



Gas Shrinkage Forum: NAEI Intro

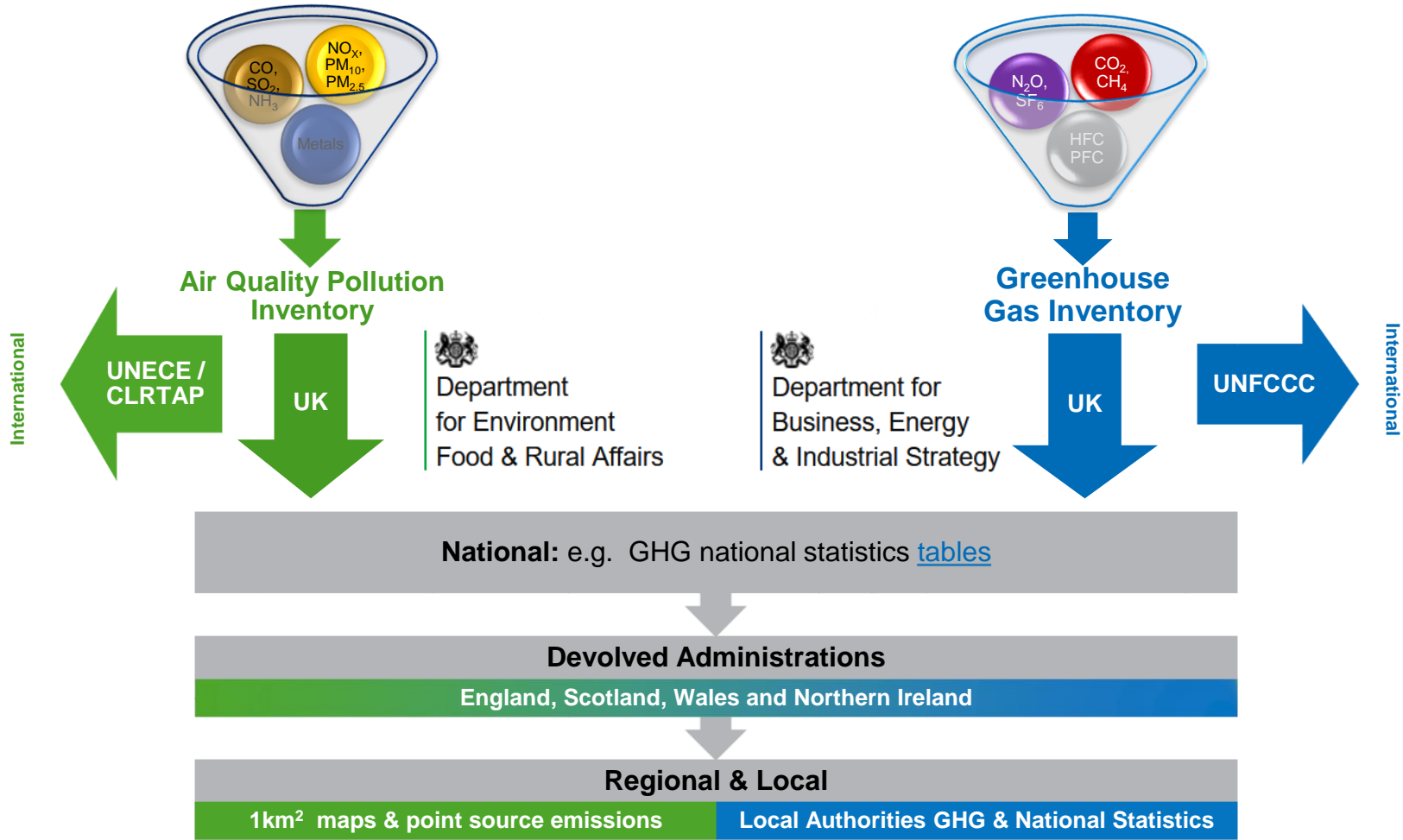
Glen Thistlethwaite, Ricardo plc
22nd March 2023



Quick intro

- Glen Thistlethwaite, NAEI Technical Director, Ricardo
- Ricardo are under contract (to 2025) to DESNZ to deliver the National Atmospheric Emissions Inventory (NAEI) which includes the UK GHG inventory
- We've been accessing the gas leakage data via requests direct to each GDN for many years, but there is greater focus from DESNZ now on the underlying model – data, assumptions, documentation etc.
- *(Part of wider DESNZ work to understand and address science and modelling risks.)*
- We'd like to request access to populated versions of the SLM for a recent year, to improve spatial resolution and enable some degree of QA of the model, to better understand risks.

National Atmospheric Emissions Inventory: main outputs



Other submissions / tasks

- Technical support to UK Government steering committees (DESNZ, Defra)
- [Default emission factors for UK Emissions Trading Scheme \(ETS\)](#)
- Analysis of UK ETS data for the DUKES team; work with the EEP team to understand DUKES vs GHGI differences; direct support to policy teams.
- [Transport emissions support for DfT statistics](#)
- Devolved Administration inventories: Scotland, Wales, N Ireland
- [Conversion factors for domestic company emissions reporting \(e.g. SECR\)](#)
- Local Authority GHG inventories; National Parks data.
- [LULUCF data /analysis for the DESNZ Land Use and Bioenergy Science team](#)
- Emission maps with resolution 1km² → air quality modelling / health impacts
- [Participation in reviews under the UNFCCC, CLRTAP \(of UK, of other countries\)](#)
- NAEI website maintenance; responding to public enquiries
- [Support to other UK UNFCCC submissions, e.g. National Communications](#)
- Various air quality pollutant emissions reporting outputs, including projections
- [Day to day ad-hoc support for Government users of NAEI data](#)

NAEI emission estimation methods (1)

Scope

- All anthropogenic emission sources: energy (combustion, fugitives), industrial processes & product use, agriculture, land use change & forestry, waste management
- All UK territorial emissions (*production based, not consumption based*)
- Many pollutants per source category: all GHGs, priority AQ pollutants (e.g. NO_x, PM_{2.5}, NMVOCs), heavy metals, Persistent Organic Pollutants (PCDD/Fs, PAHs) ..
- Long time series of data: 1990/1995 base year for GHGs, 2005 for AQ pollutants

Methods

- Consistent with prevailing international guidelines
 - 2006 IPCC Guidelines (and the 2019 Refinement to those guidelines)
 - EMEP/EEA Guidebook (for AQ pollutants)
- Resources prioritised to Key Source Categories (**high-emitting sources, those that affect the UK trends**)
 - Simpler methods for minor sources (e.g. use default emission factors)
 - “higher tier” methods for key sources (UK-specific factors, models)
 - Minimise inventory uncertainty as efficiently as we can

NAEI emission estimation methods (2)

Data Sources

- **National statistics:** **DESNZ energy stats**, DfT transport stats, ONS production stats, HMRC data, Defra agricultural stats, FC forestry stats, Defra waste stats ...
- **Industry-specific statistics / trade associations:** ISSB, MPA, UKPIA, CIA, UKWIR...
- **Regulatory reporting mechanisms:** UK Emissions Trading Scheme, IED/PRTR, EEMS and PPRS, **OFGEM RIIO-2** ...
- **Literature and research sources:** EF libraries, one-off research e.g. fuel sampling and compositional analysis

Data Quality Objectives

- **Transparency; Accuracy; Consistency** (across the time series); **Completeness; Comparability** (with other country submissions to the UNFCCC/UNECE)
- *“To minimise uncertainty and ensure that inventory estimates are neither over- nor under-estimated as far as can reasonably be judged”*

→ **Annual programme of continuous improvement**



Inventory Quality Assurance

- Annual expert reviews (UNFCCC); bilateral / peer reviews; UK inventory steering committees (pre-submission sign-off)
- Inventory verification studies: InTEM, AQ modelling (PCM) ..

Drivers for UK inventory Improvement

- **DESNZ science team** lead to drive down uncertainties
 - Net Zero
 - Carbon Budgets
 - UNFCCC / UNECE reporting (includes methane, NMVOC)
- Oil and Gas industry-specific drivers / focus
 - Global Methane Pledge, OGMP 2.0
 - Marcogaz model
 - Measurement campaigns / projects
 - Super-emitters
 - [Recent 2-year inventory improvement on upstream oil and gas]
- Risks associated with NAEI models → QA of underlying models
 - Documentation (transparency)
 - Accuracy, Completeness, Consistency
 - Representative of UK circumstances
 - Risk of duplicating emissions data from other sources? (e.g. PI)

Downstream gas shrinkage and leakage

- NAEI uses the GDN data from the [Shrinkage and Leakage Model](#)
 - ✓ Specific to UK pressures, network materials, components
 - ✓ Annual activity data on network upgrades
 - ✓ High (spatial) data resolution within the model (but not in outputs to DESNZ)
 - ✓ Consistent approach across the network, used for OFGEM reporting under price control regulations (RIIO-2)
 - ✗ We don't have much in the way of **documentation** of the model, or the underlying evidence to inform Emission Factors (e.g. per AGI type - range, variability, uncertainty)
 - ✗ Methods (e.g. AGIs) based on old data (2003/4) – **validation, improvement?**
- The NAEI spatial disaggregation of the UK network totals is based on a proxy dataset (gas consumption patterns) as we don't receive spatially resolved data
- Development of the DPLA? SLM improvements in the meantime?
- Measurements indicate mis-matches, NAEI vs field observations
 - Not unexpected
 - Aim to improve NAEI spatial resolution
 - How to identify & quantify super-emitter sources

Can we get access to populated versions of the model per GDN?

- QA of the model
- Understanding of scope, risk of gaps / double-counts
- Improve our understanding of uncertainty of the outputs
- Improve the quality of the UK submissions to UNFCCC, UNECE
- Enable DESNZ to determine next steps
- Spatial information and information per sub-source (e.g. per AGI type, including locations) will help improve NAEI emission maps (for modelling community)

Other related considerations

- Can we access more highly resolved data on the fossil/bio split of gas in the supply network?
 - Currently only national data on transfers of biogas to the network
- Ofgem – DESNZ have similar data requirements → Data Supply Agreement?
 - Reduce burden on industry reporting
 - Greater consistency

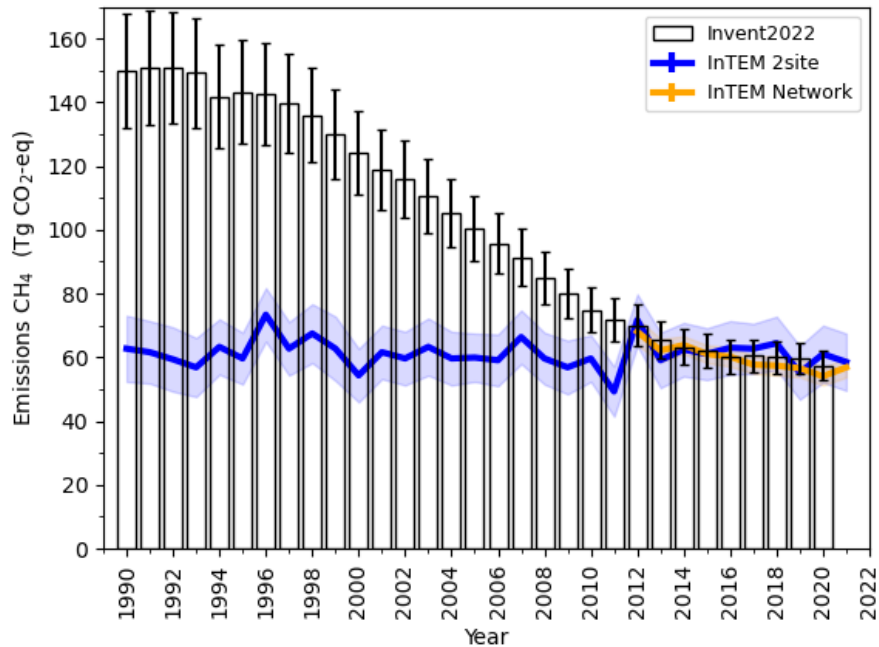
Other slides if useful / time



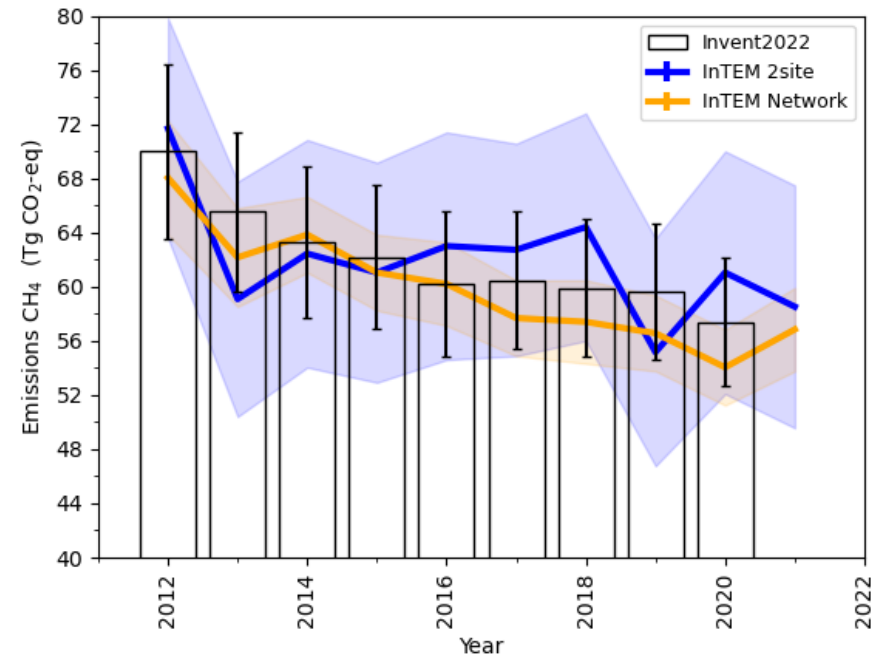
Inventory verification: methane (1)

Source: Annex 6.2 of the National Inventory Report, available at: <https://unfccc.int/documents/461922>

The InTEM verification work for the UK GHG inventory is led by Dr. Alistair Manning of the Met Office, under contract to DESNZ.



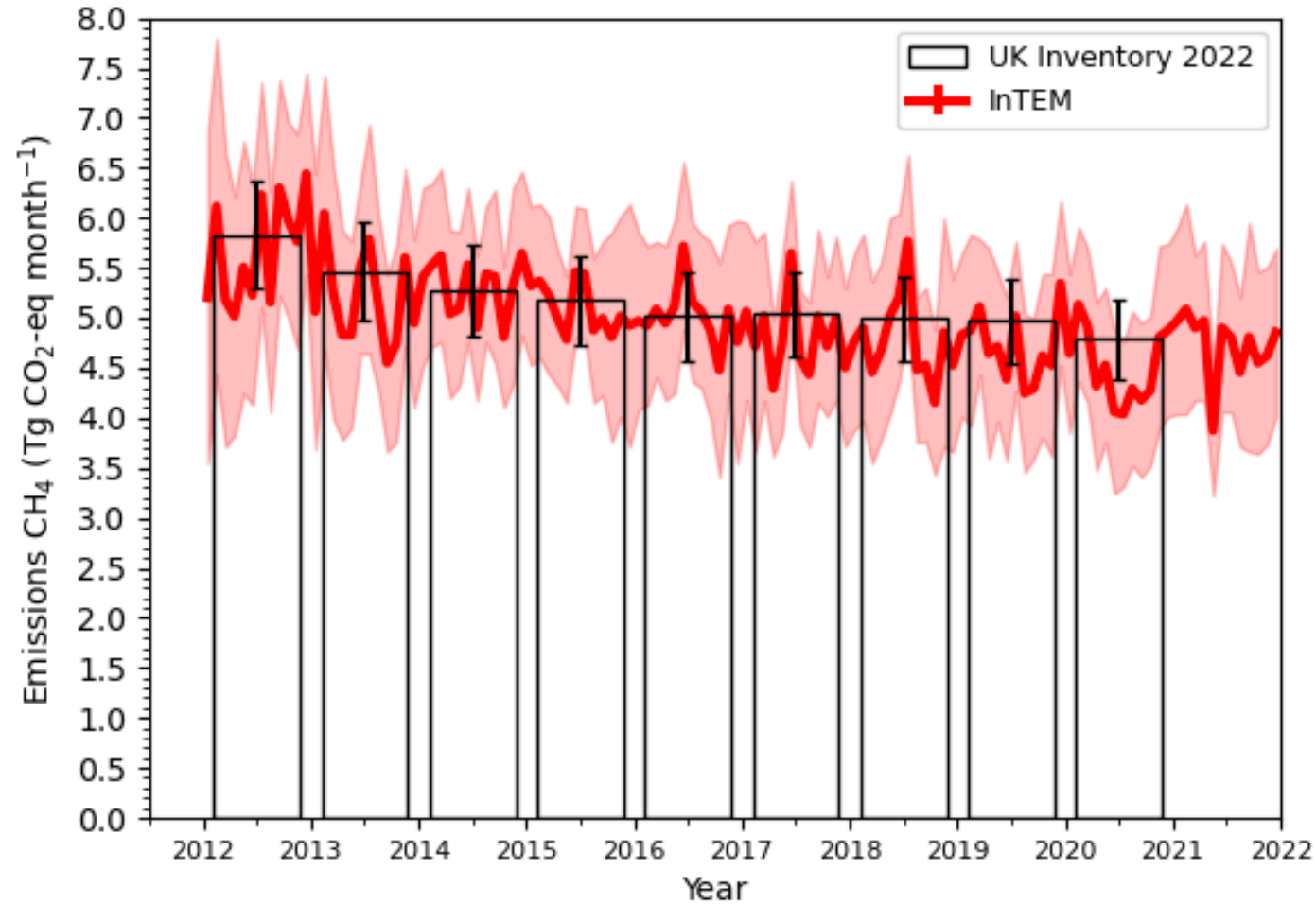
(a) 1990-2021



(b) 2012-2021

Inventory verification: methane (2) – monthly data

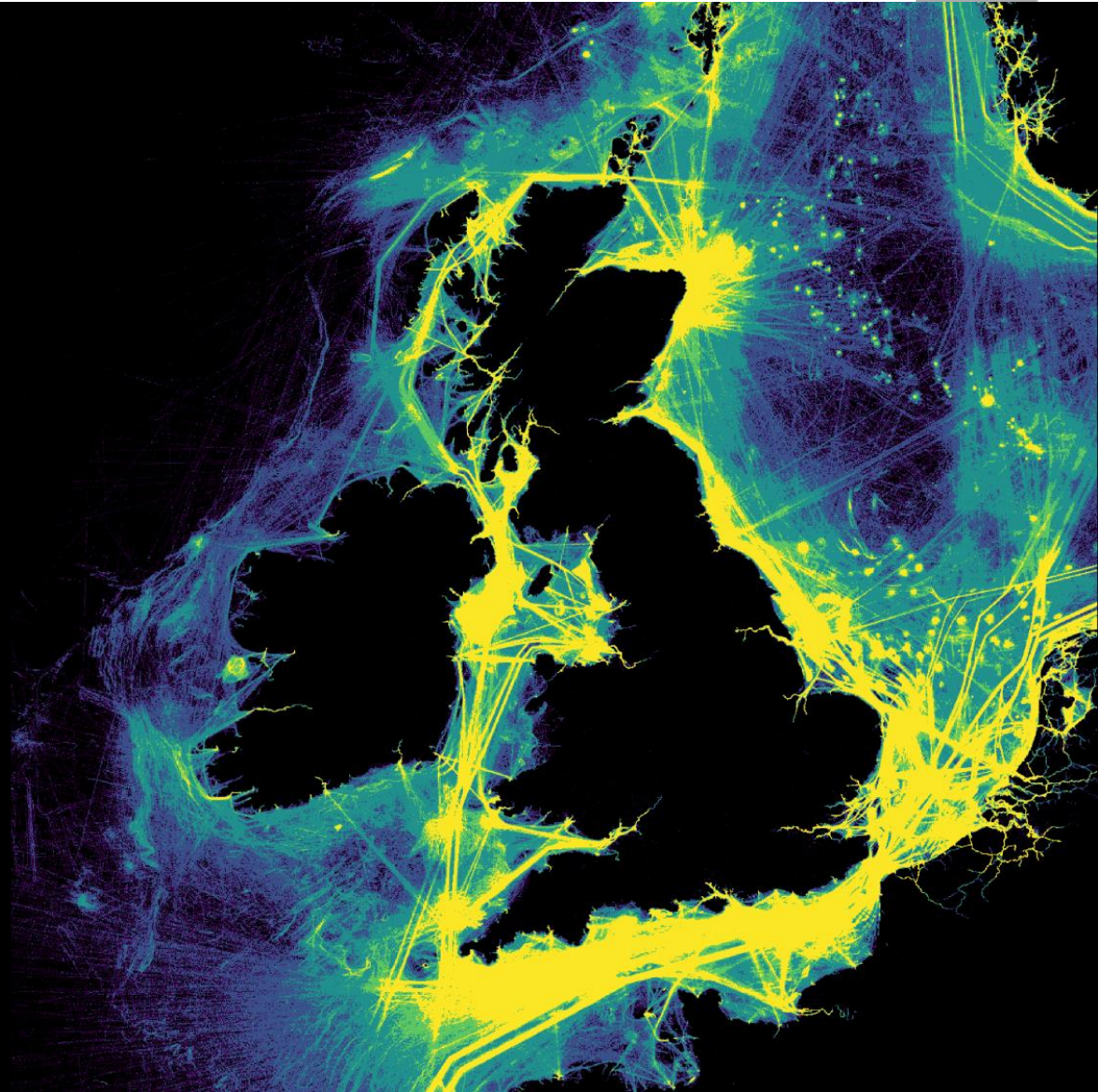
Source: Annex 6.2 of the National Inventory Report, available at: <https://unfccc.int/documents/461922>
The InTEM verification work for the UK GHG inventory is led by Dr. Alistair Manning of the Met Office, under contract to DESNZ.





Thank you for your time

Glen Thistlethwaite
Technical Director, Ricardo plc
glen.thistlethwaite@ricardo.com



Creating a world
fit for the future

