

## UK military GHG emissions and the Greening Government Commitments

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### Executive summary

This short technical paper critically examines the progress that the Ministry of Defence (MOD) has made in meeting targets for reducing greenhouse gas emissions (GHG) from its UK military bases – as defined by its Greening Government Commitments (GGCs) for 2025. It is found that the MOD is on course to exceed these targets, but that is only because the targets are very weak and undemanding. Indeed, the target for reducing ‘overall’ GHGs from military bases has been set so lax that it would be met even if the MOD took *no action* to reduce emissions before 2025. This is because the reductions necessary to hit the target are happening anyway due to the decarbonisation of the UK’s national electricity grid. Other reductions in the MOD’s emissions are, so far, towards the lower end of ambition as given in the government’s recent national energy strategy paper, *Powering Up Britain*, or are due to temporary changes related to the COVID-19 pandemic.

This paper recommends much greater ambition for the MOD’s GGC targets for 2030. It does this for three reasons: to compensate for the lack of progress to date; the greater obstacles to reductions in other military emissions, e.g. from military equipment such as warships and combat planes; and the likelihood that the UK government will increase its GHG emissions reduction ambitions due to the growing climate threat.

### 1. Introduction

UK government departments have been set a series of targets to reduce their impacts on the environment, known as the Greening Government Commitments (GGCs).<sup>1</sup> These currently cover seven areas, including mitigating climate change, minimising waste, reducing water use, and protecting wildlife. This short technical paper focuses on the Ministry of Defence (MOD) and its progress so far towards meeting its GGCs for reducing greenhouse gas (GHG) emissions by 2025 and, based on that, proposing sufficient targets for 2030.

In assessing the GGCs of the MOD, one key point needs to be made clear. Only GHG emissions from the MOD estates – such as military bases and administrative buildings – are covered by the GGCs. GHG emissions from the use of UK military equipment or ‘capability’ – including warships, combat planes, armoured land vehicles, and space vehicles – are not covered by these targets. As such, *two-thirds* of the MOD’s GHG emissions (scopes 1 and 2<sup>2</sup>) are *not* covered by these GGC targets. For the financial year 2021-22, the MOD reported

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<sup>1</sup> Defra (2021). Green Government Commitments. <https://www.gov.uk/government/collections/greening-government-commitments>

<sup>2</sup> In short, ‘scope 1’ GHG emissions are those arising from the combustion of fuel in properties (e.g. fossil gas boilers) or vehicles (e.g. petrol company cars) owned by the organisation. ‘Scope 2’ GHG emissions are those arising from energy (most commonly electricity) used by organisation but generated by a third-party.

0.96 million tonnes of carbon dioxide equivalent (MtCO<sub>2e</sub>) under the GGCs, which increases to 2.9 MtCO<sub>2e</sub> with the inclusion of ‘capability’ fuel use.<sup>3</sup> There are currently no specific targets for the reduction of GHG emissions from the MOD’s military equipment.

The GGC targets cover all the MOD’s UK establishments, but exclude energy use in Service Family Accommodation (SFA) which accounted for around 0.18 MtCO<sub>2e</sub> in 2021-22.<sup>4</sup>

## 2. MOD performance against 2025 GGCs

Under the latest set of GGCs – which have a target date of 2025, from a baseline of performance in the financial year 2017-18 – the MOD was set two main targets: a 30% reduction in ‘overall’ estate emissions in the UK (i.e. scope 1 and 2, and business-related travel emissions); and a 10% reduction in ‘direct’ (scope 1) estate emissions in the UK.<sup>5</sup> Out of the 20 government departments and bodies which were set such targets, it is worth noting that the MOD had the *least demanding* for direct emissions and the *second-least demanding* for overall emissions. This is despite the fact that the MOD’s emissions make up more than half of all central government departments covered by the GGCs.<sup>6</sup> The MOD has also reported against two subsidiary 2025 targets for reducing GHG emissions: for domestic business-related travel,<sup>7</sup> this was 30%; and for domestic flights, this was also 30%.<sup>8</sup>

The summary of the MOD’s progress to date is shown in Table 1. At first glance, the MOD appears to be performing well and is set to exceed its targets in all areas. However, if we analyse these reductions in a little more detail, it shows a less encouraging picture.

Table 1. MOD’s UK GHG emissions to date compared with their GGC targets<sup>9</sup>

	GHG emissions (MtCO <sub>2e</sub> )		Reduction (%)	
	2017-18	2021-22	Realised to date	2025 target
Estate: scope 1 and 2*	1.26	0.90	29%	30%
Estate: scope 1 (direct)	0.57	0.52	8%	10%
Business travel*	0.08	0.06	27%	30%
Domestic flights	0.0065	0.0025	62%	30%

\* Emissions from scope 1 & 2 and business travel are collectively known as ‘overall’ emissions under the GGCs.

<sup>3</sup> pp.56 & 227 in: MOD (2022). Ministry of Defence Annual Report and Accounts 2021 to 2022.

<https://www.gov.uk/government/publications/ministry-of-defence-annual-report-and-accounts-2021-to-2022>

<sup>4</sup> p.227 in: MOD (2022) – as note 3.

<sup>5</sup> The targets are specified in Annex A of: Defra (2022a). Greening Government Commitments 2021 to 2025.

<https://www.gov.uk/government/publications/greening-government-commitments-2021-to-2025>

The definitions of ‘overall’ and ‘direct’ GHG emissions are given in: Defra (2022b). Greening Government Commitments: reporting requirements for 2021 to 2025.

<https://www.gov.uk/government/publications/greening-government-commitments-2021-to-2025/greening-government-commitments-reporting-requirements-for-2021-to-2025>

<sup>6</sup> NAO (2020). MOD: Environmental Sustainability Overview. <https://www.nao.org.uk/reports/environmental-sustainability-overview/>

<sup>7</sup> The GGC ‘overall’ emission reduction target of 30% includes emissions from vehicles owned or leased by the department and from additional ‘business-related’ travel in the UK. For further details, see pp.56 & 227 in: MOD (2022) – as note 3.

<sup>8</sup> This compares with the wider GGC sub-target to reduce emissions from domestic business flights by at least 30%. For further details, see pp.56 & 227 in: MOD (2022) – as note 3.

<sup>9</sup> All data from p.56 of: MOD (2022) – as note 3.

The MOD’s GHG emissions in Table 1 are, in national climate strategies, classified as part of three different sectors – Power, Heat and Buildings, and Transport – and so it is useful to consider emissions performance in those sectors when evaluating the MOD’s efforts.

*Power (electricity supply and use)*

The MOD’s electricity consumption from the national grid makes up a large fraction of its estate energy use, and the pathway for the estate’s 30% reduction target is strongly affected by the degree to which the national grid is being decarbonised. As Table 2 shows, over the four years since the baseline, the GHG emissions per unit (kilowatt-hour or kWh) of electricity generated has fallen by 40%.

Since emissions from electricity were responsible for approximately 55% of the MOD estate’s scope 1 and 2 emissions in 2017-18,<sup>10</sup> we would expect a 22% reduction in these emissions by 2021-22 due to grid decarbonisation *alone*. In this context, the reduction in these MOD emissions of 29% by this date, as shown in Table 1, seems rather less impressive. Indeed, a conservative projection of grid decarbonation to 2025 (see next section) would lead to the MOD’s estate scope 1 and 2 emissions falling by 32% compared with 2017-18 – meaning the MOD need take *no action* to reduce its electricity-related emissions to hit the GGC target.

*Table 2. GHG conversion factors for UK electricity supplied by the national grid, 2017-2021<sup>11</sup>*

Year	GHG conversion factor (kgCO <sub>2</sub> e/kWh)	% reduction from 2017
2017	0.352	0%
2018	0.283	20%
2019	0.256	27%
2020	0.233	34%
2021	0.212	40%

*Heat and Buildings*

According to the government’s latest energy strategy paper, *Powering up Britain*, emissions from Heat and Buildings should be reducing by between 1.75% and 4.25% per year.<sup>12</sup> The annual average reductions of 2% in the MOD estate scope 1 emissions over the past four years are towards the lower end of that range, meaning there is significant opportunity for improvement.

<sup>10</sup> Calculated from data on p.227 in: MOD (2022) – see note 3.

<sup>11</sup> Data from: DESNZ (2022). Government conversion factors for company reporting of greenhouse gas emissions. <https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting>

<sup>12</sup> Calculated from figures on p.59 of: DESNZ (2023). Powering Up Britain: Net Zero Growth Plan. <https://www.gov.uk/government/publications/powering-up-britain>

## *Transport (travel)*

Emissions from business travel reported under the GGCs represent a minor contribution to the MOD's 'overall' estate emissions at around 6%. Travel restrictions related to the COVID-19 pandemic during 2020 and 2021 also means it is difficult to make any judgements concerning recent progress in emission reductions relating to travel, with emissions in 2020 and 2021 probably being significantly lower than under normal conditions. One associated indicator is that, between 2019 and 2022, the MOD's fleet of ultra-low emissions vehicles (ULEVs)<sup>13</sup> increased from 0.2% to 9%.<sup>14</sup> This falls significantly below another GGC sub-target – that 25% of the fleet should be ULEVs by the end of 2022. So, again, the positive impression given by the figures in Table 1 is probably misleading.

In summary, it seems likely that the MOD will comfortably meet most, if not all, of its four 2025 GGC targets related to reducing GHG emissions. However, this is because they are very weak and undemanding, not because the department is making significant progress. Indeed, the MOD has benefited considerably from climate action in other parts of the economy, especially the electricity sector.

### **3. Setting 2030 GGC targets**

In making recommendations for the 2030 GGCs for the MOD estate, several factors should be borne in mind:

1. the existing targets for emissions reduction in the UK's Heat and Buildings sector;
2. the existing targets for emissions reduction in the Transport sector;
3. the existing targets for the decarbonisation of the national electricity grid, i.e. the Power sector;
4. the availability of low-cost, low-carbon technologies which can be utilised by the MOD;
5. the ease of emissions reduction within the MOD's estate compared with potential reductions elsewhere in the armed forces;
6. the potential for all targets for GHG emissions reduction to be tightened as the wider impacts of climate change become more apparent.

## *Heat and Buildings*

In *Powering up Britain*, the indicative pathway for emissions reduction for the Heat and Buildings sector is 25% to 37% by 2030 from the 2021 level.<sup>15</sup> This would translate into a 31% to 42% reduction from the 2017 level. The overwhelming majority of the GHG emissions arising from the nation's Heat and Buildings sector is fossil gas heating in domestic housing, which is arguably much more difficult to decarbonise than MOD estate emissions due to its dispersed ownership. On this basis, a 2030 reduction target for the Heat and Buildings component (virtually all) of the MOD's estate scope 1 emissions should be at

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<sup>13</sup> Vehicles with reported tailpipe emissions of less than 75 gCO<sub>2</sub>/km are classified as ultra-low emission vehicles (ULEV).

<sup>14</sup> p.56 of: MOD (2022) – see note 3.

<sup>15</sup> p.59 of: DESNZ (2023) – see note 12.

least 42%. Indeed, a similar target should be set for emissions for the MOD's SFA buildings, which are currently not covered by the GGCs.

Low cost, low carbon measures in this area include building insulation and the electrification of heat, mainly through air-source heat pumps and ground-source heat pumps, depending on local conditions. Most of these technologies are widely available now, so could be installed quickly, with long-term cost savings because of reduced energy consumption.

#### *Transport (travel)*

Nationally, the Transport sector is projected to reduce carbon emissions by between 27% and 39% by 2025 from 2021 levels.<sup>16</sup> Hence a high ambition target for emissions reduction from 2017 levels would be over 40% – comparable with the Heat and Buildings sector above. Regarding the MOD's business travel emissions – which make up about 6% of 'overall' estate emissions (see above) – the most critical factor is to reduce the need to travel. During the COVID-19 pandemic, the use of video conferencing software for meetings became widespread and this form of communication should be the default option going forward – especially to avoid flying and other long-distance travel. For necessary travel, public surface transport should be the default option. As mentioned above, the MOD is already expanding its fleet of electric vehicles – but it needs to markedly increase action to help meet the target for 100% of government vehicles to be fully electric by end of 2027.<sup>17</sup>

Again, the military's comparatively centralised structure should allow it to reduce emissions in this area significantly faster than in the equivalent civilian sector.

#### *Power (electricity supply and use)*

Concerning electricity, there are three main pathways to consider: the decarbonisation of the national electricity grid; the use of high energy-efficiency appliances; and the use of onsite renewable energy technologies.

The current UK target date for "a fully low-carbon power sector" is 2035.<sup>18</sup> There are also opposition party plans for an earlier target of 2030.<sup>19</sup> Hence, in Table 3, we show projected GHG emissions reduction per unit of national grid electricity generated for two scenarios based on these two target years. It should be noted that both these targets would require an annual decarbonisation rate below that already achieved over the period 2014 to 2022, which has on average fallen by 8% each year. The 2030 target would require an annual rate of 7%, while the 2035 target would require a rate of only 4%.

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<sup>16</sup> p.65 of: DESNZ (2023) – see note 12.

<sup>17</sup> Defra (2022a) – see note 5.

<sup>18</sup> p.26 of: DESNZ (2023) – see note 12.

<sup>19</sup> See, for example: Labour Party (2022). Labour's plan for GB Energy. <https://labour.org.uk/issue/clean-energy-by-2030/>

Table 3. GHG conversion factors for national grid for two scenarios, 2022-2030<sup>20</sup>

Year	'2035 decarb' scenario		'2030 decarb' scenario	
	GHG conversion factor (kgCO <sub>2</sub> e/kWh)	% reduction from 2017	GHG conversion factor (kgCO <sub>2</sub> e/kWh)	% reduction from 2017
2022	0.193	45%	0.193	45%
2025	0.148	58%	0.121	66%
2030	0.074	79%	0.000	100%

### Combining the data

Recalling that electricity use was responsible for slightly more than half of the MOD's estate emissions, the figures in Table 3 mean that, by 2030, grid decarbonisation alone would lead to a reduction for the scope 1 and 2 emissions of the MOD's UK estate of between 43% and 55% from the 2017-18 level – without further action from the military.

Combining the '2030 decarb' scenario for the electricity grid with the higher ambition target for direct emissions above (mainly for heat and buildings) would lead to a 2030 target for scope 1 and 2 of 74% below the 2017-18 level.

This level of ambition should be supported through a range of onsite measures to reduce electricity demand at military bases, and through the supply of locally-produced renewable energy. This would include installation of high energy efficiency products and appliances, and the installation of solar panels and battery storage, e.g. as micro-grids. Again, many of these technologies are widely available now, so could be installed quickly, with long-term cost savings and improved energy supply security.

Two further considerations needed when setting the 2030 GGC targets for the MOD estate:

- Decarbonising the military's non-estate scope 1 and 2 GHG emissions – which includes fossil fuel use by warships, combat aircraft and other 'capability' – faces major technical, economic and political obstacles. Hence there is a case for targets for the estate to go significantly further.
- All national and international targets for GHG emissions reduction are likely to be tightened as the wider impacts of climate change become more apparent. Indeed, the UN Secretary General launched an initiative in March this year to persuade all industrialised nations – including the UK – to bring forward their net zero targets to 2040 instead of 2050.<sup>21</sup>

With these issues in mind, Table 4 lists our recommended target levels for the four GGC components of the MOD estate for 2030.

<sup>20</sup> Data for 2022 from: DESNZ (2022) – see note 11. Extrapolated data for 2025 and 2030 based on linear annual reductions to reach zero in the target year.

<sup>21</sup> UN News (2023). A liveable future for all is possible, if we take urgent climate action: flagship UN report. <https://news.un.org/en/story/2023/03/1134777>

*Table 4. Recommended GGCs for 2030 for the MOD estate's GHG emissions*

	Recommended GGC reduction target for 2030 (relative to 2017-18 level)
Estate: Scope 1 and 2*	90%
Estate: Scope 1	80%
Business travel*	90%
Domestic flights	95%
Single Family Accommodation (SFA)^	80%

\* Emissions from scope 1 & 2 and business travel are collectively known as 'overall' emissions under the GGCs.

^ This would be a new target beyond those areas currently covered by the GGCs

Furthermore, there is a case for setting deep GHG emissions reduction targets for the UK's overseas bases, now that separate data is available for these.

#### **4. Further areas for research**

We also take this opportunity to note some further issues that merit research in the near future:

- In the MOD's Annual Report 2021-22, the UK estate's 'overall' GHG emissions for the financial years 2019-20 and 2020-2021 are over 40% higher than quoted in previous annual reports. No explanation has been given for this.
- In the MOD's Annual Report 2021-22, inclusion of the overseas estate's 'overall' GHG emissions for each of the three financial years 2019-20 to 2021-2022 would add around 20% to the figures for the UK. Hence, separate analysis is needed on reduction targets for these emissions.
- In the MOD's Annual Report 2021-22, an estimate for the size of a 'Defence Carbon Footprint' is provided for the first time. However, this figure only covers a small fraction of the probable size of such a carbon footprint.
- The MOD has previously shown an interest in counting carbon uptake by the land it owns, as well as other 'carbon offsetting', to make reaching future GHG emissions targets easier. There are potentially significant drawbacks with such approaches which need further investigation.
- Potential GHG emissions reduction due to the UK adopting significantly different military policies and strategies – for example, those based on non-offensive defence concepts – have yet to be explored.

#### **About the author**

Dr Stuart Parkinson is Executive Director of SGR, a post he has held for 20 years, where he has co-ordinated research, education and campaigning on ethical issues across science and technology. He holds a PhD in climate change science and a Bachelors' degree in physics and engineering from Lancaster University. He has held posts in academia, industry and NGOs. He has also been an expert reviewer for the Intergovernmental Panel on Climate Change. His previous publications include research reports on UK, EU and global military carbon emissions – see: <https://www.sgr.org.uk/projects/climate-change-military-main-outputs>

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