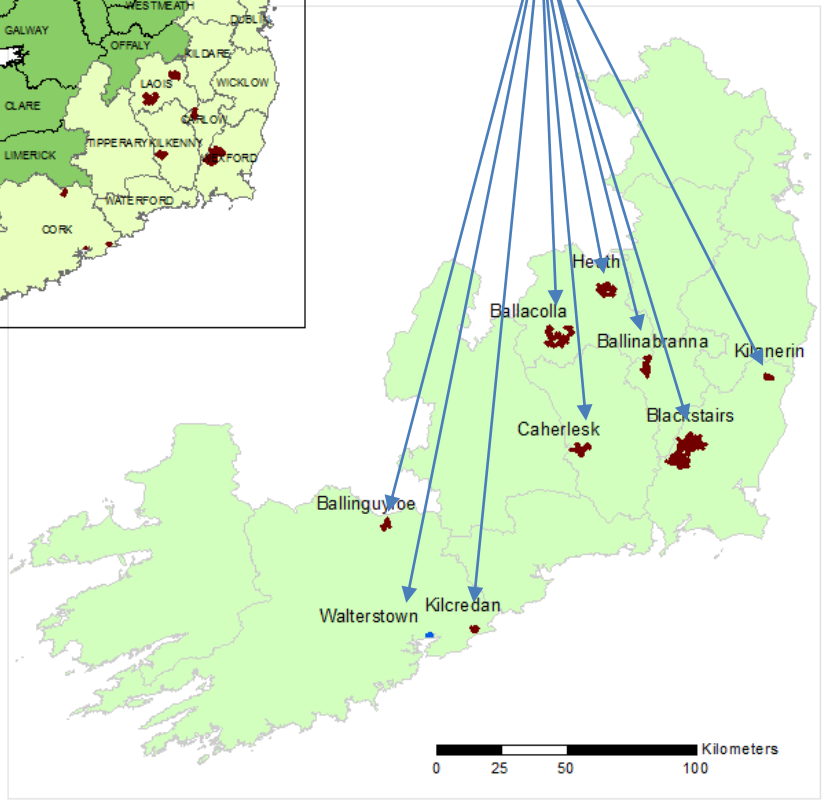


National Federation of Group Water Schemes



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Planting the seed…

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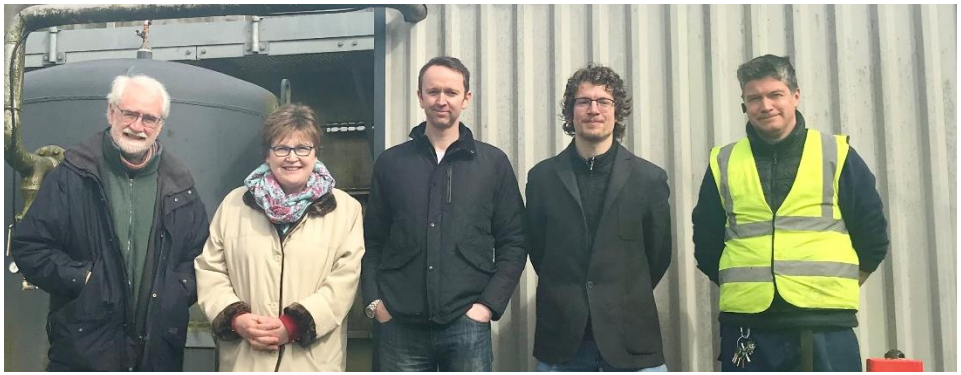

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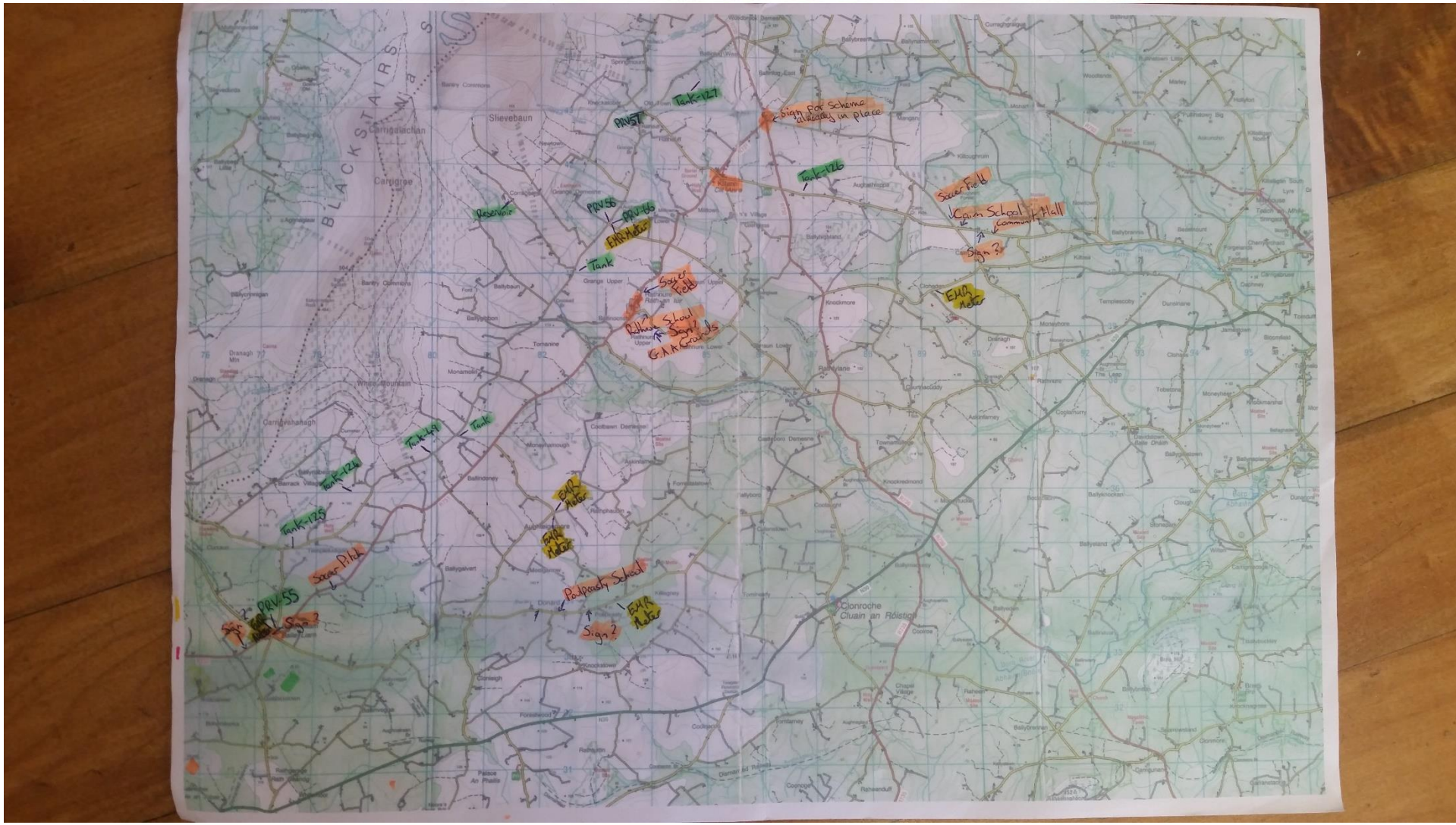
Modelling the Blackstairs Water Network



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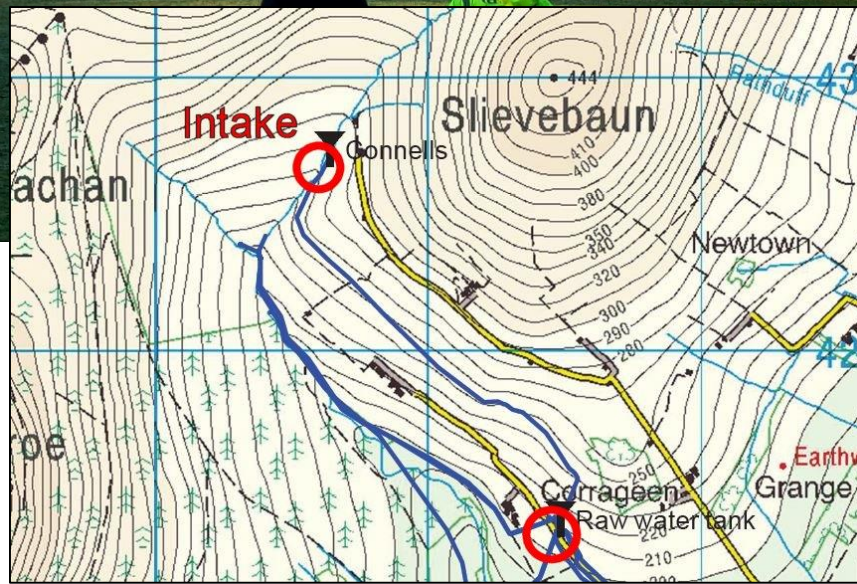
Assessing the Power Potential in Detail



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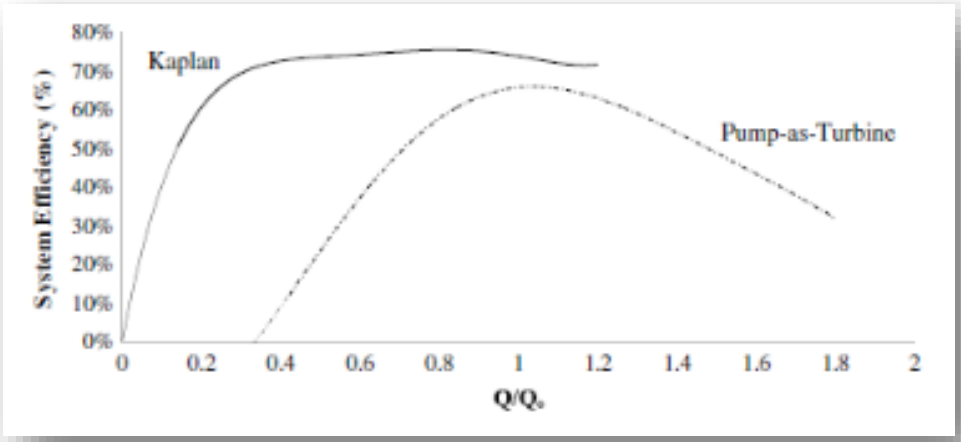
Assessing the Power Potential in Detail

Assessing the Power Potential in Detail

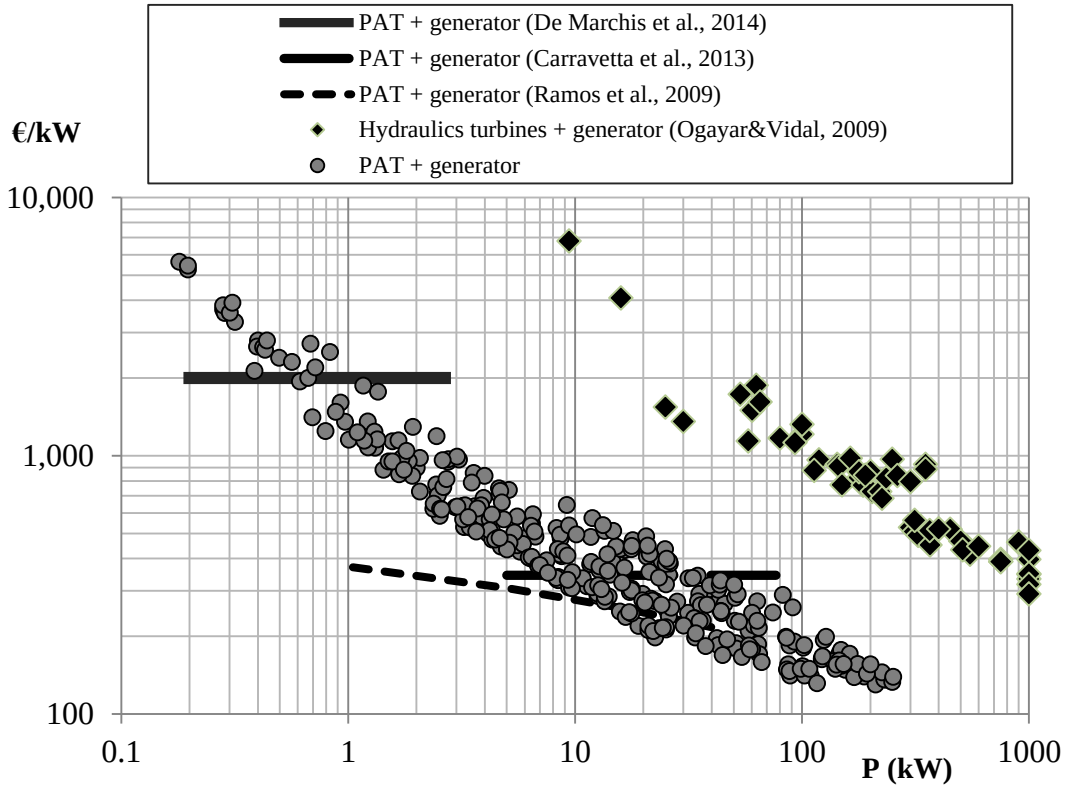
Detailed Turbine Selection & Design
Pump-as-turbine

- Conventional pump operating in reverse to produce energy
- Significantly lower cost due to mass production
- Readily available, easy maintenance, supply of spare parts
- Lower efficiency (peak & range)
- Unknown performance as turbine



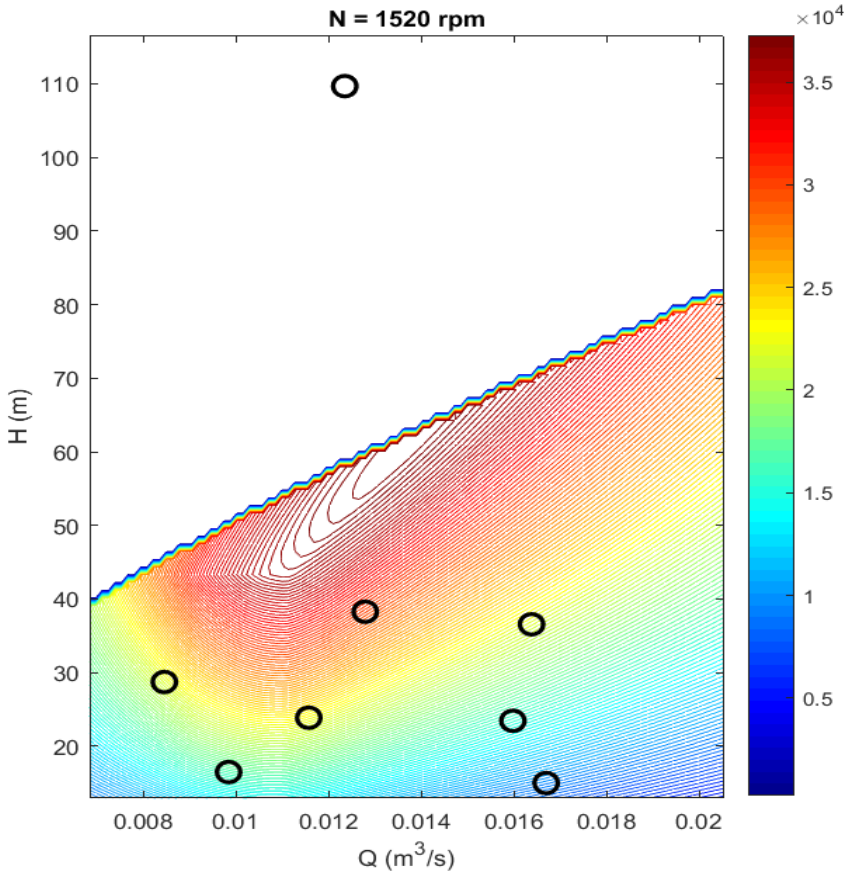
Detailed Turbine Selection & Design
Pump-as-turbine

- Assessment of >300 pumps & generators
- PATs cost 150 to 5300 €/kW
- Conventional turbines cost 1000 to 5000 €/kW for micro-hydro
- PATs are 5 to 15 times less expensive



Detailed Turbine Selection & Design
Pump-as-turbine

- PAT Design is a barrier to its exploitation in the market due to lack of information on performance or design software
- Dwr Uisce project produced a design software to facilitate greater use of PAT in water networks
- Identifies available PATs from the marketplace closest to the theoretical best efficiency point for a particular site
- Blackstairs GWS flow and head measured at 18 l/s and 40m allowed the selection of a PAT and generator to produce 4.3 kW



Yearly Energy yield (kWh/yr)

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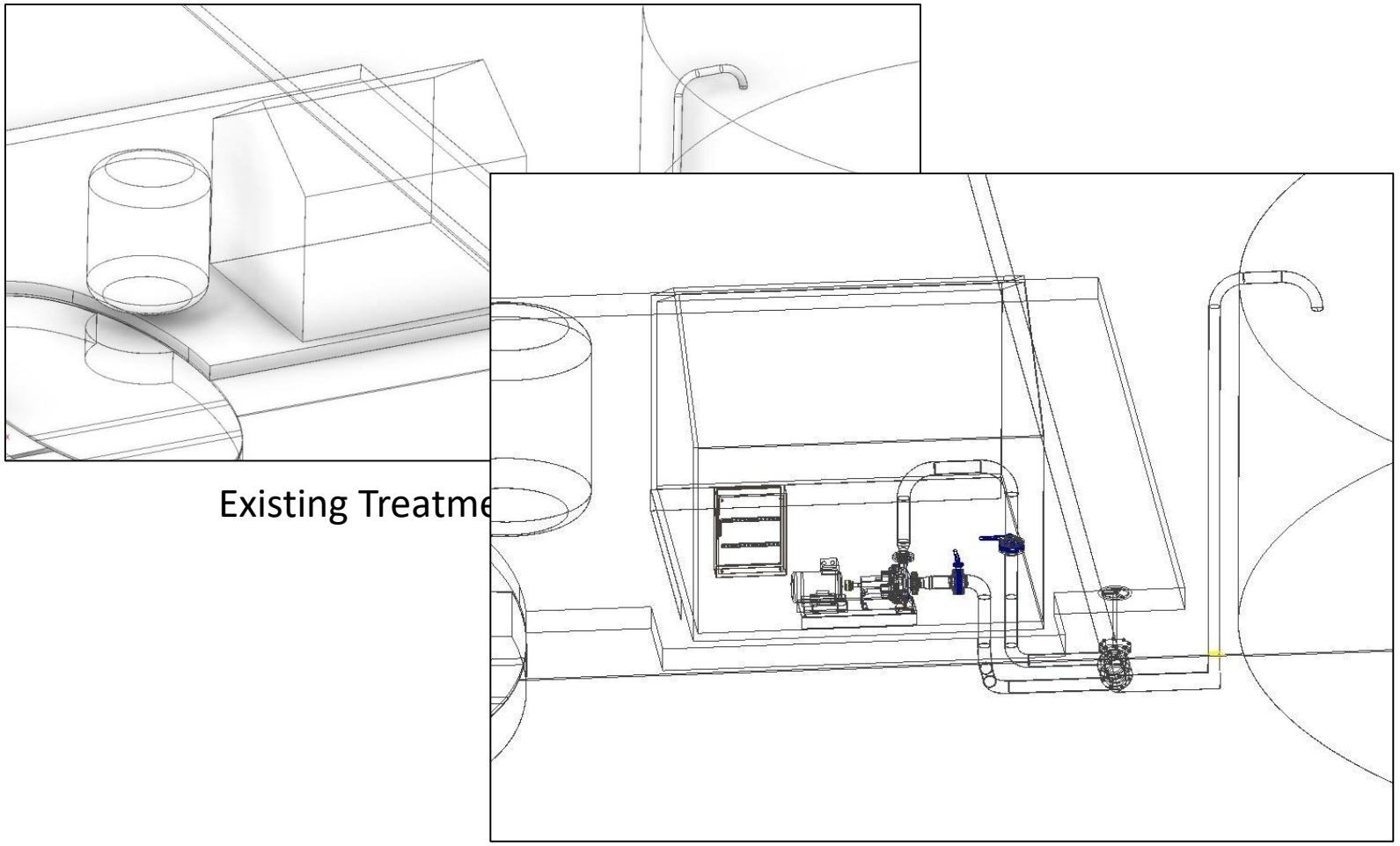
Detailed Turbine Selection & Design

Construction details…



Existing Treatme

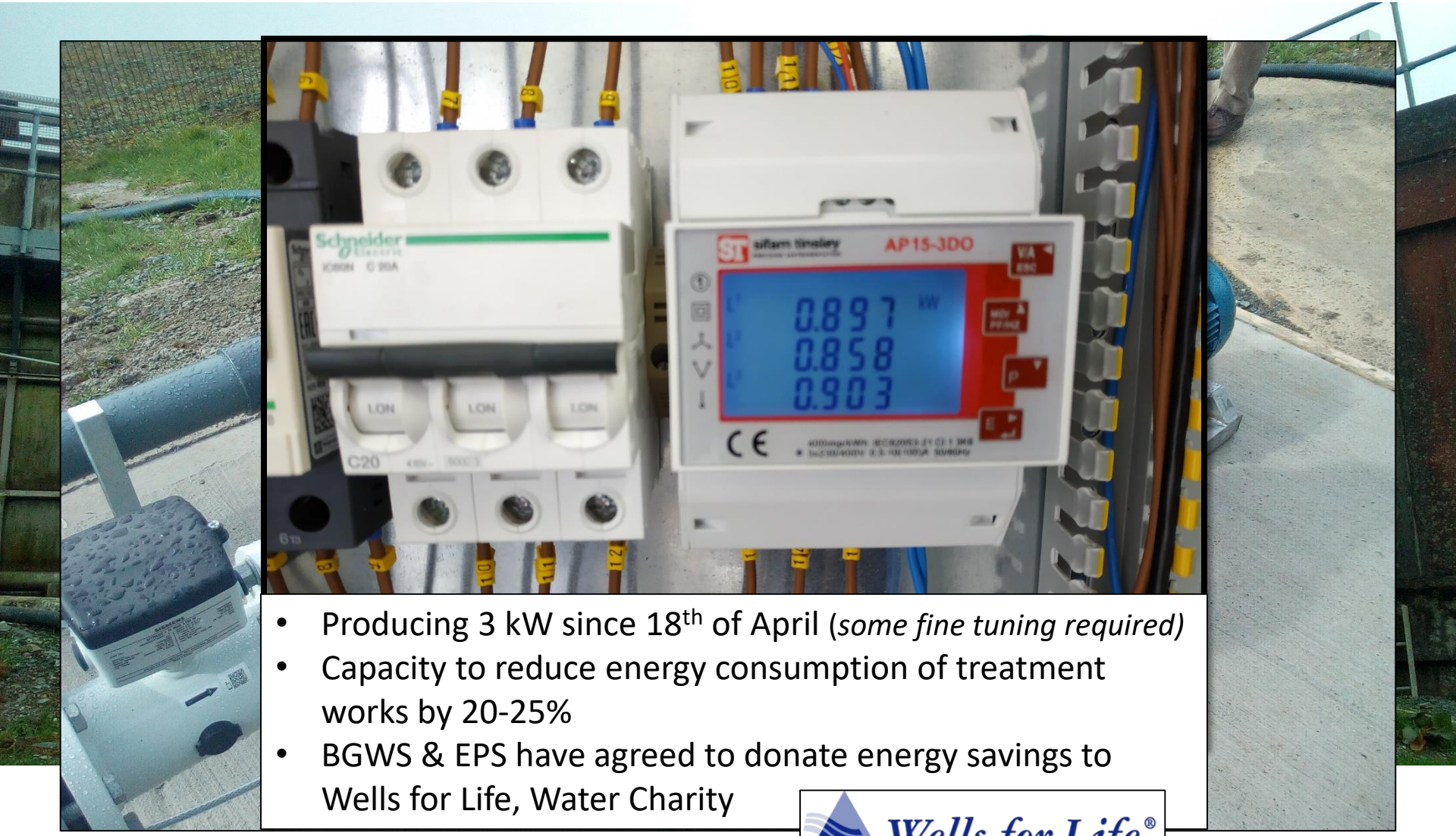
Proposed Turbine Installation

Detailed Turbine Selection & Design

Construction

Circa 3-4 days of construction work between November & April

Detailed Turbine Selection & Design
Construction



- Producing 3 kW since 18th of April (*some fine tuning required)*
- Capacity to reduce energy consumption of treatment works by 20-25%
- BGWS & EPS have agreed to donate energy savings to Wells for Life, Water Charity

Wells for Life®

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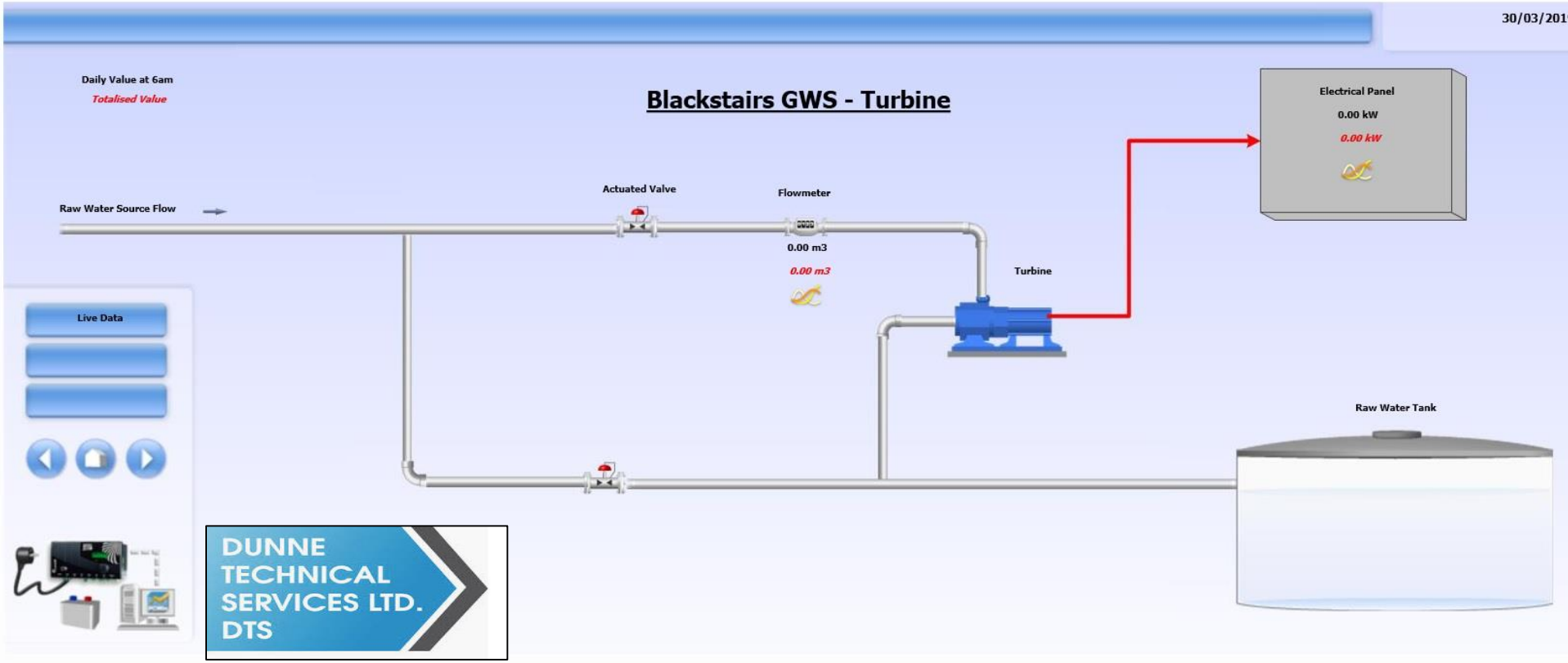
Detailed Turbine Selection & Design
Telemetry System



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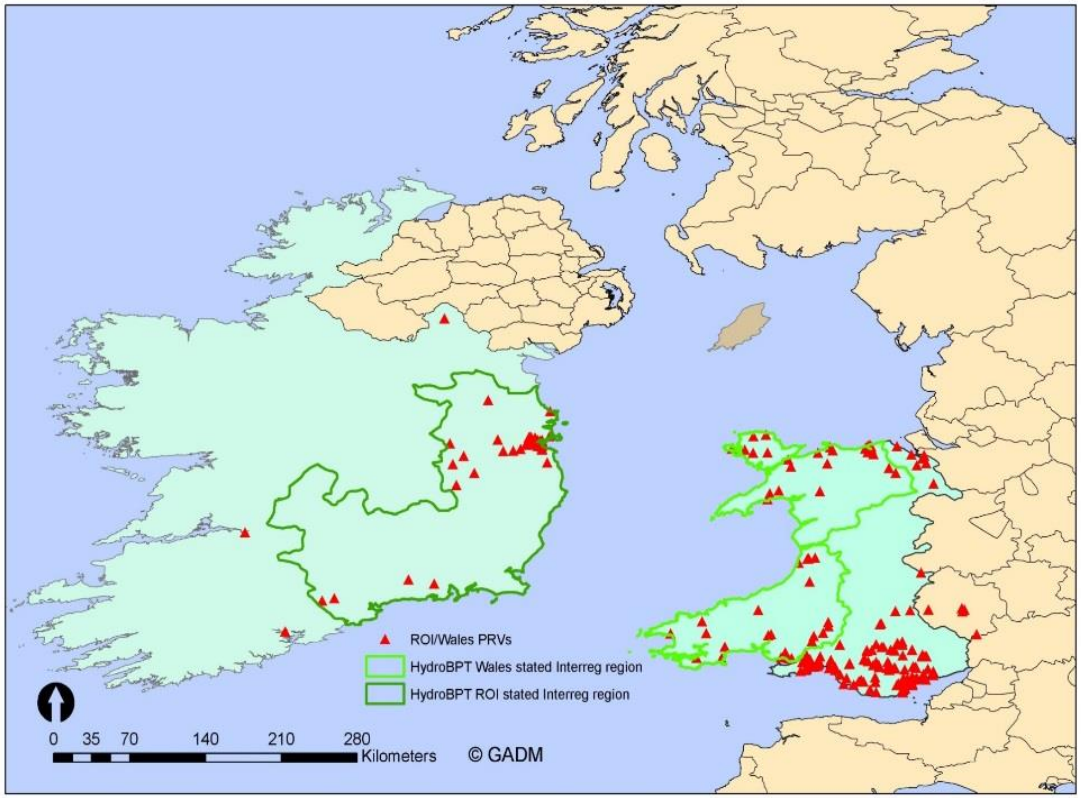
Hydropower potential in Ireland & Wales

- **18-20 GWh** could be saved annually in Ireland and Wales, reducing CO_2 emissions by **10,000 tonnes** and reducing operating cost by over **€2.5 million** (based on limited data assessed)



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Project funding & context

- Funded for 5 years (€3.4M) by the ERDF Interreg Ireland-Wales Programme 2014-2020
- Cross border innovation theme
- Increasing innovation within SMEs
- Encouraging collaboration between Higher Education, Public Sector organisations & SMEs.
- Improve innovation performance and productivity within SMEs
- Create new/improved products, services or processes.

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Dissemination

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Our Partnership

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University Research

National Federation of Group Water Schemes

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National & Local Community Organisations & SMEs

Thank you for your attention

Diolch am eich sylw

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