Renewable Energy Guidance

*Guidance for assessing the greenhouse gas impacts of renewable energy policies*

*May 2018*

How to quantify the GHG impacts ex-post

9. **ESTIMATING GHG IMPACTS EX-POST**

Ex-post impact assessment is a backward-looking assessment of the GHG impacts achieved by a policy to date. The GHG impacts can be assessed during the policy implementation period or in the years after implementation. Ex-post assessment involves estimating achieved RE addition and estimating the consequential GHG impacts. In contrast to ex-ante estimates of GHG emissions, which are based on assumptions about future RE deployment, ex-post estimates of emissions are based on observed (monitored) data collected during the policy implementation period. Users that are estimating ex-ante GHG impacts only can skip this chapter.

*Figure 9.1: Overview of steps in the chapter*

| Estimate or update baseline emissions (Section 9.2) | Estimate achieved RE addition (Section 9.3) | Estimate GHG impacts (Section 9.4) |

Checklist of key recommendations

- Estimate achieved RE addition using monitored values for the parameters described in the monitoring plan
- Estimate the GHG impacts of the policy over the assessment period, for each GHG source included in the GHG assessment boundary

9.1 **Introduction to estimating GHG impacts ex-post**

There are three main objectives to estimating GHG impacts ex-post. These are described below along with the sections of this chapter that are relevant to each.
Objective 1: Compare achieved RE addition with a policy cap, RE addition with a RE target, or GHG emission level to a sectoral emissions target

Users may want to compare achieved RE addition with a policy cap. A policy cap generally reflects the ambition or the expected amount of RE addition the policymaker is aiming to achieve. Users might also want to assess the extent to which a policy has contributed to a separate target, such as a national RE target. Lastly, users may want to compare the ex-post estimated policy scenario emissions with a sectoral target for emissions in the energy sector.

To meet these objectives, it is not necessary to develop a baseline scenario and users follow the guidance in Section 9.3.

Objective 2: Compare achieved RE addition or GHG emission reductions with a baseline scenario

Users may want to compare the achieved RE addition with what would have happened in the absence of the policy. This requires the determination of a baseline scenario, which also serves as the basis for calculating baseline emissions and GHG emission reductions.

Users develop a baseline scenario under which an equivalent amount of electricity is generated as in the policy scenario, but from business-as-usual sources rather than via the RE addition that results from the policy. All other variables (such as economic trends) are kept the same as in the policy scenario. The baseline scenario is used to estimate either the GHG emission trajectory or the GHG emissions reductions.

To meet these objectives, follow the guidance in Sections 9.2, 9.3 and 9.4.

Objective 3: Compare achieved RE addition or GHG emission reductions with an ex-ante assessment

Users may want to compare an ex-ante (expected) RE addition with achieved RE addition, to ascertain whether a policy is performing in line with expectation. Likewise, they may want to compare the GHG emission reductions achieved by a policy with the reductions estimated in an ex-ante assessment.

This can provide an indication of the impact of policy design characteristics and other factors on the RE addition (i.e., the factors set out in Chapter 7). For example, if the achieved RE addition is greater than the expected RE addition, this could be an indication that other policies are interacting with, or adding further incentive to, the policy (e.g., where a renewable portfolio standard is achieved using a feed-in tariff policy). Alternatively, if the achieved RE addition is lower than the expected RE addition, it could be that other policies have counteracted the policy’s intended impact or the policy may not have been as effective as originally predicted.

This exercise can help users avoid double-counting through the aggregation of emission reductions from interacting policies. It can also be used to check whether all the assumptions that were made during the ex-ante assessment were correct. Lastly, comparisons between ex-ante and ex-post assessments can inform subsequent improvements of ex-ante assessments. These comparisons may become part of an ongoing process to refine future assessments.

To meet these objectives, follow the guidance below in Sections 9.3 and 9.4.
Considerations for the desired level of accuracy

When selecting methods to estimate ex-post GHG impacts, users should consider objectives, the level of accuracy needed to meet stated objectives, the availability and quality of relevant data, the accessibility of methods, and capacity and resources for the assessment.

Users can follow a low accuracy approach for their assessment, which may entail collecting aggregate data on energy generation from government agencies and/or using auxiliary electricity consumption emission factors based on the most common source of auxiliary generation for the country. An intermediate accuracy approach may involve using clustered data on energy generation from electricity purchasers or distribution companies, and/or using auxiliary electricity consumption emission factors based on the most common source of auxiliary generation within the regions where the clusters are located. A high accuracy approach can involve using disaggregated metered data on electricity imports and exports, and disaggregated fuel consumption data for auxiliary generation.

9.2 Estimate or update baseline emissions (if relevant)

To estimate the GHG emission reductions achieved by the policy, baseline emissions need to be estimated. Baseline emissions should be recalculated each time an ex-post assessment is undertaken. If using the emission trajectory method, update the baseline emissions by following the steps in Section 8.2.3. If using the grid emission factor, skip this step (emission reductions are estimated based upon the RE addition and updated grid emission factor, in Section 9.4).

9.3 Estimate achieved RE addition

It is a key recommendation to estimate achieved RE addition using monitored values for the parameters described in the monitoring plan. This achieved RE addition can be estimated in terms of RE capacity addition or RE electricity generation addition. Two main parameters to monitor are, respectively, installed RE capacity and net electricity supplied to the electricity grid from RE. Further guidance on indicators, parameters and monitoring plans is provided in Chapter 10.

Where users have no, or limited, monitored data for the policy, the achieved RE addition may have to be estimated using the best data available. See the considerations for the desired level of accuracy in Section 9.1 for further guidance on choosing an approach.

9.4 Estimate GHG impacts

The achieved RE addition should be translated into GHG impacts by following the guidance set out in Chapter 8, using monitored (rather than projected) data. Chapter 10 lists all the relevant indicators and parameters for which data should be gathered to translate achieved RE addition into ex-post GHG impacts.

It is a key recommendation to estimate the GHG impacts of the policy over the assessment period, for each GHG source included in the GHG assessment boundary. For the emission trajectory method, calculate the GHG impacts of the policy by subtracting baseline emissions (estimated in Section 9.2) from the ex-post policy scenario emissions for each source category included in the GHG assessment boundary.

For the grid emission factor method, calculate the GHG impacts of the policy by multiplying the updated grid emission factor by the RE addition (expressed in terms of GWh).