

Energy Company Obligation (ECO): Using a conversion factor to convert SAP/RdSAP 2012 CO₂e emissions to SAP/RdSAP 2009 CO₂ emissions

1. This paper follows the consultation held in July 2013¹ where we proposed that the ECO Order 2012² should be amended to refer to the most up-to date versions of the Government's Standard Assessment Procedure (SAP) and Reduced Data Standard Assessment Procedure (RdSAP)³. The proposal was widely supported.
2. To manage the transition between SAP/RdSAP 2009 and SAP/RdSAP 2012, we propose that obligated energy suppliers will be permitted to use either SAP/RdSAP 2009 or SAP/RdSAP 2012 for a specific period of time (subject to accessibility of these versions) to calculate savings under the ECO Order 2012. We also propose that obligated energy suppliers will be required to use SAP/RdSAP 2012 for qualifying actions installed under the ECO Order 2015-2017⁴. More information around the timeframes associated with managing the transition between both versions of SAP and RdSAP under the ECO Order 2012 will be issued shortly.
3. The latest versions of SAP and RdSAP (2012; version 9.92) produce emission factors⁵ in terms of carbon equivalent (CO₂e). These emission factors incorporate upstream emissions plus the global warming effect of other gases (methane (CH₄) and nitrous oxide (N₂O)) as well as CO₂. Upstream emission sources include fugitive emissions, such as natural gas leakage and emissions arising from fuel and electricity used during the production and distribution process⁶. Previous versions of SAP (2009; version 9.90) and RdSAP (2009; version 9.91) calculated emissions in terms of CO₂.
4. We propose to include a conversion factor in the ECO Order 2012 and the ECO Order 2015-2017⁷, which will convert the emissions savings from CO₂e into CO₂. In doing so, we have aimed to minimise the difference between CO₂ emission factors in the 2009 versions and the converted CO₂ emission factors in 2012. This is to ensure that as far as possible, there is no impact on the ECO carbon emission targets, and that any impacts on the obligated energy suppliers' ECO delivery plans are minimised.
5. This paper presents two options for a conversion factor. A conversion factor weighted by the historical mix of fuel types for which ECO measures have been delivered so far (Option 1); and a conversion factor which is 100% mains gas weighted, i.e. the fuel type for which the majority of ECO measures have been delivered to date, and are likely to be delivered in the future (Option 2). Government

¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/225040/ECOConDocFINAL.pdf

² The Electricity and Gas (Energy Companies Obligation) Order 2012, referred to throughout this paper as the "ECO Order 2012".

³ SAP and RdSAP are used by obligated energy suppliers to calculate the carbon (CO₂) savings achieved by installing energy efficiency measures and their progress towards their ECO carbon targets.

⁴ Energy suppliers will use SAP 2012 for Scotland when it is available, which, as we understand, may become available in 2015.

⁵ Emission factors reflect emissions of CO₂ (plus upstream emissions, CH₄ and N₂O in case of SAP 2012) per kWh energy from respective fuels.

⁶ For more information, please refer to STP11/CO204 Proposed Carbon Emission and Primary Energy Factors for SAP 2012 http://www.bre.co.uk/filelibrary/SAP/2012/STP11-CO204_emission_factors.pdf.

⁷ The ECO obligations for the period 2015-2017 are referred to throughout this paper as the "ECO Order 2015-2017".

is seeking views from stakeholders on their preferred option, and evidence on any impact of a conversion factor on the delivery of their ECO targets.

6. Responses are requested by Wednesday, 03 September 2014 and should be sent to deccecoteam@decc.gsi.gov.uk. DECC would also be happy to discuss views or provide any clarification required during this period.

The issue

7. The current ECO Order refers to SAP 2009 (version 9.90) and RdSAP 2009 (version 9.91) for ECO scoring calculations. A latest version of SAP (SAP 2012, version 9.92) has already been published and implemented in England and Wales, and RdSAP 2012 is likely to be published by end of 2014. The ECO Order will be amended to incorporate these new versions.
8. SAP/RdSAP 2009 emission factors only included CO₂, whereas emission factors in SAP/RdSAP 2012 calculate emissions in terms of CO₂e (carbon equivalent), which incorporate upstream emissions as well as the global warming effect of CO₂ and other greenhouse gases (CH₄ and N₂O).
9. ECO carbon reduction targets were calculated on the basis of the emission factors in SAP/RdSAP 2009. Savings reported in CO₂e will not be in line with the ECO targets, and therefore, must be converted into CO₂. We propose to do this by using a common conversion factor, which will convert CO₂e emissions into CO₂.
10. The conversion factor is required to enable obligated suppliers to report against their carbon reduction targets with consistency. In developing the conversion factor we have aimed to minimise the difference between the CO₂ emission factors in SAP/RdSAP 2009 and the converted CO₂ emission factor in SAP/RdSAP 2012. This is because we want to ensure, as far as possible, that there is no impact on the ECO carbon reduction ambition and that any impacts on the obligated energy suppliers' ECO delivery plans are minimised.
11. Table A below shows the difference between the CO₂ emission factors in the 2009 versions and the CO₂e emission factors in 2012 versions for the most common fuel types used in properties being treated in ECO. The table shows that in case of all fuel types except LPG, the CO₂e score will be greater than the CO₂ score, both in absolute and percentage terms.

Table A: Difference between SAP/RdSAP 2009 CO₂ emission factors and SAP/RdSAP 2012 CO₂e emission factors by fuel type

(1) Fuel type	(2) SAP/RdSAP 2009 CO ₂ emission factor	(3) SAP/RdSAP 2012 CO ₂ e emission factor	(4) Difference (absolute)	(5) Difference (percentage)
Mains gas	0.198	0.216	0.018	9%
LPG	0.245	0.241	-0.004	-2%
Heating oil	0.274	0.298	0.024	9%
Coal	0.301	0.394	0.093	31%
Electricity	0.517	0.519	0.002	0%
Renewable ^a	0.018	0.029	0.011	61%
District heating ^b	0.198	0.216	0.018	9%

^a Emission factor taken as average of wood logs and wood pellets.

^b Emission factor for mains gas used.

12. If we did not include a conversion factor in the Order, the ECO carbon reduction targets would effectively be reduced as energy suppliers would be reporting the

greater CO₂e score for a given measure compared to lower CO₂ scores⁸. In addition, reporting in CO₂e would be incompatible with supplier obligations, which are set in CO₂. Therefore, without a conversion factor suppliers would be unable to meet their carbon obligations.

Options

13. We propose two options for determining the most suitable conversion factor that will convert CO₂e into CO₂ emissions. They are explained below.
14. It is important to note that alongside the changes to emission factors, there are some other changes made to the SAP/RdSAP 2012 methodology, which may have an impact on a dwelling's emissions scores. These changes reflect either the streamlining of RdSAP with SAP or further refinement of the methodologies. Any impact on emissions occurring due to other changes is neither being discussed in this document nor considered while calculating the conversion factors discussed below. For calculating the conversion factors we have assumed that everything else between the two versions of SAP/RdSAP has remained equal. Therefore, the impacts on emission scores shown below only illustrate the impact of changes to emission factors in isolation and do not take into account other changes which may affect emission scores.

Option 1: Weighted conversion factor

15. Government commissioned BRE to develop a weighted conversion factor to convert CO₂e into CO₂. The factor developed is the ratio of the emission factors used by SAP/RdSAP 2009 to those used by SAP/RdSAP 2012, weighted by carbon savings from CERO and CSCO measures notified to Ofgem for each fuel. The calculations are shown in Table 1 in Annex 1. The conversion factor so developed is equal to 0.925. Under this option, the CO₂e emissions calculated by SAP/RdSAP 2012 would be multiplied by a factor of 0.925 to remove the non-CO₂ elements from the CO₂e emissions figure. This will give an estimate of the CO₂.
16. Table B illustrates the absolute difference and percentage in the emission factors in the SAP/RdSAP 2009 and 2012 post-conversion. These columns indicate how, all else being equal, the emission factors for ECO scores would change as a result of using the weighted conversion factor. It shows that the SAP/RdSAP 2012 emission factors converted into CO₂ using the proposed weighted factor (i.e. the 'adjusted SAP/RdSAP 2012 emission factors') would be greater for all fuel types except LPG and electricity, but that the ranking of the fuel types in terms of emission factors would remain unchanged from SAP/RdSAP 2009 (with the emission factors remaining largest for electricity, coal and heating oil).

⁸ Data from BRE suggests that the emission factor for all fuels apart from LPG would be greater for CO₂e than CO₂. See table A for details.

Table B: Difference in emission factors between SAP/RdSAP 2009 and SAP/RdSAP 2012 as a result of the weighted conversion factor under Option 1

(1) Fuel type	(2) SAP/RdSAP 2009 CO2 emission factor	(3) SAP/RdSAP 2012 CO2e emission factor	(4) Adjusted SAP/RdSAP 2012 emission factor [*]	(5) Difference between (4) and (2): absolute	(6) Difference between (4) and (2): percentage
Mains gas	0.198	0.216	0.200	0.002	0.9%
LPG	0.245	0.241	0.223	-0.022	-9.0%
Heating oil	0.274	0.298	0.276	0.002	0.6%
Coal	0.301	0.394	0.364	0.063	21.1%
Electricity	0.517	0.519	0.480	-0.037	-7.1%
Renewable ^a	0.018	0.029	0.027	0.009	49.0%
District heating ^b	0.198	0.216	0.200	0.002	0.9%

^a Emission factor taken as average of wood logs and wood pellets.

^b Emission factor for mains gas used.

* CO₂e (SAP/RdSAP 2012) x 0.925 = adjusted CO₂ emission factors

Impacts on CERO and CSCO scores

17. If the obligated energy suppliers continue to deliver measures to households heated by fuels as they have done historically, and assuming everything else being equal between SAP/RdSAP 2009 and SAP/RdSAP 2012, the impact on total ECO scores (and therefore on the ECO carbon reduction target) under this option should be neutral (because the conversion factor is weighted by emissions from the historical mix of fuels delivered).

18. It could be, however, that some suppliers will seek to deliver to different fuel types than they would have done as a result of the adjusted emission factors. This is because the 2012 emission factors for some fuel types (mains gas, oil, coal, renewable and district heating) are greater than in SAP/RdSAP 2009 (see column 3 in Table B above). Whilst the extent of this impact is uncertain, Government believes that it could be limited for the following reasons:

- The change in emission factors in absolute terms for mains gas, oil, renewable and district heating is marginal.
- While the change for LPG may seem to be discouraging installation of measures in dwellings heated by LPG, the adjusted emission factor for LPG (column 4 of Table B) remains higher than that of mains gas. LPG and oil are used primarily in properties off gas grid. Therefore, any measure deemed attractive to energy suppliers for installation in properties heated by mains gas should be equally or slightly more so for LPG. The factor for LPG is less than that for oil, but that was also the position for calculations by SAP/RdSAP 2009.
- The factor for properties heated by coal is appreciably higher, making these properties more attractive than before. However, only 0.4% of dwellings treated so far under ECO have been heated by coal (Table 1 in Annex 1). Besides, as we understand, only a very small number of properties in Great Britain are heated by coal, so assuming delivery patterns remain unchanged, the effect will be limited.

- The factor for electricity is reduced, yet it remains higher than that for any other fuel type. Consequently, electrically heated dwellings continue to give higher scores (all else being equal), and application of measures to electrically heated houses is not expected to be discouraged significantly for that reason.
- The change for dwellings heated by renewable fuels appears high in percentage terms but the change in the actual emission factor in absolute terms (column 5 of Table B) is small.

19. It is important to note that to incentivise installation of insulation measures and qualifying boilers in households whose main space heating systems are non-gas, an uplifted Affordable Warmth score will be applied in the ECO Order 2015-2017⁹.

20. Overall, we do not consider that there is likely to be any major shift in delivery patterns and delivery costs as a result of the proposed adjustment to emission factors. We are, however, mindful of the potential impact the revised emission factors could have on companies' delivery patterns and welcome evidence from stakeholders on the extent to which the revised factors would affect planned delivery. In particular, we would like to know whether this will change delivery patterns to off gas grid properties.

Option 2 - Weighted conversion factor adjusted to minimise the impacts on mains gas emissions

21. As shown in table B above, a weighted conversion factor derived in Option 1 would lead to an increase in the emission factor for all fuels except for electricity and LPG; in particular, it would lead to a 0.9% increase in the emission factor for mains gas.

22. Given the fact that, to date, the majority of ECO carbon target measures have been delivered to properties heated by mains gas, the Government is considering an alternative weighted conversion factor aimed at ensuring that there will be no change in the emission factor for mains gas in moving from CO₂e to CO₂. Under this alternative option, the conversion factor for all fuels would be the ratio of the difference between the SAP/RdSAP 2012 CO₂e emission factor and SAP/RdSAP 2009 emission factor adjusted for mains gas. The factor (effectively weighted 100% towards mains gas) using this approach is 0.917¹⁰.

23. Table C below shows the SAP/RdSAP 2012 CO₂e factors converted into CO₂ by using this adjusted conversion factor for all fuel types. Table C illustrates the absolute and percentage difference in the emission factors between SAP/RdSAP 2009 and 2012. Following this conversion, the adjusted CO₂ emission factor (column 4 in Table C) would be greater for all fuels but LPG, heating oil and electricity, but, as under Option 1, ranking of the fuel types in terms of emission factors would remain unchanged from SAP/RdSAP 2009 under Option 2. Uplifts for insulation and certain heating measures in non-gas properties for the obligation period 2015-2017 will also make such properties more attractive for ECO installations (please refer to the document in footnote 9 for more information).

⁹ For more information refer to 'The Future of the Energy Company Obligation: Government Response to the 5 March 2014 Consultation'

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335002/future_energy_company_obligation_government_response.pdf

¹⁰ This is the ratio of the SAP 2009 emission factor and the SAP 2012 CO₂e emission factor: 0.198/0.216= 0.917.

Table C: Difference in emission factors between SAP/RdSAP 2009 and SAP/RdSAP 2012 as a result of using the adjusted weighted conversion factor under Option 2

(1) Fuel type	(2) SAP/RdSAP 2009 CO2 emission factor	(3) SAP/RdSAP 2012 CO2e emission factor	(4) Adjusted SAP/RdSAP 2012 emission factor*	(5) Difference between (4) and (2): absolute	(7) Difference between (4) and (2): percentage
Mains gas	0.198	0.216	0.198	0.000	0.0%
LPG	0.245	0.241	0.221	-0.024	-9.8%
Heating oil	0.274	0.298	0.273	-0.001	-0.3%
Coal	0.301	0.394	0.361	0.060	20.0%
Electricity	0.517	0.519	0.476	-0.041	-8.0%
Renewable ^a	0.018	0.029	0.027	0.009	47.7%
District heating ^b	0.198	0.216	0.198	0.000	0.0%

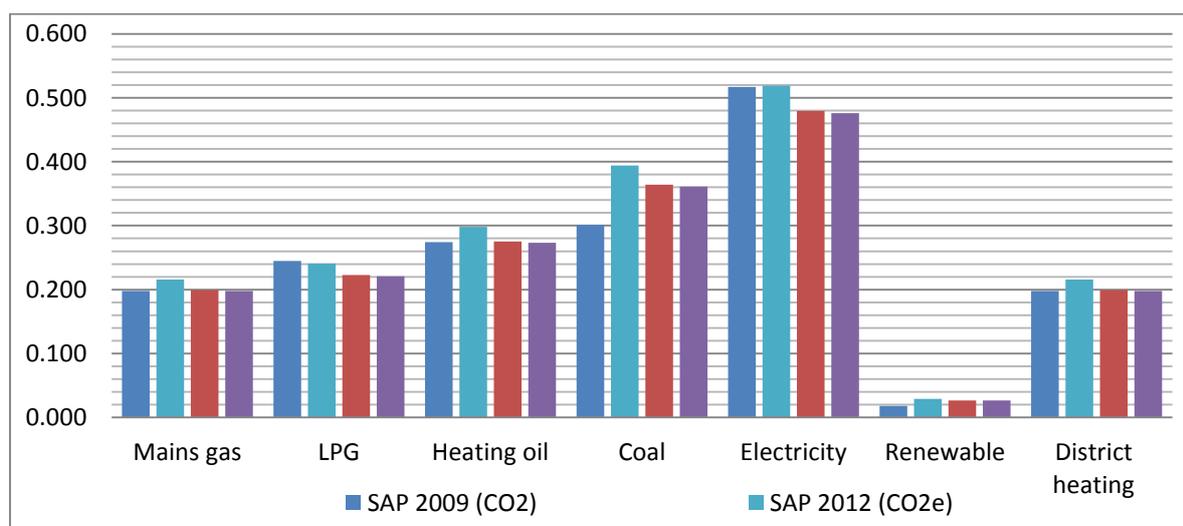
a Emission factor taken as average of wood logs and wood pellets.

b Emission factor for mains gas used.

* CO2e (SAP/RdSAP 2012) x 0.917 = adjusted CO2 emission factor.

24. Government considers that a key benefit of this option is that it would ensure no change to the emission factor for mains gas, which is the fuel type for the majority of dwellings where ECO measures are likely to be delivered. However, we recognise that this option would have the impact of further reducing the score of LPG and electricity compared to the weighted average factor described in Option 1 (see chart below for a comparison of the emission factors under SAP/RdSAP 2009, SAP/RdSAP 2012 and the two options for converting CO₂e emissions into CO₂ while using SAP/RdSAP 2012). We also recognise that there is uncertainty about the extent to which suppliers will continue to deliver the majority of measures to properties heated with mains gas.

Figure 1: Comparison of emission factors under SAP/RdSAP 2009, SAP/RdSAP 2012, and SAP/RdSAP 2012 emissions converted under Option 1 and Option 2



25. Government neither controls nor regulates how ECO measures will be distributed across households with different heating fuels. Suppliers should, everything else being equal, have an incentive to deliver to households that are heated by non-gas

fuels, as a greater volume of carbon savings (and therefore ECO carbon target compliance units) will be realised from properties heated by electricity, solid fuels or oil compared to properties heated by mains gas. However, 87 percent of measures delivered under the carbon target to the end of June 2014 were to houses heated by mains gas¹¹. If energy suppliers continue to deliver measures mainly to mains gas heated households in the future, then this option is likely to cause minimal change from the current environment compared to Option 1.

Question 1: Will the use of the proposed weighted conversion factors lead to impacts on costs and/or planned delivery patterns for energy suppliers? If so, could you specify what impacts it could have? In particular, could it change delivery patterns to off gas grid properties?

Question 2: What is your preferred Option? If you do not agree with the proposed Options, what other option do you think should be considered and why?

Timing

26. As set out in the Government response to the July 2013 consultation, DECC is working with the BRE, DCLG, Ofgem, obligated energy suppliers and SAP/RdSAP software providers to ensure that the switchover date to the updated versions of the methodologies (and therefore the software, EPCs and Green Deal Advice Reports using these methodologies) is both legally clear and practically achievable.

27. RdSAP 2012 is expected to be released towards the end of 2014. A final switchover date is currently under discussion. Setting a date for the switchover in legislation may be impractical and lead to non-compliance by energy suppliers. Therefore, we propose that under the ECO 2012 Order, energy suppliers will be able to use either version of SAP/RdSAP (2009 or 2012) for the purpose of the calculation of their ECO savings for a specific period of time. After this, we intend that all savings, including that of measures that need to be re-scored will be calculated using SAP/RdSAP 2012 versions.

Question 3: Do you agree with the proposed approach, which enables energy suppliers to use either SAP/RdSAP 2009 or SAP RdSAP 2012 for a specific period of time?

Application of the new provisions to ECO Order 2015-2017

28. For the obligation period 2015 -17, energy suppliers will be required to use SAP/RdSAP 2012 to calculate the carbon scores for measures installed in the 2015-2017 obligation period. By then, we expect that all energy suppliers will have switched to the latest version of SAP or RdSAP. We will review the conversion factor again in the event that there are further changes in SAP/RdSAP emission factors before the end of ECO.

¹¹ Green Deal and Energy Company Obligation (ECO): Monthly statistics (June 2014) <https://www.gov.uk/government/publications/green-deal-and-energy-company-obligation-eco-monthly-statistics-june-2014>

Question 4: Do you agree that the proposed conversion factor should be used in the ECO Order 2015-2017?

Question 5: Do you agree that Government should keep the conversion factor under review and consider further changes, as appropriate?

Impact on costs of delivering the ECO targets

29. The technical nature of the proposed changes means that a formal Impact Assessment is not required. Previous ECO and Green Deal impact assessments were based on cost to business of delivering the legislated targets set in CO₂ units. If we did not implement the change, and the new scores were in CO₂e units, then the cost to suppliers of delivering their ECO targets would be lower than what we have estimated. The proposed conversion factors are expected to convert CO₂e in a way that minimises the difference between CO₂ emission factors in SAP/RdSAP 2009 and the converted CO₂e emission factors in SAP/RdSAP 2012. This is to ensure that, as far as possible, there is no impact on the ECO carbon targets and that any impacts on the obligated energy suppliers' ECO delivery plans are minimised.

Annex 1: Details on Options

Option 1 –methodology for developing weighted conversion factor

The table below illustrates the methodology used to develop the weighted factor under Option 1:

- The CO₂ emission factor used by SAP/RdSAP 2009 is shown in column 2 and the CO₂e emission factor used by SAP/RdSAP 2012 is shown in column 3. This is then multiplied by 0.925 in order to be converted into CO₂ (column 8).
- Column 5 is the total carbon savings submitted to Ofgem under CERO and CSCO for each fuel type up to June 2014.
- Column 6 is the fraction of scores submitted for each fuel type, i.e. the number in column 5 divided by the total.
- Column 7 is column 4 multiplied by column 6 for each fuel type, and the sum of these values provides the overall weighting factor.

Table 1

(1) Fuel type	(2) Emission factor SAP/RdSAP 2009	(3) Emission factor SAP/RdSAP 2012	(4) Emission factor Ratio (SAP/RdSAP 2009 and SAP/RdSAP 2012)	(5) Total carbon savings from CERO+CSCO	(6) Fraction of scores submitted	(7) Weighted ratio	(8) Adjusted RdSAP/SAP 2012 emission factor
Mains gas	0.198	0.216	0.917	9,039,406	0.8063	0.739130	0.200
LPG	0.245	0.241	1.017	16,246	0.0014	0.001473	0.223
Heating oil	0.274	0.298	0.919	163,052	0.0145	0.013373	0.276
Coal	0.301	0.394	0.764	175,664	0.0157	0.011971	0.364
Electricity	0.517	0.519	0.996	1,735,546	0.1548	0.154216	0.480
Renewable ^a	0.018	0.029	0.621	48,037	0.0043	0.002660	0.027
District heating ^b	0.198	0.216	0.917	32,689	0.0029	0.002673	0.200
Other (omitted)				2,426			
			Total:	11,210,640			
					multiplying factor:	0.925496	
					to 3 d.p:	0.925	

^a Emission factor taken as average of wood logs and wood pellets.

^b Emission factor for mains gas used.

Option 2 – Methodology for developing an adjusted weighted conversion factor so that the impact on mains gas scores is unchanged and mains gas correction ratio is imposed on all fuels

Table 2

(1) Fuel type	(2) SAP/RdSAP 2009 CO ₂ emission factor	(3) SAP/RdSAP 2012 CO ₂ e emission factor	(4) Difference (absolute)	(5) Ratio (SAP/RdSAP 2009)/(SAP/RdSAP 2012)	(6) Adjusted SAP/RdSAP 2012 emission factor ^a
Mains gas	0.198	0.216	0.018	0.917	0.198
LPG	0.245	0.241	-0.004	1.017	0.221
Heating oil	0.274	0.298	0.024	0.919	0.273
Coal	0.301	0.394	0.093	0.764	0.361
Electricity	0.517	0.519	0.002	0.996	0.476
Renewable	0.018	0.029	0.011	0.621	0.027
District heating	0.198	0.216	0.018	0.917	0.198
				multiplying factor	0.917

^a SAP/RdSAP 2012 - adjusted (mains gas score unchanged, imposed on all fuels (i.e. non-weighted)).