# Overview of Different Approaches for Demonstrating Additionality of Greenhouse Gas Emissions Offset Projects[1]

## Background Paper for the EPRI Greenhouse Gas Emissions Offset Policy Dialogue Workshop 2

## September 2008

### I. Background

This paper has been prepared for a workshop that will be held by the Electric Power Research Institute (EPRI) on September 10, 2008 in Washington D.C. This is the second in a series of three workshops to be held by EPRI in 2008 on the subject of Greenhouse Gas (GHG) emissions offsets. The purpose of this paper is to provide workshop participants with a common understanding of issues and approaches associated with the concept of "additionality" as this term is used in relation to emission offset projects.

The first EPRI project workshop was held in June of 2008. It became apparent at that meeting that the topic of additionality has emerged as perhaps the most important issue in the design and implementation of emissions offsets programs. As a result, the project's second workshop will focus predominantly on the additionality issue.

### II. Introduction

A GHG emission reduction project designed to create offsets is considered to be "additional" if the reductions created by the project activity would not have occurred but for the implementation of the project and the incentives created by the offset program. This means that the project activity creating the offsets would not have been implemented under "Business-as-Usual" (BAU). It is generally agreed that GHG offsets should not be awarded to non-additional emission reduction projects because this would provide credit for emission reductions that otherwise would be expected to occur under BAU. Providing "non-additional" projects with offsets would jeopardize the environmental integrity of the GHG emissions cap in a cap-and-trade program.

The concept of additionality is easy to understand in theory, but difficult to apply in practice because there is not an analytic way to *prove* additionality. A number of different "additionality tests" – i.e., tests designed to demonstrate that an offset project is additional – have been developed and used in existing programs or proposed for use in offset programs under development. An offset program could utilize one test or alternatively a series of tests to make an additionality determination. The decision on which additionality test, or combination of additionality tests, to include in an offset

[1] Prepared by Natsource Advisory and Research Services and the Electric Power Research Institute.

program will have a significant impact on the nature and effectiveness of the offset program in addition to the supply and cost of offsets. More stringent additionality tests may be more effective in screening out non-additional projects, thereby ensuring the environmental integrity of the emissions cap. Conversely, they also may screen out truly additional projects, thereby restricting offset supply and increasing prices and compliance costs in a cap-and-trade program. Each additionality test has different strengths and weaknesses. As discussed in this paper, a number of tradeoffs need to be considered in selecting the additionality test or tests to be incorporated in an offsets program.

While this paper focuses on additionality tests, as will the majority of discussion at the upcoming workshop, it is important to note the separate but closely related issue of baselines. A project "baseline" consists of its GHG emissions that would be expected to occur in the BAU scenario, and in the absence of the project activity. In general, the volume of offsets awarded to a project is calculated as the difference between baseline emissions and emissions after project implementation. In practice, establishing a project baseline can be very challenging, as it requires a counter-factual determination of emissions in the absence of the project, which cannot be known with certainty. In addition, project baselines may change over the time the project operates as different variables impacting emissions in the "without-project" scenario change over time.

The relationship between baselines and additionality is that if a baseline is calculated and set higher than the "correct" level of BAU emissions, some of the offsets issued for the project will be "non-additional." That is, some of the associated emission reductions would have happened anyway in the absence of the project. Thus, baseline-setting is critical to the question of additionality.

However, setting a baseline only becomes relevant once a project is determined to be additional. Baseline measurement may be addressed in baseline methodologies for different project types, as is the case for projects implemented under the Clean Development Mechanism (CDM). Alternatively, it may be addressed in conjunction with project eligibility requirements, as is the case for the offset rules in the Regional Greenhouse Gas Initiative (RGGI), and as discussed in this paper.

This paper provides an overview of different approaches for demonstrating additionality within GHG emissions offset programs. It is not meant to be an exhaustive review. It describes the following approaches and topics:

- How the CDM determines additionality;
- Overview of other additionality tests;
- Statistical concepts related to additionality and the selection of additionality tests;
- Performance standards used by the EPA's Climate Leaders program to determine additionality;
- Proportional additionality; and
- Approaches to offset project additionality in RGGI.

## III. How the Clean Development Mechanism (CDM) determines additionality

The CDM, one of the "project-based mechanisms" created by the Kyoto Protocol, is the largest offset program in the world that has been developed to date.[2] It has stimulated billions of dollars in investment in reducing GHG emissions, and many observers believe it has contributed to significant levels of emission reductions in developing countries. At the same time, it has played an important role in reducing firms' and governments' costs of complying with emission reduction targets under the Kyoto Protocol.

The overwhelming majority of offsets created by the "Kyoto mechanisms" have been created by CDM projects. This is due to several reasons. One important reason is that offsets created by CDM projects (called Certified Emission Reductions, or "CERs") of 2000-2012 vintage can be used for compliance with emissions targets imposed by the European Union's Emissions Trading Scheme (EU-ETS) for the period 2005-2012. As a result, rules governing the CDM and the creation and use of offsets created by these projects have been in effect for many years now. In contrast, only offsets of 2008-2012 vintage created under the UN's Joint Implementation (JI) program (called Emission Reduction Units, or ERUs) can be used for compliance. Investment in JI projects has been increasing more recently, in part because the rules governing the JI program are becoming clearer.

The CDM has established an "additionality tool" which provides guidance to project developers regarding the demonstration of additionality. Generally speaking, offset projects must demonstrate their additionality using:

1) An investment test (often referred to as a financial additionality test); *or*
2) A barrier test; and
3) A common practice test.

If a project is deemed to meet the requirements of two tests – either 1 *or* 2, *and* test 3 – it is considered to be additional under the CDM. These three tests are described below. A more detailed summary of the CDM's additionality tests is provided in the Appendix.

***Investment Test***: In an investment test, the project developer must demonstrate that if revenue associated with offset credits to be created by the proposed project were not available, the project would not be economically feasible, or its rate of return would not be attractive. This approach assumes that CERs created by the project are a decisive

[2] The other project-based mechanism created by the Kyoto Protocol is Joint Implementation (JI), which allows industrialized countries or emitters in those countries to invest in projects located within other industrialized countries to generate Emission Reduction Units (ERUs). Given that the volume of reductions created under JI is far lower than that under CDM, this paper focuses on the CDM's approach to determining additionality. In practice, additionality determinations under JI are very similar to those under the CDM. JI projects must be assessed according to procedures administered by the JI Supervisory Committee (JISC) under the United Nations Framework Convention on Climate Change (UNFCCC).

reason for undertaking a proposed project. It assumes that the project would not be viable or attractive absent the revenue created by the sale of offsets.[3]

***Barrier Test***: A barrier test considers whether there are significant barriers to implementing a project – such as local resistance to new technologies – in the absence of revenue from GHG reductions. If such barriers exist, the project is assumed to be additional. The barrier test applied by the CDM requires that at least one realistic alternative to the project must not confront these barriers for the project to be additional. This approach assumes that GHG reductions are decisive for the project to be able to overcome existing barriers.

***Common Practice Test***: This test typically compares the emissions performance of the project to that associated with "common practice" technologies or activities in the relevant sector and region. If the project does not achieve greater emission reductions than other technologies/activities, it is assumed that they were not a decisive reason for undertaking the project. Consequently the project is not considered to be additional. The CDM's application of this test differs somewhat. It identifies other technologies/activities operating in the region that are similar to the project activity, and considers whether those activities faced barriers or enjoyed benefits that were not applicable to the project in order to make an additionality determination.

An illustration of how the CDM's additionality tool is used to determine the additionality of proposed CDM projects is provided in the Appendix.

## IV. Other approaches to determining additionality and statistical concepts relating to additionality and the selection of additionality tests

### A. Overview of other additionality tests

A number of other approaches for determining whether offset projects are additional have been described and proposed in the literature. Table 1 summarizes several of these additionality tests and is derived from Trexler, Broekhoff, and Kosloff, 2006.[4]

As discussed in Section III, the CDM utilizes the investment test, the barrier test, and the common practice test. In addition, it also implicitly applies a legal, regulatory or institutional test (although this is not presented in the additionality guidance document as a separate test, per se). If the only way to comply with mandatory laws and regulations is to implement the project activity, the activity will not be considered additional.

Similarly, the CDM implicitly applies a "project in, project out" test; the very notion of an emissions offset project is that emissions are lower with the project than in the absence

[3] See Table 1 in Trexler, Broekhoff and Kosloff, "A Statistically-Driven Approach to Offset-Based GHG Additionality Determinations: What Can We Learn?" in *Sustainable Development Law & Policy*, Winter 2006. Other definitions of additionality tests in this paper are derived from this table.
[4] Ibid.

of the project. Thus, the CDM may be considered in practice to incorporate at least five additionality tests.

**Table 1: Examples of additionality tests**

| Test | Basis for Determining Additionality |
|---|---|
| Legal, Regulatory, or Institutional Test | Does the project reduce GHG emissions below the level required by official policies, regulations, guidance, or industry standards? If not, it is not additional. If so, it may be additional (typically other tests are used to determine additionality). |
| Technology Test | Does the project involve a technology that is specifically identified as not being "business as usual?" If so, it is additional. |
| Investment Test | See Section II discussion on additionality tests used in the CDM. |
| Barrier Test | |
| Common Practice Test | |
| Timing Test | Was the project initiated after a certain date? If not, it is not additional. If so, it may be additional (typically other tests are used to determine additionality). The assumption is that projects starting before the specified date must have had motivations other than GHG reductions. |
| Performance Benchmark Test | Does the project have an emissions rate that is lower than a predetermined benchmark emissions rate for the particular technology or activity? If so, it is additional. See discussion in Section IV below |
| Project In, Project Out Test | Does the project have lower GHG emissions than a scenario in which the project has not been implemented? If so, it is additional. |

## B. Statistical concepts related to additionality and selection of additionality tests

One way to assess additionality tests is to consider their performance in correctly assessing when a project is additional and when it is not. Trexler et al. (2006)[5] describe a number of statistical concepts and provide other insights in an attempt to clarify the issues and tradeoffs involved in the choice of additionality tests for use in an offset program. Some of these concepts and insights are summarized below.

### *False positive rate and false negative rate*

An additionality test's "false positive" rate is a measure of how often the test assesses that a project is additional when it is not – i.e., when it would have happened anyway without consideration to achieving emission reductions. Trexler et al. (2006) refer to

[5] Ibid.

reductions that are credited as a result of a false-positive additionality assessment as "phantom reductions." These kinds of emissions reductions also are sometimes referred to as "anyway tons."

A "false negative" rate is the opposite – a measure of how often an additionality test assesses that a project is not additional when it actually is additional. Reductions that are not credited as a result of a false-negative additionality assessment are referred to as "lost opportunities." Every additionality test can be considered in terms of its false positive rate and its false negative rate, at least from a qualitative perspective.[6]

*Tradeoffs in selecting additionality tests*

A challenge in choosing an additionality test for an offset program is that there are inevitable tradeoffs. Trexler et al. (2006) conclude that seeking to rule out all non-additional projects by using one or more additionality tests will result in many additional projects being rejected. They cite the example of a technology test that is so restrictive that it only includes project types that have "no conceivable purpose besides climate change mitigation," such as flaring coal mine methane at an abandoned coal mine. By excluding all other types of projects, this test would "exclude a whole universe of truly additional projects."

This conclusion leads to two broader points made by the authors: 1) there is no such thing as a "technical solution to the additionality conundrum;" and 2) choosing additionality tests is a policy decision and a matter of determining the appropriate balance.

For example, the authors suggest that some parties may be "willing to trade off near-term environmental integrity in favor of getting a trading system into place." Others may seek a solution such as the highly restrictive technology test cited above to eliminate the possibility that any project that is not additional would be accepted. This objective may be pursued even if it means that many additional projects will be excluded and many of the potential benefits of an offsets program will be lost – benefits that include incentivizing emission reductions in sectors not covered by a trading program, and reducing compliance costs and overall costs to the economy of a trading program. These examples highlight the challenge to policymakers in establishing the appropriate balance. In the authors' view, the selection of additionality tests can accomplish policy objectives, but only if those objectives are specified carefully upfront.

Considerations in establishing a balance identified by the authors include the following:

- The integrity of the emissions cap versus establishing a trading system and creating incentives for technologies and practices that create climate benefits;
- The acceptable costs of offset credits (i.e. more stringent additionality tests will raise the cost of offset credits); and
- The size of the pool of offset credits needed.

[6] An assessment of the false positive and false negative rates of different additionality tests is provided in Trexler et al.

The authors posit that the ideal level of stringency of an additionality test (or multiple tests) depends on the stringency of the cap-and-trade program's emission reduction requirements. They note that "the rate of 'phantom reductions' for additionality tests is paramount when demand is low," while "[c]ompliance costs are a major issue when emissions targets are ambitious and demand is high. Every additional project that is erroneously rejected by an additionality test means higher costs as buyers have to move further up the supply curve."

*Recommended approaches: technology test or performance benchmark test*

In light of their view that additionality tests should evolve over time if and as market conditions change, the authors believe a good approach for determining offset project additionality would be to implement a technology test that initially focuses on carefully selected sectors. Under this approach, only pre-defined categories of technologies and activities that are seen as *de facto* additional (because they are not common practice) qualify to create offsets, and all other categories are excluded. The list of technologies deemed additional could be expanded to include other sectors and technologies as market demand increases due to more stringent emission reduction requirements. In the authors' view, this approach would avoid the complexity of using multiple additionality tests to attempt to exclude non-additional projects. On the other hand, as noted elsewhere in the article, a technology test can exclude many additional projects. This would limit offset supply and result in higher prices and fewer emission reductions in sectors not covered by a trading program.

Another approach which the authors see as being more versatile than a technology test is the performance benchmark test. Such tests would allow for a single benchmark to apply to multiple projects using the same technology or implementing the same activity, thereby eliminating the need for detailed project-specific additionality determinations. This approach would significantly reduce transaction costs relative to a project-by-project additionality test in which project proponents must provide a detailed demonstration of additionality. The authors acknowledge that this test would impose greater demands on regulators. This is because it involves determining current practice for various technologies and the level at which the performance benchmark should be set. However, they believe that, over time, such tests "would prove preferable to requirements of barriers and investments tests for extended weighing and interpretation of evidence of each and every project."

## C. Performance standards in EPA's Climate Leaders program

Performance benchmarks similar to those advocated by Trexler et al. (2006) currently are used by the Environmental Protection Agency's (EPA's) Climate Leaders program to determine whether a project is additional. Under this program, specific performance standards are established for different project types.[7] The standards are comprised of

[7] Information in this section was derived from "Climate Leaders – Accounting for External Reductions – Federal GHG Workshop," January 15, 2008,

performance thresholds (or benchmarks), which determine additionality, and baselines for quantifying emission reductions. The performance (i.e., additionality) benchmark may be an emissions rate, a technology standard or a practice standard. It is set at a level of performance that, "with respect to emission reductions or removals, or technologies or practices, is significantly better than average compared with similar recently undertaken practices or activities in a relevant geographic area." For example, the benchmark may be set at the top 25$^{th}$ percentile of performance, or the top 10$^{th}$ percentile. If a project meets or exceeds the benchmark, it is considered to be additional.

To determine the performance benchmark, EPA analyzes public data on "recent, similar activities in the relevant sector in a specific geographic area." Benchmarks are periodically updated to ensure continuous performance improvements, and to reflect changes in regulations, market trends and technology developments. These updates drive technological improvements and create greater volumes of emission reductions.

Some of the potential advantages and disadvantages in using a performance standard-type approach as compared to project-specific additionality tests as cited by EPA and the Offset Quality Initiative (OQI)[8] include the following:

- Avoids imposing high costs on project developers for data collection and quantification and demonstrating additionality. However, the program (i.e., the regulator) bears the (high) initial costs of collecting data and developing standards.
- Provides certainty to project developers and investors regarding the additionality of a project and the amount of offset credits it will generate, provided that the project is eligible and its performance is better than the benchmark. Under project-specific additionality testing, the project developer may have significant uncertainty regarding whether the project will be ruled to be additional, and may not know the volumes of offsets that will be awarded until the methodology is submitted for approval and reductions are quantified.
- Provides standards that are applicable to most project types, but may exclude project categories for which standards can be developed. In contrast, project-specific additionality tests are applicable to all project types, but may be subjective and must be undertaken for every project to be assessed.
- May allow for the approval of some non-additional projects to create offsets (depending on the stringency of the standard) due to the use of generalized additionality assessments and quantification processes. In contrast, project-

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http://www.fedcenter.gov/_kd/go.cfm?destination=ShowItem&Item_ID=8924, and "Climate Leaders Greenhouse Gas Inventory Protocol Offset Project Methodology for Project Type: Landfill Methane Collection and Combustion Additionality Determination," Climate Protection Partnerships Division/Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, August 2008, Version 1.3, http://epa.gov/climateleaders/documents/resources/draft_landfill_offset_protocol.pdf .

[8] A discussion on the Offset Quality Initiative is provided below.

specific additionality tests may be able to more accurately determine additionality and quantify additional emission reductions due to the specific project analysis that is undertaken. However, project-specific additionality tests may still allow for the approval of non-additional projects. In addition, making project-specific additionality tests more stringent can result in the exclusion of additional projects increasing programs compliance costs.

- Imposes low verification costs, as the verifier only needs to check project emissions and the eligibility of the project against the standard. In comparison, verification costs are high under a project-specific additionality test, as all project-specific barriers and financial data must be verified.

The approach used by EPA to determine additionality – as well as Trexler et al.'s benchmark test, proportional additionality, and RGGI's performance standards – may be characterized as "standardized" approaches for determining additionality, estimating baselines, and quantifying the emission reductions of an offset project, as defined in a paper by the Offset Quality Initiative (OQI).[9, 10] OQI's paper describes three approaches that can be used to determine additionality, estimate baselines, and quantify the emission reductions achieved by a project:[11]

- ***Project-specific assessments****:* These are "individual or case-by-case examinations of the unique circumstances of a proposed offset project. Individualized assessments may be made regarding a project's additionality, baseline, quantification, and crediting period."
- ***Standardized approaches***: "These approaches credit reductions on the basis of uniformly applicable criteria." These include performance standards (e.g. emission rates, energy use rates, market penetration rates) and technology benchmarks.
- ***Hybrid approaches***: These are approaches which combine "elements of both project-specific and standardized methodologies to balance the strengths and weaknesses of both."

OQI recommends the adoption of a hybrid approach, which "strikes the best balance between transparency and standardization, while taking into account the consideration of project-specific circumstances."[12] Although OQI does not provide specific examples of a hybrid approach, one could hypothesize that a hybrid approach might combine a performance standard with other tests, such as a timing test or another test that takes other project-level specifics into consideration.

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[9] "Ensuring Offset Quality: Integrating High Quality Greenhouse Gas Offsets Into North American Cap-and-Trade Policy," Offset Quality Initiative, July 2008, http://www.pewclimate.org/docUploads/OQI-Ensuring-Offset-Quality-white-paper.pdf .

[10] OQI is an initiative of The Climate Trust, Pew Center on Global Climate Change, California Climate Action Registry, Environmental Resources Trust, Greenhouse Gas Management Institute and The Climate Group.

[11] Ibid.

[12] Ibid.

## D. Proportional additionality

Proportional additionality is a concept proposed by Gordon Smith of Ecofor and the Nicholas Institute for Environmental Policy Solutions. It has some similarities to a performance standard.[13] While this approach was proposed for application to soil and forest sequestration projects, in principle it also could be applied to other offset project types. Under proportional additionality, it is assumed that

> "…in the absence of the project, project lands would have been managed like comparable lands in the region. Thus, outcomes on other lands provide the benchmark for measuring the GHG benefits, or offsets, produced by the project."

To implement this approach, comparable lands would need to be identified and GHG fluxes and carbon stocks would need to be assessed. To the extent possible, comparison lands would closely resemble the lands on which projects are implemented with respect to weather, soil, and topography. Land management practices at the outset of the project would need to approximate those of the region as a whole so that any subsequent changes in practices could be considered representative of the region as a whole.

One proposed approach for determining the volume of offsets that would be issued for a project is to calculate this volume as the difference between the emissions and sinks on comparison lands and those on project lands.

An alternative approach that more intuitively captures the concept of proportionality is to assess the "fractional additionality" of the project at the outset. For example, "[i]f a project plans to pursue no-till farming of small grains, and 40 percent of the farmers of small grains in the region already use no-till farming, the amount of GHG benefits the project achieves is discounted by 40%." In other words, total emission reductions attributable to the project would be discounted by 40% to determine the volume of offsets that would be issued for the project. The regulatory authority would need to update the percentage on a regular basis (e.g., every two years) to ensure an accurate discount is applied if "fractional additionality" is utilized for offset crediting purposes. The only condition for eligibility would be that the project would need to be considered a new action – i.e., the project owner could not be provided offsets for an activity that was already being undertaken.

In the author's view, this approach could be criticized for allowing non-additional projects to receive offset credits.[14] Accordingly, it may be best suited for project types in which the motivation for undertaking a project is difficult to determine, and the

[13] Gordon Smith was a principal contributing author to the paper "Harnessing Farms and Forests in the Low-Carbon Economy: How to Create, Measure, and Verify Greenhouse Gas Offsets," Nicholas Institute for Environmental Policy Solutions, Zach Willey and Bill Chameides, editors, 2007. The discussion on proportional additionality in this section is derived from chapter 5 ("Step 2: Determining Additionality and Baselines") and Appendix 5 of the paper.

[14] Based on a telephone discussion with Gordon Smith, August 19, 2008.

environmental benefits of the project are clear. Proportional additionality avoids the significant challenges of determining project developers' intentions and the validity of input assumptions in additionality determinations (e.g., a firm's required rate of return in a barrier test). At the same time, it provides incentives to undertake activities that have not yet become common practice.

## V. Approaches to offset project additionality in the Regional Greenhouse Gas Initiative (RGGI)

The Regional Greenhouse Gas Initiative has established $CO_2$ emission reduction requirements and is in the process of implementing a $CO_2$ cap and trade program covering electric power plants operating in ten Northeastern and Mid-Atlantic States to achieve these reductions. RGGI will become fully operational starting in January 2009.

The RGGI program includes a "positive list," or an initial list of eligible offset categories. It identifies the following five categories of eligible offset activities:[15]

1) Landfill methane capture and destruction (LFG);
2) Reduction in emissions of sulfur hexafluoride ($SF_6$);
3) Sequestration of carbon through afforestation;
4) End-use efficiency projects resulting in the reduction of $CO_2$ emissions from natural gas, propane and heating oil; and
5) Methane reduction from farming operations.

This list provides project developers with some confidence that the specified project activities will be eligible to create offsets. The RGGI Model Rule's positive list goes further, however, and provides more specificity on offset project eligibility requirements (i.e. additionality), how the emissions baseline for each project type is to be calculated, how emission reductions are to be calculated and monitoring and verification requirements. This additional specificity provides additional certainty to project developers and investors in offset projects regarding project eligibility/additionality determinations and the level of offset crediting that can be expected from a project. This is likely to make it easier for project developers to secure financing for projects, as it reduces many of the risks that can confront project developers under such offset programs as the CDM.

Additionality is addressed in baseline definitions, eligibility requirements, emission reduction measurement methodologies and performance standards in the Model Rule. Some examples are provided below.

- A landfill methane capture and destruction project is eligible if the landfill is not subject to New Source Performance Standards (NSPS) for municipal solid waste landfills.

[15] Other project categories may be considered for eligibility in the future.

- For $SF_6$ emission reduction projects, a performance standard for the $SF_6$ emissions rate is established. To be eligible, projects must have an emissions rate in the baseline year that is lower than the performance standard (with some specified exceptions). Emission reductions are then measured relative to those in the baseline year. This approach may be meant to avoid rewarding projects that have a high emissions baseline.
- For afforestation projects to be eligible, the land must have been non-forested for at least 10 years preceding the initiation of the project. Projects must be managed "in accordance with widely accepted environmentally sustainable forestry practices and designed to promote the restoration of native forests by using mainly native species and avoiding the introduction of invasive nonnative species." In addition, if there will be commercial timber harvest activities on the land, certification must be obtained prior to harvest activities from pre-approved certification organizations.
- Projects that reduce or avoid $CO_2$ emissions from natural gas, oil, or propane end-use combustion due to end use energy efficiency must meet various performance criteria to be eligible. For example,
    - Commercial buildings must exceed the energy performance requirements of ANSI/ASHRAE/IESNA Standard 90.12004: Energy Standard for Buildings Except Low Rise Residential Buildings by 20% or 30%, depending on the type of building.
    - Residential buildings must exceed the energy performance requirements of the 2004 International Energy Conservation Code by 30%.
    - For energy conservation measures commenced before January 1, 2009 to be eligible, they must have a market penetration rate of less than 5%.
- For the offset project category of agricultural manure management,
    - Projects must be located in a state that has a market penetration rate for anaerobic digester projects of 5% or less.
    - Eligible projects are defined as consisting of "the destruction of that portion of methane generated by an anaerobic digester that would have been generated in the absence of the offset project through the uncontrolled anaerobic storage of manure or organic food waste."
    - Other eligibility requirements also apply, including a requirement that the project employ "only manure-based anaerobic digester systems using livestock manure as the majority of digester feedstock."
    - The project may be located at a farm with 4,000 or less head of dairy cows, or a farm with equivalent animal units (based on assumptions on the average weight of cows).

## VI. Conclusion

As policymakers in the U.S. consider the design of an offset system for inclusion in a GHG cap-and-trade system there are a wide range of options to use to make additionality determinations. A number of considerations and tradeoffs should be considered in selecting the tests that are ultimately used.

If an offset program is to achieve environmental and economic objectives, priorities need to be defined and a corresponding balance needs to be achieved. Different programs have utilized different approaches. The CDM has utilized several project-specific additionality tests. The RGGI program is utilizing a positive list and providing guidance on other key issues regarding additionality and offset creation. EPA's Climate Leaders program has opted to use performance standards in making additionality determinations, rather than project-specific approaches.

Experience with these programs and others can help guide policymakers and affected parties as they attempt to devise approaches that can maximize the potential environmental and economic benefits of a GHG offset program.

## Appendix A: Additional details on the CDM's approach to additionality

This appendix provides additional details on the CDM's additionality tests, which are briefly described in Section III of this paper.

All GHG emission reduction projects submitted for approval (i.e., "registration" in the language of the CDM program) under the CDM must demonstrate that they are additional. The CDM Executive Board (EB) has issued guidance on how CDM projects can demonstrate additionality, entitled "Tool for the demonstration and assessment of additionality." The guidance document initially was issued in 2004, and has since been periodically revisited and revised (the latest revision, issued as version 5, was published in May 2008).[16]

The four steps for demonstrating additionality under the CDM are:

- Step 1: "Identification of alternatives to the project activity"
- Step 2: "Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible" (i.e. the "financial additionality" test)
- Step 3: "Barrier analysis"
- Step 4: "Common practice analysis" [17]

As discussed below, after undertaking step 1, a project developer may choose to demonstrate additionality by using the investment test *or* barrier analysis or both, *and* the common practice analysis. A summary of these steps follows.

*Step 1: Identification of alternative scenarios.*

This step identifies "realistic and credible" alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations taking into account enforcement in the region or country. These scenarios must include:

- The activity itself without being registered as a CDM project activity;
- Alternatives that have been or are currently being implemented in the country/region that deliver outputs (e.g., cement) or services (e.g., electricity) of comparable quality, properties and application areas; or
- Continuation of the without-project scenario.

[16] UNFCCC, CDM Executive Board, "Methodological Tool, "Tool for the demonstration and assessment of additionality," (Version 05), EB 39 Report, Annex 10, http://cdm.unfccc.int/EB/039/eb39_repan10.pdf .
[17] An additional requirement for demonstrating additionality applies to projects starting implementation prior to "validation" of the project by a qualified auditing or technical firm (a "Designated Operational Entity"). Such projects must provide evidence that the project was undertaken with the intention of submitting it as a CDM project.

If the only way to comply with mandatory laws and regulations is to implement the project activity, the activity will not be considered additional.

*Step 2: Investment analysis (also referred to as the "financial additionality" test)*

The Investment analysis is used to determine whether the project activity is not the most economically or financially attractive scenario, or is not economically or financially feasible without revenue from the sale of emission reductions (Certified Emission Reductions - CERs) created by the project. (Importantly, project developers may choose between using the investment analysis and the barrier analysis, or may opt to use both to demonstrate additionality. In practice, some project developers do opt to undertake both tests in an attempt to strengthen their case that the project is additional.)

If the CDM project activity does not generate financial or economic benefits other than revenue from CER sales, the investment analysis is limited to a simple cost analysis (i.e., cost comparison of the with-project scenario and alternative scenarios). If at least one alternative is less costly than the project activity, then the additionality determination proceeds directly to Step 4 (common practice analysis). If this is not the case, then further barriers (Step 3) must first be identified.

If the CDM project activity creates other financial benefits (e.g., revenue derived from power sales in the case of a LFG-to-energy project), one of two analytical approaches must be employed. An investment comparison analysis compares all alternatives using a financial/economic indicator such as internal rate of return (IRR) or Net Present Value (NPV) that is most suitable for the project type and decision context. A benchmark analysis also identifies a financial/economic indicator such as IRR, calculates the IRR or other indicator for the project, but compares it to a benchmark rate in the market. A number of rules are used to determine discount rates and benchmark rates. The analysis and assumptions must be presented in a transparent manner in the Project Design Document (PDD) so that a reader can reproduce the analysis and obtain the same results. In addition, a sensitivity analysis must be performed to illustrate that the conclusion of the analysis is robust to different assumptions. If the analysis concludes that the project is unlikely to be the most financially/economically attractive among alternatives considered in the investment analysis, or is unlikely to be financially/economically attractive (i.e. it has a less favorable indicator (e.g. lower IRR) than the market benchmark), then the project proceeds to Step 4 (Common practice analysis). If the investment analysis indicates that from a financial perspective, the project would have been carried out in any case, then further barriers must be identified (Step 3).

*Step 3: Barrier analysis.*

This step determines whether there are barriers that: i) prevent the implementation of the project specifically, and this type of project activity more generally; and ii) do not prevent the implementation of at least one of the alternatives. If the barriers prevent the undertaking of the project if it is not registered as a CDM project activity, and if the

CDM would alleviate the barriers, then the project is additional. Otherwise, it is not additional. Barriers must be realistic and credible, and may include:

1) **Investment barriers** (e.g., similar activities only have been implemented in the relevant country/region with grants or non-commercial finance terms; or a lack of private capital available due to real or perceived country investment risks, as demonstrated by the country's credit rating or reputable country investment reports)
2) **Technological barriers**. Examples include lack of skilled and/or properly trained labor in the country/region, creating a high risk of underperformance; lack of infrastructure for implementation and logistics for maintenance of the technology (e.g., lack of a gas transmission and distribution network); the risk of technology failure resulting from local circumstances is greater for the project than for alternatives; or the technology is not available in the country/region).
3) **Barriers due to prevailing practice** (e.g., the project is the first of its kind).
4) **Other barriers.** These would be preferably specified in the underlying project methodology as examples.

Evidence must be transparent and documented from independent sources. Acceptable evidence includes legislation, market studies or surveys, national or international statistics, and expert judgments from industry. If one or more barriers to the project's implementation are identified, and if these barriers are shown not to prevent the implementation of at least one of the alternatives to the project, the additionality determination proceeds to Step 4 (Common practice analysis).

*Step 4: Common practice analysis.*

This test is considered a "credibility check" for Steps 2 and/or 3. For projects that are not demonstrated to be the first of their kind in Step 3, an assessment is made of whether the project type has already diffused in the relevant sector and region. The assessment involves identifying (using documented and quantitative evidence) other activities that are operational and similar to the project activity (not including other CDM project activities). If similar operational activities are identified, the PDD must include information that explains and documents why those activities faced barriers or circumstances, or enjoyed benefits making them more financially attractive (e.g., subsidies), which the project activity did not face or cannot use. If this can be demonstrated, the project meets the requirements of Step 4.

**Figure 1: Tool for the demonstration and assessment of additionality (version 05)**
Source: UNFCCC, CDM Executive Board, EB 39 Report, Annex 10, http://cdm.unfccc.int/EB/039/eb39_repan10.pdf.