

Radyr Weir Hydroelectric Scheme

Cardiff

28th November 2016



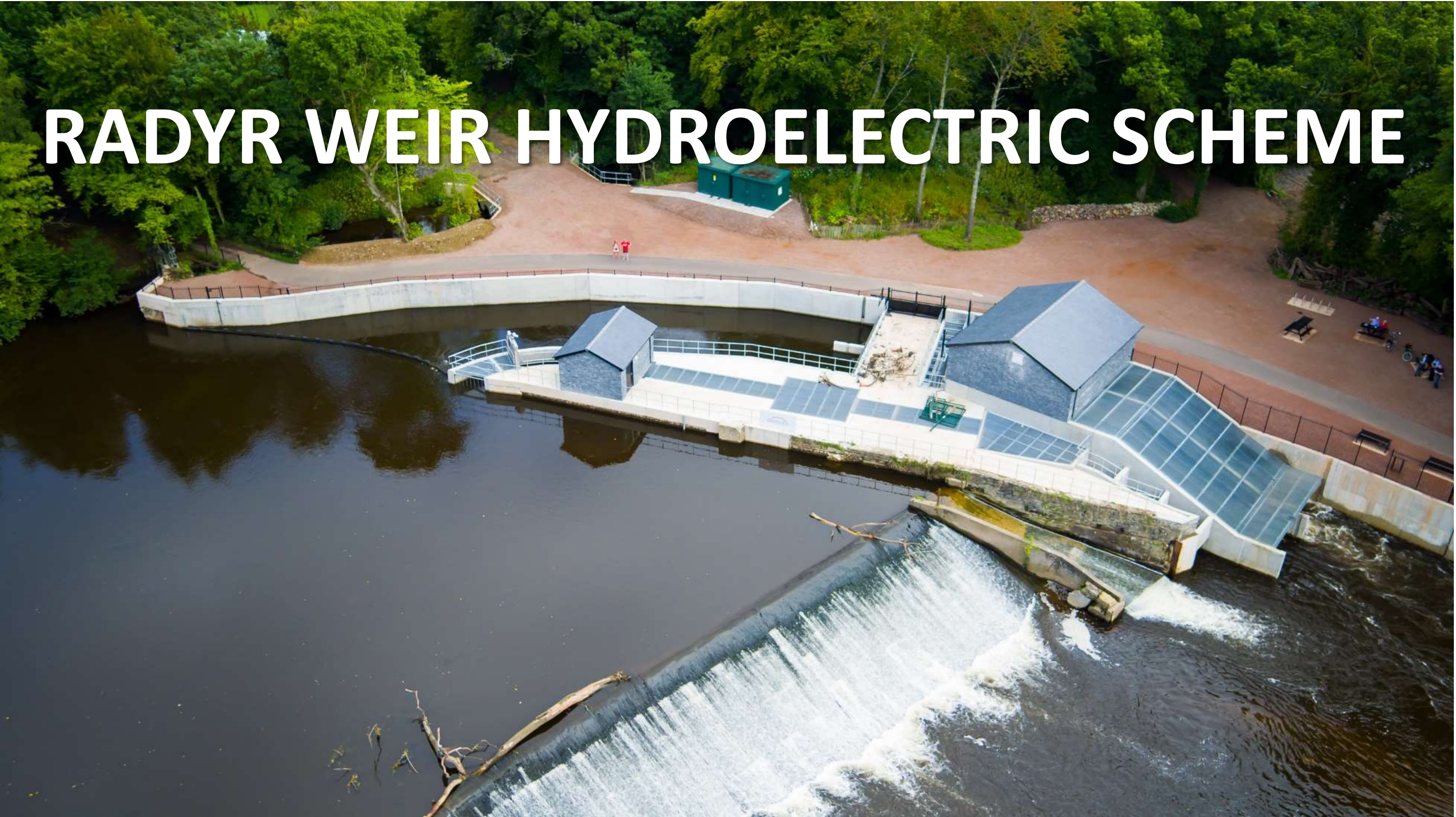
Welcome Milica Kitson

Chief Executive
Constructing Excellence in Wales





RADYR WEIR HYDROELECTRIC SCHEME



**ADEILADU
ARBENIGRWYDD**
YNG NGHYMRU



**CONSTRUCTING
EXCELLENCE**
IN WALES





Lee Davies

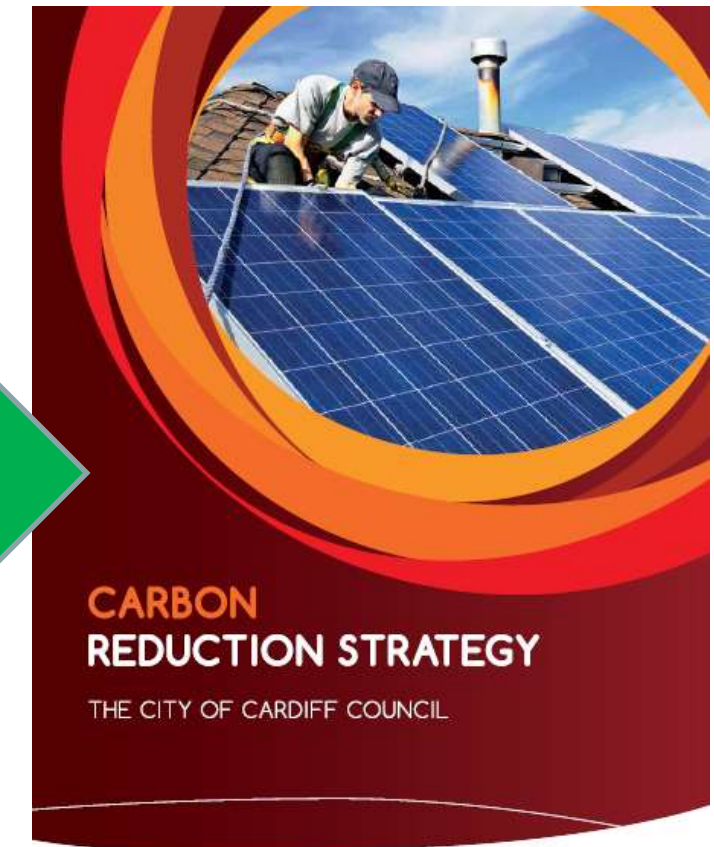
Regional Manager for Dawnus Construction

Adam De Benedictis

Energy Manager for the City of Cardiff Council

Background Context & Drivers

Where
Did We
Start



www.oneplanetcardiff.co.uk

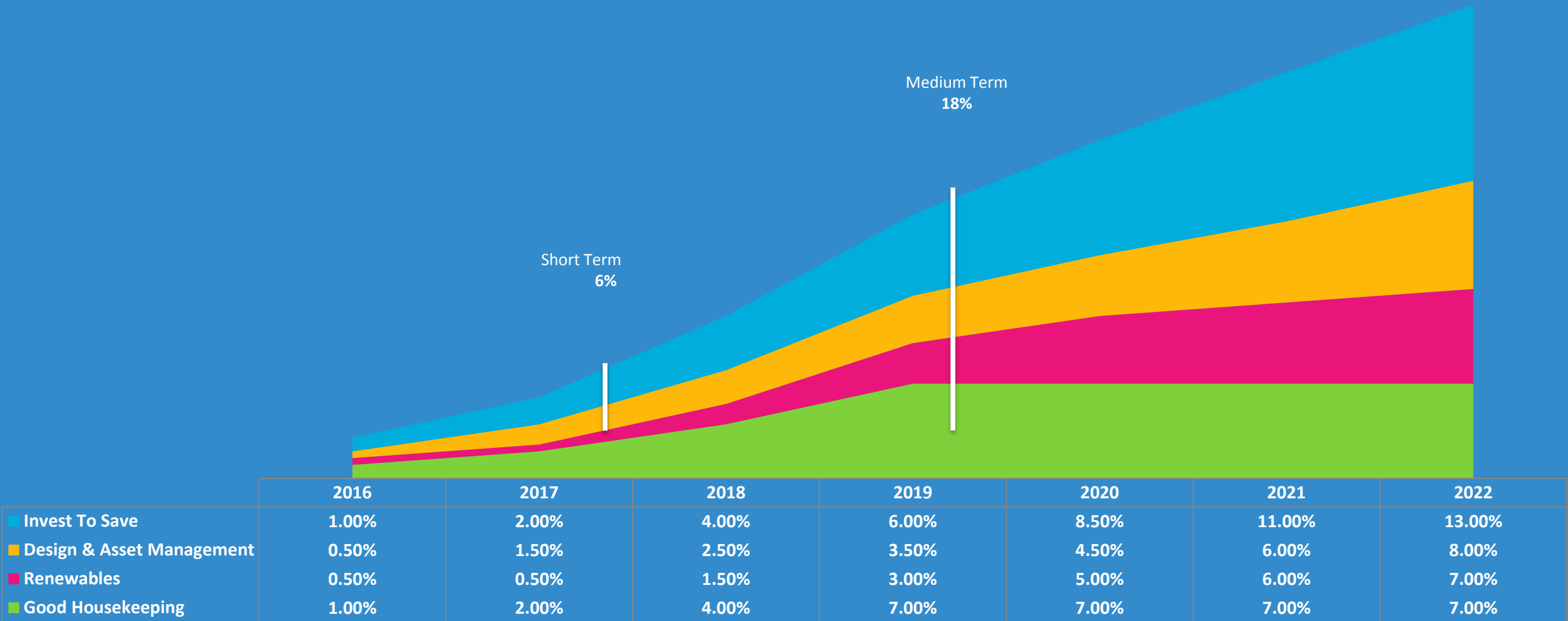


Carbon Reduction Strategy Project Strands

Long Term
35%

Medium Term
18%

Short Term
6%



CARDIFF ENERGY TEAM STATS

THE CITY OF CARDIFF COUNCIL, 2016



6,091

THE NUMBER OF TONNES OF CO2 WE HAVE REDUCED SINCE 2013/14

2,800

THE NUMBER OF SOLAR PANELS WE HAVE INSTALLED SINCE 2014/15. THIS EQUATES TO 700KW OR THE EQUIVALENT OF 200 HOMES

14

THE NUMBER OF SCHOOLS THAT WERE RETROFITTED WITH LED LIGHTING IN 2015/16

£116K

THE ANNUAL SAVING PROJECTED FOR THESE LED PROJECTS



THE RADYR WEIR HYDRO SCHEME WAS COMMISSIONED BY THE ENERGY TEAM IN DECEMBER 2015

37,500,000

THE AMOUNT OF ENERGY IN KWH THAT WILL BE GENERATED FROM RADYR WEIR DURING ITS LIFETIME

550 HOMES

THE EQUIVALENT NUMBER OF HOMES THAT COULD BE POWERED BY THE SCHEME

£9.7M

THE AMOUNT THE COUNCIL SPENDS ON ELECTRICITY AND GAS EACH YEAR

CARDIFF ENERGY TEAM STATS

THE CITY OF CARDIFF COUNCIL, 2016



130

THE NUMBER OF INTERVENTIONS TAKEN BY THE ENERGY TEAM REMOTELY TO TURN OFF THE HEATING AT SCHOOLS

£25K

THE AMOUNT OF SAVINGS ACHIEVED FROM THESE INTERVENTIONS

966

THE NUMBER OF METERS WHICH WE RECEIVE DATA FOR EVERY HALF AN HOUR

26,000

THE NUMBER OF INVOICES CHECKED EACH YEAR BY THE ENERGY TEAM



286,000

THE NUMBER OF BILLING CHECKS CONDUCTED BY THE ENERGY TEAM EACH YEAR

147

THE NUMBER OF SMART METERS WE'VE INSTALLED IN 2015/16 GIVING US IMPROVED DATA TO MANAGE OUR ESTATE

2,233

THE NUMBER OF ENERGY METERS WE MONITOR IN OUR ENERGY DATABASE

£25K

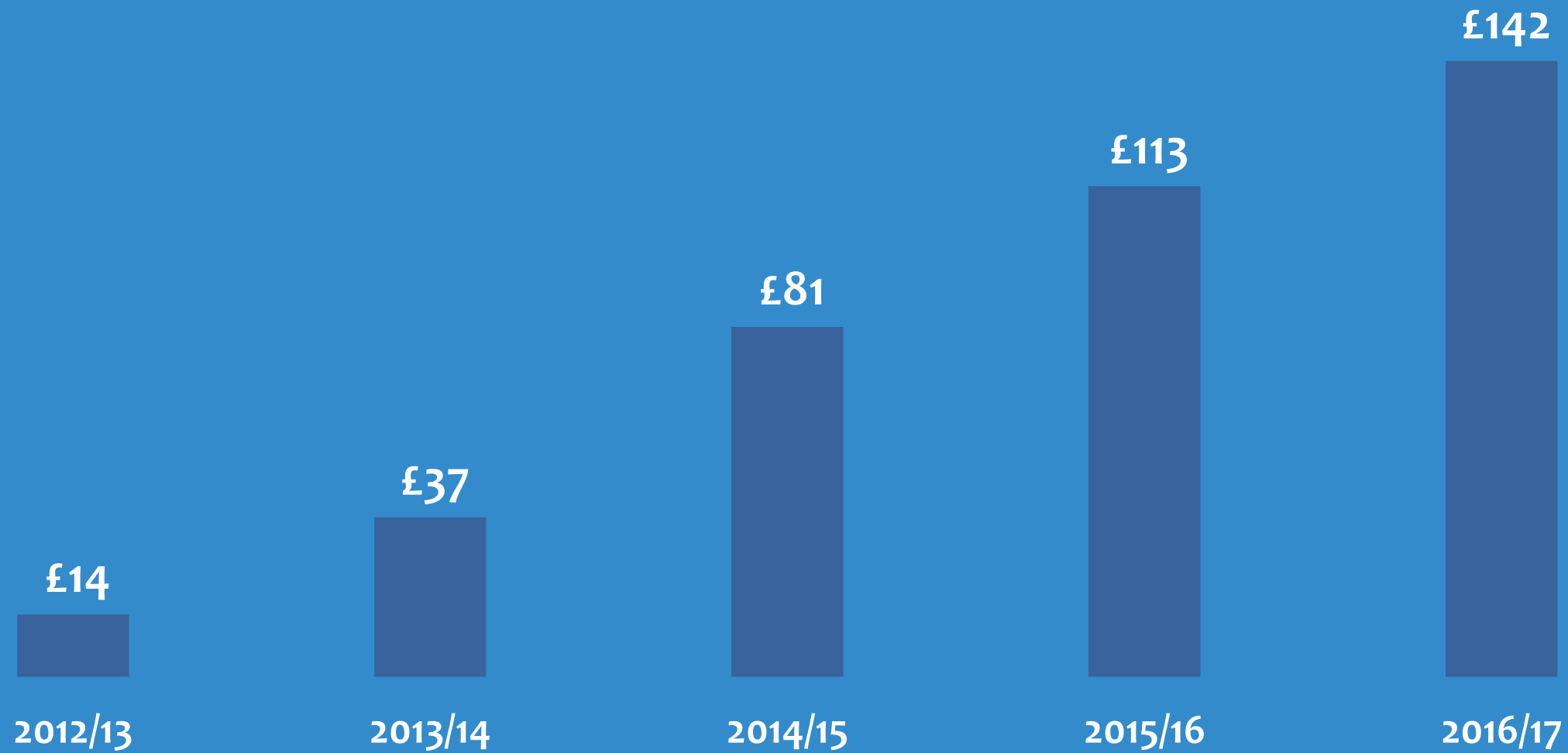
THE AMOUNT OF ENERGY SAVED FROM BEHAVIOUR CHANGE MEASURES

116

THIS IS THE NUMBER OF ASSEMBLIES, ENERGY AUDITS, WORKSHOPS AND ESTATES MANAGER TRAINING SESSIONS CONDUCTED BY THE ENERGY TEAM IN 2015/16

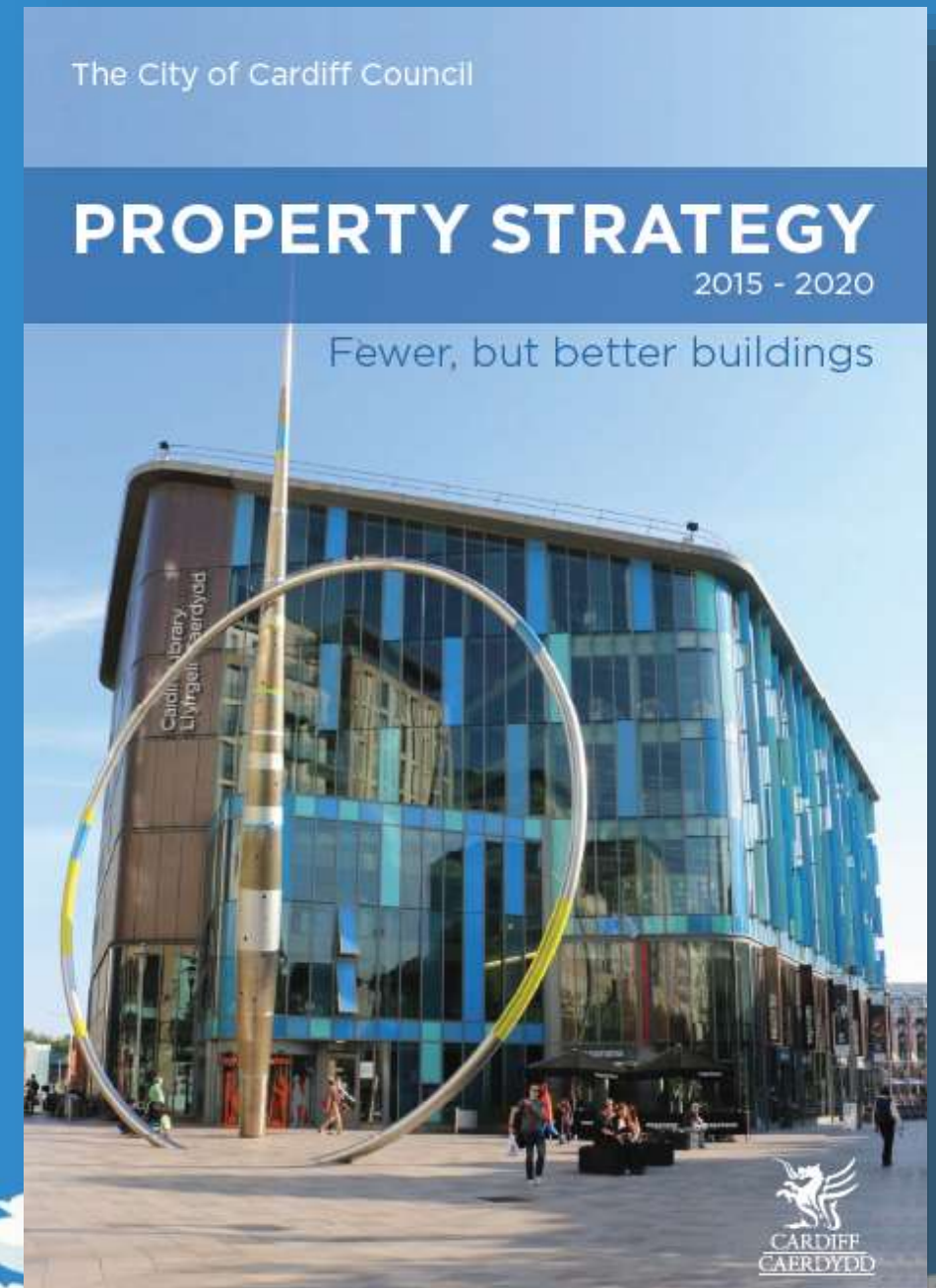


Council Savings Requirement (£m)



The Council's Estate

- * 1/3 of the city's land owned by the council
- * 400 operational buildings
- * 500 investment buildings
- * £4m income from operational estate
- * Opportunity to maximise income from non built estate?



Renewable Energy Subsidies

- * Introduced in 2010 and known as the Feed in Tariff
- * Used to stimulate the uptake of small scale renewable energy
- * Provides generators of renewable energy with income for every unit of electricity produced
- * Over time tariffs drop through a mechanism called “degression” on the assumption that technology costs are dropping
- * Radyr Weir receives 16.87 pence per kWh



Programme (key dates)

**JUN 2012
RADYR WEIR
PROJECT
COMMISSIONED**

**MAR 2013
PLANNING**

**NOV 2014
TENDERED**

**OCT 2015
PLANNED
START ON
SITE**

**18 DEC 2015
ROC
DEADLINE**

**JUL 2011
CARBON
TRUST
FEASIBILITY
STUDY**

**DEC 2013
PRE-ACC
ROC's**

**FEB 2015
AWARD TO
DAWNUS**

**JUL 2015
EARLY
START
ON SITE**

**DEC 2015
GRID
CONNECTED**

**APRIL 2016
COMPLETION**



FIRST NOTICE THAT GOVERNMENT PLANNED TO CONSULT ON DRASTIC CUTS TO HYDRO TARIFFS

Pre Accreditation

Key Constraints

- * Achieved in December 2013
- * Meant that we had 2 years to deliver to maintain tariff
- * Tariff pre accredited at 16.67p/kWh

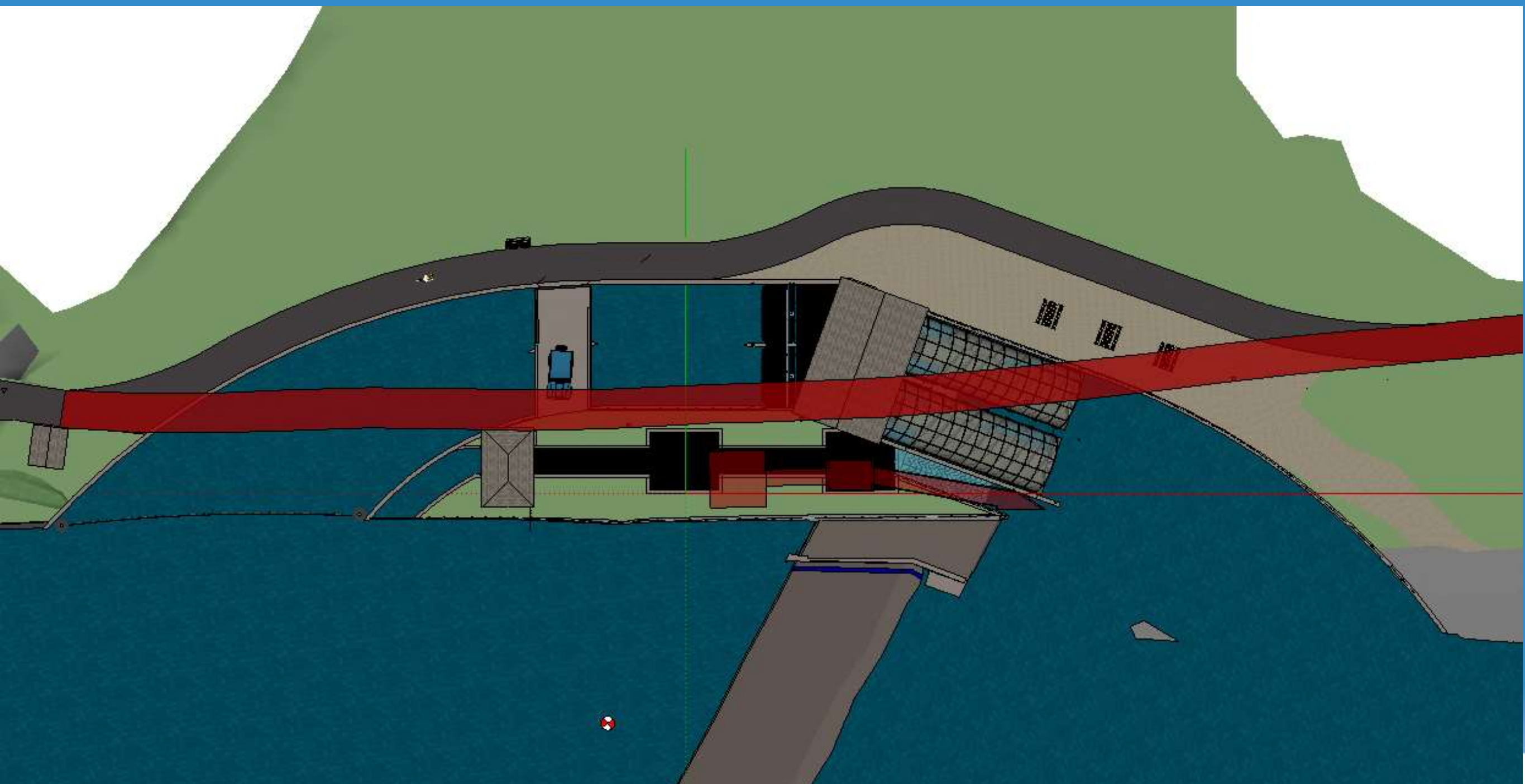
Government Consultation on Feed in Tariffs

- * Part way through the project the Government consulted on their plans to reduce the feed in tariffs considerably
- * Missing the key date for commissioning would have resulted in an unviable project
- * Tariff Rate post pre accreditation date at 6.14p/ kWh

About Radyr Weir



Original Plans



Procurement

Prior Information Notice – Informed the market to gauge their views on contract type, general appetite.

NEC3 Option A – Lump Sum Priced Contract with Activity Schedule
Driven by cost certainty

OJEU 2 Stage Tender

Two stage contract – Design and Build

To give contractor time to build design and to confirm the performance

To give either party the opportunity to walk away if the scheme didn't stack up

Included a clause to ensure the scheme produces required power output at given conditions

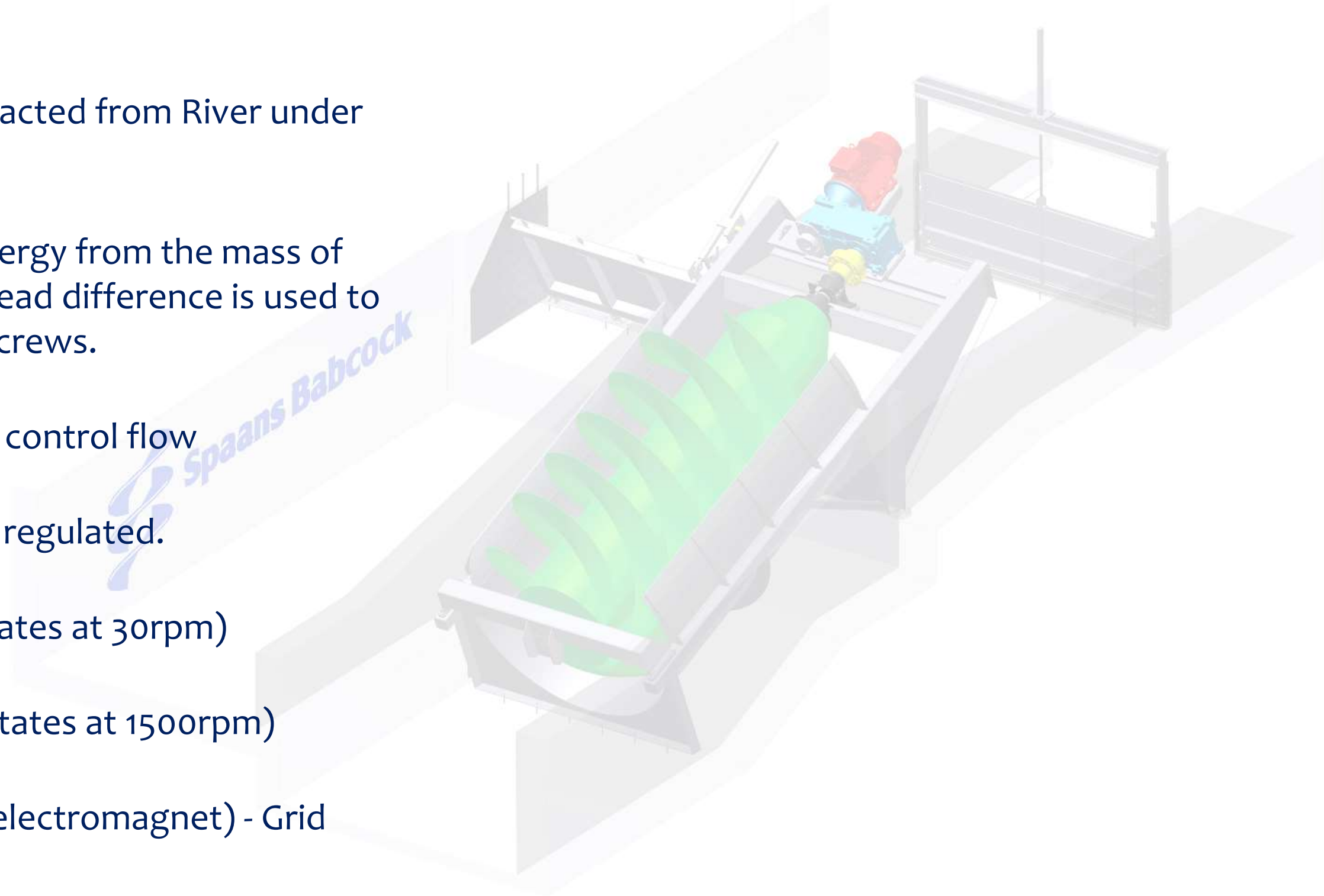
Facts & Figures

- * 2 No Archimedes Screw Turbines
- * Each 4m in diameter
- * 400kW total capacity
- * Generates 1.6GWh of electricity per annum (equivalent to 550 homes)
- * Can take a maximum of 18,000 litres of water per second
- * Rotates at a maximum of 30 rpm



How Does it Work?

- * Water Abstracted from River under Licence.
- * Potential energy from the mass of water and head difference is used to power the screws.
- * Sluice Gates control flow
- * River Levels regulated.
- * Turbine (rotates at 30rpm)
- * Gearbox (rotates at 1500rpm)
- * Generator (electromagnet) - Grid





Project Delivery



**ADEILADU
ARBENIGRWYDD
YNG NGHYMRO**



**CONSTRUCTING
EXCELLENCE
IN WALES**



Project Team

**CITY OF
CARDIFF
COUNCIL**

**FAITHFUL &
GOULD
PROJECT
MANAGER**

DAWNUS

**BURROUGHS
CIVIL
ENGINEERS**

**RENEWABLES
FIRST
DESIGN LEAD
AND HYDRO
SPECIALIST**

**SPAANS
BABCOCK
TURBINE
SUPPLIER**

**HEADLAND
ARCHAEOLOGY**

STAGE 1

CONTRACTS
MANAGER

PROJECT
MANAGER

SENIOR QS

PROJECT
ENGINEER

FOREMAN

2 x ENGINEER

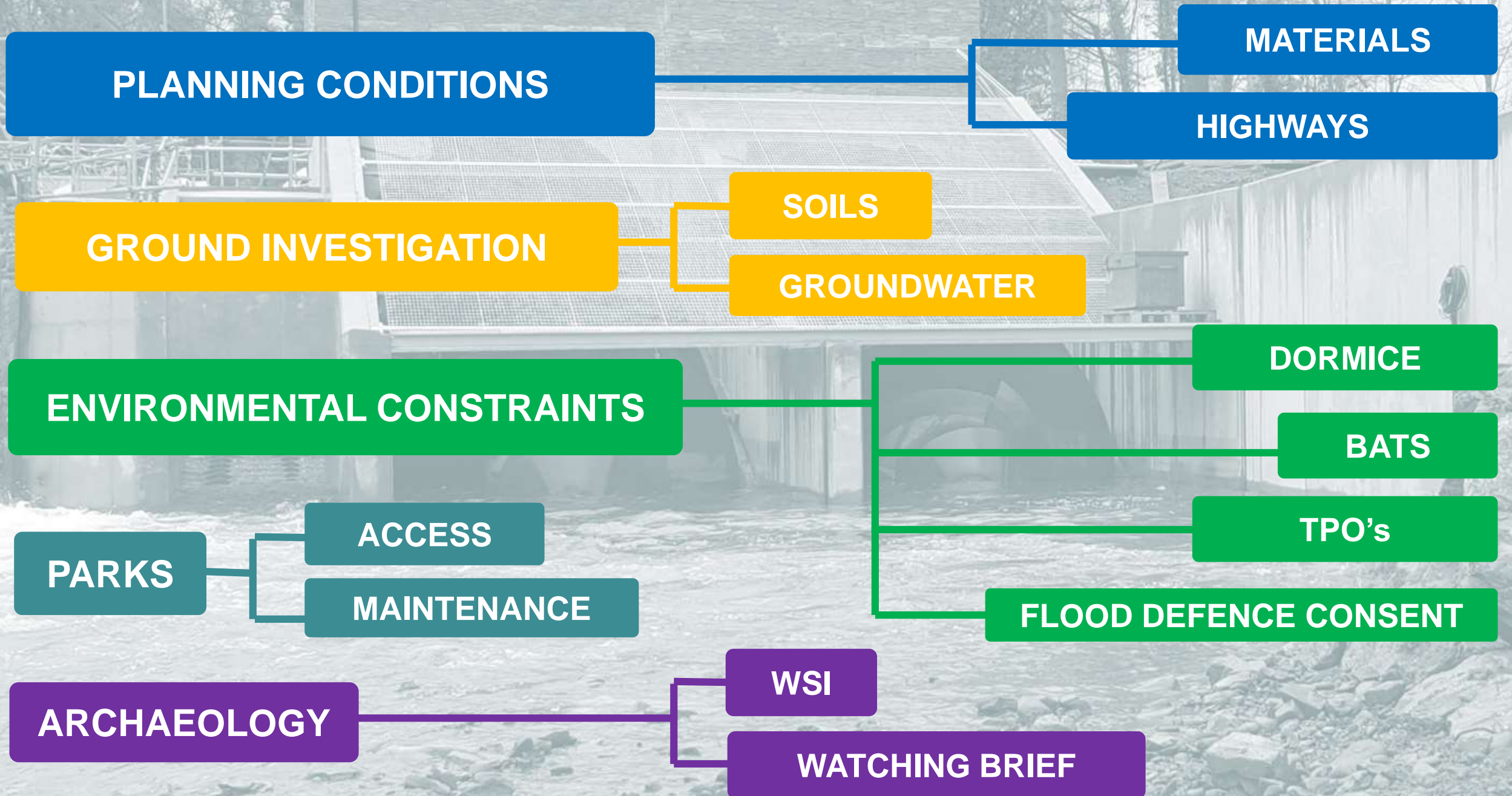
QS

STAGE 2

9 Months

7 Months

Design Development, Consents & Approvals



Programme (key dates)

Planned

Stage 1: 9 Months

Stage 2: 7 Months

FEB 2015
AWARD TO
DAWNUS

AUG 2015
ACTUAL
START ON SITE

OCT 2015
PLANNED
START ON SITE

18 DEC 2015
ROC
DEADLINE

APRIL 2016
PLANNED
COMPLETION

DEC 2015
GRID
CONNECTED

Actual

S1: 5 Months

Stage 2: 5 Months

+4 Months

Timeline Through Construction

Acceleration Measures

Challenges with Temporary Works

Design Features

3 OCT

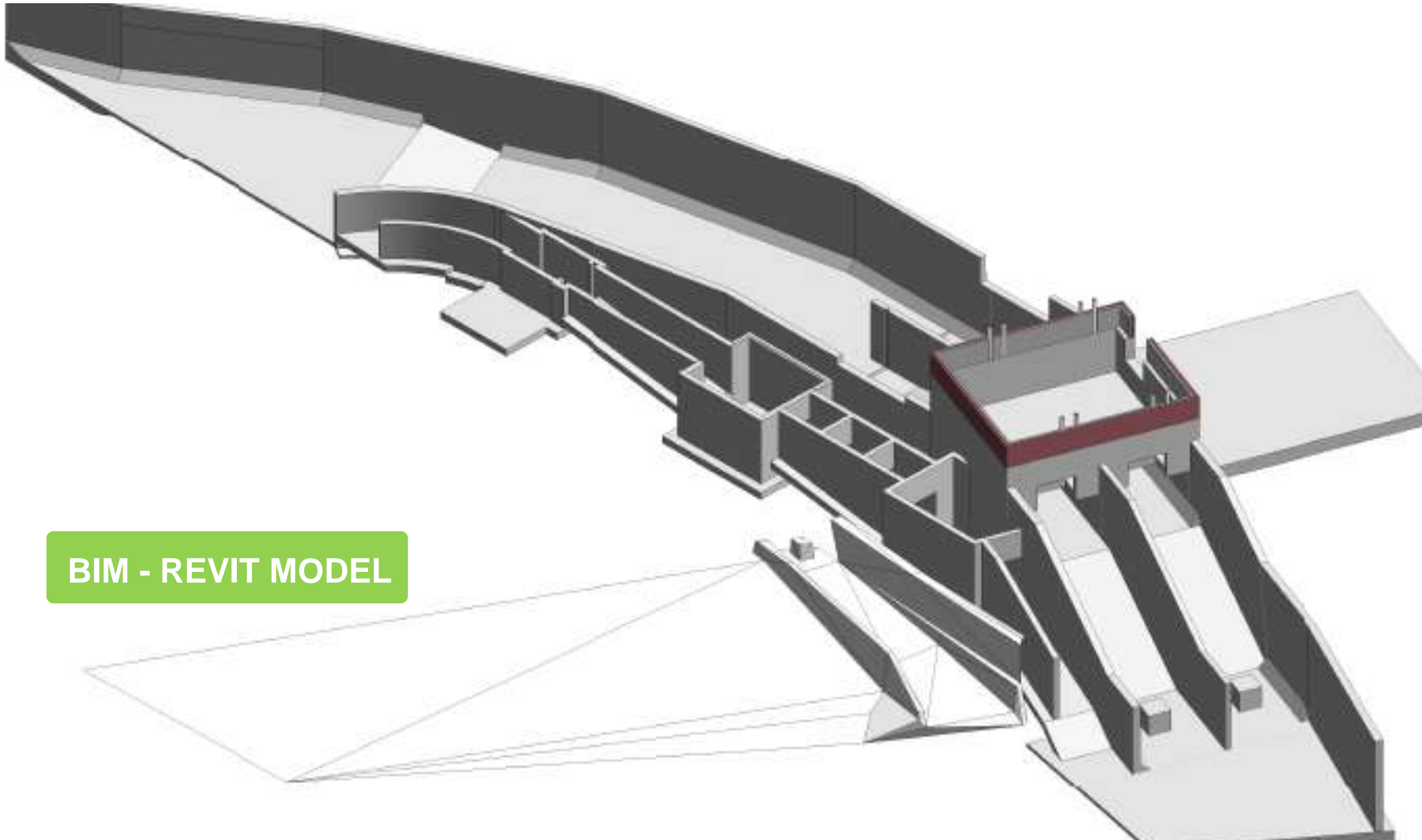


ROCK HEAD

COORDINATED
BRACING

DRAINAGE BLANKET

26 OCT



BIM - REVIT MODEL



4-5m BELOW WATER LEVEL

UNDER PINNING

7 NOV



7 NOV



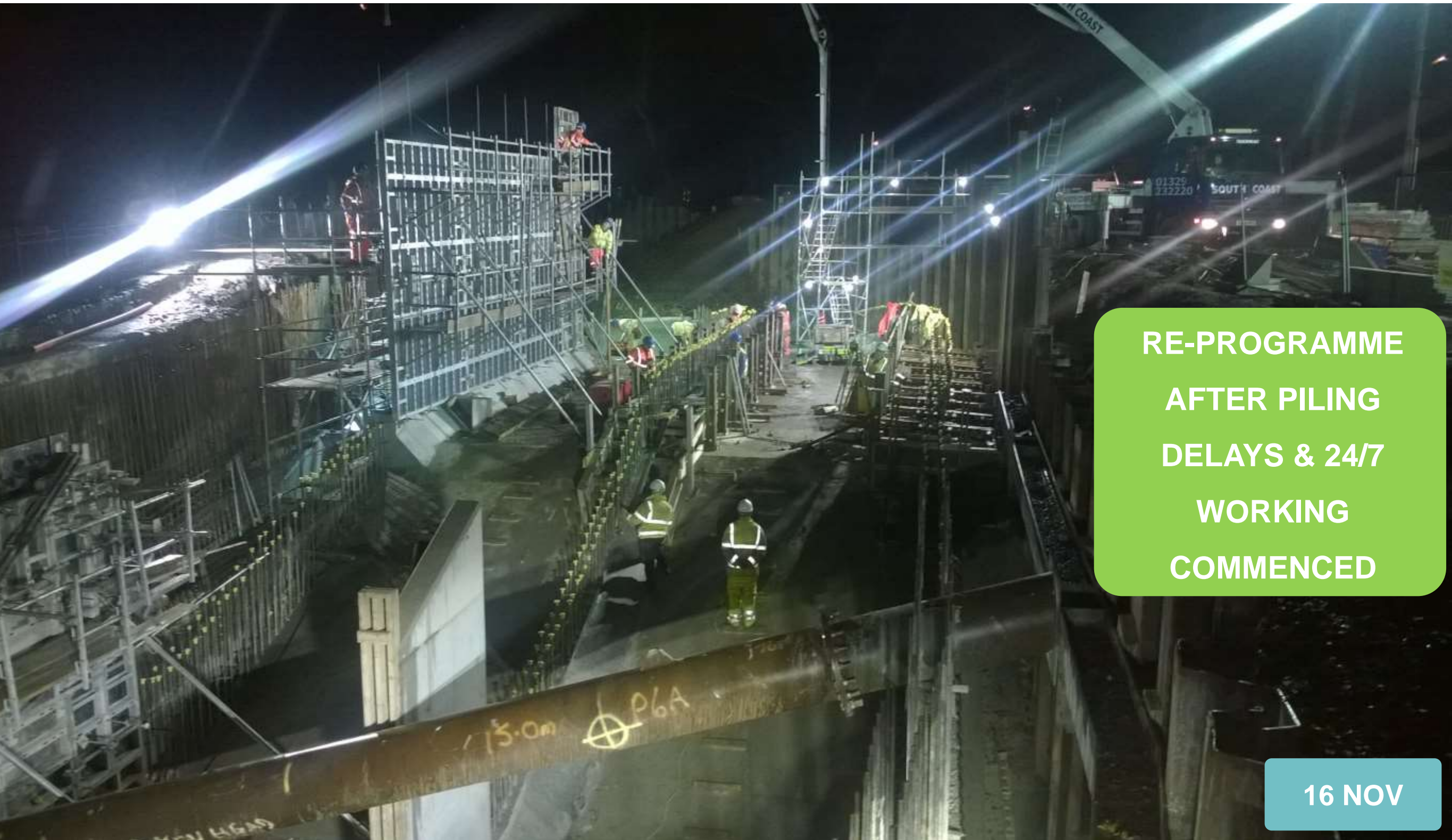
UNDER MINING
FOUNDATIONS

9 NOV



2 MAJOR POURS
PER DAY

12 NOV



RE-PROGRAMME
AFTER PILING
DELAYS & 24/7
WORKING
COMMENCED

16 NOV



COUNT THE
TRADESMEN !

18 NOV



**FINAL POUR
BEFORE THE
TURBINES ARRIVE**

22 NOV



THE TURBINES
ARRIVE FROM
HOLLAND

25 NOV



JUST WHEN WE
THINK WE ARE ON
TRACK WE GET
FLOODED OUT FOR
4 DAYS

1 DEC



THE INTAKE IS
FLOODED
TEMPORARILY TO
ALLOW US TO
COMMISSION TO
GRID

16 DEC



The Final Product



**ADEILADU
ARBENIGRWYDD
YNG NGHYMRU**



**CONSTRUCTING
EXCELLENCE
IN WALES**











Leaving a Legacy

Q&A

Ed Evans
Director
CECA Wales

