Welsh Government Housing and Regeneration
Optimised Retrofit Programme

Optimised RetroFit Programme 3

Monitoring Specification

Version: 2.0

Contents

Introduction

This document describes the requirements for environmental and energy monitoring to be delivered on projects as part of the Optimised RetroFit Programme 3 (ORP3) funding requirements.

Local authorities and registered social landlords awarded funding under ORP3 are responsible for ensuring that the requirements of this document are delivered as required. It is important to note that suppliers shall need to be informed of these requirements as part of your project at the scoping stage.

Any deviation from this specification shall be raised through the respective project's formal change control process for agreement with compliance being evaluated as part of the Welsh Government's commitment to provide ORP funding.

All prospective IES and energy monitoring suppliers should be provided with a copy of this specification as part of any tender development activities.

This document comprises 2 key sections:

- Environmental and energy monitoring requirements
- Intelligent energy system recommendations

It is highlighted that some, or all, of the monitoring required within this specification may be provided by the native functionality of available technologies (such as heat pumps and PV and battery systems with comms interfaces), or by 3rd energy management services that provide their own hardware. Landlords should explore efficiencies where possible.

Environmental and energy monitoring requirements

This monitoring specification is intended to cover various project approaches to retrofit and seeks to provide sufficient evidence to support long-term decarbonisation measures across Wales.

Energy and environmental monitoring requirements are outlined within the Scope of Monitoring section below, using a baseline standard of monitoring, with additional monitoring required based upon specific retrofit measures undertaken.

Additionally, all monitoring systems shall meet the requirements of the Data Standards section, which includes standards for data naming, structure and protocols for communication to the Welsh Government and its data processors.

All requirements under this section are mandatory unless otherwise stated.

Scope of Monitoring

Energy and environmental monitoring systems shall be provided on all homes under ORP3, both **pre-** and **post-**retrofit works as described in Table 1 on the following pages.

Where similar retrofit measures are being delivered on dwellings of a similar archetype at scale (20+ homes), the scope and scale of monitoring across schemes may be reduced through discussion and agreement with the Welsh Government.

All data points identified in table 1 below, shall be monitored in-line with the detailed monitoring point specification in Appendix A.

Table 1: Scope of pre- and post-retrofit monitoring

It is acknowledged that ORP3 project programmes may not be able to achieve the pre-retrofit monitoring requirements outlined below during the 2021/2022 heating season. Pre-retrofit monitoring requirements are therefore not mandatory for homes receiving retrofit prior to November 2023.

Applicants should instead look to deploy pre-retrofit monitoring as described below to better benchmark existing stock types that are likely to receive retrofit in following years of ORP.

		Pre-retrofit Monitoring Requirements	**Post-retrofit** Monitoring Requirements
Monitoring Period		**Min. 6 weeks Between Nov - Feb**	**60 Months / 5 years**
Minimum requirements for all dwellings		**Primary Energy** **Gas and electricity import and export metering** **Internal temperature, RH and CO_2 monitoring (15min interval)**	**Primary Energy** **Gas and electricity import and export metering** **Internal temperature, RH and CO_2 monitoring (15min interval)**
Additional requirements for specific retrofit measures	Fabric insulation and/or air tightness improvement measures	As per minimum requirements **Air tightness test recommended as per PAS2035**	As per minimum requirements **Air tightness test recommended as per PAS2035**

	New gas heating systems	As per minimum requirements	As per minimum requirements

	New Hydrogen Boilers	As per minimum requirements	In addition to minimum requirements: **Hydrogen service metering (15min interval)** **Space heat metering on wet systems (15min interval)**
	New electric heating systems (Heat pumps, panel heaters etc)	As per minimum requirements	In addition to minimum requirements: **Heating system electrical supply metering (15min interval)** **Space heat metering on wet systems (15min interval)**
	New electric hot water systems	As per minimum requirements	In addition to minimum requirements: **Heating system electrical supply metering (15min interval)** **Hot water consumption water meter (15min interval)**

	New MVHR or ventilation system	As per minimum requirements	In addition to minimum requirements: **Ventilation system electrical supply metering (15min interval)**
	New PV system	As per minimum requirements	In addition to minimum requirements: **PV Generation electrical metering (15min interval)**
	New electric battery system	As per minimum requirements	In addition to minimum requirements: **Battery charge & discharge electrical metering (15min interval)**
	New electric vehicle (EV) charging system	As per minimum requirements	In addition to minimum requirements: **EV Charge & Discharge electrical metering (15min interval)**

Note that associated external environmental data will be collected via established regional weather stations.

Data Standards

All energy and environmental monitoring systems shall comply with the Data Standards specification available at the following GitHub link:

https://github.com/abc-rp/messaging-onboarding

Energy and environmental monitoring data shall be transmitted to the Welsh Government's data processing platform using the UDMI payload scheme over the MQQT protocol also as described within the link above.

It is preferable that monitoring systems transmit data directly from hardware infrastructure to the WG messaging platform directly, though may be transmitted via 3rd party cloud platforms, with the exception of LoRaWAN servers on wide area LoRaWAN networks.

Landlords should consider and be aware of the data security aspects and ongoing costs associated with use of 3rd party cloud systems as part of their tendering process.

The specifications provided in the link above are hardware agnostic and monitoring may be delivered through any hardware platform that meets the requirements of the specification, including the use of project specific or existing LoRaWAN networks.

All prospective IES and energy monitoring suppliers should be provided with a copy of this specification as part of any tender development.

Intelligent Energy System Recommendations

There are no mandatory requirements for management of energy under ORP3, however landlords are encouraged to explore the emerging and growing energy management market that provides opportunities to reduce energy bills and carbon emissions, while supporting local and national energy infrastructure to manage a rapidly changing landscape through increased flexibility.

Energy technologies including heat pumps, thermal stores and electric batteries can reduce energy bills and carbon emissions through a combination of:

- maximising self consumption of ‘free’ on-site renewable energy
- importing and storing grid energy when cheap and low carbon
- exporting energy and receiving payment
- joining paid-for gird flexibility services such as Demand Side Response (DSR)

There are a number of market mechanisms for supporting the reduction of energy costs including variable cost energy tariffs and management of home energy systems by energy suppliers and 3rd party companies.

It is highlighted that some, or all, of the monitoring required within this specification may be provided by the native functionality of available technologies (such as heat pumps and PV and battery systems with comms interfaces), or by 3rd energy management services that provide their own hardware. Landlords should explore efficiencies where possible.

Project Equinox

UK Govt as part of its announcement on its wish for the installation of Air Source Heat Pumps, some 600,000 per year across the UK, has launched Project Equinox via OFGEM and the Electric Grid , in Wales this being Western Power Distribution and Scottish Power Energy Networks, a trial of some 500 social homes on ORP.

EQUINOX will be the first NIC project dedicated to addressing the challenges DNOs face with the electrification of heat. The project will develop novel commercial arrangements and supporting technologies that unlock flexibility from residential low carbon heating, while meeting the needs of all consumers, including the fuel poor and vulnerable.

APPENDIX A - Monitoring Point Specification

Internal Environment

Property	Format	Measurement Unit	Monitoring interval
Temperature	Number	Degrees celsius (°C)	15 minutes
Humidity	Number	% Saturation (%)	15 minutes
CO_2	Number	PPM	15 minutes

Primary Energy (Import and Export)

Property	Format	Measurement Unit	Monitoring interval
Primary Gas Volume	Number	m or^3 kWh	15 minutes
Primary Electrical Energy	Number	kWh	15 minutes

Electrical Sub-Circuit Energy

Property	Format	Measurement Unit	Monitoring interval
Heating System Circuit(s) Energy	Number	kWh	15 minutes
Domestic Hot Water System Circuit(s) Energy	Number	kWh	15 minutes
Immersion Heater Circuit(s) Energy	Number	kWh	15 minutes
Ventilation System Circuit(s) Energy	Number	kWh	15 minutes
Solar PV Circuit(s) Energy	Number	kWh	15 minutes
Electric Vehicle Charger Circuit(s) Energy	Number	kWh	15 minutes
Electrical Battery Circuit(s) Energy Charge & Discharge	Number	kWh	15 minutes
Miscellaneous Circuit(s)	Number	kWh	15 minutes

Heating Systems

Where new heat pump systems are installed, it is recommended that systems with serial data interfaces are investigated as a potential route for data collection. This route often provides multiple data points from energy consumption to energy generation, as well as a means for control by external systems or energy managers.

Property	Format	Measurement Unit	Monitoring interval
Heating System Input Energy (may be picked up at consumer unit, or incoming gas meter)	Number	kWh	15 minutes
Heating System Output Energy	Number	kWh	15 minutes
Space Heating Output Energy	Number	kWh	15 minutes
Domestic Hot Water Output Energy	Number	kWh	15 minutes

Batteries

Energy flow to, and from, electrical batteries may be monitored under the consumer unit sub-circuit monitoring above, where the battery is connected on a dedicated circuit.
Where additional monitoring points are available from battery systems, the following points will provide additional insight to system performance.

Property	Format	Measurement Unit	Monitoring interval
Charge / Discharge Energy	Number	kWh	15 minutes
State of Charge	Number	kWh	15 minutes
Rate of Charge	Number	kW	As high as possible

Electric Vehicle Chargers

Energy flow to, and from, electrical vehicle chargers can generally be monitored under the consumer unit sub-circuit monitoring above, where the charger is present on a dedicated circuit.
Where additional monitoring points are available from smart charger systems, the following points will provide additional insight to system performance.

Property	Format	Measurement Unit	Monitoring interval
Charge / Discharge Energy	Number	kWh	15 minutes
State of Charge	Number	kWh	15 minutes

Rate of Charge	Number	kW	As high as possible

Note that associated external environmental data will be collected via established regional weather stations.

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