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BASELINE SETTING

Establishing a robust baseline is central to baseline and credit schemes:

- In crediting mechanisms, the baseline represents a scenario of emissions levels in the absence of the project (business-as-usual). When actual emissions from a project are below the baseline emissions, the difference between the two is eligible for credits.
- In penalty mechanisms, the baseline is generally a specified performance target. An entity is penalised for emissions above the baseline, and some schemes may credit for performance below the same baseline. In others, the penalty and crediting baselines could be set at different levels or in different ways.

Baselines will be an important design feature of the ERF for both the crediting mechanism and the safeguard mechanism. Some of the options, concepts and data requirements for crediting and penalty baselines are similar. Their different objectives, however, mean that some have very different implications for crediting and penalties. For example:

- Setting baselines consistent with business-as-usual emissions is important in crediting mechanisms (to ensure that emissions reductions are additional) but is not important in a penalty mechanism. Baselines in penalty systems are instead designed to achieve some kind of performance target, such as maintaining emissions at historical levels or reducing emissions in absolute terms. It is incidental if the baseline is at or below business-as-usual emissions, what matters is meeting the target.
- Participating in a crediting mechanism is normally voluntary, so participants expect to recoup the cost of the emissions reductions through the sale of the credit. Overly strict baselines in a crediting system could deter participation, or increase the cost of credits. Participation in a penalty system, on the other hand, is mandatory and the incidence of cost will depend on the objectives of the scheme and how the baseline is set.

This section focuses on crediting baselines as these are more relevant to the immediate design of the ERF. The Government has indicated that baselines for the safeguard mechanism will be subject to further consultation and the mechanism will not operate until 1 July 2015. This section looks across a range of schemes, including the CFI (crediting only) and international experience to draw insights relevant for the ERF's crediting mechanism.

5.1 CFI APPROACH TO BASELINES

CFI projects must use an applicable methodology that sets out the baseline for the project against which emissions reductions are measured. While the additionality tests discussed in Section 4.1 determine that the project is genuinely additional, the baseline is the mechanism by which the quantity of additional reductions (therefore credits) is measured.

Baselines can be determined on an absolute or emissions intensity basis (discussed below). As outlined in Box 5.1, the approach to determining baselines under the CFI varies by activity and project-specific variables. Reforestation and afforestation projects are likely to have constant baselines (that is, emissions are assumed/expected to stay constant in the absence of the project, and sequestration increases under the project scenario). On the other hand, emissions reduction activities are likely to either have declining or inclining baselines. A declining baseline means that a reduction in emissions was expected in the absence of the project, and there is an additional reduction under the project scenario. For an inclining baseline, an increase in emissions was expected in the absence of the project, and emissions increase at less than this rate under the project (DoE 2014b).

BOX 5.1: BASELINES UNDER THE CFI (SIMPLIFIED)

LANDFILL GAS PROJECTS

Landfill gas projects capture methane emissions that would otherwise be released to the atmosphere. The baseline here is calculated in light of business-as-usual capture rates, which are determined through a three-step process:

1. Where there is a qualitative requirement to capture emissions (which does not include specific instructions or directions), apply a capture rate of 30 per cent. If there is no qualitative requirement, the capture rate is zero.
2. Calculate the quantitative regulatory requirement from the relevant state and territory guidelines. If there is no quantitative requirement, the capture rate is zero.
3. Use the higher of the two capture rates to calculate the emissions baseline. Where there are no quantitative or qualitative regulatory requirements, the capture rate is zero and the emissions baseline assumes 100 per cent release of methane emissions.

PIGGERY PROJECTS

The baseline for a piggery methane capture project represents the annual methane emissions that would have been generated and released from each project lagoon in the absence of the abatement activity.

The baseline is calculated based on the amount of volatile solids in the effluent stream deposited into each project lagoon.

The amount of volatile solids in the effluent stream is calculated using the PigBal model, which was developed by the Queensland Department of Primary Industries. Project proponents input all required data (such as the number of pigs, breed of pigs and the type of feed used) into the PigBal model in accordance with the procedures and requirements set out in the PigBal Manual.

REFORESTATION AND AFFORESTATION PROJECTS

The baseline for these types of project is taken to be zero and all new sequestration activity is credited.

SAVANNA BURNING

The baseline is the average emissions for the 10 years prior to the commencement of the project. Abatement is calculated by determining the annual emissions in the reporting period and comparing it to the baseline. Annual emissions in both the baseline period and the reporting period are calculated using vegetation and fire maps.

Total emissions from fire for a project are calculated by determining how many hectares of each vegetation type are burnt in each fire season and multiplying this area by several values that take the variation in emissions in each vegetation type and season into account.

DIVERTING WASTE TO AN ALTERNATIVE WASTE TREATMENT FACILITY

The baseline is the methane that would have been emitted from a landfill if the waste had gone to landfill rather than being diverted.

This baseline assumes that, in the absence of the project, the waste would be transported to a nearby landfill, which would comply with state average landfill performance (DCCEE 2013).

Appropriate consideration of project-specific factors helps set accurate baselines, but can lead to multiple methodologies for essentially the same activity. For example, in the CFI there are three separate methodologies for the destruction of methane from piggeries. Each has a different baseline taking account of project-specific variables such as the size of the project, location, technologies used, state-based regulations and other factors.

If methodologies become more standardised or principles-based and devolve more of the specific analysis to project approval assessment, there may be implications for determining baselines and crediting emissions reductions. If the methodology simply devolves baseline setting to the project-approval phase, this increases the burden on the CER to assess baselines, or on the proponent to establish the project baseline. Alternatively, if the methodology sets a very standardised baseline, this leaves less consideration for project-specific variables. For heterogeneous activities, this runs the risk of crediting non-additional abatement. Any attempt to simplify baselines will need to be weighed against these consequences.

5.2 EXPERIENCES FROM OTHER SCHEMES

Most schemes set out detailed rules for how baselines are to be determined in a methodology. While these may be tailored for the specific circumstances, there are some commonalities across schemes.

The approaches to baseline design from other schemes provide a useful starting point for developing baselines in Australia. These would need to be tailored to Australia's particular circumstances.

5.2.1 ABSOLUTE OR INTENSITY BASELINES

All baseline emissions are a product of the baseline activity (the action that would occur in the absence of the project) and the baseline emissions factor of that activity (emissions per unit of baseline activity). Baselines can be defined on either an absolute or intensity basis.

An absolute baseline calculates baseline emissions by estimating both the level of activity and emissions factor for the crediting period. Intensity baselines only determine the baseline emissions factor in advance; baseline emissions are then established at the time of crediting by multiplying the actual activity by that emissions factor. In both cases credits are still in absolute terms (one tonne of emissions reduction per credit), reflecting the difference between the baseline emissions and actual emissions. The key difference is that an absolute baseline estimates activity in advance (ex-ante).

One disadvantage of an absolute baseline is that the baseline activity may be influenced by a range of external factors that could change over the period, so the activity used to set the

baseline could prove to be a poor estimate. In this case, credits issued under an absolute baseline may not reflect additional emissions reductions and may instead result from unexpected variations in activity.

Intensity baselines assume that baseline activity is equal to actual activity—a reasonable assumption provided that undertaking the project does not influence activity levels. If activity increases, an intensity baseline allows a project to receive credits for improvements in intensity even if its total emissions increased over the period. This is because it is assumed that the improvement in intensity has reduced emissions from business-as-usual. If the additional income from crediting makes it worthwhile to do more of an activity, then actual activity is not a good proxy for baseline activity. In these circumstances, an intensity baseline would lead to over-crediting. An absolute baseline that estimates activity in advance would be better.

One disadvantage of an intensity baseline is that both the actual emissions and actual activity must be measured for crediting. If an absolute baseline is used then only actual emissions need to be measured. Another disadvantage of an intensity baseline is that the activity must be defined, so they are better suited to activities that can be clearly defined. For example, intensity baselines could be measured in terms of a unit of input or output, such as tonnes of CO₂-e per square metre of building space used. Intensity baselines are more challenging if an activity is not as easily defined; for example, for a facility that produces multiple products.

Both absolute and intensity baselines have a role to play in crediting mechanisms. The choice of which to use depends on the specific nature of the activity and the availability and suitability of the activity data. Absolute baselines are often used in emissions destruction methodologies. This is because it is assumed that all destroyed emissions would otherwise be released into the atmosphere. For instance, in the CDM methodology for the capture and utilisation or destruction of mine methane, baselines are estimated ex-ante and assume that prior to the project all methane was either released into the atmosphere or only partially used for heat generation.

Similarly, baselines for forestry projects assume that no emissions would have been removed from the atmosphere. For example, the *Greenhouse Gas Benchmark Rule (Carbon Sequestration) No. 5 of 2003* measured the direct changes in carbon stock on eligible land.

Many energy efficiency methodologies and displacement methodologies use intensity baselines. For example, the New South Wales ESS methodologies use intensity baselines for measuring improvements in building energy efficiency. The baseline is the emissions intensity of the floor space in the building (kgCO₂/m²) required by regulation. In the CDM, fossil fuel displacement methodologies often define baseline emissions as the emissions intensity of grid electricity, with the volume of electricity displaced measured over the period.

5.2.2 HISTORICAL OR PROJECTED DATA

The second issue is whether to use historical or projected data to develop the baseline. Each of these data sources has strengths and weaknesses, and in practice most schemes use a combination of both. The choice between historical and projected data will depend on the nature of the activity or facility being credited, what is known about the future and how (or if) any expected changes will impact the activity. There is also a trade-off between the improved accuracy of projections and the convenience of historical data.

Historical approaches establish baselines based on previous emissions and activities. Historical data are relatively easy to objectively measure and verify (if measurement systems are already in place), and may provide a good guide to the future where activity and production methods are expected to remain relatively stable.

Historical data does not, on its own, account well for circumstances where activities or emissions intensity are changing or are expected to change in the future. For instance, the use of historic emissions as an absolute baseline could credit a firm simply for reducing its production in response to an economic downturn, rather than for doing anything to reduce emissions.

Projected baselines forecast future emissions based on expected future changes in external circumstances, such as changes in technologies, the regulatory environment or other economic drivers. In this regard, they can achieve a more accurate business-as-usual baseline than historical data. Like all forecasts, however, projected baselines rely on assumptions about the future and are subject to uncertainty. Projections also require more data and judgment than historical data, which can lead to additional complexity and costs.

The PAT scheme uses three years of historical data to determine baselines for liable entities. Where data does not present a reliable picture of future output, the scheme has rules for smoothing or excluding data. The methodologies for PAT were developed through an extensive four-year consultation period with affected firms. Many other schemes also use historical data. For example, the CDM has a methodology for improving the electrical energy efficiency of submerged electric arc furnaces used in industrial production. This specifically requires that 'data for the most recent three years preceding the implementation of the project activity is available to estimate the baseline emissions'.

Other CDM methodologies use projected data in baselines. For example, the CDM methodology for the manufacturing of energy-efficient domestic refrigerators incorporates into the baseline the 'autonomous improvement' of energy efficiency of refrigerators, which estimates how the technology would improve over time in the absence of the activity.

5.2.3 INDIVIDUAL OR STANDARDISED BASELINES

A third issue to consider when establishing baselines is whether a project or activity is assessed based on its own specific information, some common industry or standardised information, or a fully standardised set of information, including industry-level benchmarking.

An individualised baseline accurately reflects the circumstances of the project, activity or entity. Collecting and assessing data, however, can be time-consuming and costly. Some schemes use common data such as default emissions factors, to simplify the baseline setting process. The resulting baseline, however, may not accurately reflect the true business-as-usual scenario of the specific project.

The New South Wales ESS uses a partial standardised approach to assessing energy savings from commercial lighting projects. A range of standardised factors, including default efficiencies for a range of lamp types and standard number of operating hours are used to deem the energy savings. Similarly, the CDM also uses standardised baselines, for example, methodologies for new grid-connected renewable power plants use standardised baseline emissions factors (IETA 2009) (see Box 5.2).

A fully standardised approach uses data from multiple facilities or scheme participants to develop a single standard baseline, against which individual activities or facilities are compared. This baseline is effectively an average, so there will inevitably be some projects or facilities above or below. This could lead to the crediting of non-additional emissions reductions, for instance, to facilities that may have already invested in emissions-reducing technologies or practices. In a voluntary scheme this could lead to selection bias where non-additional projects crowd out the genuinely additional ones. On the other hand, while setting a standardised baseline may initially be data-intensive, when weighed against the costs of establishing multiple individual baselines it may prove cost-effective. It could be particularly useful when there is likely to be broad uptake, or in a penalty scheme where participation is mandatory and achieving specific targets is the focus.

Benchmark approaches are a more stringent form of standardised baselines. They set a performance level (for example, that emissions levels not exceed the average of the top 10 per cent of emitters in a sector), which usually reflects a scheme objective or target. The performance of individual facilities or projects is then measured against that benchmark. The PAT scheme, for instance, adopts sector-level targets for energy consumption. Within each sector, individual facilities are benchmarked against the best-performing facility. Like standardised baselines, the calculation of a benchmark requires sufficient information on sectoral and facility performance levels to identify the cut-off point (Prag and Briner 2012).

BOX 5.2: THE CLEAN DEVELOPMENT MECHANISM AND STANDARDISATION

The CDM has traditionally assessed baselines on a project-by-project basis. There have been many reform calls over the years to develop more standardised approaches.

In response, in 2011 the CDM Executive Board approved the *Guideline for the Establishment of Sector Specific Standardized Baselines*. This guideline allows for baselines that are not specific to one type of project activity in a sector, but can be applicable to most of the possible project activities in that sector. It specifies that standardised baselines can be submitted for the following activities (subject to eligibility criteria):

- fuel and feed stock switch
- switch of technology with or without change of energy sources (including energy efficiency improvement)
- methane destruction
- methane formation avoidance
- emission factors for a sector.

To date there have been four approved standardised baselines:

- grid emission factor for the Southern African power pool
- fuel switch, technology switch and methane destruction in the charcoal sector of Uganda
- grid emission factors for the Republic of Uzbekistan
- technology switch in the rice mill sector of Cambodia.

These baselines have been used in a small number of methodologies to date.

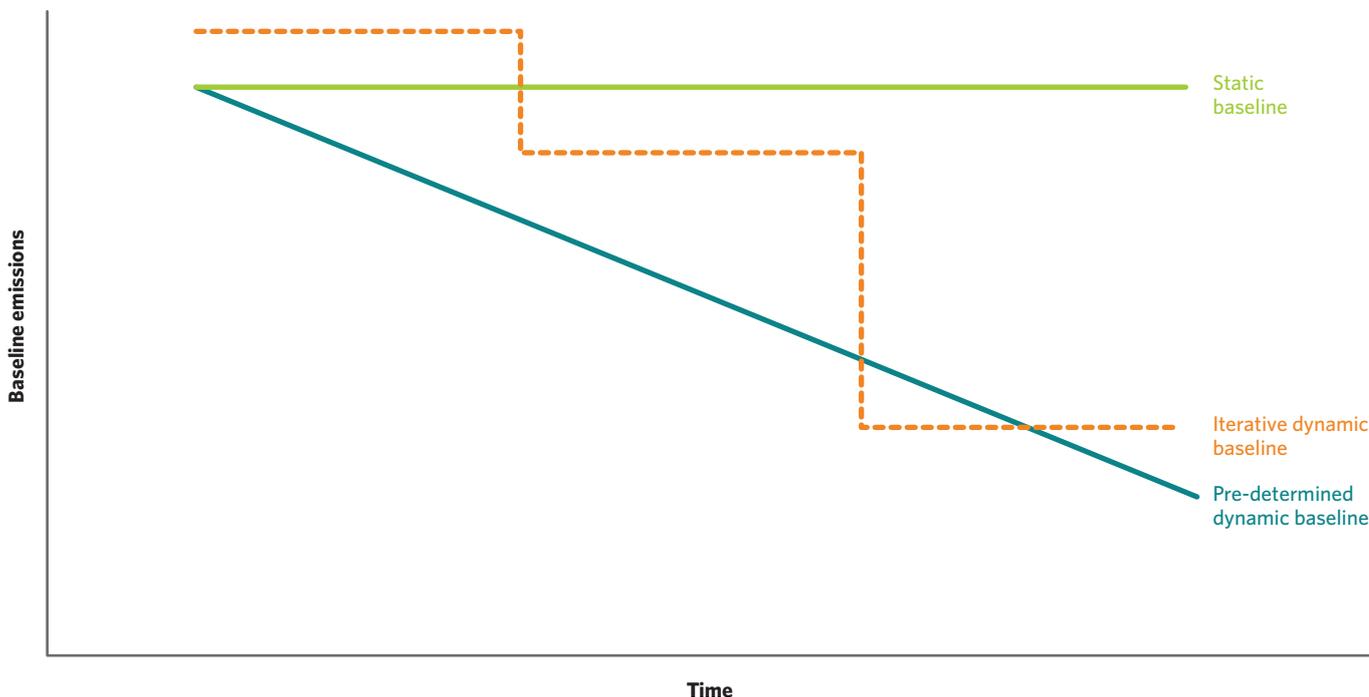
5.2.4 HOW TO UPDATE BASELINES OVER TIME

A fourth issue is whether, and how, the baseline should change over time. Once a baseline is established, some underlying factors may change in ways that shift business-as-usual emissions, leading to under- or over-crediting. There are several options for updating baselines.

A static baseline does not change over the crediting period, providing certainty for investors by holding emissions factors and activity data used to establish the baseline fixed. Most schemes employ static baselines, including Alberta and the CDM. Static baselines can be reviewed at the end of the crediting period prior to renewal, allowing more up-to-date emissions factors and activity data to be used for the next baseline. The risks associated with static baselines can be mitigated by using shorter crediting periods. This allows for more frequent reviews of the baseline, but may prove more costly for project proponents and administrators.

The crediting period length need not be the same for all projects – it should be informed by implications for project certainty (which generally suggests a longer crediting period) and the robustness of the baseline. For example, California's protocols specify different crediting periods—generally between seven and 10 years, but up to 25 years for forestry. A key consideration is the likely period for the return on investment and expected future changes in regulations. If it is expected that the regulatory environment for an activity is likely to change in the near term, then a shorter crediting period would be established.

FIGURE 5.1: STATIC AND DYNAMIC BASELINES



Source: Climate Change Authority based on Prag & Briner 2012.

Dynamic baselines can be more suitable where changing external circumstances are expected to affect the ‘additionality’ of the emissions reductions. For example, a future change in local laws requiring the activity to be undertaken can be accommodated in a dynamic baseline. These can be set upfront (pre-determined) or adjusted periodically (iterative) (see Figure 5.1).

Pre-determined dynamic baselines incorporate expected changes into the baseline in advance. The baseline adjusts over the crediting period, reducing risks of over- or under-crediting. As this is established in advance, it provides predictability for project operators while also taking account of expected changes in circumstances. The Alberta offsets scheme, for instance, utilises dynamic baselines for some offset projects as well as for new entrants.

Iterative baselines revise the baseline during the crediting period—not in advance. This offers scheme administrators more flexibility and accuracy, tailoring adjustments to actual changes in circumstances. This, however, provides much less certainty for project operators. Reviews can impose substantial administrative costs on project operators and scheme administrators.

Alberta uses an iterative baseline for a fugitive gas destruction methodology, the *Protocol for Solution Gas Conservation*. This activity captures small solution gas (methane) streams released as part of oil and bitumen extraction processes and flares the captured gas. The methodology specifies that the baseline is recalculated annually to account for variations in the emissions factor.

In summary:

- Static baselines are simpler to calculate and increase certainty to project proponents, but may not be as accurate if factors influencing the baseline change over the period. This risk could be mitigated through shorter crediting periods.
- Dynamic baselines provide more accurate measurement of emissions reductions but increase uncertainty to project proponents. Specifying the timing of baseline reviews or defined improvement rates upfront can increase predictability.

5.2.5 FACILITY OR ACTIVITY LEVEL

A fifth issue is whether the baseline is set for a single activity or for the facility as a whole. This can influence scale (the total amount of emissions covered) and scope (the types of emitting activities covered).

Setting the crediting baseline at the activity level can more precisely measure the emissions reductions from a specific activity (for example, replacing a boiler with a more efficient boiler). Each different activity to reduce emissions would have its own baseline, and reductions would be measured and audited by activity. An ‘activity’ for the purposes of a crediting baseline is an action that reduces emissions, not an economic activity such as producing a certain product. There is a clear distinction between the concept of an activity in the ERF and that which underpins the free allocation of emissions units under the carbon pricing mechanism.

Setting the baseline at the facility level allows multiple activities in a facility to be measured simultaneously. The baseline would need to establish the business-as-usual emissions for the facility; this would require a good understanding of the facility and may be as complex as determining activity baselines. Once the facility baseline is determined, however, it provides flexibility in the emissions reductions activities that can be credited over the period and can reduce measurement and audit costs.

Most voluntary crediting schemes set baselines at the activity level. Facility baselines are only used in those schemes where penalties and crediting are determined off the same baseline.

Alberta uses facility-level baselines for liable entities under its mandatory scheme. These are measured on emissions intensity per production unit, and are more complicated for facilities that have multiple products.

Similarly, India's PAT adopts facility-level baselines. The baselines for the PAT are intensity-based (per unit of production). The PAT rules specify that the main product produced in the facility is adopted for the baseline or an 'equivalent product' is calculated based on the product mix.

Setting the crediting baseline at a facility level can promote scale efficiencies, as a greater quantity of emissions reductions would usually be measured and credited than at the individual activity level.

5.3 INSIGHTS FOR THE ERF—BASELINES

The ERF will use baselines for the crediting mechanism and safeguard mechanism. This section focuses on crediting baselines.

Baseline setting will be central to the operation and success of the ERF. While getting it right may be difficult, it is important. Good baselines help ensure that the credits issued are additional, encourage participation and enhance Australia's capacity to meet its emissions reduction targets.

The ERF Green Paper sets out a number of instances where activities that reduce emissions will be ineligible for crediting on the basis that they would have occurred anyway. These include:

- declines in business activity due to normal market conditions
- activities already occurring as part of normal business practice
- activities that were implemented before the introduction of the ERF
- actions required by law
- activities already receiving an incentive through other policy measures.

Baselines will need to be set with these objectives in mind to ensure that crediting is not applied in these circumstances.

5.3.1 CLEAR RULES AND GOVERNANCE ARE IMPORTANT FOR DETERMINING THE BASELINE

Establishing a clear set of rules for how baselines are to be determined will help to achieve consistent treatment of similar projects, reduce uncertainty for project proponents and allow for scheme administrators to more easily approve baselines.

All schemes have methodologies that set out detailed instructions for determining baselines. Some methodologies allow a degree of flexibility by incorporating different options for calculating baselines, but otherwise there is little discretion to determine how the baseline will be set.

Making methodologies less prescriptive could reduce the costs and the time it takes to develop them, potentially making them more broadly applicable. This needs to be weighed against the costs of determining and approving baselines at the project development and approval stage. Less prescriptive methodologies would shift the burden of determining whether a baseline is robust to the regulator, and increase risk and uncertainty to project developers. To ensure a consistent approach, the regulator would likely need to develop rules or precedents in any event. It may therefore be more efficient if these are established at the time of developing the methodology.

Experience suggests that good governance is also important when establishing baselines. There are clear incentives for project proponents to try to negotiate generous baselines. Roles and responsibilities for determining the rules and approving baselines should be well established. Ideally, baselines will be set according to established rules, in a transparent and predictable way.

5.3.2 MOST SCHEMES USE ACTIVITY METHODOLOGIES

The ERF Green Paper proposes that two types of methodologies be developed:

1. Activity methods—for a specified action that reduces emissions.
2. Facility methods—aggregate emissions reductions from multiple activities at a facility level, with baselines calculated using historical emissions data collected under the *National Greenhouse and Energy Reporting Act 2007* (Cth).

Activity methods are more closely aligned with the methodologies that have been developed and used in other schemes. Both intensity and absolute baselines could have a role in the ERF, depending on the nature of the activity.

Facility methods for crediting emissions reductions are not common in other schemes, but some parallels can be made with those that use the same baseline for crediting and penalty (for example, the Indian PAT and Alberta scheme).

Intensity baselines can be difficult to develop at a facility level. This is a particular problem for facilities that produce multiple products, as the ERF methodology will need to combine them into a single intensity metric. Absolute baselines could be easier to establish at the facility level because the ERF could use existing definitions of facility and data available in the National Greenhouse and Energy Reporting System. Either approach, however, would require an understanding of the facility and the actions that have resulted in any emissions reductions to ensure that credits are not provided for actions that would have happened anyway.

The ERF Green Paper states that facility methods will be based on historical emissions data. This may not provide a good proxy for business-as-usual, without consideration of other factors such as changes in production, the rate of technology improvement, capital replacement plans and whether the historical data used is representative. It may be necessary to apply extra tests that identify reasons for the emissions reductions, to help ensure additionality and apply some exclusions. This would need to be completed on a facility-by-facility basis, and is likely to be time-consuming and resource-intensive.

The ERF Green Paper proposes that operators of an emitting facility could choose between facility and activity methods. Given that facility methods are intended to aggregate emissions reductions from multiple activities within the same facility, it will be desirable for crediting to be as consistent as possible between activities and facilities. Any facility methods may therefore need to be developed in accordance with the same principles and process as activity methods.

5.3.3 HIGH-QUALITY HISTORICAL EMISSIONS DATA ARE AVAILABLE FOR MANY EMITTERS—BUT OTHER DATA ARE ALSO NEEDED

The National Greenhouse and Energy Reporting System provides high-quality historical emissions data for large emitters in many, but not all, sectors. This can be informative when developing baselines, but will need to be supplemented with data from other sources. Baseline calculations may also require data on production and activity, the technology and other viable alternatives, and other relevant factors.

Developing robust baselines can be data-intensive and time-consuming. There may be some opportunity to use methodologies from other schemes as a basis of methodologies in Australia. However, varying degrees of customisation for Australian circumstances will be required.

5.3.4 METHODOLOGIES SHOULD CLARIFY HOW BASELINES WILL CHANGE OVER TIME

To remain robust, both activity and facility methods will need to be updated over time. This is the norm in other schemes. Ideally, methods should be updated regularly, so that baselines for new projects using that methodology incorporate the latest information. As this will take time and effort to administer, the factors that change more frequently should be prioritised.

A related question is whether baselines for existing projects should be updated during the crediting period. Most schemes use static baselines that do not change; dynamic baselines are less common.

- Where the ERF uses static baselines, the length of the crediting period will be important. Shorter crediting periods mean that baselines will be updated more frequently, increasing uncertainty about returns for project proponents. This would in turn push up the bid price for emissions reductions bidding into the ERF.
- Where the ERF uses dynamic baselines, administrators will need to decide whether to set 'improvement rates' upfront to pre-determine the baseline or to schedule iterative reviews. Pre-defined rates give greater certainty about returns, helping reduce bid prices.

A flexible approach is preferable to a one-size-fits-all approach. If the activity is expected to be relatively stable, then a static baseline with longer crediting periods may be appropriate. If the activity is expected to change, then either a static baseline with a shorter crediting period or a dynamic baseline may be preferable. The mechanics of updating the baseline can be tailored to individual activities and be embedded in the methodology for clarity.