Remote telemetry for environmental monitoring of groundwater, ground gas and non-aqueous phase liquids

energy institute

REMOTE TELEMETRY FOR ENVIRONMENTAL MONITORING OF GROUNDWATER, GROUND GAS AND NON-AQUEOUS PHASE LIQUIDS

GUIDANCE TO SUPPORT APPROPRIATE TECHNOLOGY SELECTION

First edition

October 2017

Published by

Energy Institute, London

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Registered charity number 1097899

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This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

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The EI gratefully acknowledges the financial contributions towards the scientific and technical programme from the following companies

Apache North Sea
BP Exploration Operating Co Ltd
BP Oil UK Ltd
Centrica
Chevron North Sea Ltd
Chevron Products Company
CLH
ConocoPhillips Ltd
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DONG Energy
EDF Energy
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Total E&P UK Limited
Total UK Limited
Tullow Oil
Uniper
Valero
Vattenfall
Vitol Energy
Woodside
World Fuel Services

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ISBN 978 0 85293 855 3

Published by the Energy Institute

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CONTENTS

Contents continued

Page

LIST OF FIGURES, TABLES, BOXES AND EXAMPLES

Page

Figures

Tables

Boxes

List of figures, tables, boxes and examples (continued)

Page

Examples

FOREWORD

Remote telemetry methods can improve the efficiency and quality of environmental data gathering. However, with the proliferation of the technology and its application, it is important to recognise the merits and suitability of each method to ensure value in the chosen application. Considerations include: investment and running costs, reliability, resilience, operator training, data accuracy, quality assurance (QA)/quality control (QC) requirements and data security. A number of technologies now exist which have been employed to monitor groundwater, ground gas and non-aqueous phase liquids (NAPLs) in a wide range of industries.

This guidance was commissioned by the Energy Institute (EI) to raise awareness of the applicability and value of remote telemetry technologies in environmental monitoring. It provides an independent review of remote telemetry monitoring methods worldwide, a general classification and description of general operating principles, methods and infrastructure arrangements as well as identification of key factors to consider when comparing and contrasting each technology. A flowchart guides the choice of generic methods including application recommendation for each.

The guidance aims to assist a wide range of stakeholders, including industrial site operators, health, safety and environmental managers, regulatory authorities, environmental and non-governmental organisations as well as consultants.

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Technology in this area is changing and developing rather rapidly. The EI aims to monitor developments in this area to include updates in future editions. Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, London W1G 7AR.

ACKNOWLEDGEMENTS

This project was commissioned by the Energy Institute's (EI) Soil Waste and Groundwater Group.

The EI wishes to record its appreciation of the work carried out by Arcadis UK project team and also its gratitude for the valuable contributions made by the steering panel during the course of the project.

Martyn Lambson	BP
Tammy Brantley	Certas Energy
Martyn Dunk	Exxon Mobil
Tim Greaves	Exxon Mobil
Serguey Arkadakskiy	Saudi Aramco
Ekaterina Kremleva	Saudi Aramco
Nigel Clarke	Shell

In particular the EI would like to express its thanks to the lead authors Jonathan Coulson, Roy Dennis and Katy Baker from Arcadis UK.

Thanks are also given to the following for their contributions to the development of this publication:

Lenny Coakley	Arcadis
Wendy Dobing	Arcadis
Stephen McNulty	AmbiSense Ltd.
Jane Sidall	Historic England
Jon Sidebotham	Arcadis
Neil Townend	Modern Water
Vincent Van Walt	Van Walt Inc.

Project coordination and committee liaison were undertaken by Beate Hildenbrand (EI).

1 INTRODUCTION

1.1 AIM AND REMIT

Recent years have seen an increased focus on the importance of compliance with new or evolving environmental protection legislation, leading to ever greater collection of environmental data to help inform robust decision-making and monitor compliance. A natural progression has been the development of new methods and techniques that can be used to gather such information in the safest and most cost-effective manner. This includes collection of data using remote systems with the information transmitted back to the user without need to repeatedly visit a site. However, knowledge and understanding of available techniques and technologies for undertaking remote telemetry environmental monitoring is not widespread. This publication is intended to raise awareness of the applicability and value of remote telemetry technologies in environmental monitoring.

For the purposes of this publication, telemetry has been defined as:

> *'The automatic measurement and transmission of data, typically employed to collect information from remote or inaccessible locations'.*

Remote monitoring has been defined as:

> *'A process by which automatic measurements are made remotely. Data may be transmitted via a telemetry system but could also be stored electronically and collected manually at the data gathering location'.*

While there are many potential advantages in employing remote telemetry monitoring to obtain environmental data, there are a number of important criteria that should be evaluated before any system is employed, such that the advantages and potential disadvantages can be considered prior to implementation. The information presented in this publication is designed to support users in the selection of appropriate techniques and technologies based on their requirements, using a flowchart to aid the reader (section 2).

The remit of this publication is the monitoring of groundwater, ground gas and NAPLs by remote telemetry monitoring. While remote monitoring without use of telemetry may only store data *in situ* for future manual collection, it has also been included in this publication as a topic of potential interest to the readers.

The preparation of this publication included a literature review, engagement with suppliers of a wide range of remote telemetry monitoring technologies and liaison with consultants involved in the collection and transmission of environmental monitoring data.

1.2 INTENDED AUDIENCE

This publication has been developed to assist a wide range of stakeholders, including those listed in Box 1, regarding the selection of appropriate remote technologies for the monitoring of environmental parameters.

While the focus of this guidance is primarily on downstream activities onshore, the principles presented are also valid for other applications like onshore well pads and/or offshore operations.

Box 1: Intended audience for the guidance

- Industrial site operators
- Health, Safety and Environmental managers
- Regulatory authorities
- Environmental and non-governmental organisations
- Consultants

1.3 VALUE OF REMOTE MONITORING AND TELEMETRY

Remote monitoring and telemetry systems can provide significant benefits to monitoring projects which can include:

- reduced travel and associated reduction in risks to workers;
- likely reduction in data collection errors;
- consistency in form of data collected;
- potential to collect significantly more data in comparison to manual data collection in a more consistent form;
- instantaneous alerts where deviation in data observed, and
- potential for reduction in life cycle costs.

By increasing the level of automation there are significant benefits to be gained through the reduction of labour and travel costs, improved safety and ensuring a consistent standard of data quality.

While there are apparent benefits from use of remote telemetry techniques and technologies, these need to be balanced against the potential disadvantages. For example:

- Reliance needs to be placed on the reliability of the equipment, which may require routine maintenance visits.
- The equipment could be vulnerable to third party damage or theft.
- The increase in capital expenditure may outweigh the long-term savings in visiting site to collect environmental data, and needs consideration at an early stage in the selection process.
- The required technology may still be in its infancy, and thus difficult to purchase or rent.

Support in how to assess the potential advantages and disadvantages of different technologies is provided in sections 4 and 5.

1.4 ENVIRONMENTAL MEDIA

The primary focus of this publication is on the application of remote telemetry monitoring schemes for three types of environmental media. These are:

- groundwater;
- separate phase liquids (NAPL), and
- ground gases (sometimes known as soil vapour or soil gas).