HOW MEASUREMENT IS DEVELOPING THE UK'S LOW CARBON ECONOMY

Jane Burston

Jane Burston, Head of the Centre for Carbon Measurement, explains why the development of measurement infrastructure is vital to advancing low carbon technologies and informing policy response to climate change.

In 2008 the UK became the first country in the world to set legally binding carbon targets in the Climate Change Act. The Act set goals for emission reductions of 34 per cent by 2020 and 80 per cent by 2050. Accurate measurement will play a critical part in enabling the UK's transition to a low carbon economy and will benefit government, business and the wider society.

Advancing carbon measurement practices will reduce uncertainties in climate data and provide the confidence that is required to account for, price and trade carbon emissions. It will also help accelerate the development and adoption of low carbon technologies.

Businesses need incentives to reduce emissions and make low carbon investments. If heavy industry is to reduce emissions through carbon capture and storage, they need to be able to prove the effectiveness and safety of the processes and technologies being used. The government needs to have faith that the resulting investments will deliver our carbon targets, and the public needs to know that low carbon products do what they say.

Getting this right will help us develop an environmental goods and services sector that can deliver nationally and internationally. It will allow the UK to lead the world as the financial centre of the global carbon market (projected to be over $1 trillion by 2020) and will secure the UK's position as a leader in growth and innovation as well as emission reduction.

All of this requires the development of a measurement infrastructure – not only in the UK but internationally. The National Physical Laboratory (NPL) has launched the Centre for Carbon Measurement – a world-first facility that will provide just that.

THE CENTRE FOR CARBON MEASUREMENT

NPL occupies a unique position as the UK's National Measurement Institute and sits at the intersection between scientific discovery and application. Our expertise and research make a huge impact in areas such as security, healthcare, defence and energy.

Recently launched at our London headquarters, the Centre for Carbon Measurement will supply the necessary measurement infrastructure to support the UK's transition to a low carbon economy and provide capabilities to test instrumentation, develop low carbon technologies, and provide confidence in data used to model the potential impact of climate change.

The Centre has consulted stakeholders from across government, academia and business to inform the focus of our projects. These stakeholders, which include the National Grid, E.ON, the Department for Energy and Climate Change and the National Centre for Earth Observation, endorse the three areas of our work: reporting and reducing uncertainties in climate data used to monitor and model climate change; supporting existing and emerging tax, trade and regulatory instruments for carbon pricing and reporting; and accelerating the development of, and validating, the performance of low carbon technologies.

REPORTING AND REDUCING UNCERTAINTIES IN CLIMATE DATA

One area where measurement is becoming increasingly vital is predicting the impact of climate change. Work to date enables us to say with a degree of confidence that our climate is changing due to man-made emissions. What the data and climate models do not yet allow us to predict, with the certainty we need, is the future impact of climate change and how quickly and where the impacts will be felt.

We need to improve the accuracy of climate change data in order better to inform government policy regarding mitigation and adaptation programmes, and the areas in which our resources would have the biggest impact. Should we be scaling up wind farms, developing the Thames Barrier or moving populations away from low-lying and coastal areas?

Improving the accuracy and reliability of climate data through data auditing and setting standards is a difficult task. We are making measurements of small signals against a noisy background using instruments across the globe, in a way that is internationally consistent and can be relied upon for decades.

The Centre will develop standards and validate the sensors used in satellites so that accurate, laboratory-quality measurements of climate parameters can be made from space – essentially launching National Measurement Institutes into orbit.

These data will allow modelling of climate change to understand its impact; enabling international agreements and

national policies for climate change mitigation and adaptation to be placed on a firm footing.

SUPPORTING CARBON TRADING AND PRICING

Our second focus is to support the infrastructure for carbon trading, pricing and reporting.

Countries which have agreed to cap their carbon emissions often purchase carbon credits to help meet their allocated quantity. These 'offset' credits are produced by emission-reduction projects in developing countries such as avoided deforestation. The validity of offset projects is reliant on accurate measurement to validate the extent of carbon dioxide mitigation and sustain a viable carbon trading system.

NPL is a world leader in atmospheric measurements and, with industry partners, has developed a range of technologies that could be adapted to measure carbon dioxide emissions. One of these is NPL's unique Differential Absorption Lidar (DIAL) which generates a 3D map of emissions and calculates the concentrations, providing rapid, accurate measurements of airborne emissions up to 3km away.

Heavy industries that emit carbon dioxide have to purchase carbon credits to help mitigate their effect on climate change. Under the existing EU Emission Trading Scheme (ETS), organisations must purchase one 'allowance' for every tonne of carbon emitted. As well as creating costly outgoings, the supply of allowances is limited, incentivising organisations to reduce their carbon emissions.

Pumping carbon dioxide underground would avoid emissions entering the atmosphere and so reduce the number of allowances companies have to buy. Demonstrating that the process is effective and safe – and that captured carbon dioxide is not leaking back into the atmosphere – will require reliable measurement.

Carbon Capture and Storage (CCS) is likely to be in depleted oil and gas reservoirs, which are often under the seabed. These offshore sites could use acoustic techniques to monitor and measure potential leaks. Gas bubbles created by carbon dioxide scatter sound strongly and may be detected using imaging or sonar techniques. Geo-acoustic sensors could be positioned on the sea-floor to detect movement and provide early warning of the changes in sea-bed composition. The Centre for Carbon Measurement has the relevant facilities for testing marine acoustics, allowing underwater acoustic measurements for CCS to be developed.

As the international community seeks to develop more sophisticated and coordinated policies, it will become increasingly important that the underpinning measurement infrastructure keeps in step. The work of the Centre for Carbon Measurement will enable regulation, ensure fair and stable carbon markets, support businesses in reporting and managing emissions, and provide confidence to establish and meet international agreements.

ACCELERATING DEVELOPMENT OF LOW CARBON TECHNOLOGIES

Our final focus area is supporting the development of low carbon technologies. The Centre provides access to the best measurement techniques for developers of low carbon products and clean technologies, which will allow validation of their performance.

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This will provide the confidence to secure investment to develop and commercialise the product, ensure regulations are met and reassure customers that the claims about the product are valid. Such support is key to the delivery of policies such as the Green Deal, and to commercialising advances in areas such as building energy efficiency, fuel cells, renewables and smart devices.

The measurement challenges faced by developers and users of low carbon technologies are often best solved in real-world situations rather than in a lab setting. Part of the Centre's work will build on an existing NPL facility – the 'hotbox' – which measures energy performance of large building sections and materials such as solid wall insulation to evaluate the thermal performance. We aim to develop this capability for use on full, occupied buildings in order to determine how such products perform in real-world settings.

THE IMPACT ON THE UK SKILLS-BASE AND THE ECONOMY

The development of a National Measurement Infrastructure to meet these carbon challenges supports many of the individual activities set out in the Department for Energy and Climate Change's Carbon Plan. In addition, the Centre will aim to support the up-skilling of the UK workforce for a low carbon future, provide significant direct economic benefit and ensure the UK continues to be a leader in the effort to address climate change.

Launched in March 2012, the first year of activity for the Centre of Carbon Measurement will bring together existing expertise and build new capabilities along with partners. We are looking for those with an interest in this area – from business, government and academia – to work with us to expand the capabilities of the Centre and to take advantage of our expertise to advance their own low carbon practices, technologies and research.

Without a robust measurement infrastructure, it is difficult to know the scale of the climate problem or the adequacy of the solutions – whether those are policies, projects or technologies. NPL's existing work has helped solve some of the most pressing issues. With the introduction of the Centre for Carbon Measurement at a world leading centre of excellence in measurement science, NPL and its partners will be able to make a profound and global difference.

http://www.npl.co.uk/carbon-measurement/

ABOUT NPL

The National Physical Laboratory (NPL) is one of the UK's leading science facilities and research centres. It is a world-leading centre of excellence in developing and applying the most accurate standards, science and technology available.