Annex C. Tax policy options

August 2019

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Introduction

Introduction

PwC has been asked by the States of Guernsey (SoG) to evaluate potential tax policy options for Guernsey. We have modelled the economic impact and expected tax revenue for six taxes, listed below, and evaluated them according to key tax policies.

Tax policy options	Definition
Hydrocarbon tax	Unit tax on heat content measured in MBTU (millions of British Thermal Unit)
Carbon tax	Unit tax on carbon emissions
Pollution tax	Unit tax on carbon emissions, with a larger tax base
Mileage tax	Unit tax on miles travelled, with a tax rate that varies by vehicle type
Heating efficiency tax	Annual unit tax on inefficient housing stocks
Appliance efficiency tax	Ad valorem sales tax on purchases of inefficient appliances (% of price)

According to SOG, the primary objective of a new tax policy would be to improve energy efficiency in Guernsey. The secondary objective would be to ensure that there will be a sustainable tax revenue stream in the future, in order to counteract falling fuel duty revenue. We have drawn on the results of the energy demand forecast to model future tax revenues assuming no change in tax policy or consumer behaviour. Building on this, we have modelled the impact that each tax would have on energy demand as consumers change their behaviour over time.

Modelling approach

We have broken down our modelling approach into 5 stages as follows:

PwC's Modelling Approach

Identify tax base

- The tax base is what the tax would be levied on.
- This may be fuel consumption, the stock of energy inefficient housing, or miles driven by vehicles.

Forecast tax base

- After identifying what the tax would be levied on, we forecast this tax base over time.
- For example, how will the consumption of petrol and diesel change in the next 32 years?

Target tax revenue

- We identify the tax revenue that needs to be recovered, i.e. recovering £20m to replace fuel duty revenue.

Reverse engineer unit tax rate

- We calculate the implied tax rate under the new regime that would generate the target tax revenue in the present.
- Using this implied tax rate we calculate the expected tax revenue pre-behavioural change.

Economic modelling simulation

- Using our economic model, we simulate the feedback effects which allows us to identify behavioural change and the wider economic impacts of the tax.

Tax analysis output

1. Expected tax revenue – pre- and post-behavioural change
2. Behavioural change – change in tax base caused by the introduction of the tax
3. Economic indicators – related to efficiency, affordability, sustainability and certainty

Key definitions

Tax base	• The aggregate value of the financial stream or assets on which the tax can be imposed
Unit tax rate	• A tax that is defined as a fixed amount for each unit of tax base
Economic efficiency	• Economic efficiency is achieved when social welfare is maximized and the deadweight loss per unit tax raised is minimized, i.e. the loss of GDP per £1 revenue raised.
Externalities	• Costs or benefits that affect a third party who did not choose to incur that cost or benefit

Expected tax revenue under the current tax regime

Current tax revenue in Guernsey is about £90m (excluding income tax, transfers and investment returns), of which fuel duty accounts for £20m. All tax revenue are expected to increase, with the exception of fuel duty. Four of the six tax options considered in this report would be intended to replace fuel duty. These are the hydrocarbon, carbon, pollution and mileage taxes. **Note that fuel duty revenue is expected to decrease over time due to the transition to electric vehicles.**

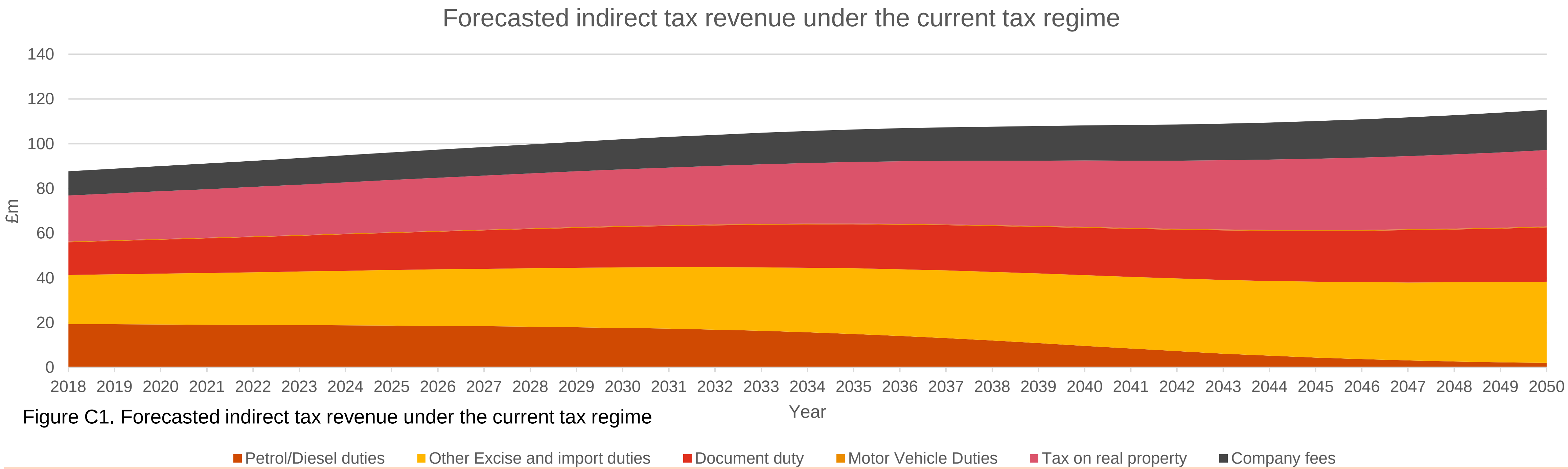

Figure C1. Forecasted indirect tax revenue under the current tax regime

How do we calculate expected tax revenue?

We have forecasted future revenue for all taxes except fuel duty by tying them to the GDP forecast calculated for the energy demand forecast. First, we calculated the percentage of each tax revenue out of GDP using historical tax data. We then assume that this ratio will remain constant over time and multiply them by the GDP forecast. For fuel duty, we calculated the effective tax rate by dividing tax revenue by the tax base. Assuming the effective tax rate remains constant, we multiply this by the expected tax base (i.e. expected litres of consumptions of petrol/diesel) to obtain figures for fuel duty.

Principles for evaluating tax policies

To compare tax policies, we measure each against the following principles:

Tax principles	Explanation
Economic efficiency	We measure the economic efficiency as the costliness of the tax to GDP. All taxes have a negative impact on GDP which we refer to as the deadweight loss (DWL). However, a tax is deemed to be relatively efficient if it results in a less than 30p reduction in GDP for every £1 of revenue raised.
GDP impact	The negative impact on GDP is also presented as a percentage of GDP to demonstrate the scale of the impact of different taxes.
Sustainability	Taxes increase the price of a good, therefore encourage consumers to reduce their consumption. This is referred to as behavioural change. The more consumers change their behaviour as a result of a tax, the less revenue will be raised by the tax in future and the tax will be less sustainable. The tax revenue after behavioural change has been accounted for is referred to as the revenue realised.
Affordability	We calculate the proportion of household income that would be spent on the tax on average to understand whether the tax will be affordable for households. For the tax policies designed to replace fuel duty we provide the affordability of fuel duty (referred to as pre-change) to compare against affordability post-change.
Complexity	We consider the difficulty of implementing the tax. For example, in order to introduce the heating efficiency tax a heating efficiency rating system would need to be introduced and all houses would need to be rated.

Summary of key indicators in 2030

We have found that none of the potential taxes would have a significant negative effect on the Guernsey economy. As each tax is better for achieving different objectives, SoG needs to be clear what its overall objectives are for energy policy.

We report the indicators for evaluating tax policies for 2030 as by this stage most behavioural change has occurred. We find that none of the taxes would have a significant negative effect on the Guernsey economy and none would place a large burden on household income.

Given developments in technological efficiency, energy consumption in Guernsey is forecast to decline. Therefore, even before behavioural change revenue raised by taxes on energy consumption will fall over time. Implementing a tax on energy consumption will accelerate the transition towards less energy intensive technology, as the sustainability figure indicates.

				Key indicators in 2030				
Options	**Revenue realised in 2020 in £m**	**Revenue realised in 2030 in £m**	**Revenue realised in 2050 in £m**	**Economic efficiency** (reduction in GDP per £1 of revenue raised)	**% GDP impact** (% of GDP Loss)	**Sustainability** (% of expected revenue recovered)	**Affordability** (% of annual income for average household)	**Complexity** (How costly is implementation)
Hydrocarbon tax	16.8	10.8	3.1	39p	-0.17%	64.8%	0.34%	Low
Carbon tax	17.0	13.9	4.8	21p	-0.09%	83.6%	0.44%	High
Pollution tax	16.9	13.9	4.9	21p	-0.09%	83.6%	0.44%	High
Mileage tax	17.3	16.5	3.9	34p	-0.16%	86.7%	0.73%	Medium
Heating efficiency tax	12.6	10.3	6.4	17p	-0.05%	92.5%	0.32%	High

Choosing which tax to implement depends on which objectives are most important

In this analysis we consider three possible objectives for tax policy.

Objective for tax policy	Selection criteria	Most appropriate tax policy in 2050
Economic efficiency Minimise the loss to GDP caused by a tax	Choose the tax that results in the lowest deadweight loss and the smallest percentage impact to GDP.	**Heating efficiency tax**
Sustainable revenue Maximise the revenue raised by the tax to generate additional Government funding	Choose the tax with the highest forecast revenue realised. Sustainability is a useful indicator but this does not reflect the scale of revenue raised.	**Heating efficiency tax**
Carbon reduction Maximise the reduction in carbon emissions as the tax encourages consumers to use less carbon intensive energy	Choose the tax with the lowest sustainability. Low sustainability indicates consumers change their behaviour to avoid paying the tax, which means switching to less energy intensive consumption.	**Hydrocarbon tax** Pollution tax has the second lowest sustainability. However, this tax is levied on a wider tax base so the impact on carbon reduction may be more pronounced.

Methodology for hydrocarbon, carbon and pollution taxes

Stage 1: Input from energy demand forecast

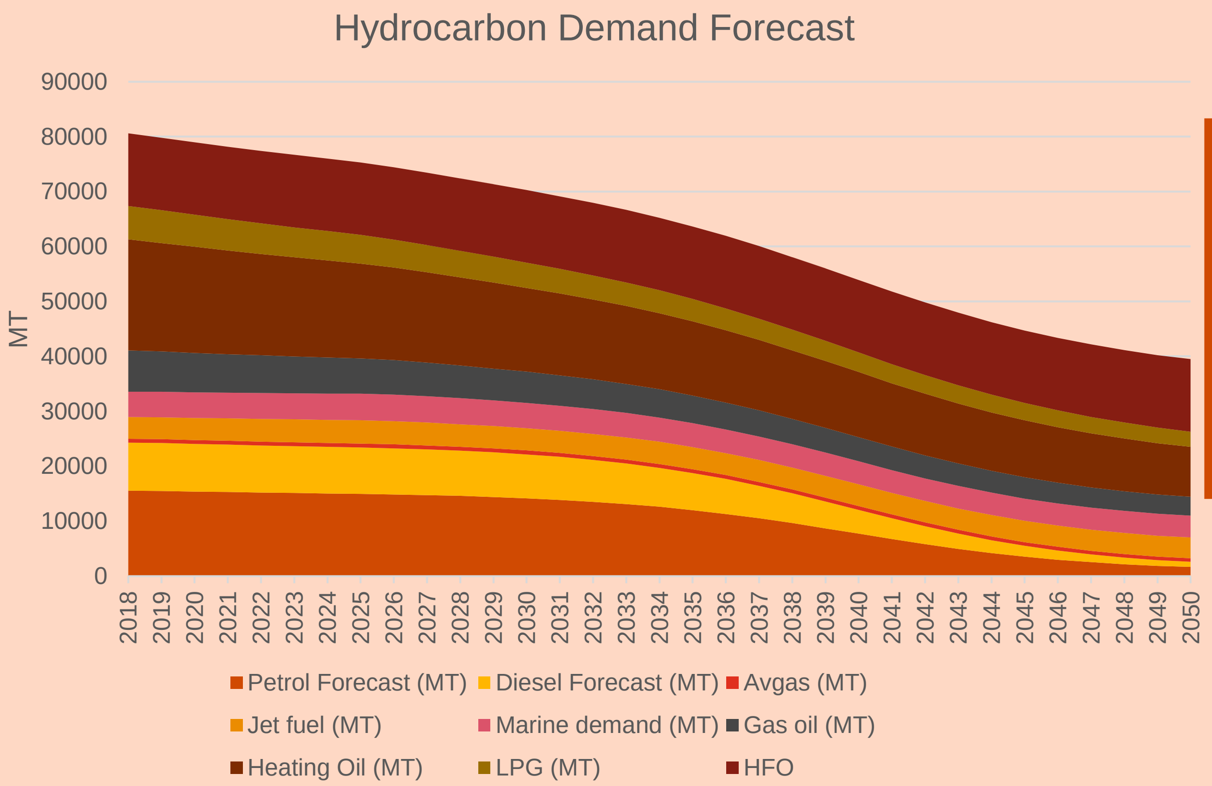

Figure C2. Hydrocarbon Demand Forecast

Stage 2: Calculate tax base using conversion table

	MT	kWh/MT	BTUs	MBTUs/ MT	Carbon (kg)	CO2e (kg)
Petrol	1	13366.82	45609472.05	45.61	859.49	3124.76
Diesel	1	13071.66	44602370.23	44.60	990.83	3237.59
Avgas	1	13314.84	45432121.61	45.43	292.85	3250.55
Jet fuel	1	11428.57	38995904.38	39.00	251.36	2830.63
Gas oil	1	13071.66	44602370.23	44.60	990.83	3614.58
Heating oil	1	14636.42	49941540.66	49.94	1071.39	3610.07
LPG	1	14433.78	49250115.40	49.25	844.38	3095.76
HFO	1	11287.13	38513281.80	38.51	584.67	3028.45

Stage 3: Calculate tax revenue

$$Tax\ revenue = Tax\ base * Unit\ tax\ rate$$

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Hydrocarbon tax

The hydrocarbon tax is levied on units of MBTU (millions of British Thermal Units) consumed in the tax base

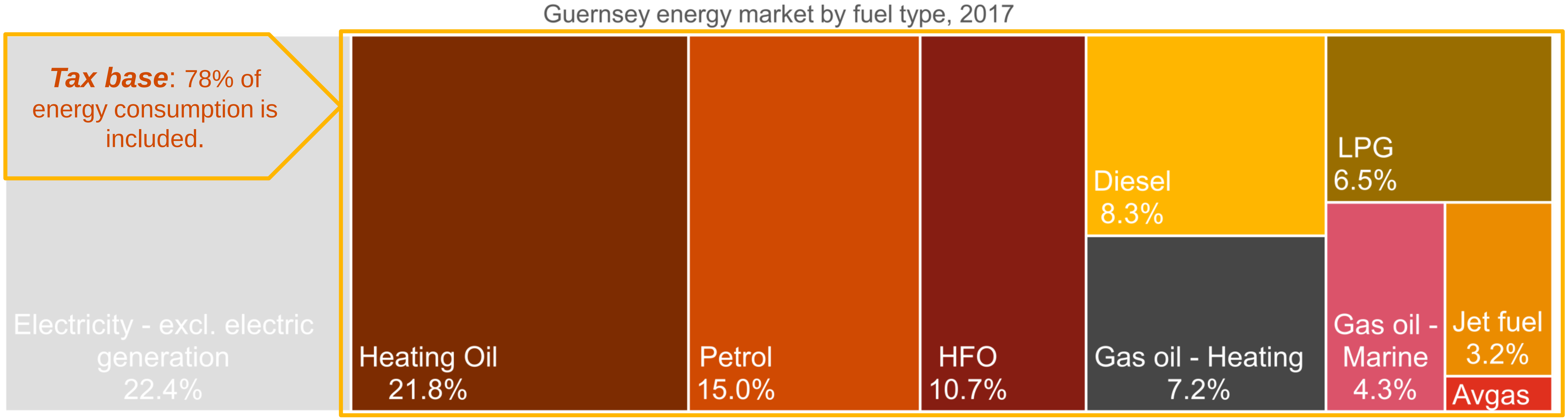

Figure C3. Guernsey energy market by fuel type, 2017

	Petrol	Diesel
Revenue (2017) £m	12.834	6.597
Total tax base (MBTU)	3683687.3	
Implied unit tax per MBTU (Revenue/Total tax base)	5.3	

The hydrocarbon tax base amounts to 78% of energy consumption in Guernsey. This is greater than the tax base for fuel duty which only amounts to 23% of total energy consumption.

Tax revenue also depends on the unit tax rate on each MBTU. We have calculated the implied tax rate that would recover fuel duty revenue (£20m), shown on the table in the left. The energy demand forecast provides expected changes to the tax base in the future, allowing us to estimate future tax revenue.

Note we have used 13,200 MT per year to calculate the equivalent MBTU for HFO.

Following the introduction of a hydrocarbon tax, energy consumption would be 66% lower in 2050

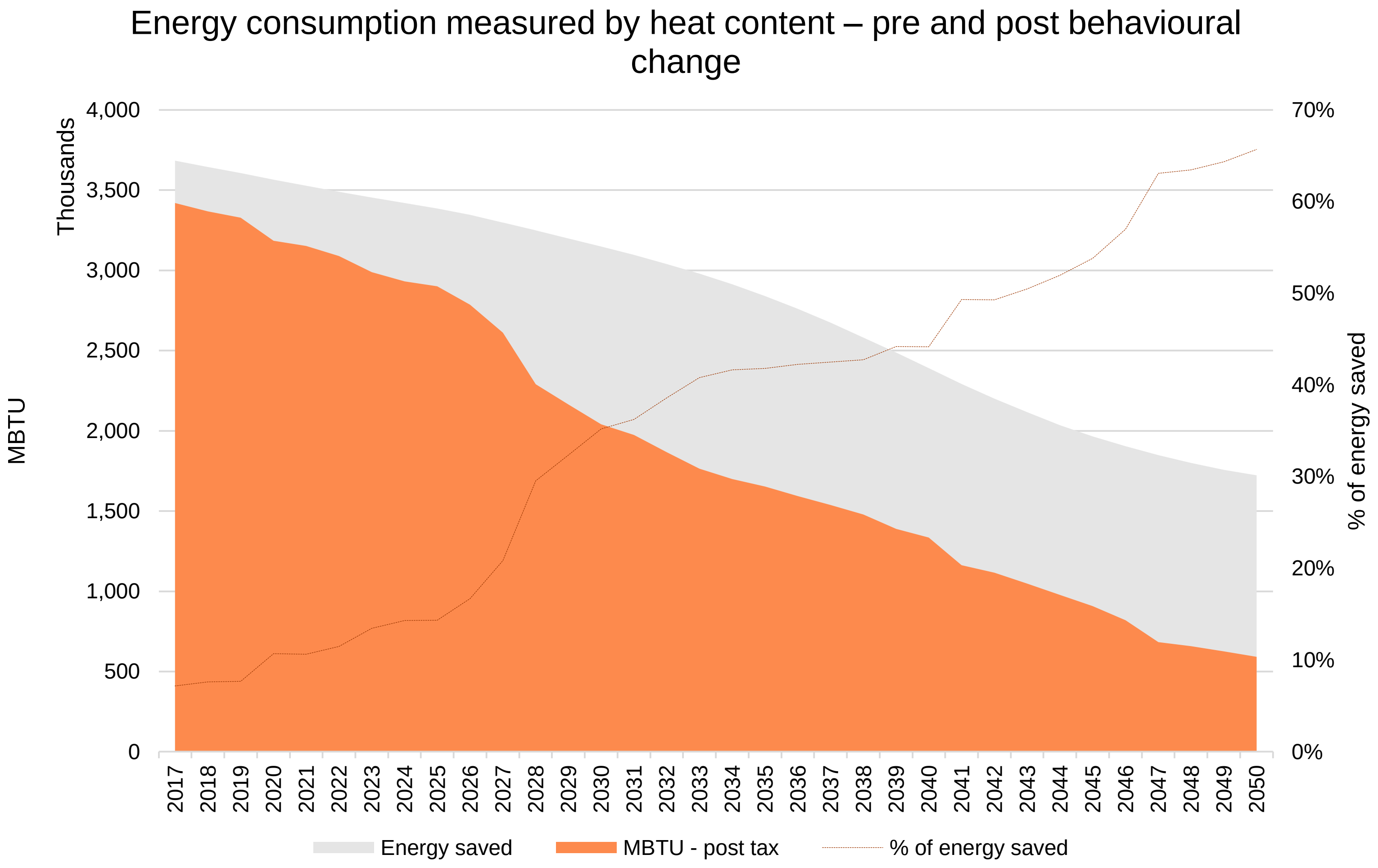

Figure C4. Energy consumption by heat content – pre and post behavioural change

In the absence of the tax, energy consumption is forecast to decline. The grey section of this graph depicts the fall in energy consumption, measured in million British Thermal Units (MBTU), as predicted by our energy demand forecast. MBTU measures the heat content of energy, which corresponds directly to kWh.

In comparison to the baseline forecast of energy demand, the hydrocarbon tax would have the following effects:

- The consumption of energy sources taxed by the hydrocarbon tax (all energy sources excluding imported electricity) would fall by 8% in 2019 and by 66% in 2050.
- Until 2025 this tax would have limited impact on consumption, but from 2025 onwards the impact would be more significant.
- The level of energy saved remains roughly the same after 2033.

Revenue raised by the hydrocarbon tax will decline over time

Assumptions under different tax rates

	Unit tax rate per MBTUs	Assumptions
Low	5.3	Implied tax rate that would recover fuel duty revenue (£20m) across the whole tax base
Medium	11.4	Average of the High and Low tax rates
High	17.6	Implied tax rate that would recover fuel duty revenue (£20m) across petrol/diesel consumption

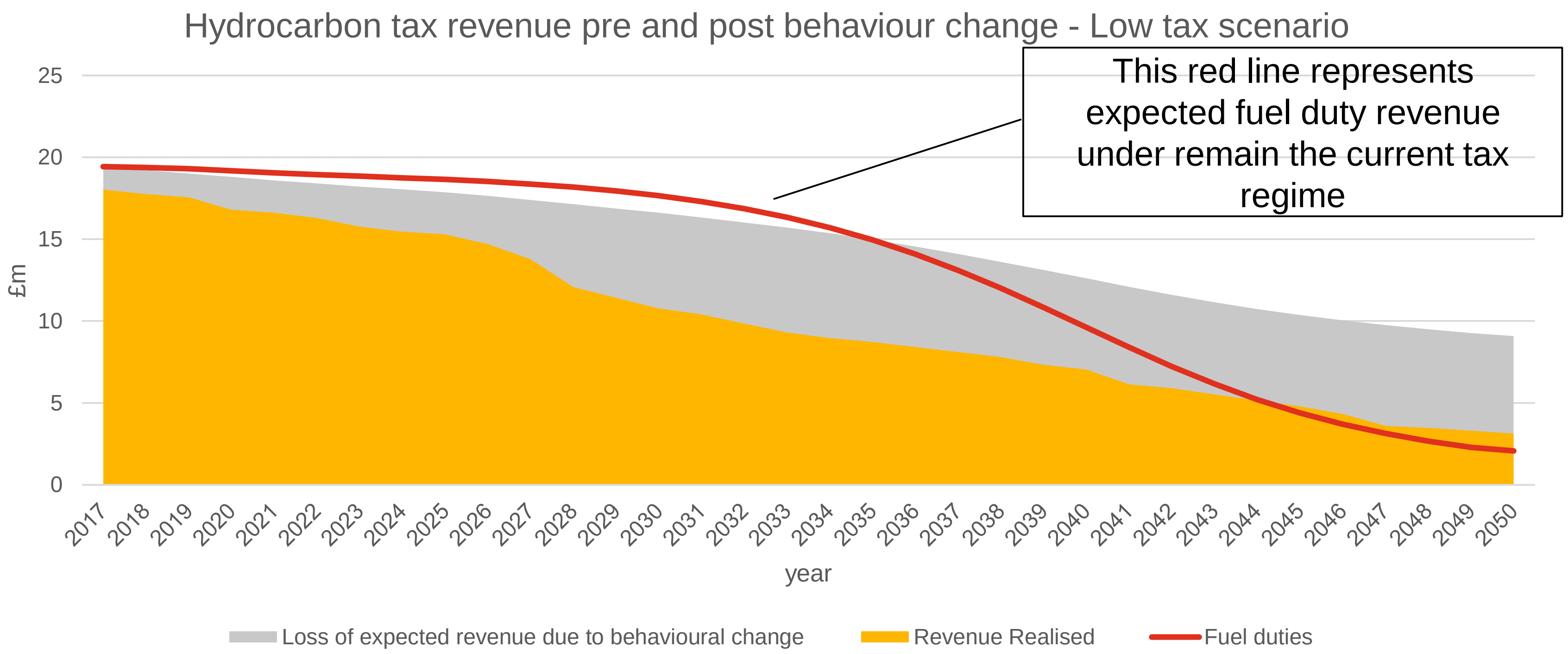

Figure C5. Hydrocarbon tax revenue pre and post behaviour change – Low tax scenario

- Expected revenue realised is shown in the yellow shaded area. This decline is caused by the reduction in energy consumption due to:
  1. Improvements in energy efficiency
  2. Tax effects
- The grey shaded area corresponds to the "loss" of expected revenue due to behavioural change.
- The red line shows the expected tax revenue under the current fuel duty regime. In the low scenario, the hydrocarbon tax would not fully recover fuel duty revenue before 2044.

The hydrocarbon tax is the least efficient tax policy considered in this analysis

The hydrocarbon tax would reduce GDP by 0.25% in 2018, which is the highest amongst all other tax options. This is reflected by the high DWL per unit of tax (0.39). This suggests that the hydrocarbon tax is relatively inefficient as it incurs more cost to the economy than other tax policy options for the level of tax revenue raised.

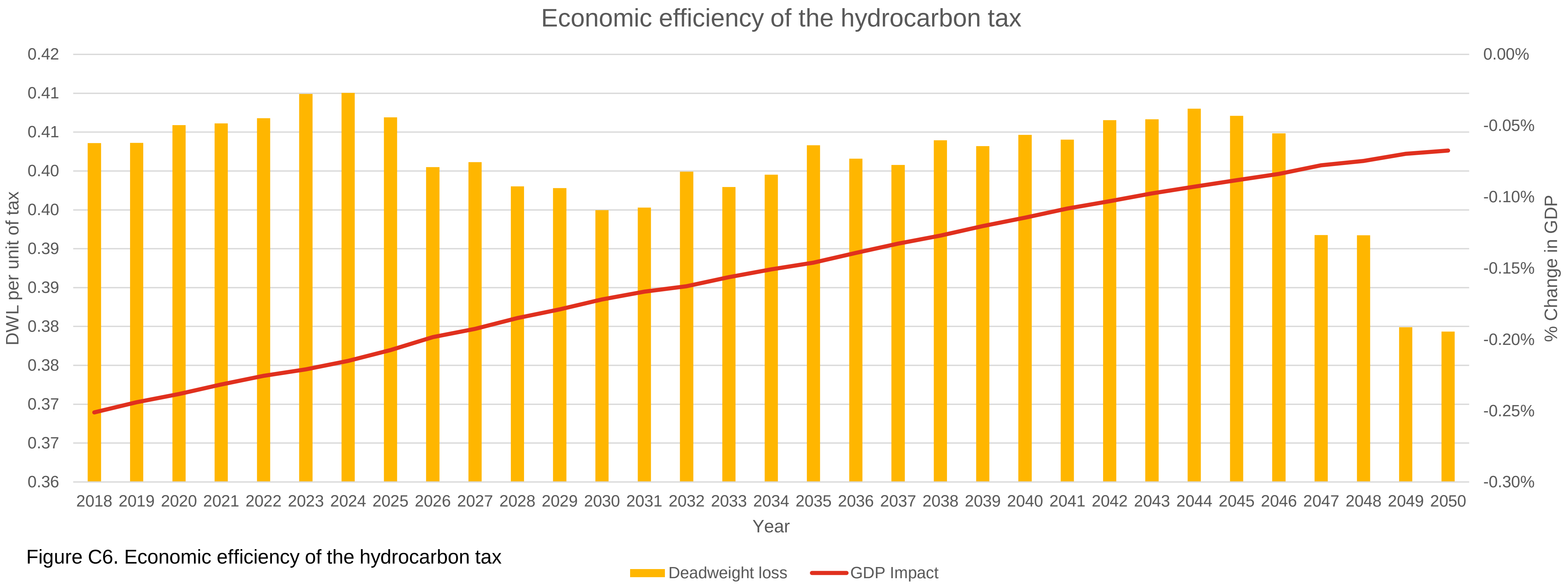

Figure C6. Economic efficiency of the hydrocarbon tax

Hydrocarbon tax: a tax on energy consumption, excluding imported electricity, based on energy intensity

Under this model, all sources of energy are taxed, except imported electricity. Heat content is measured in terms of million British Thermal Units.

Economic efficiency: the hydrocarbon tax is the least efficient of the taxes we have analysed. For every £1 of revenue raised, 38p of GDP will be lost in 2050. Given the large size of the tax base, this is also the greatest loss to GDP.

Sustainable revenue: the hydrocarbon tax has the lowest sustainability in 2050 and will raise the least revenue of all the taxes we have analysed

Carbon reduction: the low sustainability of the hydrocarbon tax indicates that this tax would cause the most behavioural change and therefore generate the greatest reduction in carbon emissions.

Affordability: the hydrocarbon tax would be more affordable than fuel duty until 2044. Regardless of the comparison, the average tax burden is very low.

Complexity: given the transparency of energy consumption, the tax will not be difficult to implement as it can be calculated from energy bills.

Tax Principles		Forecast outcome		
		Low Scenario		
		2018	2030	2050
Revenue realised (£m)		17.8	10.8	3.1
Economic efficiency (Dead weight loss in £ per unit of tax)		40p	39p	38p
Economic efficiency (% loss to GDP)		-0.25%	-0.17%	-0.07%
Sustainability (% of expected revenue recovered)		92.4%	64.8%	34.3%
Affordability (% of annual income for average Household)	Pre*	1.03%	0.55%	0.03%
	Post	0.94%	0.34%	0.05%
Complexity		Low		

*This refers to the affordability of fuel duty

3

Carbon tax

The carbon tax is levied on each unit of carbon emissions generated by the tax base

Tax base: 99.4% of the energy consumption in Guernsey is included.

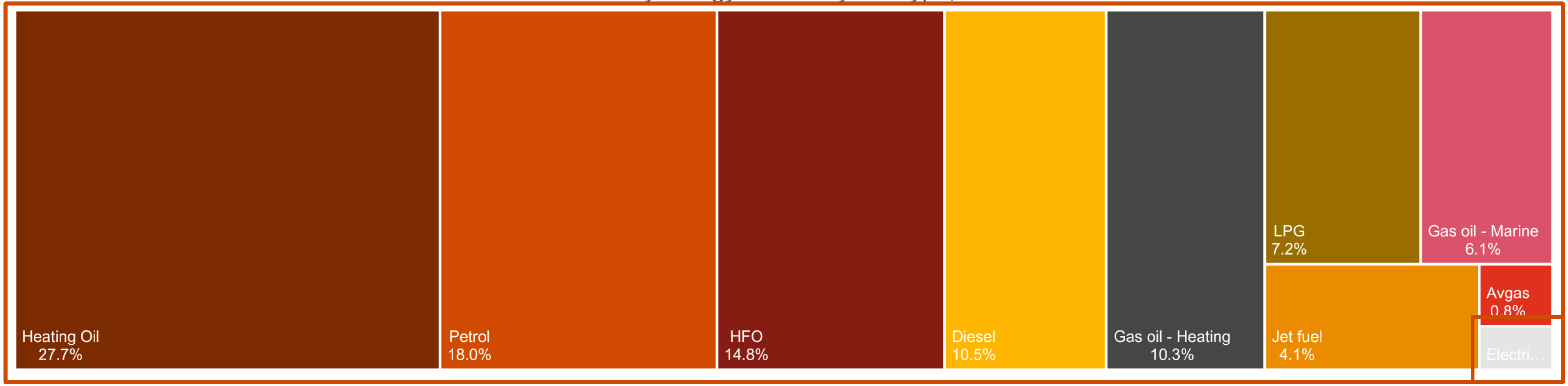

Figure C7. Guernsey energy market by fuel type, 2017

	Petrol	Diesel
Revenue (2017) £m	12.834	6.597
Total tax base kgCO2e	268838295.4	
Implied unit tax per CO2e (Revenue/Total tax base)	0.072277924	

Note that CO2e includes CO2, CH4 and N20 emissions, all expressed in terms of CO2 equivalent.

The carbon tax base amounts to 99.4% of carbon emissions generated in Guernsey. This is greater than the tax base for fuel duty which only amounts to 28.5% of total carbon emissions.

Tax revenue also depends on the unit tax rate on each unit of carbon emitted. We have calculated the implied tax rate that would recover fuel duty revenue (£20m), shown on the table in the left. The energy demand forecast provides expected changes to the tax base in the future, allowing us to estimate future tax revenue.

Following the introduction of a carbon tax, carbon emissions would be 48% lower in 2050

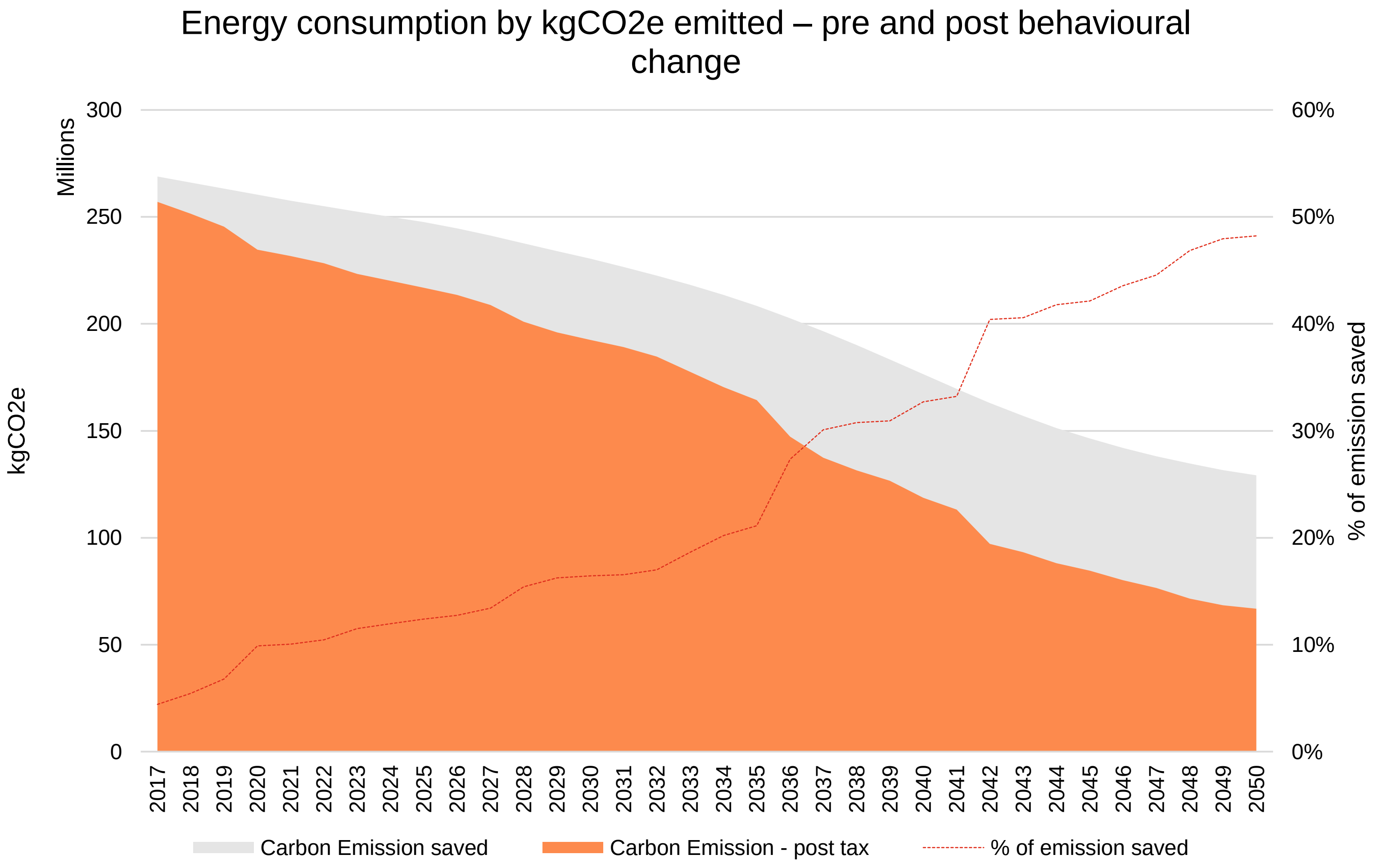

Figure C8. Energy consumption by kgCO2e emitted – pre and post behavioural change

In the absence of the tax, energy consumption is forecast to decline. The grey section of this graph depicts the fall in energy consumption, measured in the carbon emissions produced predicted by our energy demand forecast. Carbon emissions are calculated using the UK emission factors.

In comparison to the baseline forecast of energy demand, the carbon tax would have the following effects:

- Carbon emissions from energy sources taxed by the carbon tax (all energy sources excluding imported electricity) would fall by 7% in 2019 and by 48% in 2050.
- Until 2035 this tax would have limited impact on emissions, but from 2035 onwards the impact would be more significant.
- The level of energy saved remains roughly the same after 2041.

Revenue raised by the carbon tax will decline over time

Assumptions under different tax rates

	Unit tax rate per kg CO2e	Assumptions
Low	0.07	Implied tax rate that would recover fuel duty revenue (£20m) across the whole tax base
Medium	0.16	Average of the High and Low tax rates
High	0.25	Implied tax rate that would recover fuel duty revenue (£20m) across petrol/diesel consumption

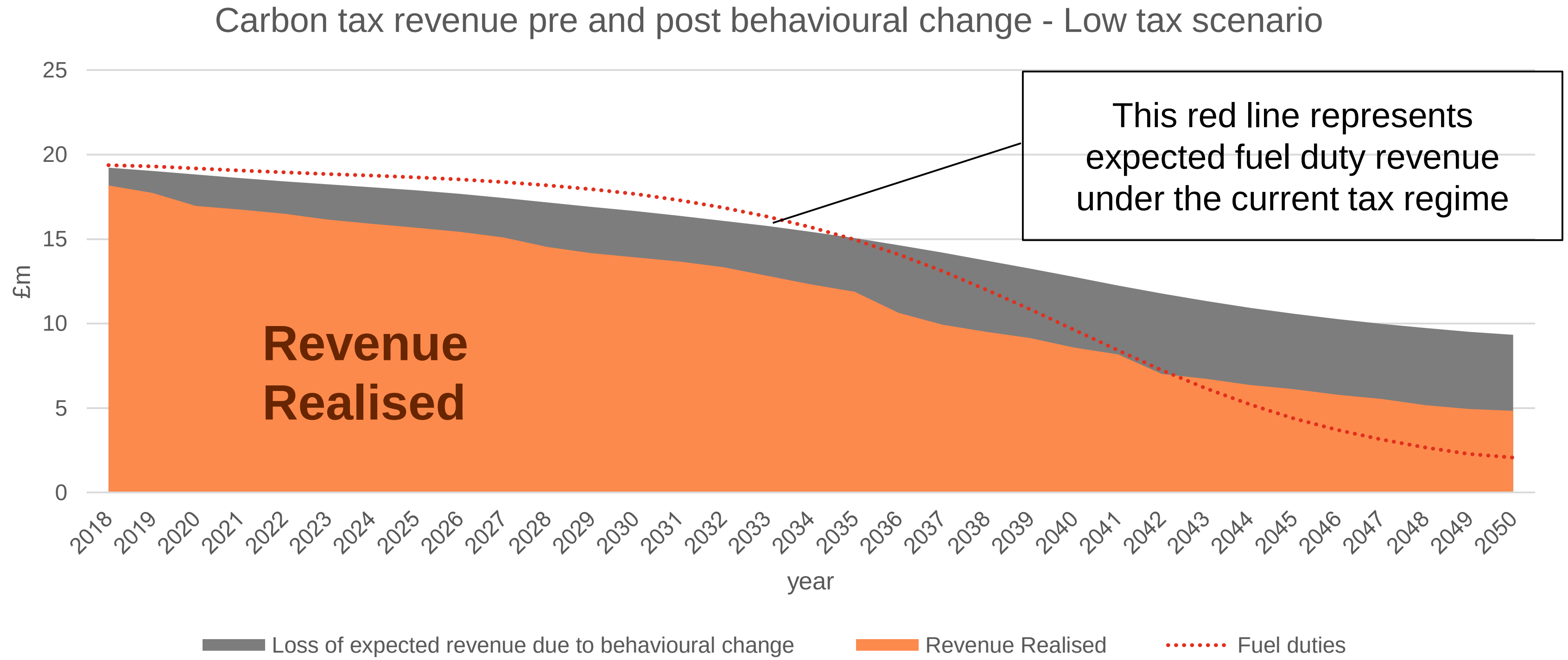

Figure C9. Carbon tax revenue pre and post behavioural change - Low tax scenario

- Expected revenue realised is shown in the orange shaded area. This decline is caused by the reduction in energy consumption due to:
    1. Improvements in energy efficiency
    2. Tax effects
- The grey shaded area corresponds to the "loss" of expected revenue due to behavioural change.
- The red line shows the expected tax revenue under the current fuel duty regime. In the low scenario, the carbon tax would not fully recover fuel duty revenue before 2042.

The carbon tax is the second most efficient tax and incurs limited cost to the economy

The carbon tax would reduce GDP by 0.09% in 2030, which is the second lowest of all other tax options. This is reflected by the low DWL per unit of tax (0.21). This suggests that the carbon tax is relatively efficient as it incurs less cost to the economy than most other tax policy options for the level of tax revenue raised.

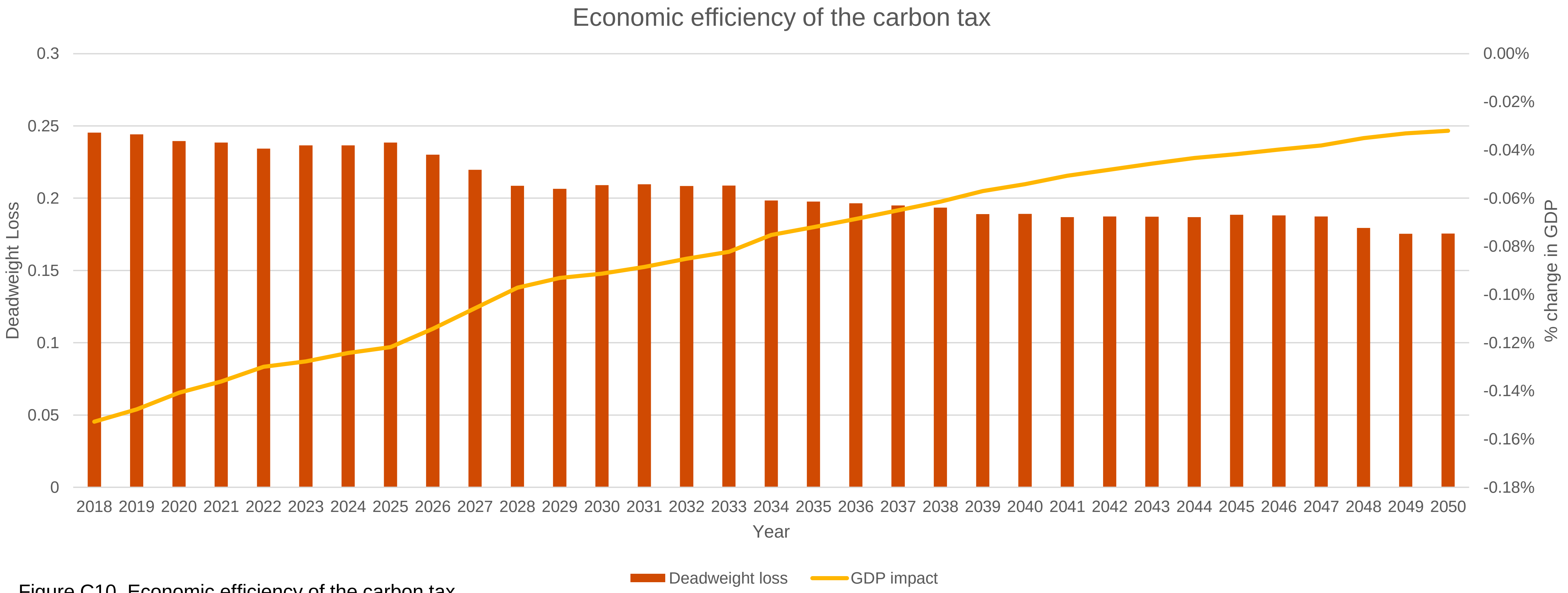

Figure C10. Economic efficiency of the carbon tax

Carbon tax: a tax on carbon emissions from all energy consumption on the island

Under this model a tax is paid on all on-island carbon emissions, so all sources of energy are taxed except imported electricity.

Economic efficiency: the carbon tax is the second most efficient of the taxes we have analysed. For every £1 of revenue raised, 18p of GDP will be lost in 2050. Despite the large size of the tax base, the loss to GDP is minimal.

Sustainable revenue: the carbon tax has the second lowest sustainability in 2050 but would raise more revenue than the hydrocarbon or mileage taxes.

Carbon reduction: the relatively low sustainability of the carbon tax indicates that this tax would cause moderate behavioural change and therefore generate a large reduction in carbon emissions.

Affordability: the carbon tax would be more affordable than fuel duty until 2042. Regardless of the comparison, the average tax burden is very low.

Complexity: given the transparency of energy consumption, the tax will not be difficult to implement for households as it can be added onto energy bills on the basis of carbon emissions per kWh used. However, the tax will be difficult to implement for companies who use energy to power polluting activity. In these cases, carbon monitors will need to be installed to track emissions.

Tax Principles		Forecast outcome		
		Low Scenario		
		2018	2030	2050
Revenue realised (£m)		18.2	13.9	4.8
Economic efficiency (Dead weight loss in £ per unit of tax)		25p	21p	18p
Economic efficiency (% loss to GDP)		-0.15%	-0.09%	-0.03%
Sustainability (% of expected revenue recovered)		94.6%	83.6%	51.8%
Affordability (% of annual income for average Household)	Pre*	1.03%	0.55%	0.03%
	Post	0.97%	0.44%	0.07%
Complexity		High		

*This refers to the affordability of fuel duty

4

Pollution tax

The pollution tax is levied on each unit of carbon emissions generated by the tax base

Tax base: All energy consumption in Guernsey is included*

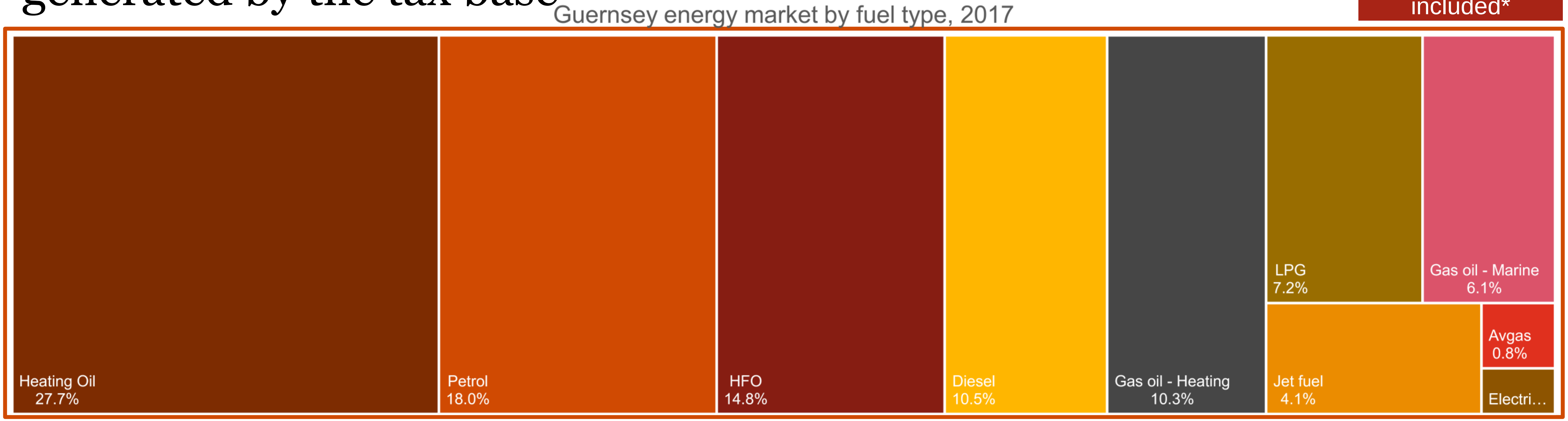

Figure C11. Guernsey energy market by fuel type, 2017

	Petrol	Diesel
Revenue (2017) £m	12.834	6.597
Total tax base kgCO2e	270875647.6	
Implied unit tax per CO2e (Revenue/Total tax base)	0.071734296	

Note that CO2e includes CO2, CH4 and N20 emissions, all expressed in terms of CO2 equivalent.

The pollution tax base amounts to 100% of carbon emissions generated in Guernsey. This is greater than the tax base for fuel duty which only amounts to 28.5% of total carbon emissions.

Tax revenue also depends on the unit tax rate on each unit of carbon emitted. We have calculated the implied tax rate that would recover fuel duty revenue (£20m), shown on the table in the left. The energy demand forecast provides expected changes to the tax base in the future, allowing us to estimate future tax revenue.

The difference between the tax bases of the carbon and pollution taxes in 2018 is 0.6 percentage points. This similarity is due to the relatively low carbon intensity of imported electricity. According to GEL, the carbon emission factor for imported electricity is 0.005 kgCO2e/kWh.

*Note that imported electricity carbon emission only accounts for 0.6% of total carbon emissions. However, in terms of kWh, it accounts for 19% - this difference was the motivation for the differentiation between the carbon and pollution taxes.

Following the introduction of a pollution tax, carbon emissions would be 48% lower in 2050

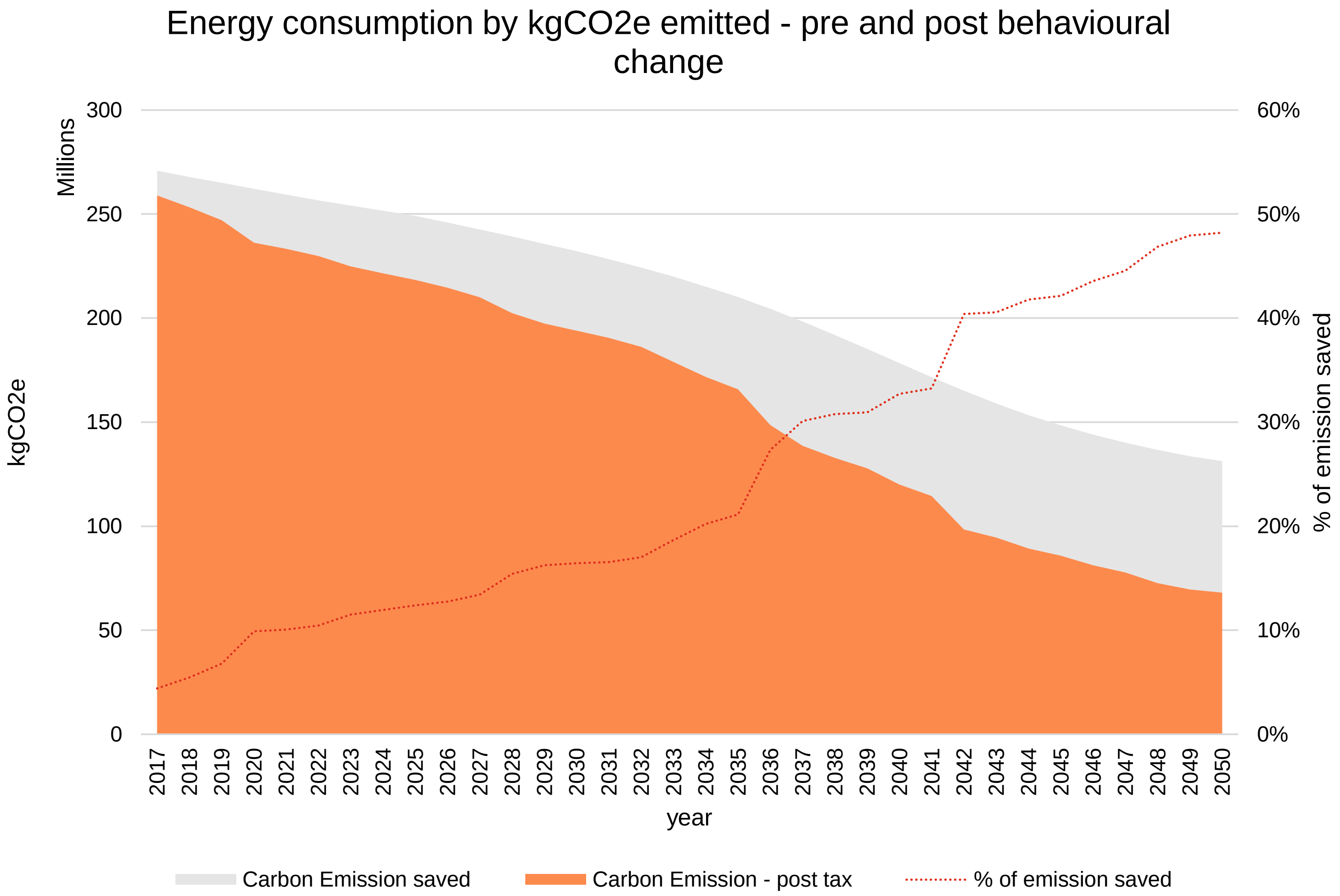

Figure C12. Energy consumption by kgCO2e emitted – pre and post behavioural change

In the absence of the tax, energy consumption is forecast to decline. The grey section of this graph depicts the fall in energy consumption, measured in the carbon emissions produced predicted by our energy demand forecast. Carbon emissions are calculated using the UK emission factors.

In comparison to the baseline forecast of energy demand, the pollution tax would have the following effects:

- Carbon emissions from energy sources taxed by the pollution tax (all energy sources including imported electricity) would fall by 7% in 2019 and by 48% in 2050.
- The behavioural impact of the tax will become more pronounced after 2035.
- The level of energy saved remains roughly the same throughout the period.

Revenue raised by the pollution tax will decline over time

Assumptions under different tax rates

	Unit tax rate per kg CO2e	Assumptions
Low	0.07	Implied tax rate that would recover fuel duty revenue (£20m) across the whole tax base
Medium	0.16	Average of the High and Low tax rates
High	0.25	Implied tax rate that would recover fuel duty revenue (£20m) across petrol/diesel consumption

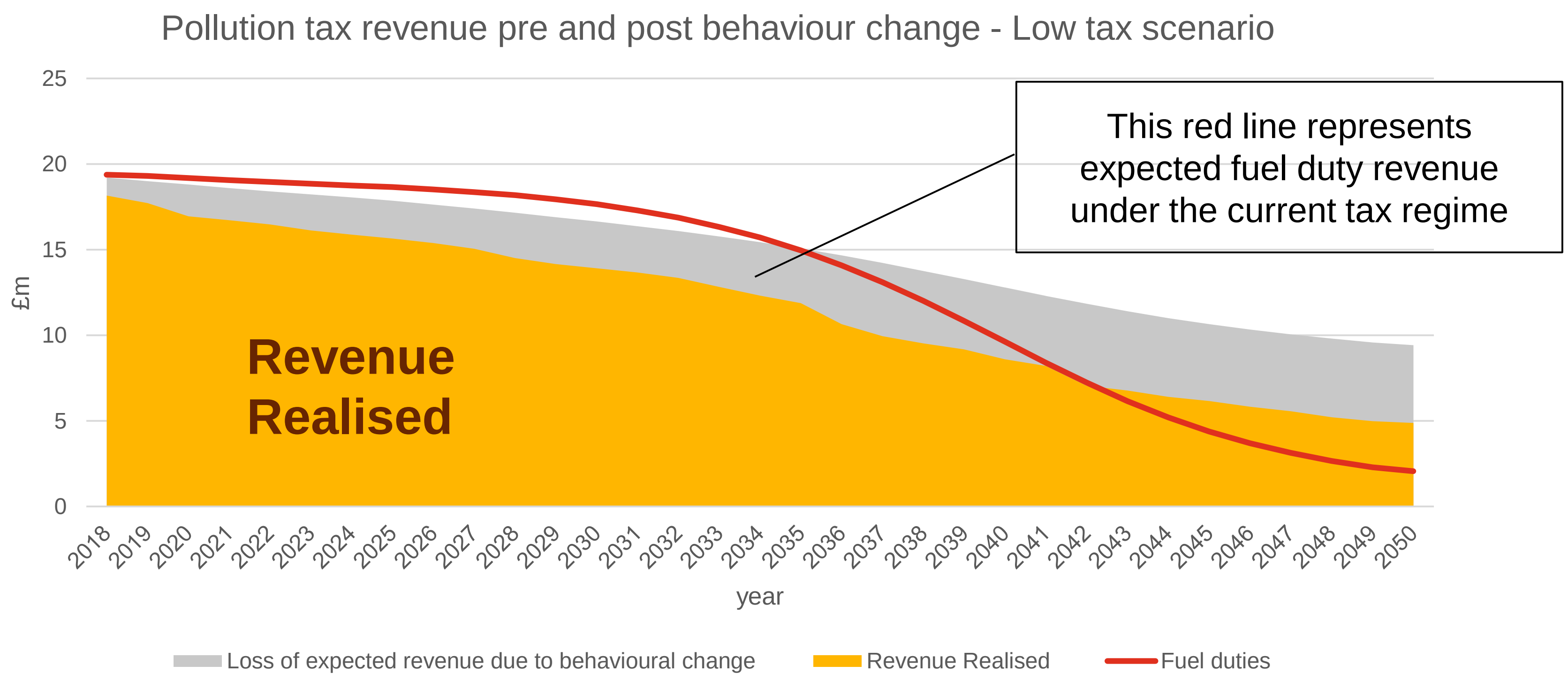

Figure C13. Pollution tax revenue pre and post behaviour change - Low tax scenario

- Expected revenue realised is shown in the yellow shaded area. This decline is caused by the reduction in energy consumption due to:
  1. Improvements in energy efficiency
  2. Tax effects
- The grey shaded area corresponds to the “loss” of expected revenue due to behavioural change.
- The red line shows the expected tax revenue under the current fuel duty regime. In the low scenario, the pollution tax would not fully recover fuel duty revenue before 2041.

The pollution tax is the second most efficient tax and incurs limited cost to the economy

The pollution tax would reduce GDP by 0.09% in 2030, in line with the carbon tax. This is reflected by the low DWL per unit of tax (0.21). This suggests that the pollution tax is relatively efficient as it incurs less cost to the economy than most other tax policy options for the level of tax revenue raised.

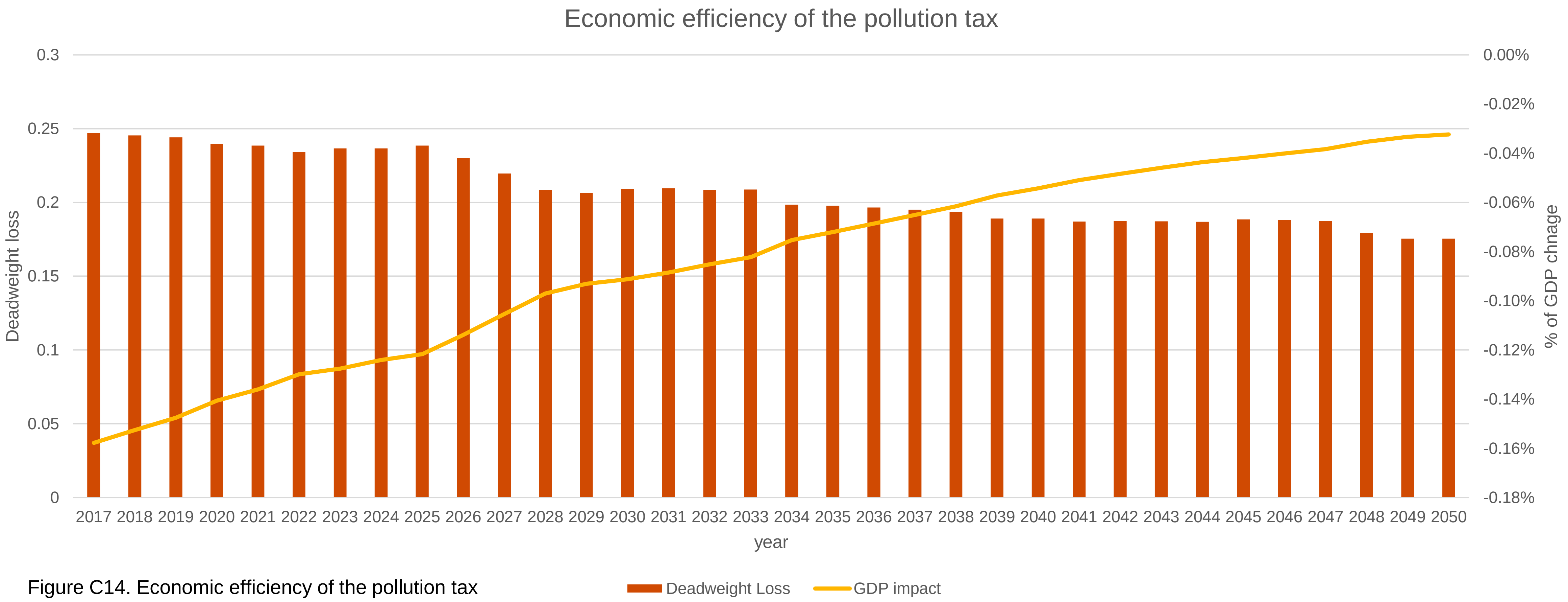

Figure C14. Economic efficiency of the pollution tax

Pollution tax: a tax on carbon emissions from all energy consumption, including imported electricity

Under this model a tax is paid on all carbon emissions, including those from imported electricity.

Economic efficiency: the pollution tax ranks third for economic efficiency in 2050. For every £1 of revenue raised, 18p of GDP will be lost in 2050. Despite the larger size of the tax base, the loss to GDP is minimal.

Sustainable revenue: the pollution tax ranks third for sustainability in 2050 but would raise the second most revenue due to the size of the tax base. The tax base includes all sources of energy so consumers are less able to avoid paying.

Carbon reduction: the relatively low sustainability indicates that this tax would cause some behavioural change and generate a large fall in carbon emissions.

Affordability: the pollution tax would be more affordable than fuel duty until 2038. Regardless of the comparison, the average tax burden is very low.

Complexity: given the transparency of energy consumption, the tax will not be difficult to implement for households as it can be added onto energy bills on the basis of carbon emissions per kWh used. However, the tax will be difficult to implement for companies who use energy to power polluting activity. In these cases, carbon monitors will need to be installed to track emissions.

Tax Principles		Forecast outcome		
		Low Scenario		
		2018	2030	2050
Revenue realised (£m)		18.2	13.9	4.9
Economic efficiency (Dead weight loss in £ per unit of tax)		25p	21p	18p
Economic efficiency (% loss to GDP)		-0.15%	-0.09%	-0.03%
Sustainability (% of expected revenue recovered)		94.6%	83.6%	51.8%
Affordability (% of annual income for average Household)	Pre*	1.03%	0.55%	0.03%
	Post	0.96%	0.44%	0.07%
Complexity		High		

*This refers to the affordability of fuel duty

5

Mileage tax

Mileage tax is a tax levied on the number of miles driven

Tax base: Miles driven by all cars, excluding electric vehicles

The mileage tax is a unit tax levied on the number of miles driven. The tax rate varies by the fuel type of the vehicle. In particular, the unit tax rate for petrol, diesel and gas vehicles is higher than that for hybrid and electric vehicles as vehicles that use hydrocarbon fuel emit more carbon.

Practically, the State of Guernsey would then need a mechanism to collect mileage data for each registered vehicle in order to correctly determine the tax base.

Methodology

The tax base for this policy would be the total miles travelled by each type of vehicle. To derive this we then need information regarding 1. The number of vehicles by fuel type and 2. Average miles travelled by fuel type. This data is provided by SoG.

We assume all types of vehicles are driven 4,000 miles per year and multiply this by the number of registered vehicles to obtain the tax base.

The tax rates are calculated to recover fuel duty revenue (£20m) that is paid by petrol/diesel vehicle users.

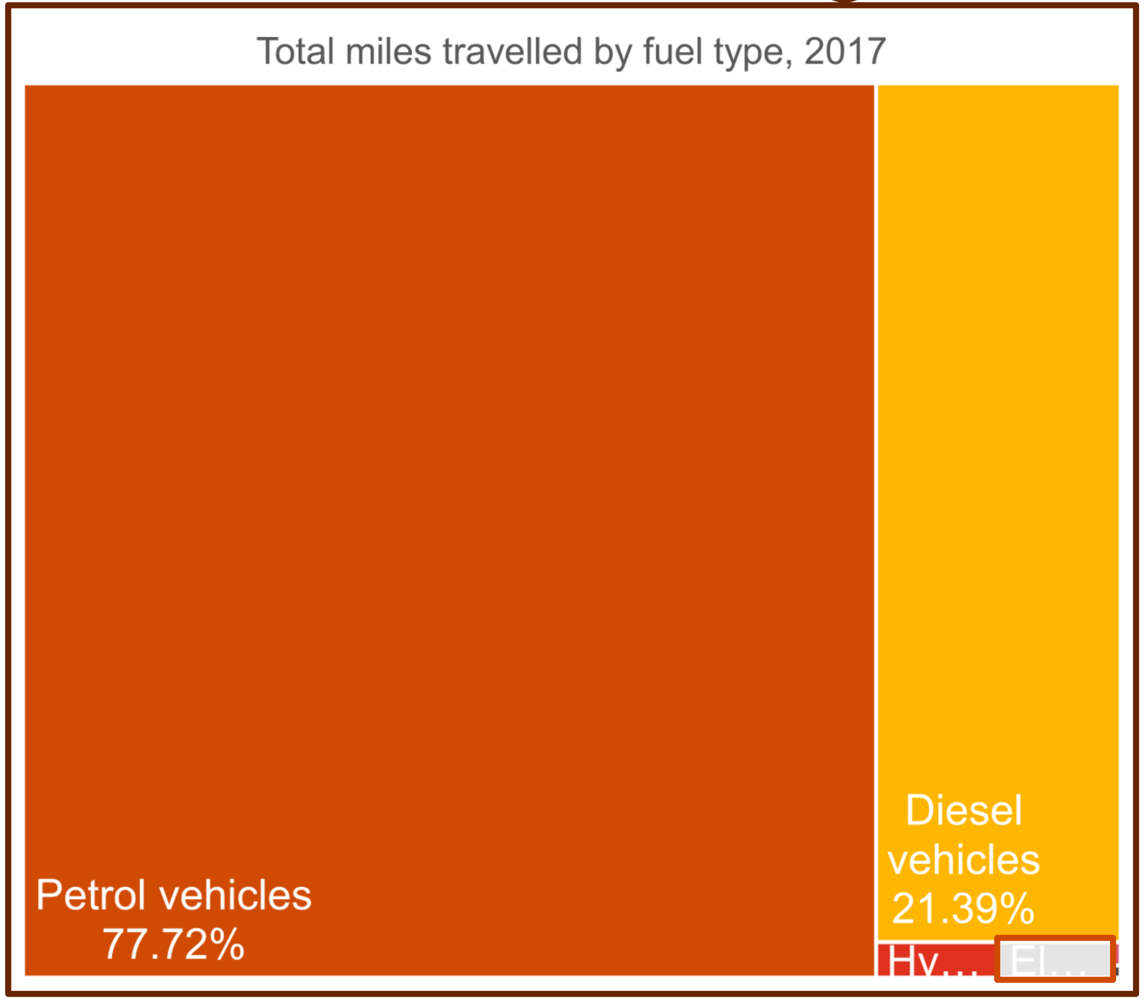

Figure C15. Total miles travelled by in 2017 by fuel type

Exclude EVs

The tax rate varies by vehicle type and number of miles driven

We have imposed a tax structure that varies by vehicle type according to price elasticity and the behavioural change that we would like to encourage.

Mileage tax revenue estimation in 2017

Total					
			Tax rate £/mile		
Fuel	**Average Mileage**	**Vehicle Count**	**2000**	**>2000**	**Revenue £m**
PETROL	4000	67501	0.075	0.037	15.212
DIESEL	4000	18576	0.075	0.037	4.186
HYBRID ELECTRIC	4000	386	0.022	0.011	0.026
ELECTRIC	4000	357	0.000	0.000	0.000
GAS	4000	19	0.075	0.037	0.004
GAS BI FUEL	4000	10	0.075	0.037	0.002
				Total	19.43

Taxi					
			Tax rate £/mile		
Fuel	**Average Mileage**	**Vehicle Count**	**10000**	**>10000**	**Revenue £m**
PETROL	28041.7272	97	0.037443	0.018722	0.0692
DIESEL	28041.7272	27	0.037443	0.018722	0.0190
HYBRID ELECTRIC	28041.7272	1	0.011233	0.005616	0.0001
ELECTRIC	28041.7272	1	0	0	0.0000
				Total	0.0884

We have structured the unit tax rates as follow:

- The rate for first 2,000 miles is twice of that for miles above 2,000. Short distance travel is more price elastic due to the higher availability of substitutes, so a lower tax rate would be sufficient for behavioural change.
- The rate for hybrid is one-third of that for petrol and diesel to reflect the fact that hybrid vehicles are only partly powered by hydrocarbon fuel. Therefore, hybrid vehicles are more carbon efficient and so should be taxed less to encourage the transition towards carbon efficiency.
- All rates for taxis are half of the rates shown in the table and the split point is set to 10,000 miles rather than 2,000 to reflect the higher average mileage of 28,000 miles for taxis.

The mileage tax will raise £17m in 2030, post behavioural change

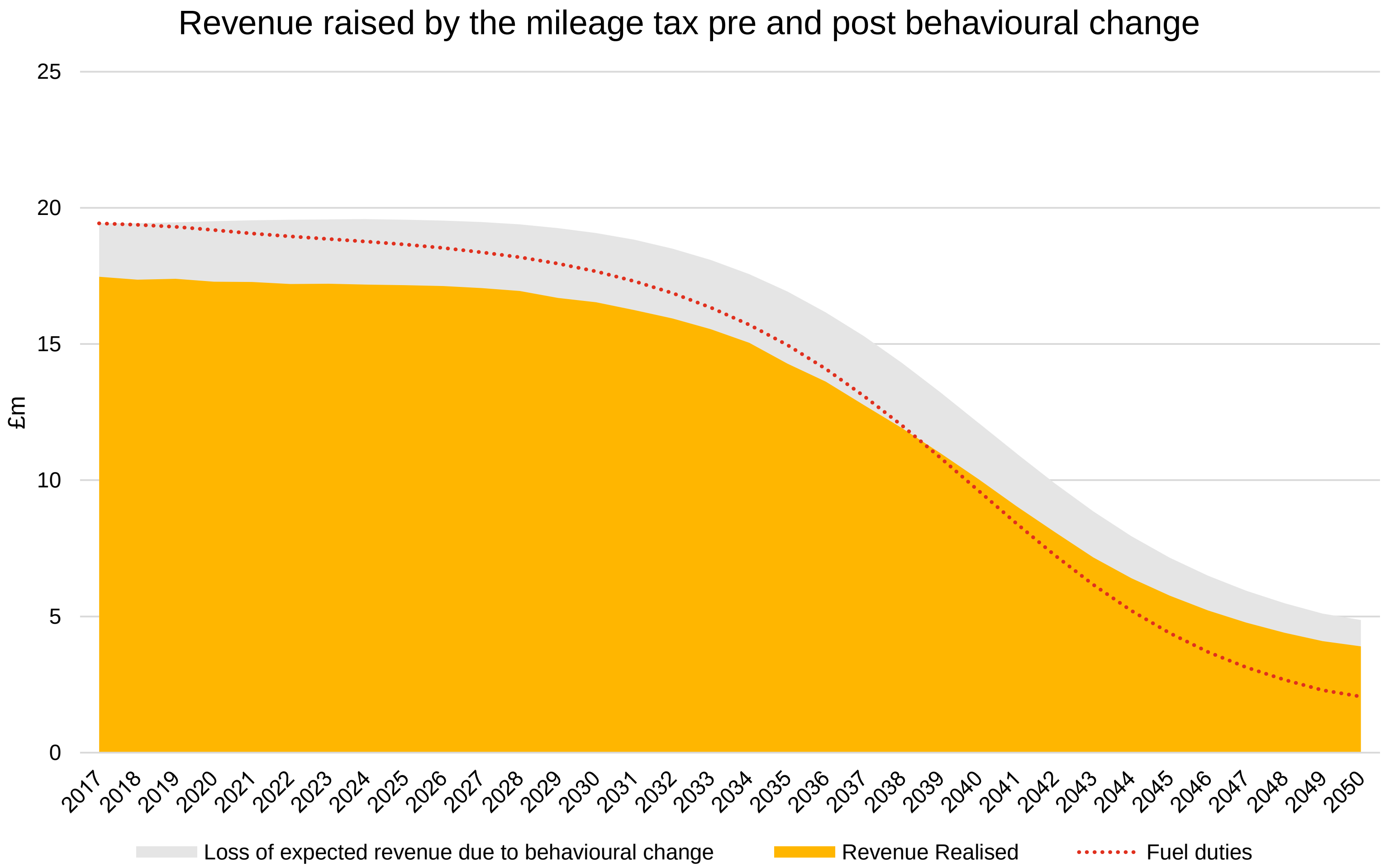

Figure C16. Revenue raised by the mileage tax – pre and post behavioural change

The mileage tax will raise the highest revenue in 2030, however this is forecast to decline as the transition to electric vehicles accelerates.

Electric vehicles pay a lower tax rate than ICE vehicles, therefore as consumers switch to electric vehicles the revenue raised by the tax declines.

Above the baseline transition to electric vehicles, the mileage tax would encourage limited behavioural change meaning in comparison to the baseline the tax is highly sustainable.

However as the mileage tax is not based on the efficiency of vehicles like fuel duty is, the mileage tax will raise more revenue post behavioural than fuel duty from 2039 onwards.

Mileage tax: a tax on the distance travelled according the vehicle type

Vehicles are taxed per mile travelled. Electric vehicles are taxed at a lower rate than ICE vehicles.

Economic efficiency: the mileage tax is the second least efficient tax in 2050. For every £1 of revenue raised, 25p of GDP will be lost in 2050. Despite the large size of the tax base, the loss to GDP is minimal.

Sustainable revenue: the mileage tax is the most sustainable tax in 2050. However, it generates the second least revenue in 2050 due to the transition to electric vehicles assumed in the baseline. Electric vehicles pay a lower rate of tax therefore as the transition gets underway, the revenue realised declines.

Carbon reduction: the high sustainability of this tax indicates this tax would cause limited behavioural change beyond the transition to electric vehicles assumed in the baseline.

Affordability: the mileage tax would be more affordable than fuel duty until 2039. Regardless of the comparison, the average tax burden is very low.

Complexity: all cars have a milometer that tracks distance travelled therefore measuring the tax base would not be difficult. However, a central system would need to be introduced to monitor mileage driven each year.

Tax Principles		Forecast outcome		
		Low Scenario		
		2018	2030	2050
Revenue realised (£m)		17.4	16.5	3.9
Economic efficiency (Dead weight loss in £ per unit of tax)		38p	34p	25p
Economic efficiency (% loss to GDP)		-0.24%	-0.16%	-0.04%
Sustainability (% of expected revenue recovered)		89.4%	86.7%	80.0%
Affordability (% of annual income for average Household)	Pre*	1.03%	0.55%	0.03%
	Post	0.95%	0.73%	0.13%
Complexity		Medium		

*This refers to the affordability of fuel duty

6

Appliance efficiency tax

The appliance efficiency tax is levied on the sale of appliances rated A++ or below

The appliance efficiency tax is a tax on the sale of inefficient appliances in order to incentivise consumers to switch to more efficient appliances.

Methodology

We have made the following assumptions to derive proxy of expected revenue due to a lack of Guernsey-specific data:

1. The appliances sales revenue/GDP ratio is the same across UK and Guernsey (0.22%).
2. The ratio above is constant throughout the forecast period.
3. The energy label distribution of appliances in Guernsey follows the distribution of energy labels for white goods in Europe, including refrigerators, washing machines and dryers.

Under these assumptions, we can estimate 1. the volume of appliance sales, and 2. the distribution by energy label classification. This allows us to calculate sales volumes for each energy label classification, which we multiply by the tax rate:

	A+++	A++	A+	A	B	C	D
Tax rate % of price	0%	5%	10%	20%	40%	50%	60%

Estimated proportion of appliance sales by energy label

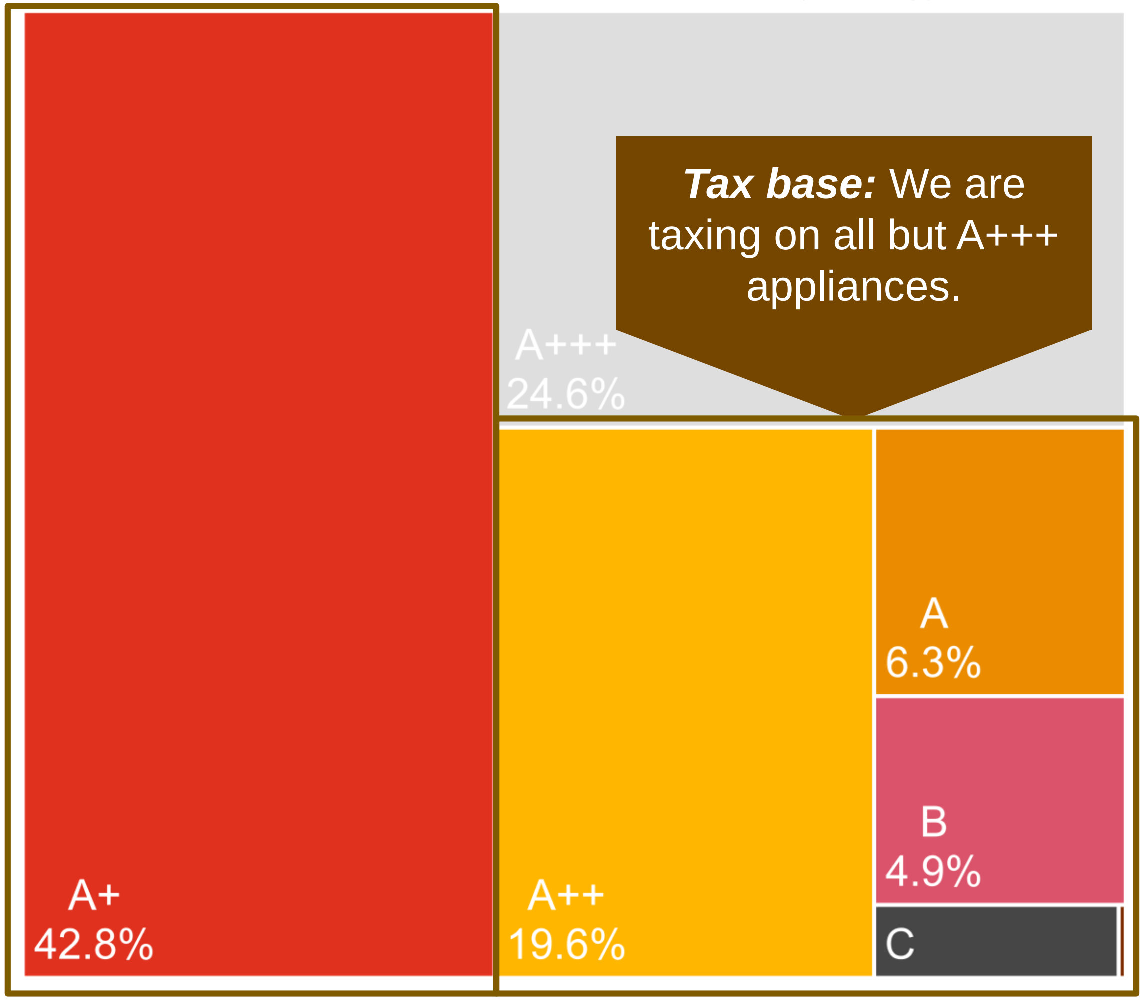

Figure C17. Estimated proportion of appliance sales by energy label

Appliance efficiency tax: a tax on the sale of inefficient appliances

Sales of inefficient appliances are taxed, so consumers are incentivised to purchase more efficient appliances.

Guernsey's manufacturing sector only accounts for approximately 1% of the economy, meaning most appliances are imported. Tax revenue is expected to decline over time due to improvements in appliance efficiency resulting from technological developments.

We have estimated the change in the distribution EU energy labels for appliances to reflect the following goals of the EU energy target:

1. There will be almost no appliances with band B, C and D from 2030 onwards
2. The share of band A+++ will take up around 65% of the market, with A++ and A+ taking 30% and 5%, respectively from 2030 onwards

We expect that the transition towards efficient appliances would accelerate as a result of this tax. However, due to the low level of revenue raised we have not been able to simulate the resulting behavioural change in our economic model.

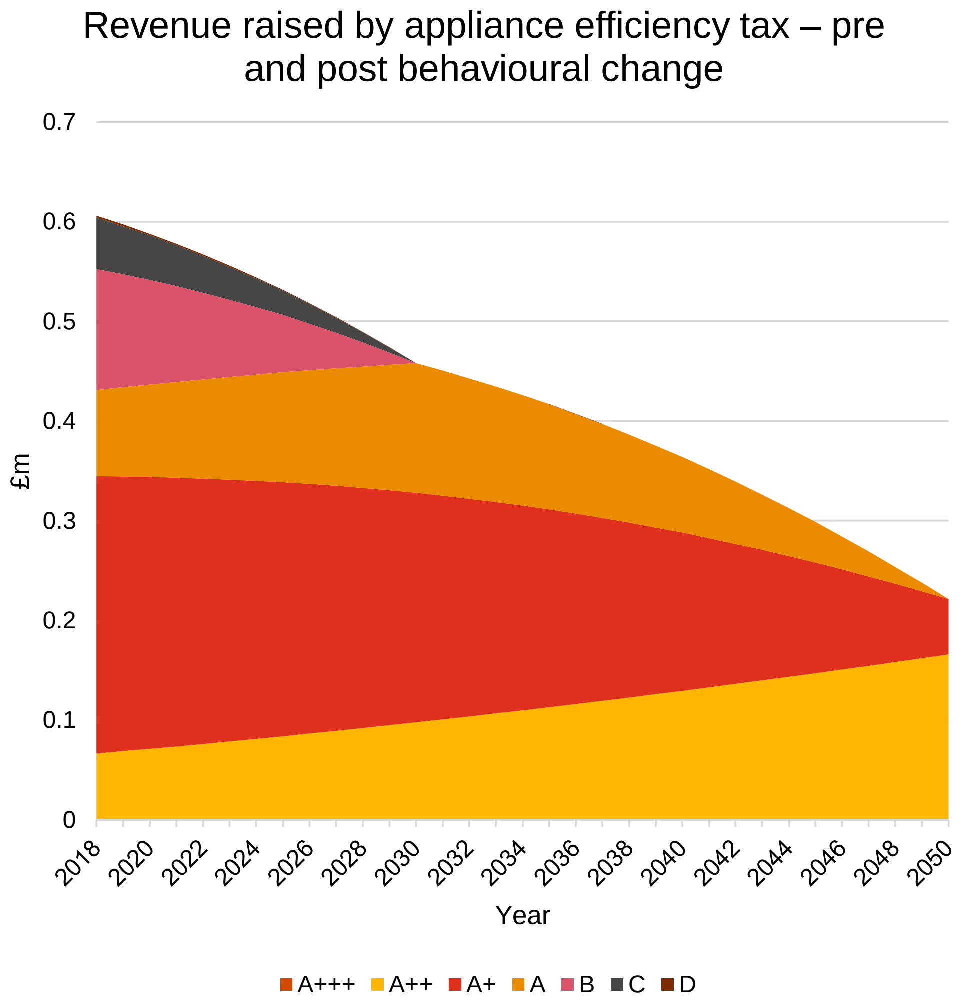

Figure C18. Revenue raised by appliance efficiency tax – pre and post behavioural change

7

Heating efficiency tax

The heating efficiency tax is levied on energy inefficient dwellings

Tax base: The tax is levied on houses rated B or below.

The heating efficiency tax is a tax on the inefficient housing stock. The tax is levied based on energy ratings whereby the lower the rating, the higher the tax.

Practically, Guernsey would need to develop a mechanism to collect the efficiency rating of the housing stock.

Methodology

Due to the lack of data on Guernsey's housing stock efficiency distribution, we derived a proxy distribution from 1. data on Isle of Wight EPC distribution, and 2. the age distribution of housing stock in Guernsey*. We forecasted the future distribution by following the non-compliant scenarios in the National Grid Future Energy Scenarios (2018)*. This gives us the tax base throughout the forecast period which we use to derive the tax revenue equivalent.

	A	B	C	D	E	F	G
Tax rates £ per year	0	100	200	300	400	800	1000

According to the energy infrastructure options report, the average cost of upgrading houses is about £6,300. this motivates the magnitude of the tax rates. For example, a forward-looking household in band G would prefer to make a one-off payment to upgrade their house rather than paying £1,000 every year. This should incentivise behavioural change.

*Details of the methodology on estimating Guernsey Heating Efficiency ratings is shown in the Energy Demand Forecast's Annex A.

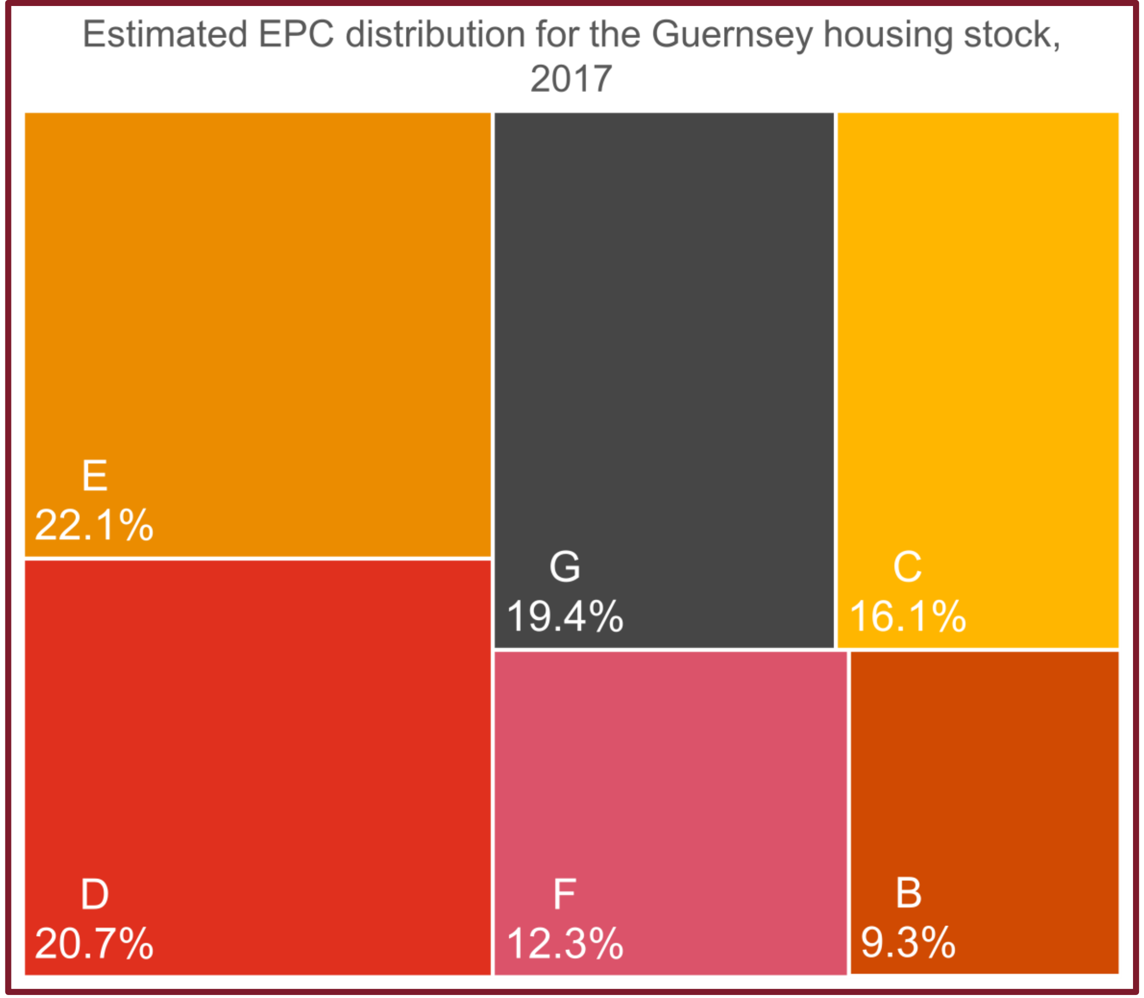

Figure C19. Estimated EPC distribution for the Guernsey housing stock, 2017

The heating efficiency tax would raise £13m in 2018 post behavioural change

The heating efficiency tax would raise £12.7m in 2018. This would decline over time, even before accounting for behavioural change, due to the assumption that the efficiency of the housing stock will slowly improve over time. Figure C20 reflects the forecasted transition from houses in band E, F and G to houses in bands A to D. This transition leads to the shrinking of the tax base as band A houses are exempt from the heating efficiency tax.

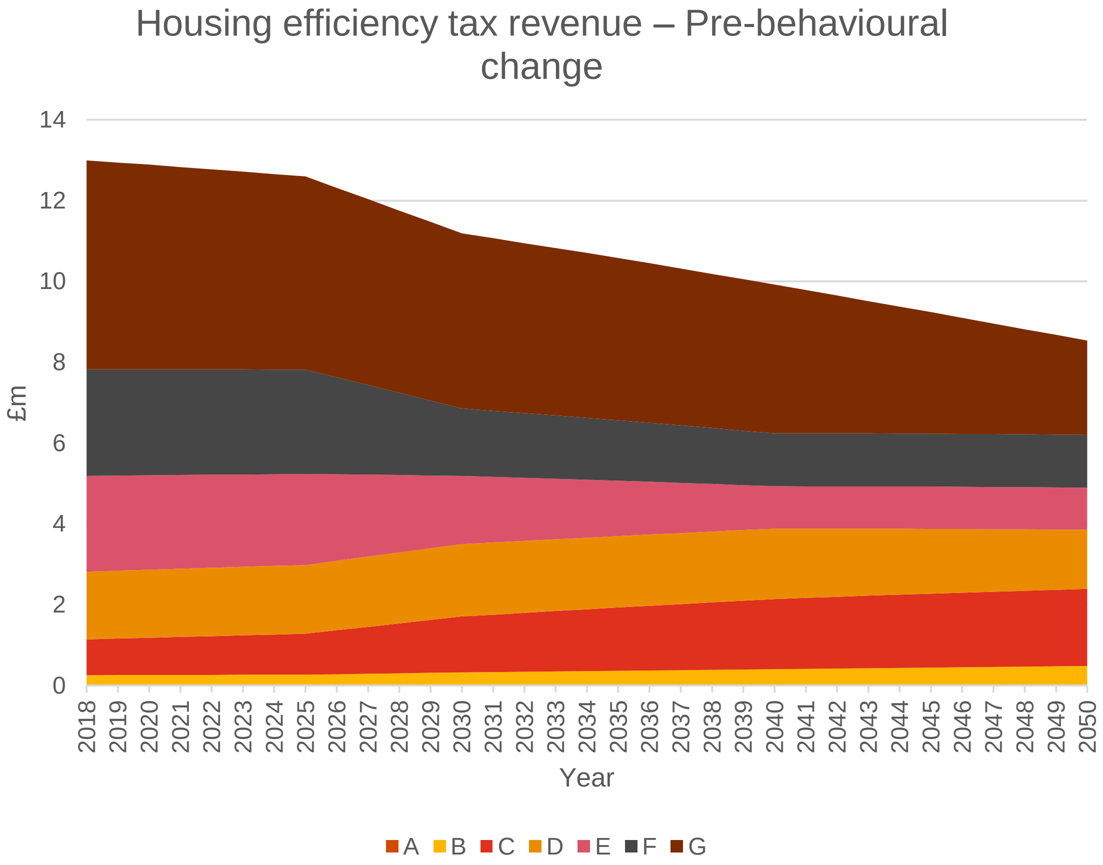

Figure C20. Housing efficiency tax revenue – Pre-behavioural change

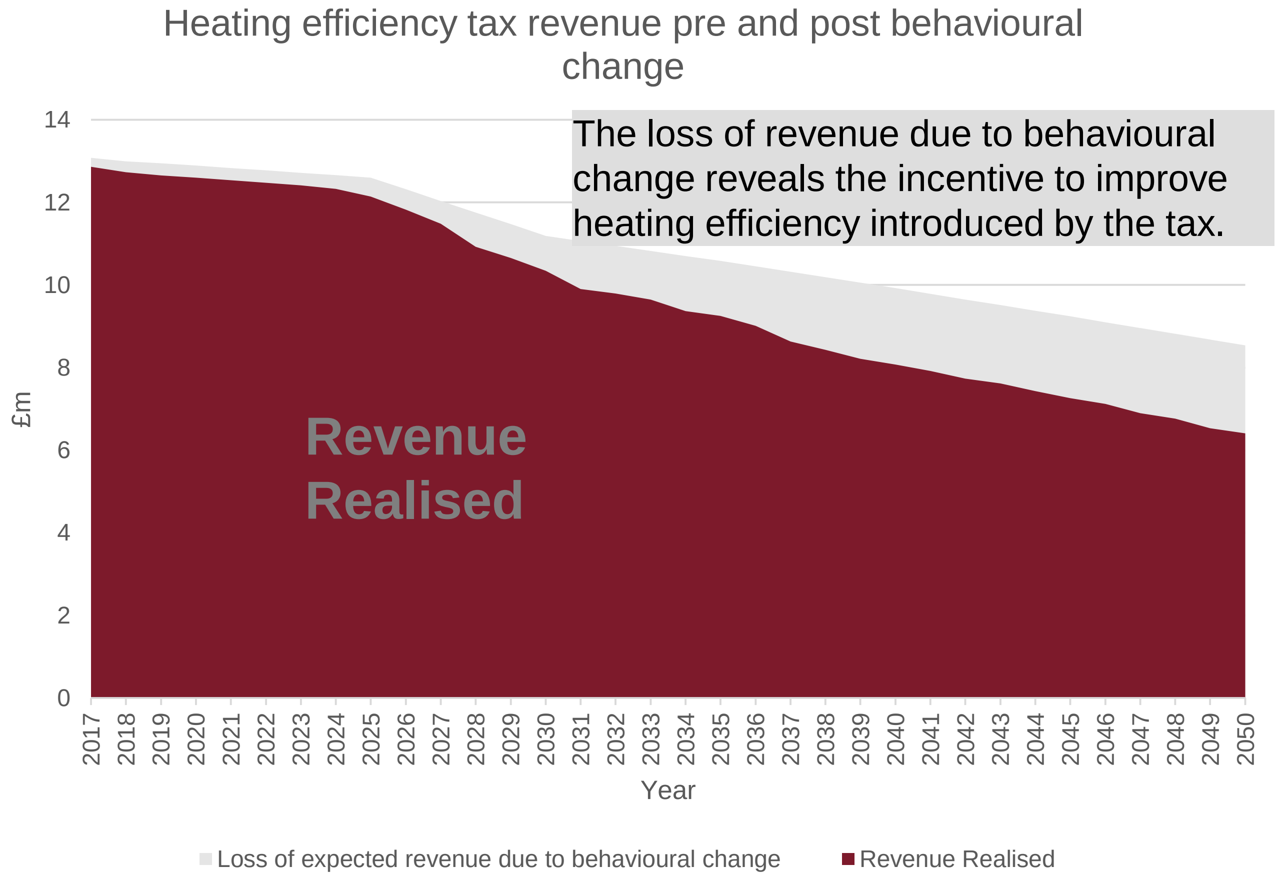

Figure C21. Heating efficiency tax revenue pre and post behavioural change

The heating efficiency tax is the most efficient tax, and has the least negative impact on GDP

The heating efficiency tax would reduce GDP by 0.05% in 2030, the lowest of all tax policies considered. This is reflected by the low DWL per unit of tax, which falls to zero in 2050. The tax base is sustainable, which allows more tax revenue to be raised without inducing a negative economic impact.

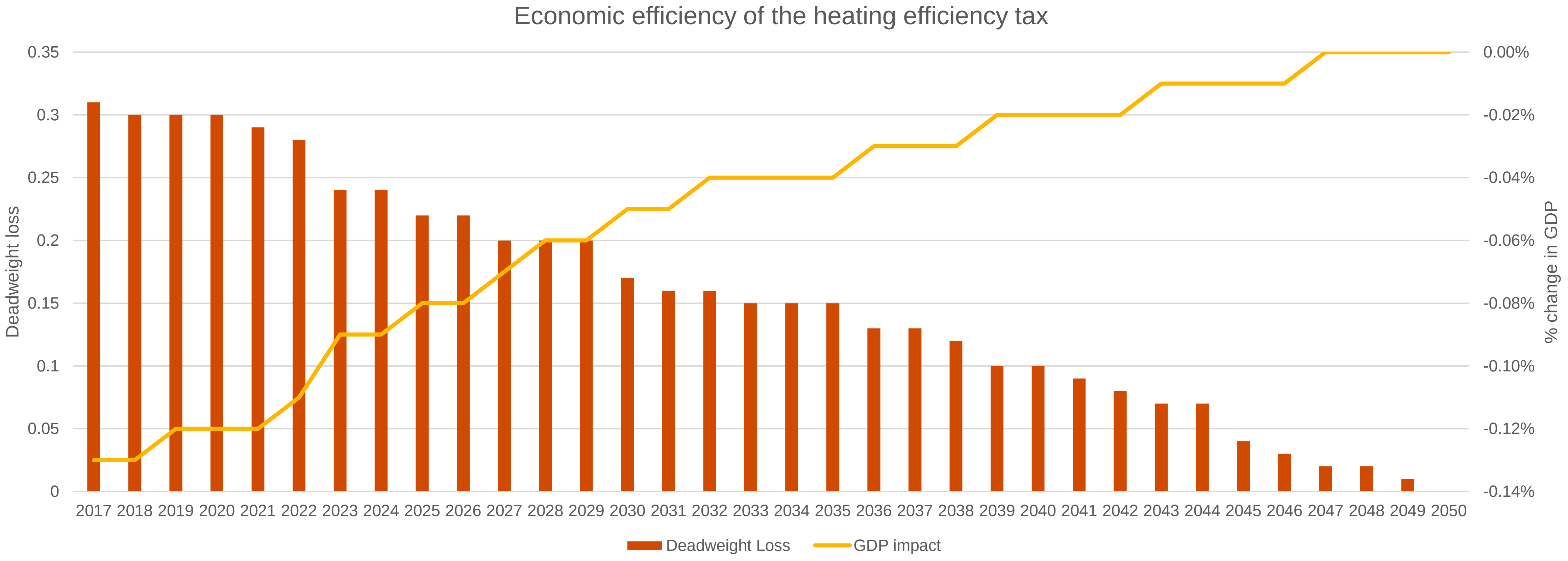

Figure C22. Economic efficiency of the heating efficiency tax

Heating efficiency tax: a tax on the heating efficiency of the housing stock

Households are taxed based on the heating efficiency of their dwellings, i.e. the lower the efficiency, the higher the tax rate.

Economic efficiency: the heating efficiency tax is the most efficient tax policy in 2030 and 2050. In 2050, there is no loss to GDP as a result of this tax.

Sustainable revenue: the heating efficiency tax is the second most sustainable tax in 2050, meaning it will lead to limited behavioural change beyond that assumed in the baseline. The revenue stream will decline over time as households are assumed to improve their heating efficiency in the baseline, however this tax will raise the second most revenue in 2050.

Carbon reduction: the high sustainability of this tax indicates this tax would cause limited behavioural change beyond the improvements assumed in the baseline.

Affordability: the average tax burden of the heating efficiency tax is very low.

Complexity: the tax policy would be complex to implement as an efficiency rating system would need to be introduced, and applied to all of the housing stock. Houses then have to be reassessed after any improvements to measure the extent to which their heating efficiency had improved. Note that some houses may need exemptions, i.e. listed buildings are prohibited from installing double glazing.

Tax Principles	Forecast outcome		
	2018	2030	2050
Revenue realised (£m)	12.7	10.3	6.4
Economic efficiency (Dead weight loss in £ per unit of tax)	30p	17p	0p
Economic efficiency (% loss to GDP)	-0.13%	-0.05%	0.00%
Sustainability (% of expected revenue recovered)	97.9%	92.5%	75.1%
Affordability (% of annual income for average Household)	0.68%	0.32%	0.09%
Complexity	High		

Thank you

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