CLEAN DEVELOPMENT MECHANISM

**CDM-MP80-A17**

# Concept note

# Consistent use of market share, market saturation, market penetration and penetration rate

Version 01.0

**United Nations**
Framework Convention on
Climate Change

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# 1. Procedural background

1. The Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board), at its 100th meeting, considered the request of the methodologies panel (MP) to provide a mandate to revise and expand the concept of market share to include the penetration rate as an additional element to determine whether a project could be considered additional. The Board requested the MP to explain further the scope, timelines and outputs of the proposed work in a concept note.

2. The Board, at its 101st meeting, considered the concept note "Proposed work on market share, market saturation and penetration rate" and requested the MP to initiate the work and prepare a concept note. The Board requested that the new concept note should build on the experience of the CDM in this area and take into account the guidance from the Board at this meeting, including:

    (a) The consistency of the approach for setting thresholds;

    (b) The criteria and rationale for setting thresholds;

    (c) Options for other approaches to setting thresholds (e.g. graded thresholds, use of more than one criterion such as market share and rate of change thereof, or use of more objective criteria for defining the market);

    (d) Road testing of the proposed approaches with practical examples.

3. This work is carried out under the project 223 (Simplification of methodologies) under objective 1(c): Develop simplified and user-friendly standards and procedures that increase efficiency and ensure environmental integrity of the CDM two-year business and management plan 2018–2019 (EB97, annex 1).

# 2. Purpose

4. This is an initial version of this concept note. Through this note, the MP would like to update the Board on the progress of the work to date so that the Board could provide further guidance and direction to the MP. Therefore the MP has not made any recommendations in section 6 below (Recommendations to the Board), other than to seek guidance from the Board.

5. The purpose of this concept note is to:

    (a) Present an assessment of the existing CDM methodologies, tools and guidelines on the use of market share and/or market penetration for additionality and common practice demonstration;

    (b) Identify criteria and rationale for the thresholds including any potential inconsistencies in the use of market penetration rates, market shares, market saturation in CDM methodologies/tools with a view to propose improvements;

    (c) Consider possible approaches for the definition of market share, market penetration, market saturation and rate of change of market share in the context of the CDM and assess their applicability in various sectors/methodologies/tools;

(d) Consider possible approaches and values/rates for market share/penetration rate/ market saturation linked to additionality and common practice; and

(e) Conduct road-testing of the identified approaches with practical examples.

# 3. Key issues and proposed solutions

## 3.1. General

6. The MP conducted an in-depth analysis on the use of market share, market penetration, and market saturation concepts to demonstrate additionality and common practice.

7. Based on the assessment and literature review detailed in this concept note, the MP considered initial options for the definitions for market share, market penetration as outlined in paragraph 37.

8. The MP also considered alternate possible approaches to strengthen the demonstration of additionality and common practice.

## 3.2. Review of the existing guidance in CDM

9. The existing guidelines relevant to the assessment of additionality and common practice of a project activity or technology are:

(a) Guidance related to use of additionality tool;

(b) Guidelines for objective demonstration and assessment of barriers;

(c) Guidelines on the assessment of investment analysis;

(d) Non-binding best practice examples to demonstrate additionality for small-scale (SSC) project activities.

10. The existing tools relevant to the assessment of additionality and common practice of a project activity or technology are:

(a) Tool for the demonstration and assessment of additionality (tool 01);

(b) Combined tool to identify the baseline scenario and demonstrate additionality (tool 02);

(c) Demonstration of additionality of micro-scale project activities (tool 19);

(d) Demonstration of additionality of small-scale project activities (tool 21);

(e) Additionality of first-of-its-kind project activities (tool 23);

(f) Common practice (tool 24);

(g) Positive lists of technologies (tool 32).

11. Out of these, the market condition assessment is used only in tool 19 and tool 21. The market conditions for the automatic additionality or common practice check are also given in the specific large scale or small-scale methodologies.

12. The CDM guidelines, tools and methodologies (both large scale and small scale) use market environment and threshold levels in assessing the automatic additionality and/or common practice for different types of project activity/technology. The example for the market environment as per tool 19 and tool 21 include:

    (a) Special underdeveloped zone (SUZ) region within the host country;

    (b) Least developed countries (LDCs);

    (c) Small island developing states (SIDS);

    (d) End users being households, communities or small and medium-sized enterprises (SMEs).

13. Similarly, as per tool 19 and tool 21, the threshold levels for the project activity/technology are set based on the,

    (a) Equipment capacity (in terms of installed capacity (MW), power generation or energy savings (MWh) or emission reductions ($tCO_2$));

    (b) Technology diffusion level (in terms of market penetration or market share or rate of penetration (%)).

## 3.3. Additionality: key issues.

### 3.3.1. Analysis of existing situation

14. In the existing CDM guidelines, tools and methodologies, the level of diffusion of a technology is used as one of the options to evaluate automatic additionality for a project activity in the host country.

15. At present, the evaluation of “market penetration or market share” is visible in the CDM additionality evaluation only when the technology is either:

    (a) a project activity of capacity more than 5 MW;

    (b) implemented in a host country other than an LDC or SIDS or SUZ;

    (c) not in the positive list of small scale or micro-scale activity (without market condition assessment) or tool 32;

    (d) not a first-of-its-kind activity in the host country;

    (e) practiced/available in the host country for some period of time, but still not a common practice and considered to be facing significant barriers.

16. In the current context, the terms “market penetration”, “market share”, “market saturation” and “penetration rate” are used interchangeably in the CDM tools and methodologies. As per the footnote 1 of appendix in tool 19, the market penetration is defined as the proportion of stock (of project technology) functional at the user end out of the total technologies/measures (providing similar services) in the region. Accordingly, the equation for the market penetration is given below.

$$Market\ penetration = \frac{Number\ of\ equiment\ in\ operation\ by\ the\ project\ technology}{Total\ number\ of\ similar\ equipment\ offering\ same\ service\ as\ that\ of\ project\ technology}$$ Equation (1)

17. The footnote 1 of appendix in tool 19 also states that the above definition is applicable for the "market saturation". In section 3.3.2 below, this existing CDM definition is compared with the established definitions of "market penetration" and "market share".

18. The term "market penetration" (or simply penetration) is especially used only in tool 19 that applies to microscale activities – though it is referred by several methodologies for additionality check. Tool 21 and all other methodologies use the term "market share" (or simply share). The methodology AMS-III.BM (Lightweight two and three wheeled personal transportation) uses both the terms stating that "the share (penetration) of e-bikes in bicycle use in the city is below or equal to 5% based on number annual bicycle trips undertaken in the city or based on market share".

19. In the methodology ACM0005 (Increasing the blend in cement production), the detailed method and guidelines for calculating the market share (for cement blend) is provided. The methodology states that "The market share shall be calculated as the percentage of the amount of blended cement in the total amount of all cement types produced in the host country ((tons of blended cement/total tons of cement production) x100%) during the last three years prior to: (a) the start date of the CDM project activity; or (b) the start of validation, whatever is earlier. The market share value must be based on the reliable and publicly available data sources (e.g., cement manufacturers associations or governmental agencies). Other CDM projects shall be included in this assessment".

20. The market diffusion assessment is used only for the technologies that are expected to have already reached significant diffusion in the developing or under developed countries such as the cook stoves, Compact Fluorescent Lamps (CFLs), solar water heating (SWH) systems, etc. In general, the value for diffusion thresholds for the additionality has varied from ≤2% to ≤50% based upon the technology type. In no condition, the threshold has been more than 50%.

21. The diffusion thresholds show significant range based on the type of end user or the implementing agency rather than the technology itself. For example,

    (a) All technologies used by the communities or households such as SWH, ICS, etc., are given a threshold level of ≤ 5%.

    (b) Technologies implemented in supplied side i.e., by the industrial or power sectors are provided with a threshold values ranging between ≤ 2% (renewable power in national grid) and < 50% (production of commercial refrigeration systems).

    (c) Technologies that mostly come under scope of government or related utilities are provided with a threshold values ranging between ≤ 20% (bus rapid transit system) and < 50% (waste treatment processes).

22. Table 1 summarizes different categories, technologies covered and their threshold levels.

**Table 1. Diffusion threshold ranges for additionality and/or common practice**

| No. | Category | Technologies | Threshold value | CDM tools and methodologies | Threshold applied for |
|---|---|---|---|---|---|
| 1. | Users of the technology/measure are individuals or households or communities or Small and Medium Enterprises (SMEs) | • SWH<br>• Improved cook stoves (ICS)<br>• High efficiency biomass fired system<br>• Solar lamps<br>• Switch from non-renewable biomass for thermal application<br>• Electric and hybrid vehicles<br>• E-bikes<br>• Improved efficiency of vehicle fleets | ≤ 5% | Tool 19<br>AMS I.E<br>AMS III.C<br>AMS III.BC<br>AMS III.BM | Additionality |
| 2. | Implementers of the technology/measure are commercial establishments and industries | Implementation of decision support system for hydro power plant optimization | -[1] | AM0052 | Common practice |
| | | Renewable energy power generation in national grids | ≤ 2% | ACM0002 | Additionality |
| | | Renewable energy power generation in isolated grids | ≤ 2% | AM0103 | Additionality |
| | | • LNG buses<br>• Increasing composition of blend in cement production | ≤ 5% | AMS III.Y<br>ACM0005 | Additionality |
| | | Agricultural waste as feed stock for paper, cardboard and bio oil production | < 10% | AM0057 | Additionality |

[1] The CDM project activity is not a common practice if the companies that provide the technology, used in the CDM project activity, have minimal business in the country where the CDM project is being implemented.

| No. | Category | Technologies | Threshold value | CDM tools and methodologies | Threshold applied for |
|---|---|---|---|---|---|
| | | • Electric taxiing in airports | ≤ 20% | AM0116 | Additionality |
| | | Energy efficiency improvements in boilers | < 33% | AM0044 | Common practice |
| | | • Commercial refrigeration<br>• Domestic refrigeration<br>• Conversion of single cycle to combined cycle power generation<br>• Utilizing waste heat to pre heat the raw materials | < 50% | AM0071<br>ACM0007<br>AM0066<br>AM0113 | Common practice |
| 3. | Implementers of the technology/measure are government or related utilities | Establishing high voltage direct current transmission line | - | AM0097 | Common practice |
| | | • High speed passenger rail system<br>• Mass rapid transit system<br>• Bus Rapid transit system | ≤ 20% | AM0101<br>ACM0016<br>AM0031 | Common practice |
| | | District cooling system | ≤ 20% | AM0117 | Additionality |
| | | • Rural electrification through renewable energy source<br>• Rural electrification through grid extension<br>• Alternate waste treatment processes | ≤ 50% | Tool 21<br>ACM0022 | Additionality |

23. As per tool 19, the data vintage used for the above market diffusion assessment cannot include data older than three years prior to the:

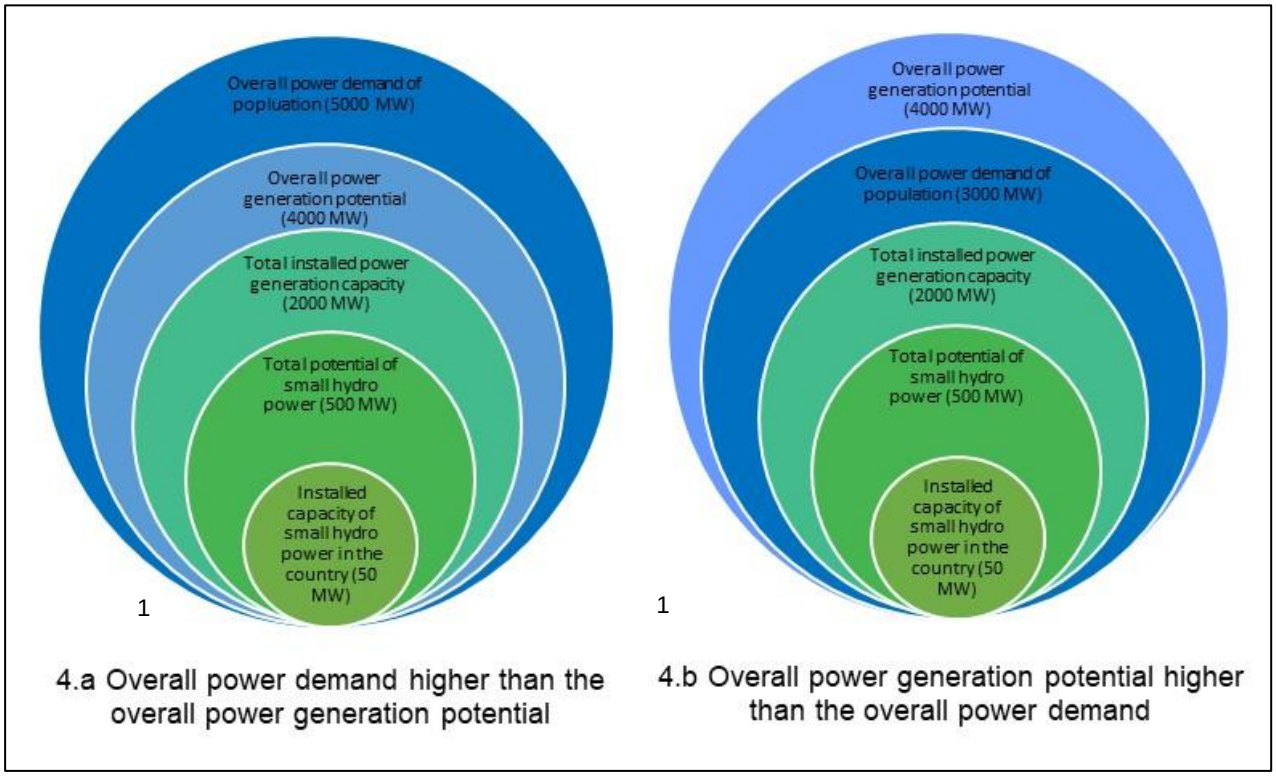
    (a) Start date of the CDM project activity; or

    (b) Start of validation/inclusion, whichever is earlier

### 3.3.2. Challenges in using statistical definitions under CDM

24. There is a high risk of inaccuracy in estimating the potential market size. Further, the differences in estimating the market boundaries produce significant variances in estimating the market penetration or market share. Few example scenarios on different contexts of using the indicators in the CDM are discussed below.

**Figure 1. Scenarios of power demand and potential in a country - with small hydro power**




25. A small hydro power generation (grid connected) capacity in a host country could be limited and concentrated in few regions of the country. When considering the boundary for the overall market size for power generation, there are two different scenarios as presented in Figure 1. The overall power demand of the population[2] can be more than the cumulative power generation of the country as presented in (a) or the overall power demand of the population can be less than the cumulative power generation potential of the country as presented in (b). For the scenario analysis, option (a) is assumed. The target market size referred in this analysis is the theoretical potential based on the resource availability (of small hydro power) within the country or region. An example of grid connected small hydro power technology is considered by using the threshold value

[2] Average power consumption per person (kWh/per capita) * total population of the country (numbers)

given in the ACM0002 methodology for defining the market indicators as per the existing CDM context and the statistical definition.

26. Condition given in methodology (ACM0002): *Para 29 (a) The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent.*

#### 3.3.2.1. Example 1: Small hydro power technology

27. The estimation of "market share" of small hydro power project as per the above guidance in the CDM context is given in Figure 2. Under the existing CDM context, the installed power generation capacity in the country must be taken for the evaluation of share of a renewable energy technology.

**Figure 2. "Market share" as per the current CDM context**

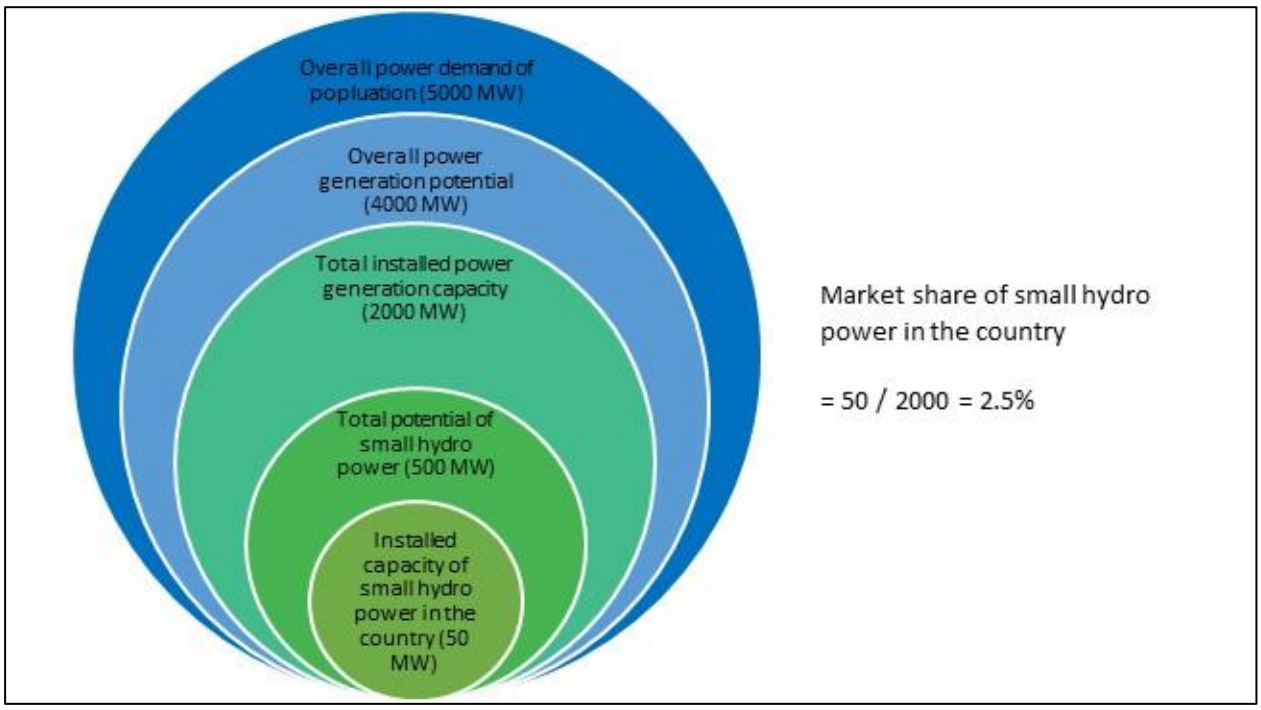
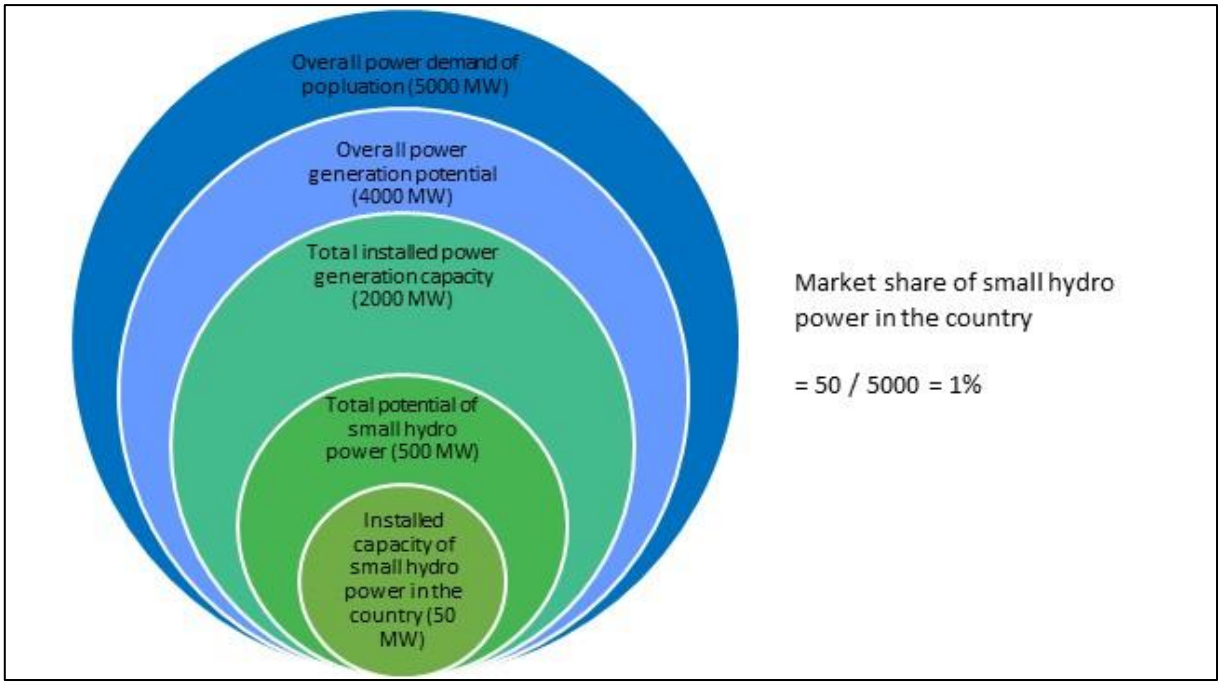


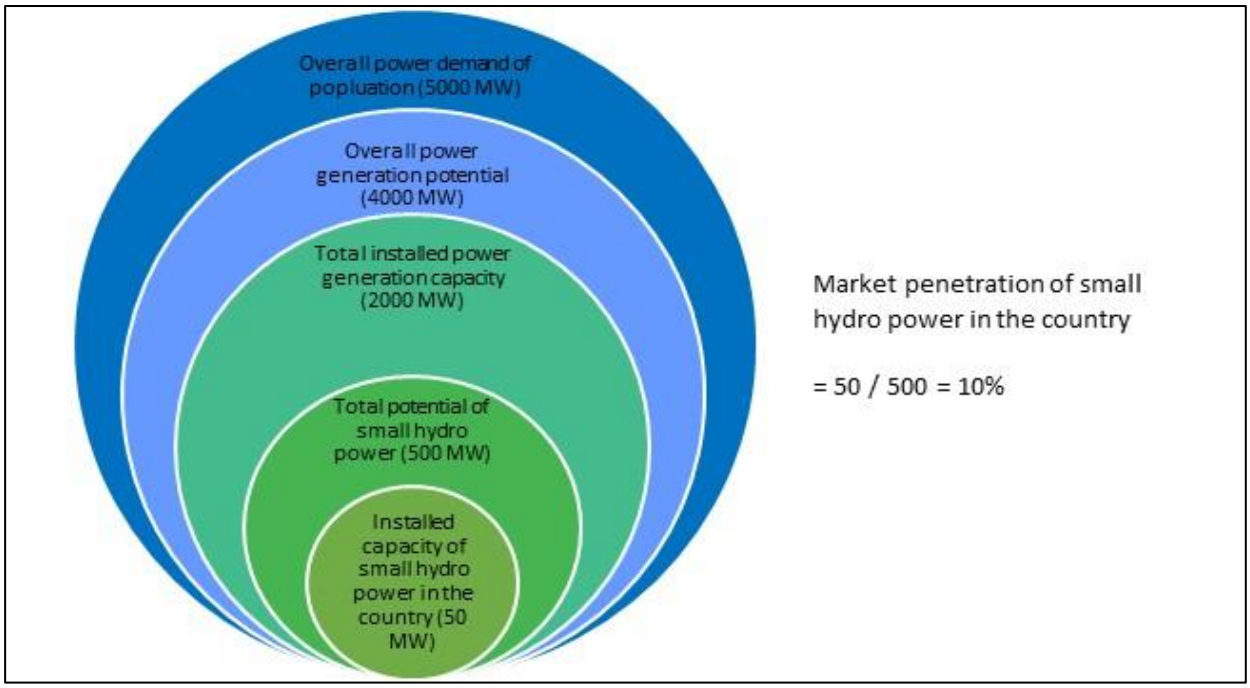
**Figure 3. "Market share" as per the statistical definition**




28. The "market share" estimation of small hydro power project as per the statistical definitions (to consider "total market size") is given in Figure 3. Here, the total market size means the overall power demand of the population in the country.

29. Similarly, the "market penetration" estimation of the small hydro power project as per the statistical definitions (to consider "target market size") is given in Figure 4. Here, the target market size means the total potential for small hydro power in the country.

**Figure 4. "Market penetration" as per the statistical definition**



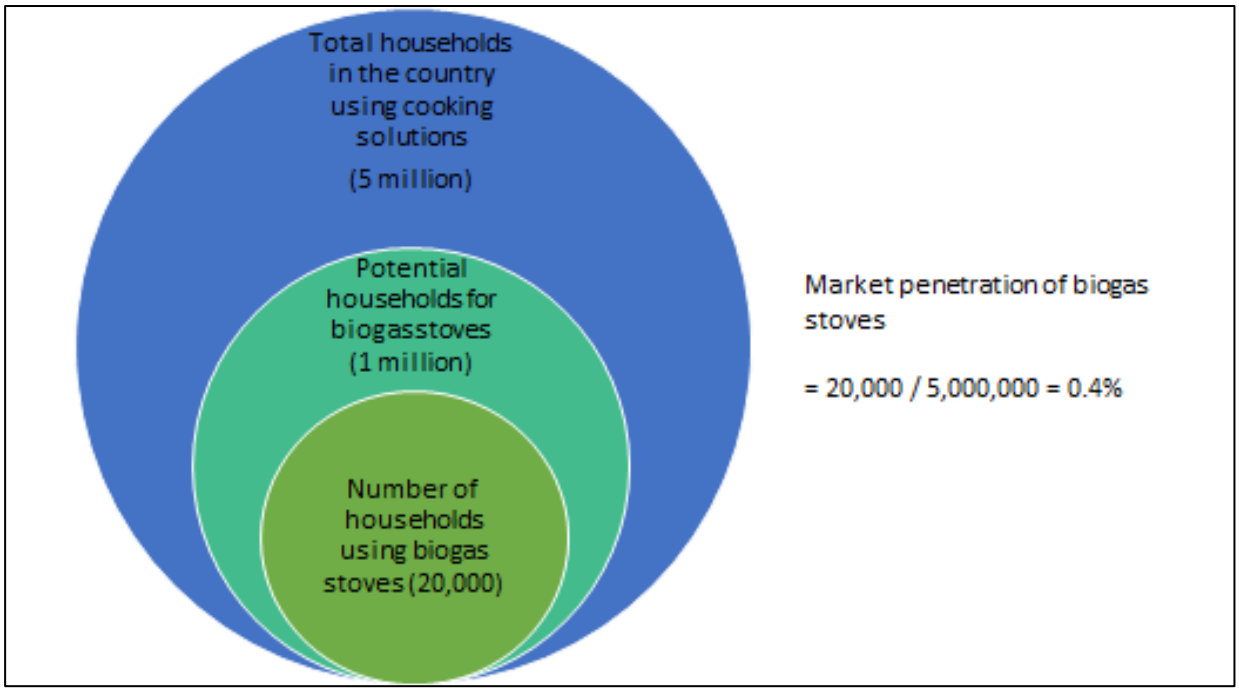

### 3.3.2.2. Example 2: Biogas cooking technology

30. The installation and use of biogas stoves may be limited to locations with availability of biomass/agro waste, availability of land for bio-digesters installation, affordability of cost, etc. The assessment of market condition of biogas stoves in a host country is discussed below by considering the threshold value given in the tool 19.

31. Condition given in Appendix of tool 19: *The penetration of the proposed technology is equal to or less than 5 percent of the technologies/measures (providing similar services) in the region in order to be considered as automatically additional.*

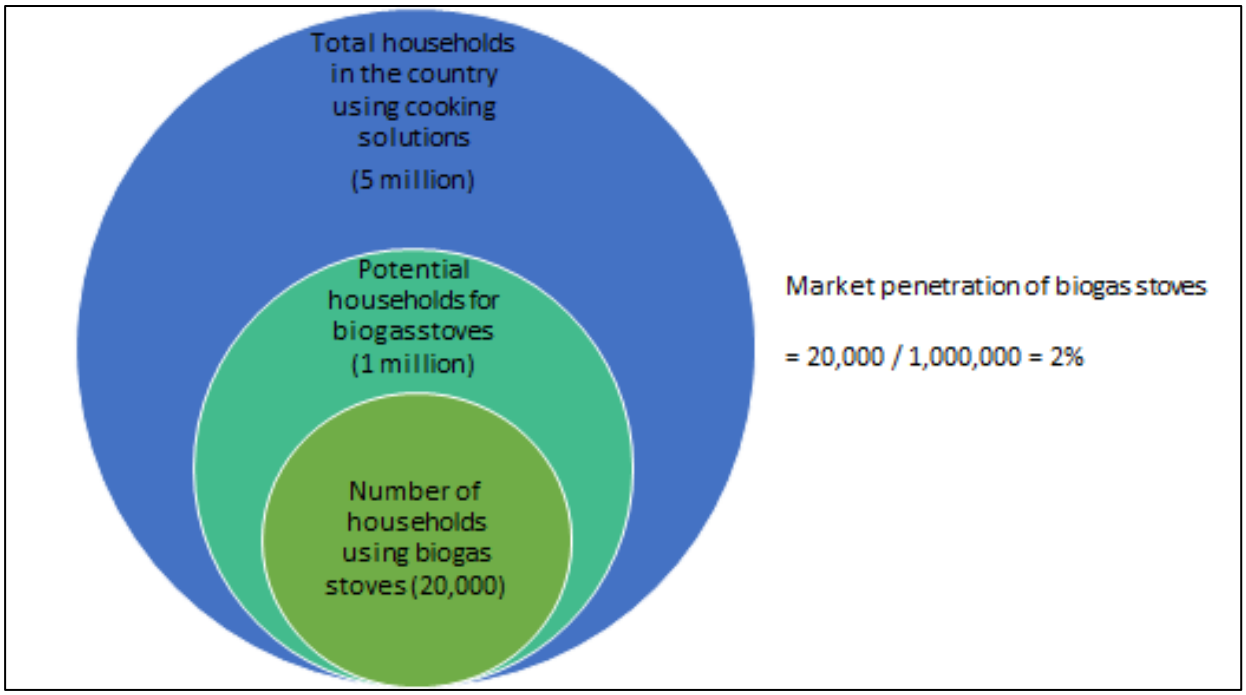
32. For the distributed units, the tool 19 uses the term "market penetration" as the indicator. Accordingly, the estimation of "market penetration" of the biogas stoves as per the current CDM context is given in Figure 5.

**Figure 5. "Market penetration" as per current CDM context**



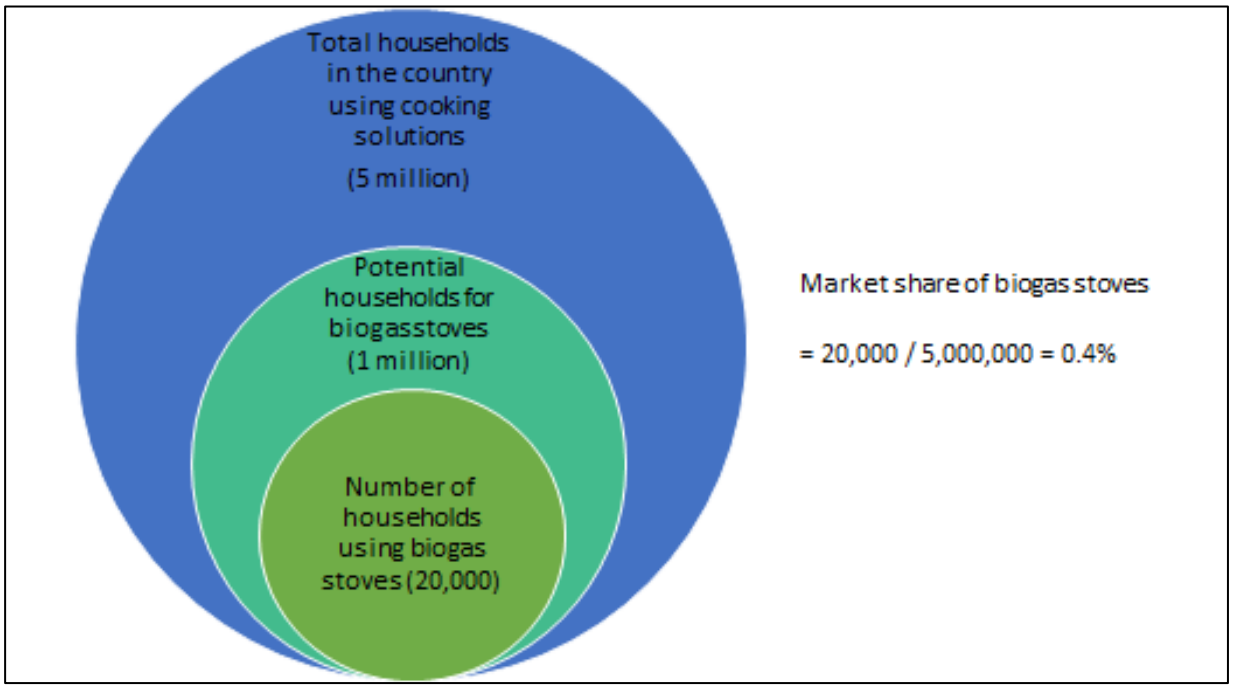

33. In the above scenario, even though the total market size is the number of households using cooking solutions in the host country, it cannot be considered that all of them will be potential consumers for the biogas stoves. The potential target market for biogas stoves may include households using traditional three stone fired stoves, improved cook stoves, LPG stoves & electric stoves and with good availability of biomass feedstock. The estimation of "market penetration" of the biogas stoves as per the statistical definition (considering "target market size") is given in Figure 6.

**Figure 6. "Market penetration" as per statistical definition**




34. Further, the estimation of "market share" of the biogas stoves as per the statistical definitions is given in Figure 7. It is to be noted here that the Figure 5 and Figure 7 show that the existing CDM context of "market penetration" equates to the "market share" condition as per the statistical definition.

**Figure 7. "Market share" as per statistical definition**



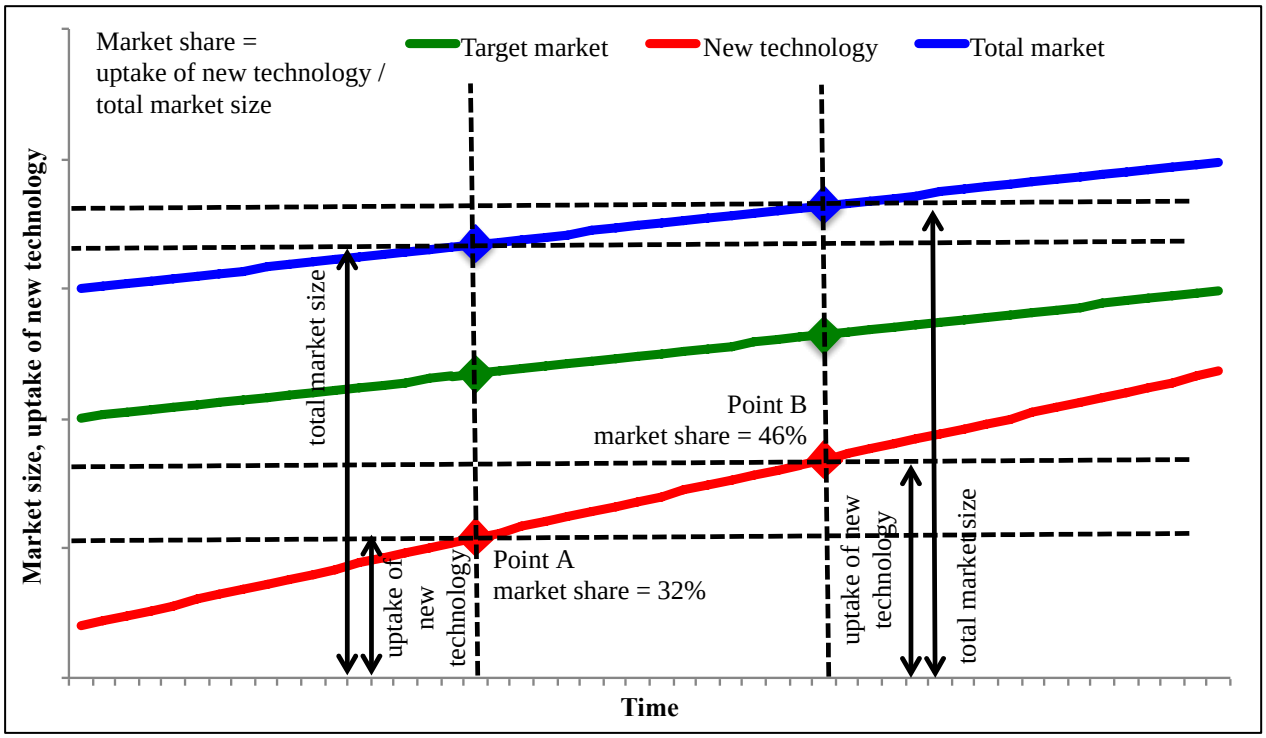
35. From the above two examples and analysis, it can be observed that the use of terms "market share" or "market penetration" to evaluate a diffusion of a technology in a host country or region or city may vary based on the technology and context.

## 3.4. Recommendations on definitions in the context of the CDM:

### 3.4.1. Statistical terms and definitions

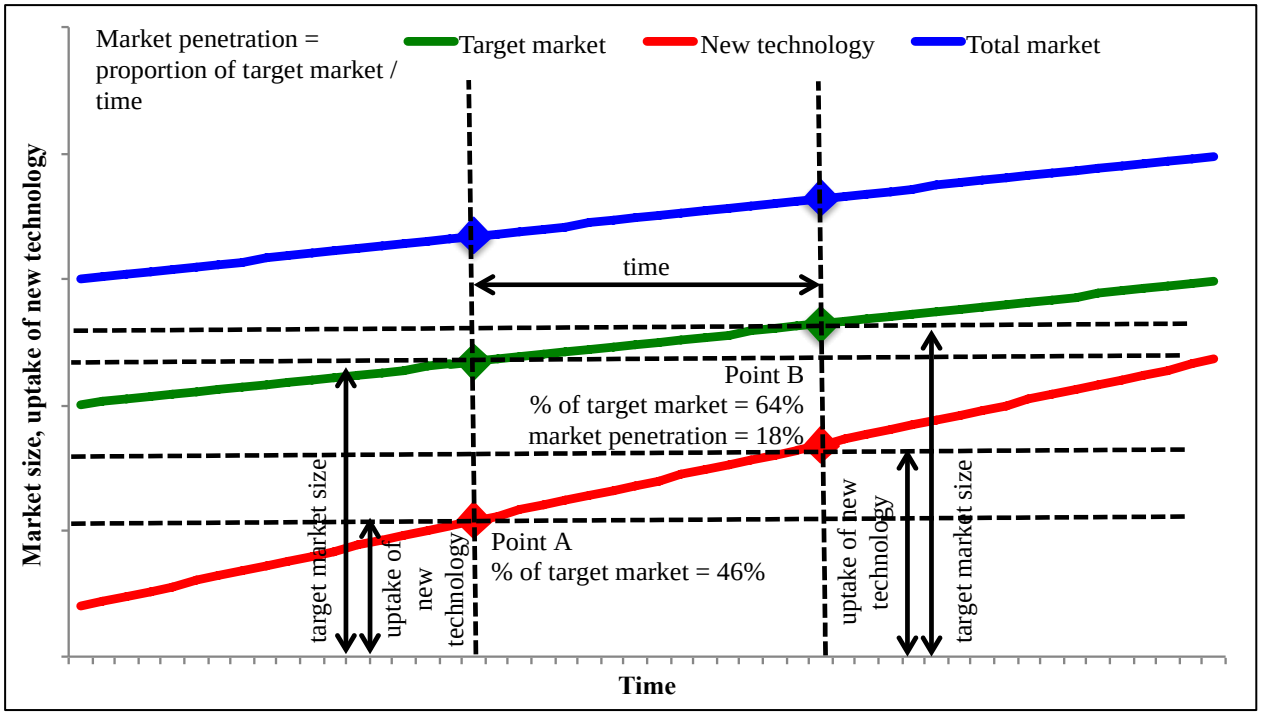
36. The terms and definitions for the key indicators of technology diffusion as per the statistical principles and literature review are provided below. Figure 8 shows the representation of evaluating market share and Figure 9 shows the representation of evaluating market penetration with respect to base indicators like the total market size and target market size of a technology.

**Figure 8. Market share of a technology[3]**




[3] Consultant Report I.

**Figure 9. Market penetration of a technology[4]**




37. Based on the figures shown above, following are the proposed statistical terms and definition for the key indicators in assessing the technology diffusion.

(a) **Total market size:** It is the expected total market value for a technology and is equal to the total population or households or end consumers or capacity in the geographic region under study;

(b) **Target market size:** It is the potential market value for a technology out of the total population or households or end consumers or the potential capacity in the geographic region under study. It is the conservative size estimated through the theoretical, technical, economic and the projected market basis;

(c) **Market share:** It is the percentage of total market value that the technology captures out of the total market size. Figure 8 shows the representation of market share;

(d) **Market penetration:** It is the percentage of total market value that the technology captures out of the target market size for that technology over a defined period of time. Figure 9 shows the representation of market penetration;

(e) **Market saturation:** It is the condition where a product has been completely diffused throughout a market (i.e., market penetration is 100%) and there are no further potential customers.

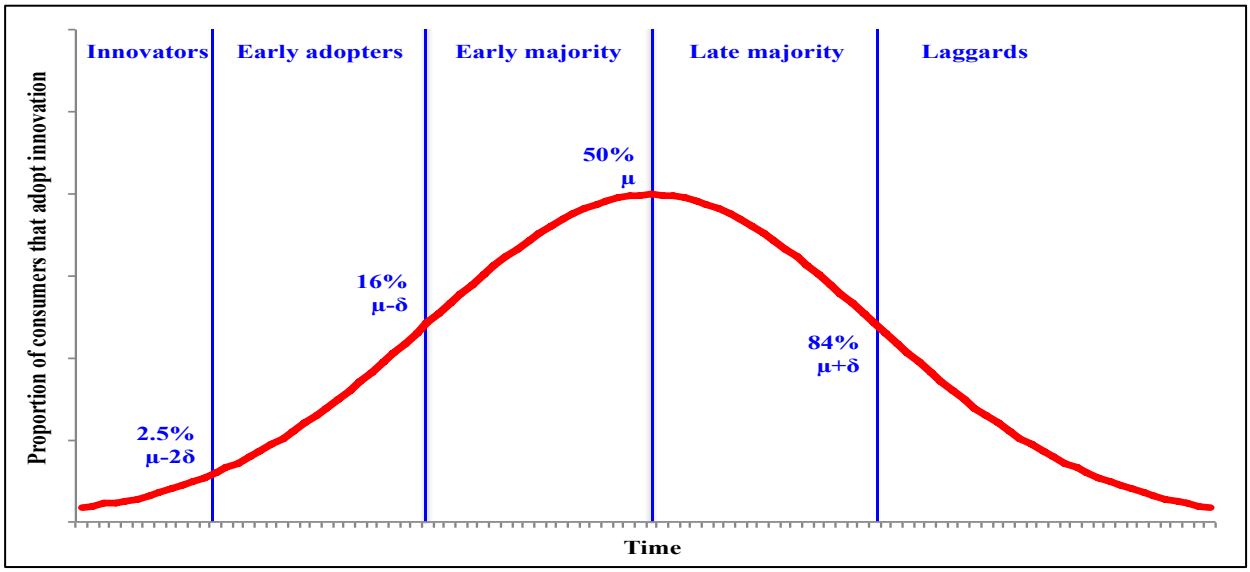
[4] Consultant Report 1.

## 3.5. Potential Alternate approaches for additionality

### 3.5.1. Accelerating growth rate approach

38. Under the accelerating growth rate approach, a technology is considered to face significant market barriers until it reaches the 16% diffusion level. At the same time, the growth rate of technology diffusion will be accelerating at this stage as per the statistical distribution explained by Rogers theory (Figure 10 ). Once it crosses the 16% threshold, still there will be growth in the market (until reaching 50% diffusion level), but the acceleration rate will start to decrease.

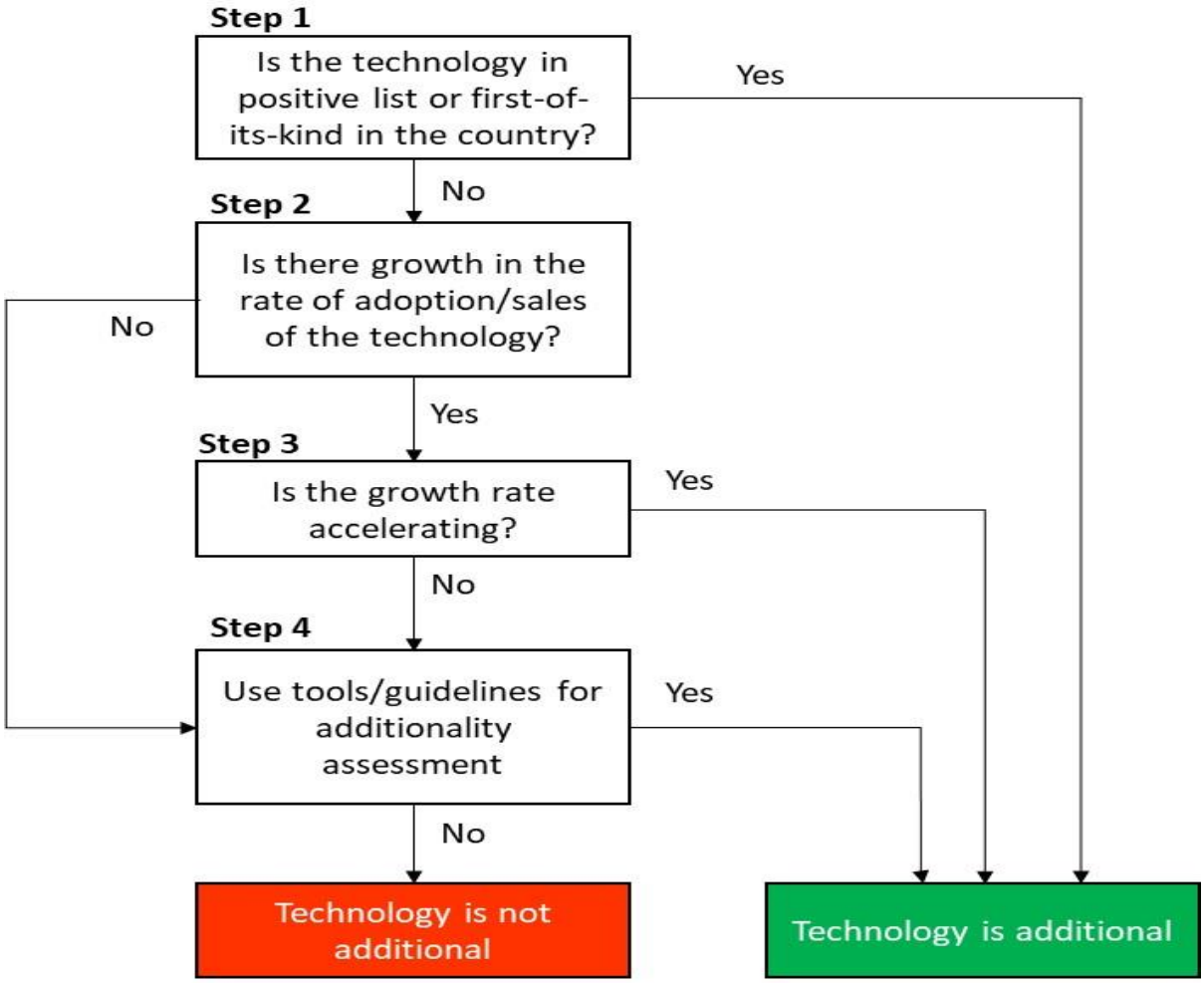
**Figure 10. Market penetration of a technology, Roger's diffusion model**




39. Given that the evaluation of indicators like "market share" or "market penetration" are difficult and vary from technology to technology, an alternative could be to use the accelerating growth rate of the market (i.e., year on year increase in sales or use of product or technology) as an indirect measure to demonstrate that the technology diffusion is still within 16% threshold. In this approach, the risks involved in setting of thresholds, evaluation and assessment of the same for different technologies will be reduced. For the purpose of this analysis, a rolling three-year time frame may be used, as this would also omit annual anomalies and may better capture the trend of technology diffusion.

40. Further, a technology is considered to be in innovation stage until reaching the 2.5% diffusion level. At such a stage, there will be limited data available and a clear market trend at this stage may not be available. A technology in this stage may potentially be considered as the "first-of-its-kind" under the CDM context.

**Figure 10. Additionality assessment using accelerating growth rate**




41. The flow chart in Figure 10 shows the steps involved in testing the automatic additionality of any technology. A project developer will first check if the technology is first-of-its-kind or in the positive list of CDM tools (without the need for any market diffusion assessment). If not, then the project developer can collect the data and check if there is year-on-year growth in the technology diffusion. If there is growth, then the project developer can check if there is year-on-year increase in growth rate (i.e., accelerating growth rate) in the technology diffusion. The technology may be considered as additional if there is accelerating growth rate in the market. If the technology does not show any such pattern, there may be political or economic conditions affecting the technology. In that case, the project developer may use existing Tools for demonstration and assessment of additionality of the technology.

### 3.5.2. Road testing of the accelerating growth rate approach

42. To test the potential approach, the steps as per flow chart in Figure 10 were applied on the selected technologies. The results achieved by this approach were then validated against the approach stated in the existing conditions for that technology in the CDM tools and methodologies.

43. For this, the list of technologies that use the market penetration or market share condition were identified from the study of the existing conditions as given in Table 1. Next the number of registered projects and under validation using these technologies were collected from the CDM PA and PoA database.

44. The selection also considered technologies of different types such as grid connected power generation, distributed units, energy efficient products, etc., for the better representation purpose. Further, the available market data were collected for these technologies. Accordingly, the following technologies were selected for road testing based on best available market data.

    (a) Solar water heating (SWH) systems;

    (b) Electric vehicles (EV);

    (c) Solar Photo Voltaic (PV) (grid connected);

    (d) Concentrated solar power (CSP) (grid connected);

    (e) Off-shore wind (grid connected).

45. Following are the key observations from the road testing of accelerating growth rate approach with few sample technologies:

    (a) The accelerating growth rate approach rightly captures the market condition where a specific technology is just emerging with the diffusion level of less than 16% and faces several barriers due to baseline practices. Thus, it may be possible to use it to demonstrate the additionality of a technology;

    (b) The trend in accelerating growth rate of technology may be distorted by several external influences such as policy changes, availability of funds or incentives, etc. In such cases, the project developer shall demonstrate the additionality through the existing Tools for demonstration and assessment of additionality;

    (c) The definition for the first-of-its-kind condition could be amended to also include a technology with <2.5% diffusion level in a region or country;

    (d) The accelerating growth rate approach may be applicable to most of the technologies covered in relevant tools and methodologies under the CDM that currently use the market penetration or market share conditions to demonstrate the additionality;

    (e) For those technologies where the methodologies use market share or market penetration to demonstrate the common practice, the methodology could be amended to use the accelerating growth rate to prove additionality as well. The same can be done for other methodologies that do not use any market penetration or market share assessment for its technologies but refer to the tools to demonstrate additionality and common practice.

46. The detailed road testing is contained in Appendix 1 below.

### 3.5.3. Potential changes to the CDM tools and methodologies

47. Based on the analysis and discussions, the working group initially identified (more alternatives may be identified in subsequent work) two options that could potentially be used for amendments in the CDM tools and methodologies to simplify diffusion level assessment for additionality.

#### 3.5.3.1. Scenario A:

48. One option could be the accelerating growth rate approach that could be used in lieu of the market penetration or market share threshold. In such a scenario, the order of choosing the options for demonstration of the additionality could be the following:

    (a) Positive list as in tool 21 (small scale) or tool 19 (micro scale) or tool 32 – based on capacity thresholds;

    (b) First-of-its-kind – tool 23 (including technology within 2.5% diffusion level);

    (c) Accelerating growth rate of market of that technology;

    (d) Use of prevailing barriers to demonstrate additionality of the project (tool 1/tool 2).

#### 3.5.3.2. Scenario B:

49. In this scenario, a single threshold value of 16% diffusion level may be set for all the technologies instead of using the market share or market penetration as threshold values. In that case, the order of choosing the options for demonstration of the additionality could potentially be the following:

    (a) Positive list as in tool 21 (small scale) or tool 19 (micro scale) or tool 32 – based on capacity thresholds;

    (b) First-of-its-kind – tool 23 (including technology within 2.5% market share);

    (c) Accelerating growth rate of market of that technology;

    (d) Diffusion level of technology (market share or market penetration) ≤ 16%;

    (e) Use of prevailing barriers to demonstrate additionality of the project (tool 1/tool 2).

## 3.6. Comparison of existing context and accelerating growth rate approach

50. The advantages and disadvantages in applying the conditions for automatic additionality in the existing CDM context and that of the accelerating growth rate are discussed in Table 2.

**Table 2. Comparison of the existing CDM context and the accelerating growth rate approach**

| No | Existing CDM Context | Accelerating growth rate of market approach |
|---|---|---|
| **Advantages over the existing CDM context** | | |
| 1 | Risk in defining market size to estimate the market share or market penetration. | Defining the market size is not needed. Only the geographical boundary of the project activity can serve the purpose. |
| 2 | Thresholds values must be set for each technology type in the respective tools and methodologies. | There are no thresholds values. The assessment only checks if there is any year-on-year accelerating growth rate in the market. |
| 3 | Market share or market penetration is an indicator of technology diffusion at a particular time instant (i.e., a month or year). For some technologies (CFLs, Solar PV), this may change rapidly. | A three-year data needs to be used and thus better captures the long-term market trend in the region or country. |
| 4 | Data of similar and competing equipment in the market is also needed to arrive at the market share or market penetration of the specific technology. Thus, data requirement is more. (Example: sale of water heaters of different energy source is needed to calculate the share of SWH in the market). | The approaches use the data of the specific technology only. (Example: Sale of SWH system alone is needed to assess the accelerating growth rate). Thus, data requirement is less. |
| 5 | The threshold value set for a technology in relevant tool or methodology must be periodically revised (once in three years) to update it to latest market condition. | Since there are no threshold values, there is no need of such periodic revisions. |
| **Disadvantages over the existing CDM context** | | |
| 1 | Different technologies with varying capacity ranges face different kind of barriers. So different threshold for different technologies will take this aspect into account. | The approach does not differentiate between the technologies or their capacity ranges. |
| 2 | The threshold check provides a clear indication of diffusion level of a technology or product relative to the existing baseline practices in the region or country. | The approach does not provide any insight into the diffusion level of the technology relative to other similar or baseline practices in the region or country. |
| 3 | Market share or market penetration assessment is a general approach followed in most of the research studies and business plans. Therefore, the people are well aware of these indicators and values of the same may be easily available in public domain. | Since the approach needs three-year data for a specific technology of project activity, it might be difficult to find consistent and reliable data in public domain. |
| 4 | Sample surveys are often used to quickly assess the market share or market penetration of a technology. | The approach cannot use results from a sample survey. |

## 3.7. Alternate approach for common practice

### 3.7.1. Existing conditions in the CDM

51. The common practice check is required under the CDM context to ensure that a project activity using a specific technology is not a prevailing practice in the host country or region. All the Tools for demonstration and assessment of additionality require common practice check as a part of it and refer to tool 24 (Common practice) for the guidelines.

52. There are two options for the project developers to prove that a project activity is not a common practice in the host country:

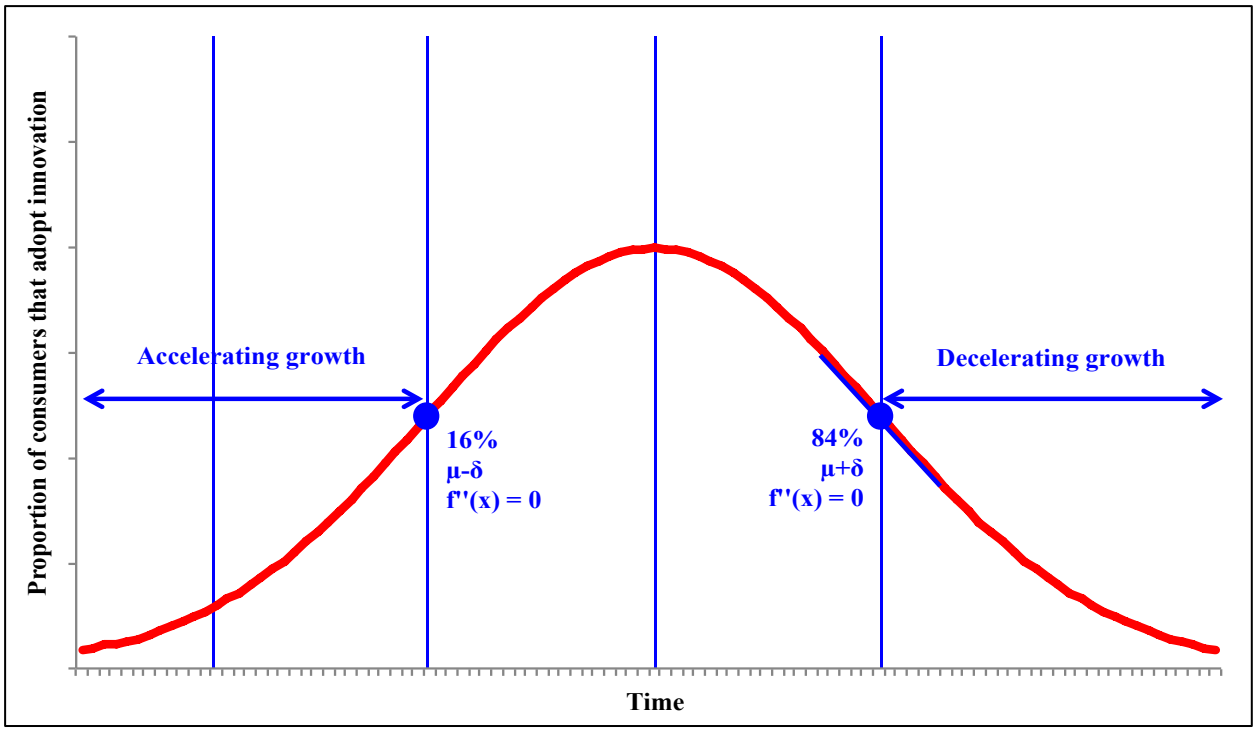
(a) Tool 24 (common practice) deals with evaluating the level of diffusion of a technology in a region or country;

(b) Specific methodologies also define diffusion level check for the applicability of the methodology or assessment of the common practice. The range of diffusion level for common practice has varied from ≤ 20% to ≤ 50%.

### 3.7.2. Statistical analysis of diffusion levels

53. By the time a technology has achieved sufficient market penetration to make it to early majority stage (i.e., above 16% diffusion level), it is interpreted that it has begun to overcome the market barriers and will be embraced by the specific target population gradually. Refer to Figure 11 for this condition.

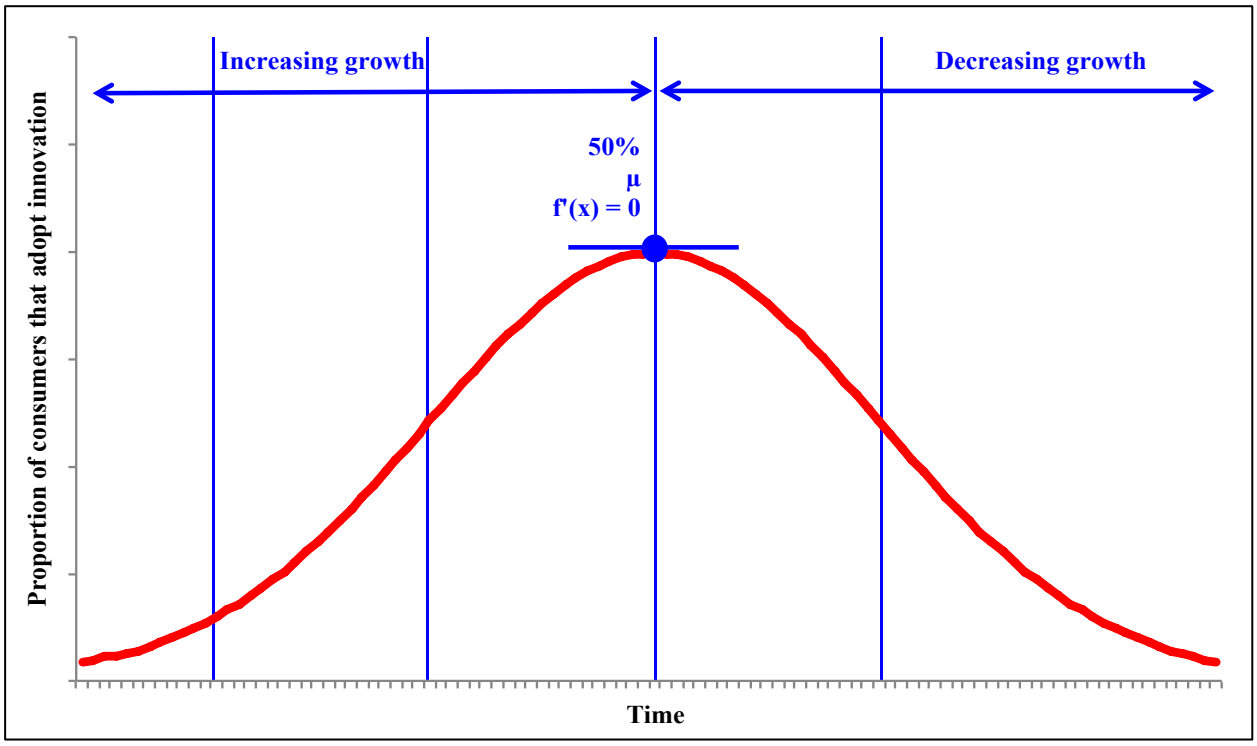
**Figure 11. Capturing 16% market penetration**




54. Once a technology has gained 50% of diffusion level, it is interpreted as that it has become a prevailing practice in the market. The technology needs little or no support after this

stage and the growth in market penetration will be slowing down after this diffusion level. Refer Figure 12 for this condition.

**Figure 12. Capturing 50% market penetration**

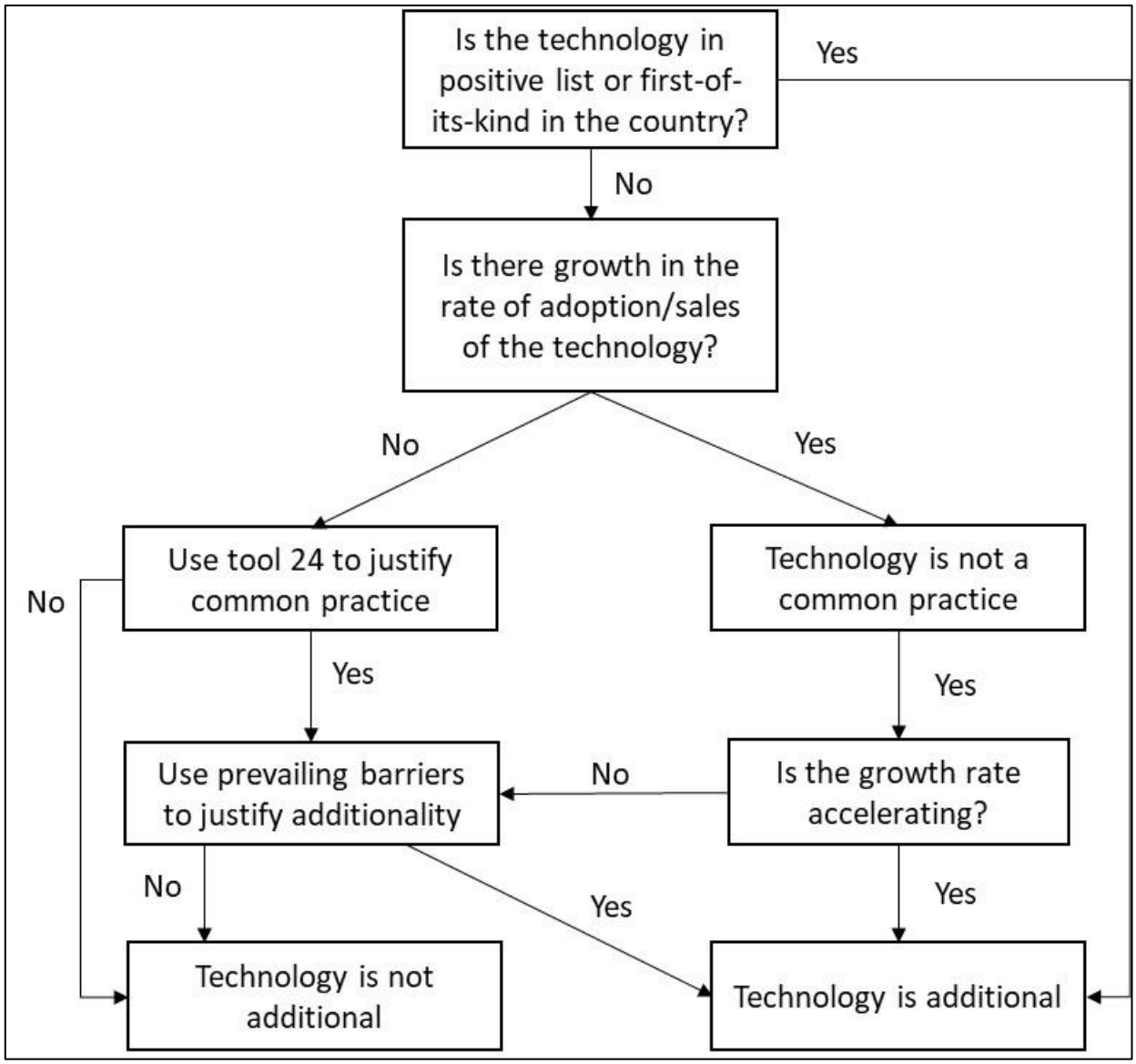



55. Combining above two characteristics, it may be stated that a technology is steadily penetrating the market (year-on-year increasing growth) when it is between 16% and 50% diffusion level.

### 3.7.3. Accelerating growth rate approach under the CDM

56. Given the above observations, it may be stated that although a technology cannot prove additionality simply by showing it is between 16% and 50% diffusion level, it is an indirect indicator that the technology has not yet reached to the majority of population and thus it is not a common practice. Figure 13 provides the schematic of assessing common practice using growth rate of the market.

**Figure 13. Schematic for assessing common practice with proposed approach**




57. Therefore, as an extension to the accelerating growth rate approach to define additionality, the presence of growth rate in the diffusion level of a technology (i.e., year-on-year growth and not necessarily at accelerating level) shall indicate that the technology is still not a common practice in the host country or region.

58. The project developer may be allowed to consider this market growth rate approach to justify that a technology is not a common practice. The rolling three-year data can be used for this analysis. This is a potential option along with the existing guidelines provided in tool 24 (common practice).

#### 3.7.3.1. Example 1: Installation of energy efficient boilers

59. Table 3 provides the sample annual installation data of energy efficient boilers in the host country. As per this condition, there is a growth rate in the market of energy efficient

boilers. Therefore, it can be directly considered that the technology is not a common practice in the host country. As next step, the project developer can also prove the additionality using the accelerating growth rate approach or the prevailing barriers analysis.

**Table 3. Sample annual installation data of energy efficient boilers**

| Year | Net increase in annual installations (Numbers) | Growth rate (%)[5] |
|---|---|---|
| 2016 | 825 | - |
| 2017 | 913 | 10 |
| 2018 | 997 | 9 |

#### 3.7.3.2. Example 2: Production of low Global Warming Potential (GWP) domestic refrigerators

60. Table 4 provides the sample annual production data of low GWP (e.g. energy efficient, low GWP refrigerant) domestic refrigerators in the host country. As per this condition, there is no growth rate in the production of low GWP domestic refrigerators. Therefore, it cannot be directly considered that the technology is not a common practice in the host country. The project developer may choose to prove that the technology is not common practice using tool 24.

**Table 4. Sample annual production data of low GWP domestic refrigerators**

| Year | Net increase in annual production (Numbers) | Growth rate (%)[6] |
|---|---|---|
| 2016 | 25,316 | - |
| 2017 | 24,111 | -4.7 |
| 2018 | 23,300 | -3.3 |

## 3.8. Criteria in applying accelerating growth rate

61. The analysis of the accelerating growth rate of market approach for different technologies did not show much variations with respect to the large scale or small scale or micro-scale project activity. So, there is no limitation in applying this to project activity of different scales.

62. Though the accelerating growth rate of market approach does not need the market size (total or target), the boundary of the market (city or region or country) needs to be defined

[5] (Current year growth – previous year growth)/previous year growth

[6] (Current year growth – previous year growth)/previous year growth

within which the project activity is implemented, and the accelerating growth rate of market is expected to happen.

63. In order to omit annual anomalies and to better capture the trend of diffusion, at least three years of data must be available to capture the year-on-year growth rate trend.

64. It shall be noted that different project developers may choose different parameter to evaluate the accelerating growth rate of market and thus may arrive at different results for a same technology in a given region or country.

65. Also, the results from the sample survey carried out in a region or country provide assessment of market condition at that instant alone (volume of sales or installation or MW) and thus cannot serve to evaluate accelerating growth rate of the market.

## 3.9. Summary of applicability of growth rate approach

66. There are 213 approved methodologies (as of July 2019) under the CDM. Each methodology may cover one or more technologies. Out of the total 213 methodologies (large scale & small scale), only 26 methodologies have directly provided conditions to evaluate the technology diffusion. The rest of the methodologies refer to the tool 1 or tool 2 or tool 19 or tool 21.

67. Out of these 26 methodologies that have directly provided conditions to evaluate the technology diffusion, only 16 use the market share or market penetration assessment to demonstrate the automatic additionality and the rest use the assessment to only ensure that the technology is not a common practice in the host country.

68. For the analysis in this report, 26 different technology types are considered. These technology types are primarily chosen based on the availability of separate methodology for that technology. Under several technologies mentioned in the positive list in tool 19, the clean and energy efficient cook stoves and high efficiency biomass fired system are similar technologies and therefore, considered under the same technology type. The SWH systems and solar lamps mentioned in the positive list in tool 19 are considered as different technology types.

69. Table 5 provides the summary of analysis on applicability of growth rate approach for different technologies. The detailed analysis of applicability for different technology types are contained in Appendix 2 below.

**Table 5. Applicability of accelerating growth rate for different technologies**

| No. | Technology | Purpose of market condition check in the tool / methodology | Relevant methodology/tool | Applicability of the accelerating growth rate approach |
|---|---|---|---|---|
| ***A*** | ***Technologies for which accelerating growth rate approach may be directly applicable*** | | | |

| No. | Technology | Purpose of market condition check in the tool / methodology | Relevant methodology/tool | Applicability of the accelerating growth rate approach |
|---|---|---|---|---|
| 1 | Improved cook stoves/High efficiency biomass fired system | Automatic additionality | Tool 19 | • If LDC, the technology is automatically additional.<br>• For non-LDC, the proposed approach can be applied. |
| 2 | Switch from non-renewable biomass for thermal application | Automatic additionality | AMS-I.E | Proposed approach is applicable for both LDC and non-LDC countries (for technologies and capacity range not covered in the positive list of tool 19 and tool 21) |
| 3 | Solar water heating system | Automatic additionality | Tool 19 | • If LDC, the technology is automatically additional.<br>• For non-LDC, the proposed approach can be applied |
| 4 | Solar lamps | Automatic additionality | Tool 19 | • If LDC, the technology is automatically additional.<br>• For non-LDC, the proposed approach can be applied for automatic additionality check. |
| 5 | Electric and hybrid vehicles | Automatic additionality | AMS-III.C | Proposed approach is for both LDC and non-LDC countries |
| 6 | E-bikes | Automatic additionality | AMS-III.BM | Proposed approach is for both LDC and non-LDC countries |
| 7 | Improved efficiency of vehicle fleets | Automatic additionality | AMS-III.BC | Proposed approach is for both LDC and non-LDC countries |

| No. | Technology | Purpose of market condition check in the tool / methodology | Relevant methodology/tool | Applicability of the accelerating growth rate approach |
|---|---|---|---|---|
| 8 | Renewable energy power generation in national grids | Automatic additionality | ACM0002 | Proposed approach is for both LDC and non-LDC countries |
| 9 | Renewable energy power generation in isolated grids | Automatic additionality | AM0103 | Proposed approach is for both LDC and non-LDC countries |
| 10 | Increasing composition of blend in cement production | Automatic additionality | ACM0005 | Proposed approach is for both LDC and non-LDC countries |
| 11 | Agricultural waste as feed stock for paper, cardboard and bio oil production | Automatic additionality | AM0057 | Proposed approach is for both LDC and non-LDC countries |
| 12 | Electric taxiing in airports | Automatic additionality | AM0116 | Proposed approach is for both LDC and non-LDC countries |
| 13 | Rural electrification through renewable energy source / grid extension | Automatic additionality | Tool21 | Proposed approach is for both LDC and non-LDC countries |
| 14 | Alternate waste treatment processes | Automatic additionality | ACM0022 | • If LDC, the technology is automatically additional.<br>• For non-LDC, the proposed approach can be applied |
| 15 | District cooling system | Automatic additionality | AM0117 | Proposed approach is for both LDC and non-LDC countries |
| 16 | Liquefied natural gas (LNG) fueled buses | Automatic additionality | AMS-III.AY | Proposed approach is for both LDC and non-LDC countries |

| No. | Technology | Purpose of market condition check in the tool / methodology | Relevant methodology/tool | Applicability of the accelerating growth rate approach |
|---|---|---|---|---|
| ***B*** | ***Technologies for which proposed approach can be used <u>with amendments</u> in the corresponding methodologies*** | | | |
| 1 | Implementation of decision support system for hydro power plant optimization | Common practice check | AM0052 | The market condition is used only to assess the common practice or applicability of the methodology for these technologies.<br>Additionality must be proved only by the assessing prevailing barriers, as per the respective methodology.<br>Therefore, the proposed approach could be used if suitable amendments are made in the methodology. |
| 2 | Self-ballasted CFLs | Common practice check | AM0113 | |
| 3 | Energy efficiency improvements in boilers | Common practice check | AM0044 | |
| 4 | Commercial refrigeration/ Domestic refrigeration | Applicability check of methodology | AM0071 | |
| 5 | Conversion of single cycle to combined cycle power generation | Common practice check | ACM0007 | |
| 6 | Utilizing waste heat to pre heat the raw materials in iron manufacturing | Common practice check | AM0066 | |
| 7 | Establishing high voltage direct current transmission line | Common practice check | AM0097 | |
| 8 | High speed passenger rail system | Common practice check | AM0101 | |
| 9 | Mass rapid transit system | Common practice check | ACM0016 | |
| 10 | Bus Rapid transit system | Common practice check | AM0031 | |

70. Apart from the above discussed methodologies, there are other methodologies which refer the tools for demonstration of additionality and common practice. The review of different methodologies and the applicability of accelerating growth rate approach is provided in Annex 6 for reference.

# 4. Impacts

71. The proposed work will improve the understanding of market penetration rate, market share, market saturation in the context of the CDM project activities/Programme of Activities and its application when demonstrating additionality and conducting common practice analysis.

72. It will lead to consistent use of the criteria and thresholds across methodologies/tools where these values will be based on relevant references/sources.

73. It will ensure consistency amongst the various methodologies and tools, when demonstrating additionality.

# 5. Subsequent work and timelines

74. Taking into account any guidance from the Board, the MP will finalise the concept note and propose options to revise the CDM guidelines, methodologies and tools to include relevant definitions and new/additional approaches.

# 6. Recommendations to the Board

75. The MP recommends that the Board take note of the progress made on this subject and provide any guidance to the MP, in particular on the proposed definitions and possible complementary approaches for demonstrating additionality, common practice and on the consistent application of the terms “market share”, “market saturation”, “market penetration” and “penetration rate” in the CDM methodologies and tools.

# Appendix 1. Road testing of growth rate approach

## 1. Solar water heating systems

1. For testing the validity and applicability of the proposed approach, the SWH technology within the geographic boundary of India is considered for the analysis.

### 1.1. Step 1: Checking if technology is in positive list or first-of-its-kind in the country

2. The tool 21 "Demonstration of additionality of small-scale project activities" does not include SWH systems in its positive list of technologies.

3. As per tool 19, "Demonstration of additionality of microscale project activities", version 9, SWH system is automatically additional only if:

   (a) Geographic location of the project activity is in one of the LDCs/SIDS or in a SUZ of the host country *OR*

   (b) End users are the households, communities or SMEs *AND* market penetration is ≤ 5% of the technologies/measures (providing similar services) in the region

4. Since the considered geographic boundary is India which is not LDC/SIDS, so condition (a) is not applicable.

5. The inference from condition (b) is that without "market penetration" assessment, this technology is not automatically additional under micro-scale project activity in CDM.

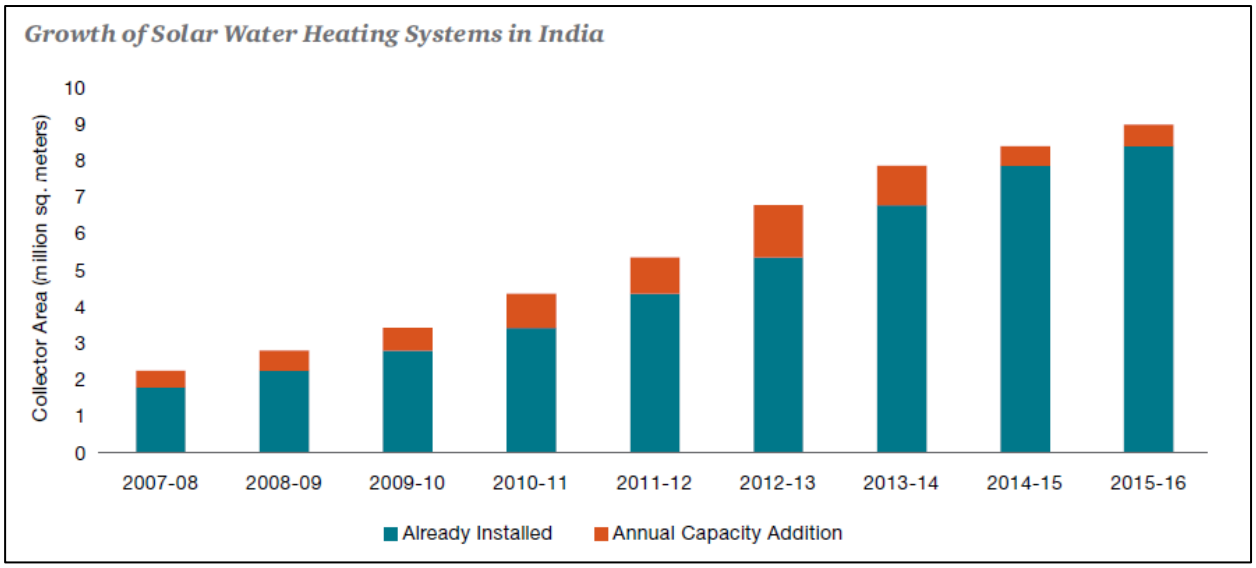
6. SWH technology has been introduced and available in India since 1980s[7]. Therefore, it does not come under the first-of-its-kind technology in India.

### 1.2. Step 2. Check if there is growth of SWH technology in the country

7. Figure 1 shows the growth in SWH system installation in India from 2007 to 2016.

[7] Solar Water Heaters Usage in India –Current Scenario and Vision 2020-Review, IJRDET, Feb 2014

**Figure 1. Growth of SWH systems in India[8]**




8. As per above information, there is growth in adoption of SWH systems in India.

### 1.3. Step 3. Check if the growth rate is accelerating

9. For this assessment, the latest three-year growth data from 2013-14 to 2015-16 is considered. Table 1 shows the assessment of growth in installations (million square meters) and the growth rate (%).

**Table 1. Growth rate of SWH systems in India[9]**

| Year | Annual installation (total million sq. meters) | Growth rate (%)[10] | Acceleration in growth rate (%)[11] |
|---|---|---|---|
| | A | $B = ((A_i – A_{i-1})x100) / A_{i-1}$ | $C = ((B_i – B_{i-1})x100) / B_{i-1}$ |
| 2012-13 | 7 | - | - |
| 2013-14 | 8 | 14.29 | - |
| 2014-15 | 8.5 | 6.25 | -56.25 |
| 2015-16 | 9 | 5.88 | -5.88 |

*Note: Where " i" represents the year*

[8] India's CST sector - vision 2022, MNRE, GEF-UNIDO

[9] India's CST sector - vision 2022, MNRE, GEF-UNIDO

[10] (Current year growth – previous year growth)/previous year growth

[11] (Current year growth rate – previous year growth rate)/previous year growth rate

10. The analysis of data shows that growth rate of SWH systems in India is decelerating in the assessment period of 2013-14 to 2015-16.

11. Therefore, the technology cannot be considered as automatically additional according to the accelerating growth rate approach. Further it needs to be confirmed that the growth of the technology/product follows a normal distribution curve and that the three years data is not influenced by any externality.

### 1.4. Step 4. Use guidelines or tools for additionality check

12. The decelerating growth rate of a technology does not mean that the technology is not additional. The decelerating growth rate may be due to the market limitations such as absence of supportive policies or inadequate funds or absence of incentives to promote the technology or any other prevailing barriers.

13. There was a capital subsidy (30-60% of the total investment cost) provided for SWH systems by the Ministry of Non-renewable and Renewable Energy (MNRE), India from 2010. However, the subsidy was stopped in September 2014 since there were more number of installations which increased subsidy burden for the government[12]. This has led to fall of market growth for the SWH systems in India as observed from the Figure 1.

14. The checking of condition is shown in Figure 2.

15. Given the observations, the project activity using SWH systems in India must consider using the other additionality assessment conditions given in tool 21 or other guidelines/ methodologies as applicable. The general assessment conditions as per tool 21 include:

    (a) Investment barrier;

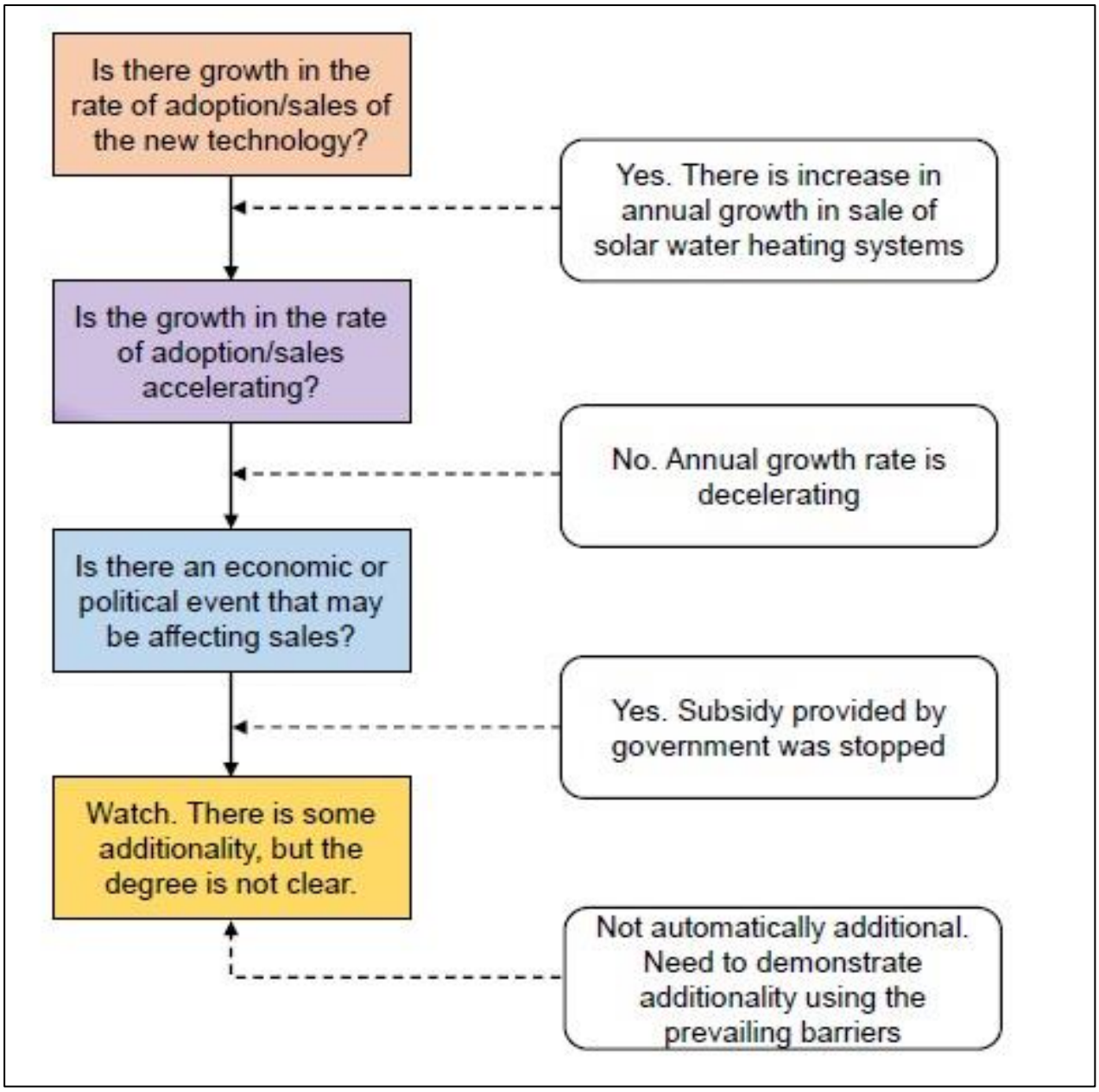
    (b) Technological barrier;

    (c) Barrier due to prevailing practice;

    (d) Other barriers.

[12] https://economictimes.indiatimes.com/industry/cons-products/durables/discontinuation-of-subsidy-forcing-many-solar-water-heater-makers-to-shut-down operations/articleshow/44989316.cms?from=mdr : last accessed on 07/08/2019

**Figure 2. Flow chart of assessing automatic additionality for SWH system (India)**




### 1.5. Validation of result through existing CDM conditions

16. As stated earlier in step 1, under tool 19, “Demonstration of additionality of micro-scale project activities”, version 09.0, SWH system is automatically additional only if:

    (a) Geographic location of the project activity is in one of the LDCs/SIDS or in a SUZ of the host country); *OR*

    (b) End users are the households, communities or SMEs AND market penetration is equal to or less than 5 per cent of the technologies/measures (providing similar services) in the region.

17. Since the considered geographical boundary is India which is not LDC/SIDS, so condition (a) is not applicable.

18. The analysis of market penetration of SWH system in India is carried out as per option (b). The tool 19, Appendix. "Determination of penetration of proposed technology/measure" states that the penetration of the proposed technology must be ≤ 5% of the technologies/measures providing similar services in that region. The same option is proposed in the small-scale methodology – AMS.I-J. Solar water heating systems, version 2.

19. In India, the technologies providing similar water heating services are electric storage, electric instantaneous, gas instantaneous and SWH. As per the "Policy opportunities for more efficient residential water heating" report[13], the market share of SWH systems in India had reached around 14% in 2012 itself. Table 2 presents the market share of different water heating systems in India. Therefore, it can be considered that the technology has market share of more than 5% and is not automatically additional. However, the project participants may prove the additionality through assessment of other barriers specific to the project technology and design.

**Table 2. Market share of SWH in India**

| No. | Water heater type | Market share (%) |
|---|---|---|
| 1 | Electric storage | 54 |
| 2 | Electric instantaneous | 22 |
| 3 | Gas instantaneous | 10 |
| 4 | Solar | 14 |
| | **Total** | **100** |

### 1.6. Observations:

20. Both the approaches have identified the SWH technology is not automatically additional in India

21. Though the market share of SWH system is less than 16%, the growth rate has been decelerating due to the discontinuation of subsidy schemes.

22. Project developer must demonstrate additionality using the prevailing barriers specific to the project activity condition.

[13] Waide Strategic Efficiency Ltd, November 2015

## 1.7. Electric vehicles (EVs)

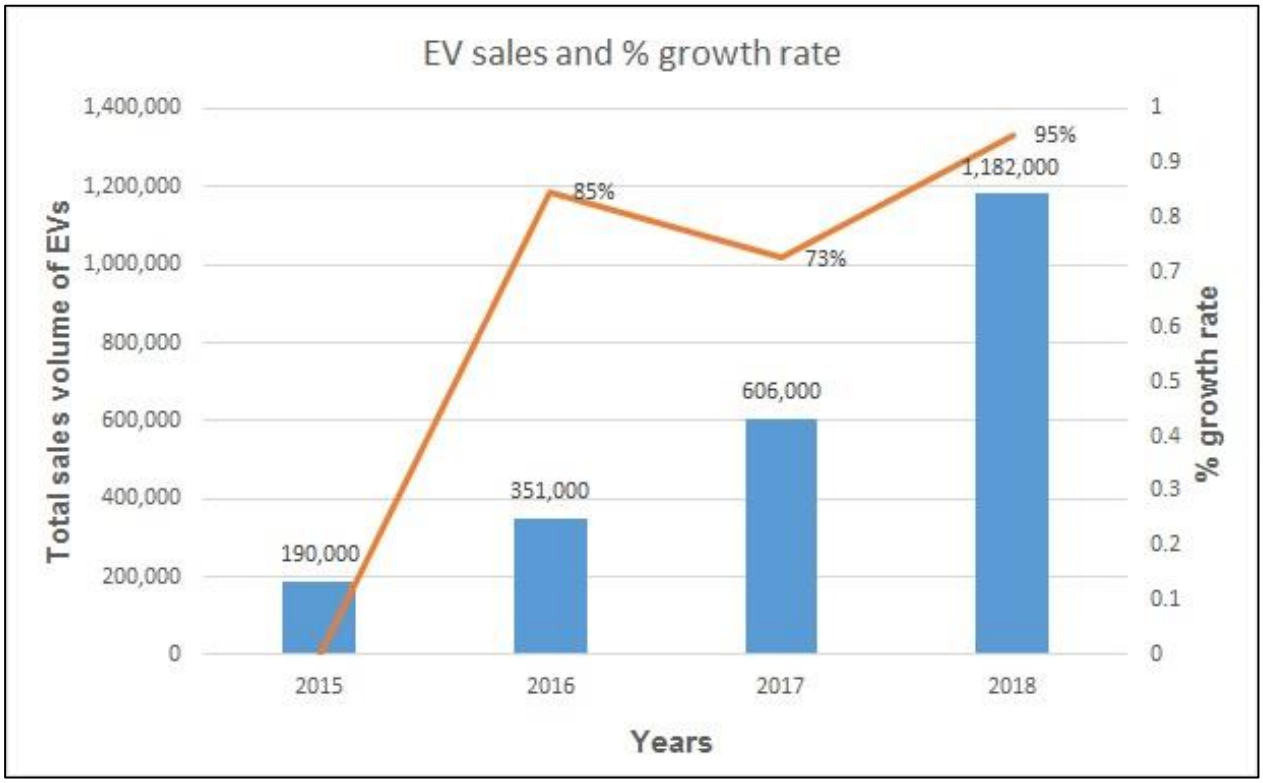
23. For testing the validity and applicability of the proposed approach, the electric vehicles (EVs) technology within the geographic boundary of China is considered for the analysis.

### 1.7.1. Step 1: Checking if the technology is in positive list or first-of-its-kind in the country

24. The EVs are not in the positive list of technologies (neither in tool 19 nor in tool 21). Since the EVs were introduced in China in late 90's, it is not a first-of-its-kind project in the country.

### 1.7.2. Step 2. Check if there is growth of EV technology in the country

**Figure 3. Growth of EV sales in China[14]**




25. Figure 3 shows the growth in EVs in China from 2015 to 2018. As per the above information, there is growth in adoption of EV in China.

### 1.7.3. Step 3. Check if the growth rate is accelerating

26. For this assessment, the latest four-year growth data from 2015-18 is considered. Table 3 shows the assessment of growth of EV sales and the growth rate (%).

[14] Date from 2015 – 2018 from website http://www.ev-volumes.com/news/global-plug-in-sales - last accessed on 07/08/2019

**Table 3. Growth rate of EV in China**

| Year | Net annual EV sales | Growth rate (%)[15] | Acceleration in growth rate (%)[16] |
|---|---|---|---|
| | A | $B = ((A_i – A_{i-1})x100) /A_{i-1}$ | $C = ((B_i – B_{i-1})x100) /B_{i-1}$ |
| 2015 | 190,000 | - | - |
| 2016 | 351,000 | 85% | - |
| 2017 | 606,000 | 73% | -14% |
| 2018 | 1,182,000 | 95% | 31% |

*Note: Where " i" represents the year*

27. The analysis of data shows that growth rate of EVs in China is accelerating in the assessment period of 2015 – 2018. Therefore, the technology can be considered as additional according to the accelerating growth rate approach.

### 1.7.4. Step 4. Use guidelines or tools for additionality check

28. Since the EV technology is automatically additional, this step is not required.

29. The Chinese government has provided several polices to encourage the EV market. This include restrictions on purchase of conventional fuel vehicles, subsidy on the EV purchase cost, one-hour free parking for EV in parking lots, building sufficient charging infrastructure, etc.[17] Because of these promotional activities, the EV market is undergoing an accelerating growth rate.

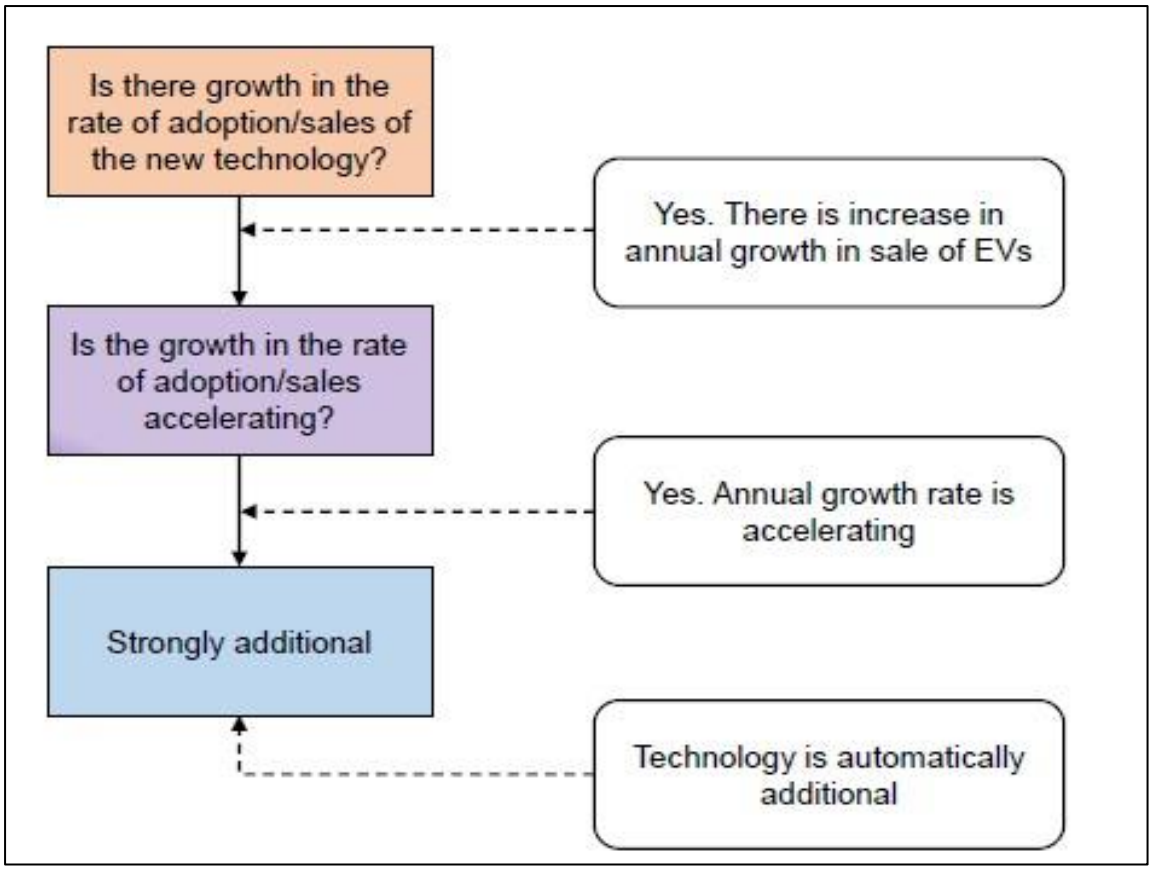
30. The checking of condition is given in Figure 4.

[15] (Current year growth – previous year growth)/previous year growth

[16] (Current year growth rate – previous year growth rate)/previous year growth rate

[17] https://www.researchgate.net/publication/327849027_Evaluating_the_Effect_of_Policies_and_the_Development_of_Charging_Infrastructure_on_Electric_Vehicle_Diffusion_in_China: - last accessed on 07/08/2019

**Figure 4. Flow chart of assessing automatic additionality for EV (China)**




## 1.8. Validation of result through existing CDM conditions

31. As per the methodology "AMS III C – Emission reductions by electric and hybrid vehicles", version 15.0, additionality can be proved by using either of the following two options:

### 1.8.1. Option 1:

32. *Demonstrate that the project* activity *would otherwise not be implemented due to the existence of one or more barrier(s) listed in the "Methodological tool: Demonstration of additionality of small-scale project activities". The barrier(s) can be demonstrated for buyers/users and/or charging service providers of the electric vehicles even if the manufacturer or retailer of the electric vehicles is implementing the project.*

### 1.8.2. Option 2:

33. *Demonstrate ex ante that the market share of project electric/hybrid vehicles is equal to or smaller than 5 per cent of the vehicles of the same category (e.g. if project vehicles are electric scooters, market share of electric two wheelers is equal to or smaller than 5 per cent of all motorized two wheelers, irrespective of the manufacturer) in the region.*

34. The analysis for the market share of EVs in China was carried out by considering option 2 above. As per the International Energy Agency's (IEA) Global EV outlook 2018, it was

found that the market share of EVs in China were 1.3% in 2016 and 2.2% in 2017[18]. Therefore, it can be considered that the EV projects are automatically additional in China.

### 1.9. Observations:

35. Both the approaches concluded that the technology is automatically additional in China.

36. As the market share of EVs in China is less than 2.5%, it may be still considered first-of-its kind in the country (in "early adoption" stage as per the Rogers theory).

### 1.10. Grid connected Solar PV power generation

37. For testing the validity and applicability of the alternate approach, the grid connected solar PV power technology within the geographic boundary of India is considered for the analysis.

#### 1.10.1. Step 1: Checking if technology is in positive list or first-of-its-kind in the country

38. As per the CDM methodology ACM0002, "Grid-connected electricity generation from renewable sources", version 19, a technology is automatically additional only if:

(a) *The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent; OR*

(b) *The total installed capacity of the technology in the host country is less than or equal to 50 MW.*

39. The condition (b) will not be applicable to India, since the solar installed capacity is greater than 50 MW. The solar PV technology was in operation since 2009[19] in India. Therefore, it does not come under the first-of-its-kind technology.

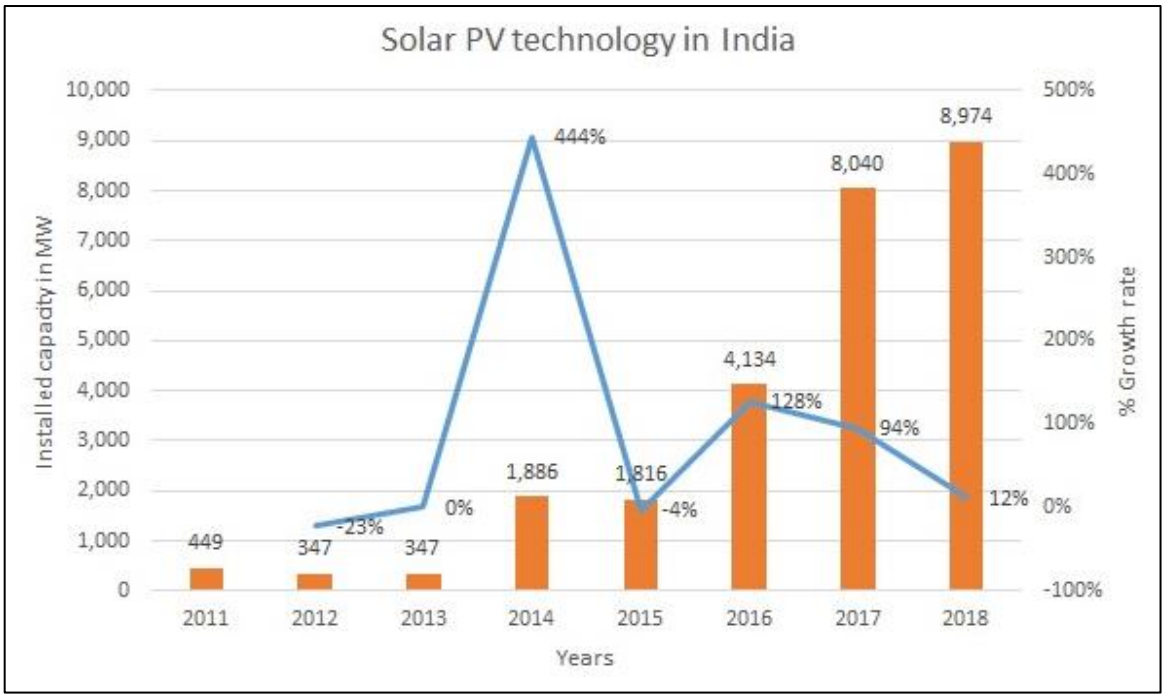
#### 1.10.2. Step 2. Check if there is growth of solar PV technology in India

40. Figure 5 shows the growth in solar PV technology in India from 2011 to 2018.

[18] Battery & plug-in hybrid vehicles put together, Table A8 & A9, Global EV outlook 2018 towards cross model electrification, International Energy Agency, 2018.

[19] https://www.indiatoday.in/india/story/indias-first-solar-power-plant-opens-in-punjab-63048-2009-12-15 - last accessed on 07/08/2019

**Figure 5. Growth of solar PV technology in India[20]**




41. As per the above information, there is a growth in adoption of solar PV technology in India.

### 1.10.3. Step 3. Check if the growth rate is accelerating

42. For this assessment, the latest four-year net capacity addition from 2015 to 2018 is considered. Table 4 shows the assessment of growth of net capacity addition and the growth rate (%).

**Table 4. Solar PV growth rate in India21**

| Year | Net capacity addition (MW) | Growth rate (%) | Acceleration in growth rate (%) |
|---|---|---|---|
| | A | $B = ((A_i - A_{i-1})x100) / A_{i-1}$ | $C = ((B_i - B_{i-1})x100) / B_{i-1}$ |
| 2015 | 1,816 | - | |
| 2016 | 4,134 | 128% | - |
| 2017 | 8,040 | 94% | -26% |

[20] https://public.tableau.com/views/IRENARETimeSeries/Charts?:embed=y&:showVizHome=no&publish=yes&:toolbar=no - last accessed on 07/08/2019.

[21] https://public.tableau.com/views/IRENARETimeSeries/Charts?:embed=y&:showVizHome=no&publish=yes&:toolbar=no - last accessed on 07/08/2019.

| Year | Net capacity addition (MW) | Growth rate (%) | Acceleration in growth rate (%) |
|---|---|---|---|
| | **A** | **$B = ((A_i - A_{i-1})x100) / A_{i-1}$** | **$C = ((B_i - B_{i-1})x100) / B_{i-1}$** |
| 2018 | 8,974 | 12% | -88% |

*Note: Where " i" represents the year*

43. The analysis of data shows that growth rate of solar PV technology in India is decelerating in the last 3 years of 2016-2018. Therefore, the technology cannot be considered as automatically additional.

### 1.10.4. Step 4. Use guidelines or tools for additionality check

44. The decelerating growth rate of a technology does not mean that the technology is not additional. The decelerating growth rate may be due to the market conditions such as absence of supportive policies or inadequate funds or absence of incentives to promote the technology or any other prevailing barriers.

45. The following are few observations on the market trend of Solar PV in India:

(a) The technology received a thrust through the Jawaharlal Nehru National Solar Mission (JNNSM) launched in 2010. The phase 1 of program was from 2010 – 2013. This resulted in upsurge of installation observed in 2014 (closure of projects under phase 1);

(b) The second phase of mission was from 2014- 2017 and third phase is from 2017-2022;

(c) Few barriers restricting the rapid uptake of technology are transmission infrastructure and managing grid availability;[22]

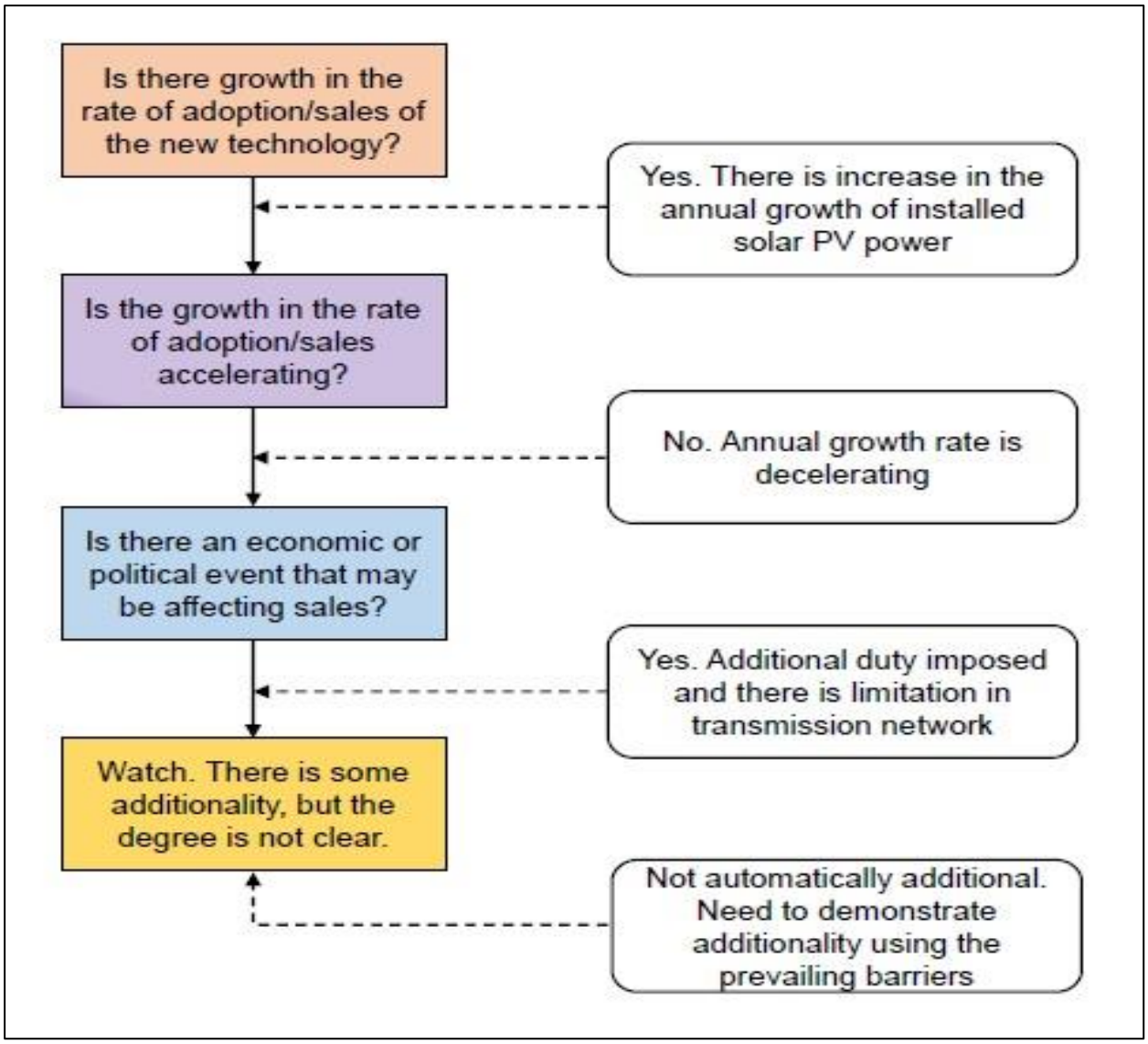
(d) Barriers such as imposition of safeguard duty for imported cells and modules, lack of clarity on Gross Service Tax (GST) rate applicability on solar power projects, unavailability of land and evacuation facilities are also considered to slowdown solar power projects[23].

46. The checking of condition is given in Figure 6.

[22] https://www.pv-tech.org/news/india-reaches-23.1gw-of-grid-connected-solar-mnre - last accessed on 07/08/2019

[23] https://www.vikramsolar.com/blog-a-decline-in-solar-growth-root-cause-analysis/amp/: Last accessed on 07/08/2019

**Figure 6. Flow chart of assessing automatic additionality for grid connected solar PV (India)**




47. Given the observations, the project activity using solar PV technology in India must consider using the other additionality assessment conditions given in the guidelines/methodologies as applicable. The general assessment conditions include:

    (a) Investment barrier;

    (b) Technological barrier;

    (c) Barrier due to prevailing practice;

    (d) Other barriers.

### 1.11. Validation of result through existing CDM conditions

48. As per the ACM0002 CDM methodology, the project activity is automatically additional if *"The percentage share of total installed capacity of the specific technology in the total*

*installed grid connected power generation capacity in the host country is equal to or less than two per cent".*

49. The total installed grid power capacity in India is around 357 GW[24]. The total installed grid connected solar PV power capacity is 26 GW[25]. Thus, the market penetration for grid connected solar PV technology in India is 7.83% as of 2018[26]. Therefore, the grid connected solar PV power generation in India cannot be considered as automatically additional.

### 1.12. Observations:

50. Both the approaches have identified that the grid connected solar PV technology is not automatically additional in India

51. Though the market share of grid connected solar PV is less than 16%, the growth rate has been decelerating due to the additional duty imposed and the limitations in the transmission network

52. Project developer must demonstrate additionality using the prevailing barriers specific to the project activity condition

### 1.13. Grid connected Concentrated Solar Power (CSP) generation

53. For testing the validity and applicability of the proposed approach, the grid connected CSP technology within the geographic boundary of India is considered for the analysis.

#### 1.13.1. Step 1: Checking if technology is in positive list or first-of-its-kind in the country

54. As per the CDM methodology ACM0002, "Grid-connected electricity generation from renewable sources", version 19, a technology is automatically additional only if:

(a) *The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent; OR*

(b) *The total installed capacity of the technology in the host country is less than or equal to 50 MW.*

55. The condition (b) will not be applicable to India, since the installed CSP is greater than 50 MW. The CSP technology based power plants have been in operation since 2011[27] in India. Therefore, it does not come under first-of-its-kind technology.

#### 1.13.2. Step 2. Check if there is growth of CSP technology in India

56. Figure 7 shows the growth in grid connected solar CSP technology in India from 2011 to 2018.`

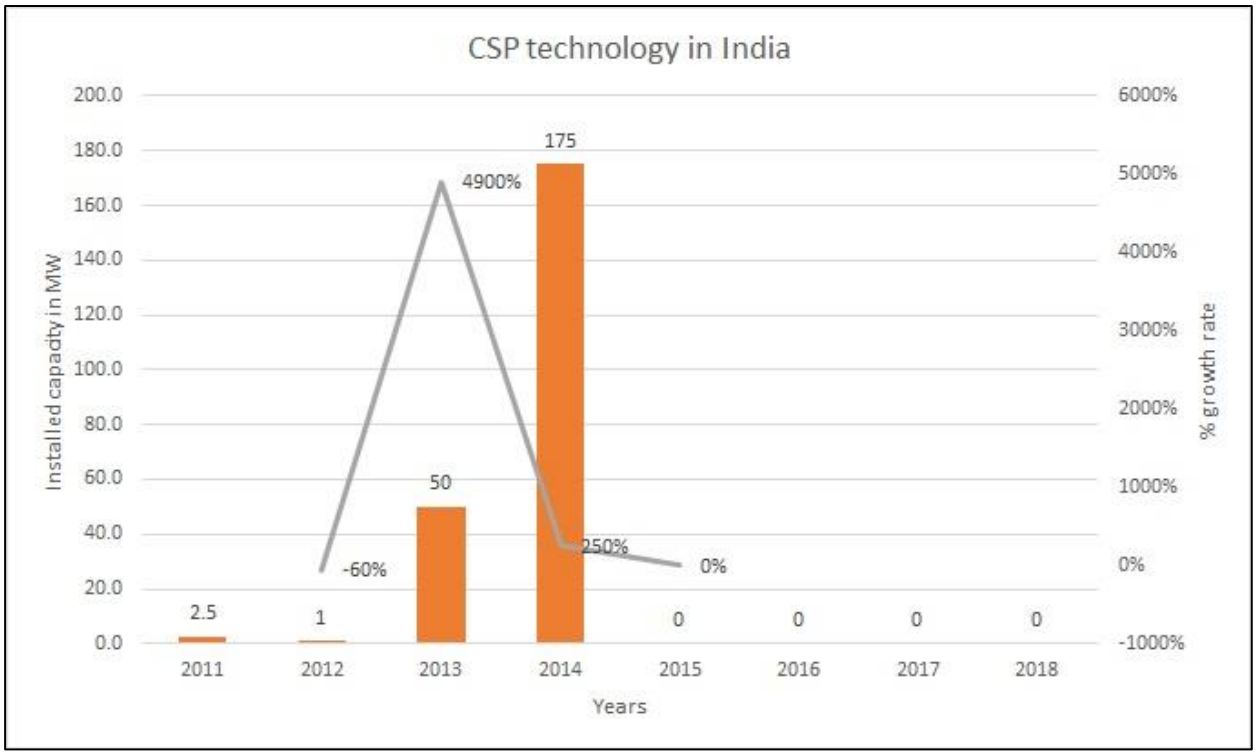
[24] https://en.wikipedia.org/wiki/Electricity_sector_in_India - last accessed on 07/08/2019

[25] https://mercomindia.com/solars-share-indias-total-installed-capacity-7-9-end-2018/ - last accessed on 07/08/2019

[26] Estimated using the data obtained from the IRENA database.

[27] http://helioscsp.com/indias-concentrated-solar-power-csp/ - last accessed on 07/08/2019

**Figure 7. Growth of solar CSP technology in India28**




57. As per above information, there is no growth in adoption of CSP technology in India after 2015.

### 1.13.3. Step 3. Check if the growth rate is accelerating

58. Since there is no growth in last 4 years, this checking is not needed.

59. The analysis of data shows that the technology growth rate is not accelerating. Therefore, it cannot be considered as automatically additional.

### 1.13.4. Step 4. Use guidelines or tools for additionality check

60. The decelerating growth rate of a technology does not mean that the technology is not additional. The decelerating growth rate may be due to market conditions such as absence of supportive policies or inadequate funds or absence of incentives to promote the technology or other prevailing barriers.

61. The following are few observations on the market trends of CSP in India:

    (a) The technology received a thrust through the Jawaharlal Nehru National Solar Mission (JNNSM) launched in 2010. The phase 1 of program was from 2010 – 2013.

[28] https://public.tableau.com/views/IRENARETimeSeries/Charts?:embed=y&:showVizHome=no&publish=yes&:toolbar=no - last accessed on 07/08/2019.

(b) But the further up-take of technology or commissioning of planned projects faced challenged due to the barriers faced in installation and operation of initial installed plants in phase 1. The barriers included[29]:

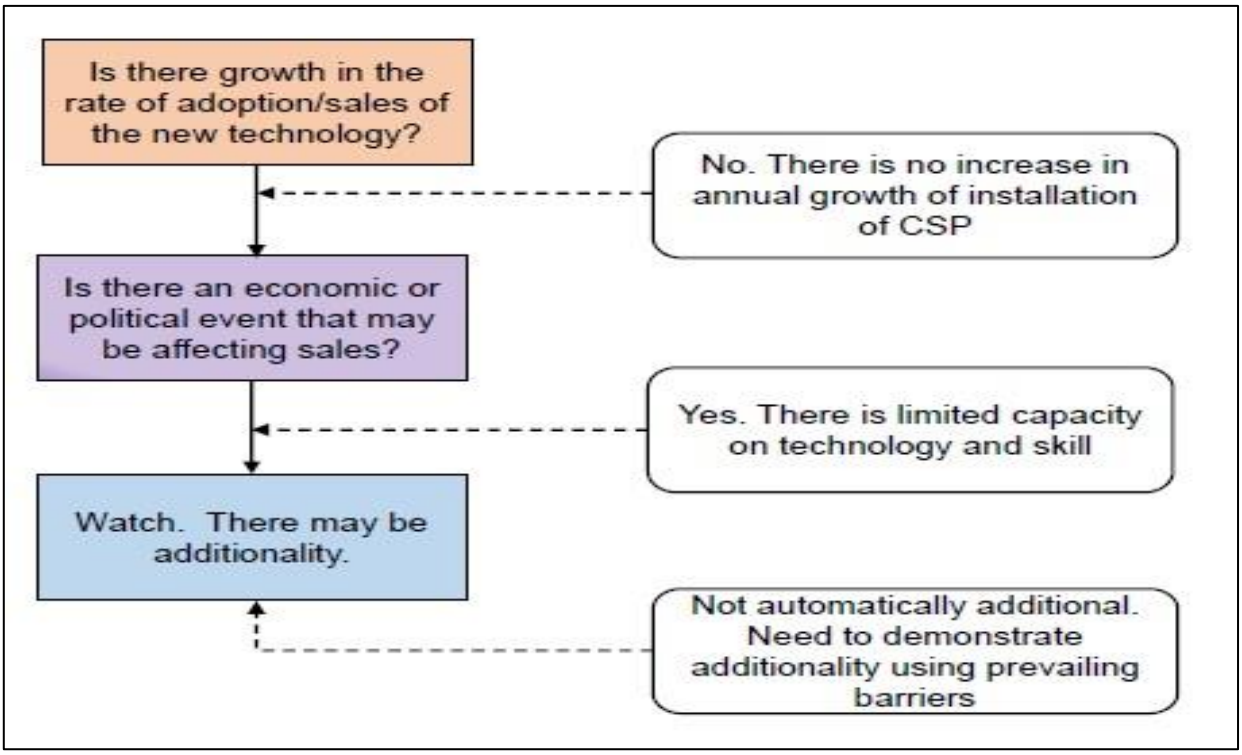
(i) Unreliable solar data;

(ii) High cost compared to PV;

(iii) Low availability of skilled labour.

62. The checking of condition is given in Figure 8.

**Figure 8. Flow chart of assessing automatic additionality for grid connected CSP (India)**




63. Given the observations, the project activity using CSP technology in India must consider using the other additionality assessment conditions given in the guidelines/methodologies as applicable. The general assessment conditions include:

(a) Investment barrier;

(b) Technological barrier;

(c) Barrier due to prevailing practice;

(d) Other barriers.

[29] https://www.currentscience.ac.in/Volumes/115/02/0222.pdf - last accessed on 07/08/2019

### 1.13.5. Validation of result through existing CDM conditions

64. As per the ACM0002 CDM methodology, the project activity is automatic additional if "The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent"

65. The analysis of market share of CSP technology in India was carried out. It is found that the share of CSP generation in India is only 0.07% as of 2018[30]. Therefore, the CSP technology in India can be considered as automatically additional.

### 1.14. Observations:

(a) As per the accelerating growth rate approach, the technology is not automatic additional;

(b) As per the market share approach of current CDM conditions, the technology is automatically additional;

(c) There are only five CSP power plants installed in India[31]. Therefore, the growth rate shows varying trends based on commissioning of each plant. This can be an example condition for the "Early adoption" where the market diffusion is < 2.5% and it is difficult to predict growth rate trend in that region of diffusion curve;

(d) If a technology with < 2.5% market diffusion is considered as first-of-its-kind in the country, then the CSP technology will be automatically additional in India.

### 1.15. Grid connected off-shore wind power generation

66. For testing the validity and applicability of the proposed approach, the grid connected concentrated off-shore wind technology within the geographic boundary of China is considered for the analysis.

### 1.15.1. Step 1: Checking if the technology is in positive list or first-of-its-kind in the country

67. As per the CDM methodology ACM0002, "Grid-connected electricity generation from renewable sources", version 19, a technology is automatically additional only if:

*(a) The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent; OR*

(b) *The total installed capacity of the technology in the host country is less than or equal to 50 MW.*

68. The condition (b) will not be applicable to China, since the offshore wind installed capacity is greater than 50 MW. The offshore wind power generation has been in operation since 2010[32] in China. Therefore, it does not come under the first-of-its-kind technology.

[30] Estimated using the data obtained from the IRENA database.

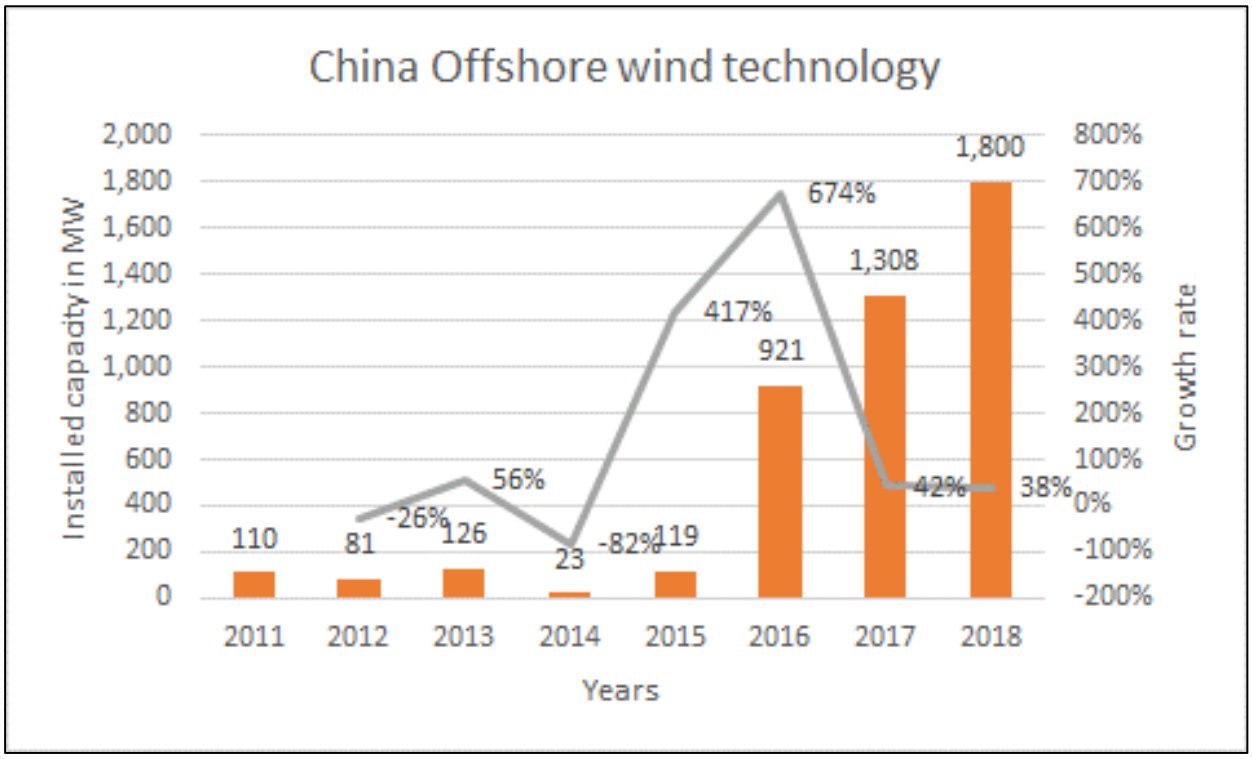
[31] https://www.currentscience.ac.in/Volumes/115/02/0222.pdf last accessed on 07/08/2019.

[32] https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Wind_power_in_China.html - last accessed on 07/08/2019.

### 1.15.2. Step 2. Check if there is growth in offshore wind technology in China

69. Figure 9 shows the growth in offshore wind technology in China from 2011 to 2018.

**Figure 9. Growth of offshore wind technology in China[33]**




70. As per above information, there is growth in adoption of offshore wind technology in China.

### 1.15.3. Step 3. Check if the growth rate is accelerating

71. For this assessment, the latest four-year growth data from 2015 to 2018 is considered. Table 5 shows the assessment of growth in off-shore wind technology and its growth rate (%).

[33] https://public.tableau.com/views/IRENARETimeSeries/Charts?:embed=y&:showVizHome=no&publish=yes&:toolbar=no - last accessed on 07/08/2019.

**Table 5. Offshore wind technology growth rate in China[34]**

| Year | Net capacity addition (MW) | Growth rate (%) | Acceleration in growth rate (%) |
|---|---|---|---|
| | A | $B = ((A_i - A_{i-1})x100) / A_{i-1}$ | $C = ((B_i - B_{i-1})x100) / B_{i-1}$ |
| 2015 | 119 | - | - |
| 2016 | 921 | 674% | - |
| 2017 | 1,308 | 42% | -94% |
| 2018 | 1,800 | 38% | -10% |

*Note: Where " i" represents the year*

72. The analysis of data shows that growth rate of offshore wind technology in China is decelerating in the last 3 years period of 2016 to 2018. Therefore, the technology cannot be considered as automatically additional.

### 1.15.4. Step 4. Use guidelines or tools for additionality check

73. The decelerating growth rate of a technology does not mean that the technology is not additional. The decelerating growth rate may be due to market conditions such as absence of policies or inadequate funds or absence of incentives to promote the technology or other prevailing barriers.

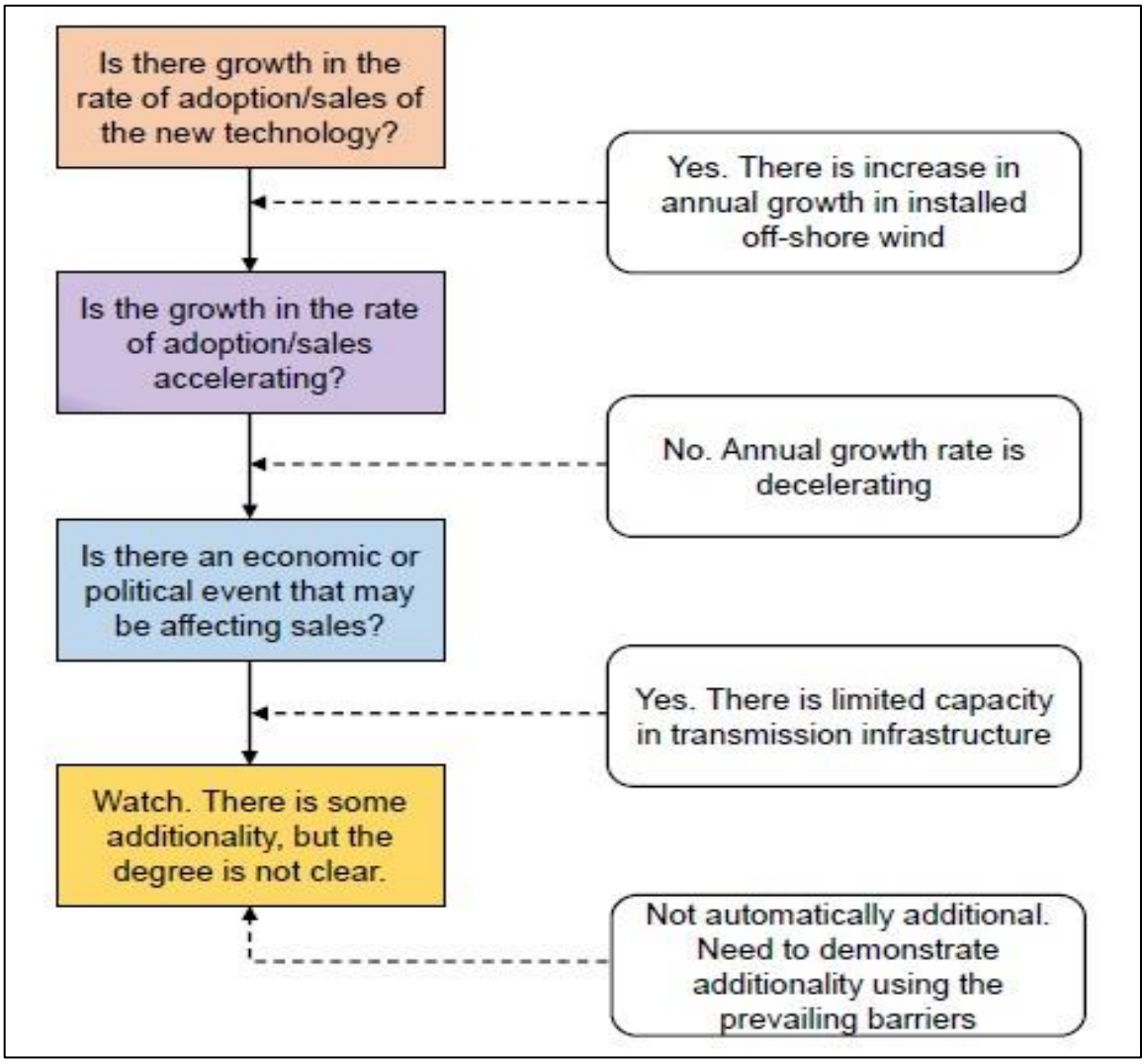
74. Major barriers limiting the rapid up-take of off-shore wind technology in China were found to be the lack of long distance transmission infrastructure and difficulties in managing the grid availability for power export[35].

75. The checking of condition is given in Figure 10.

[34] https://public.tableau.com/views/IRENARETimeSeries/Charts?:embed=y&:showVizHome=no&publish=yes&:toolbar=no - last accessed on 07/08/2019

[35] Fixing wind curtailment with electric power system reform in China

**Figure 10. Flow chart of assessing automatic additionality for grid connected off-shore wind (China)**




76. Given the observations, the project activity using offshore wind technology in China must consider using the other additionality assessment conditions given in the guidelines/ methodologies as applicable

### 1.16. Validation of result through existing CDM conditions

*77.* As per the ACM0002 CDM methodology, the project activity is automatically additional if "The *percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is equal to or less than two per cent".*

78. The analysis for the market share of offshore wind technology in China was carried out. It is found that the share of offshore wind technology was 0.24% as of 2018[36]. Therefore, the technology can be considered as automatically additional in China.

[36] Estimated using the data obtained from the IRENA database.

### 1.17. Observations:

79. As per the accelerating growth rate approach, the technology is not automatically additional.

80. As per the market penetration approach of current CDM conditions, the technology is automatically additional.

81. This can be an example condition for the “Early adoption” where the market diffusion is < 2.5% and it is difficult to predict growth rate trend in that region of diffusion curve.

82. If a technology with < 2.5% market diffusion is considered as first-of-its-kind in the country, then the off-shore technology will be automatically additional in China.

# Appendix 2. Applicability for different technology types

1. The preliminary analysis and applicability of the accelerating growth rate approach for each technology type with reference to its methodology and its market assessment conditions are discussed below.

## 1. Clean and energy efficient cook stoves/High efficiency biomass fired system

| | |
|---|---|
| Reference tool/methodology for additionality condition | Tool 19. Demonstration of additionality of microscale project activities |
| Existing condition | If the penetration is ≤ 5% of the technologies/measures in the region, it is automatically additional |

2. Only 11% of Africans use clean cook stoves that run on modern fuels, such as liquefied petroleum gas (LPG) (5%) and electric stoves (6%), as their primary cooking appliances. Another 10% of the households in Africa have access to both the basic improved cook stoves (ICS) (less than 5%) and legacy cook stoves (less than 5%) that offer only moderate improvements in fuel efficiency and emissions over the traditional cooking technologies. In aggregate, Africa has a significantly lower rate of access to the clean and improved solutions (25%, excluding legacy stoves) than any other region globally[1]. The percentage households NOT with clean cooking access in different regions are[2]

   (a) Sub-Saharan Africa : 88%

   (b) Overall Africa : 70%

   (c) Developing Asia : 49%

3. It can be observed that the diffusion of improved cook stoves or the high efficiency biomass fired system is still at the accelerating stage in the African region. Also, most of the African nations are Least Developed Countries (LDCs) and thus the technology will be additional.

4. In Kenya, which is not an LDC, about 3.7 million out of 10 million households in 2017 were using one or several improved cook stoves[3].

5. Given these observations, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region. In the developing Asia, around 50% of households are already provided with access to clean cook stoves. Therefore, these countries could use this accelerating growth rate approach to demonstrate automatic additionality or use existing Tools to demonstrate additionality.

[1] Clean and improved cooking in sub-Saharan Africa, World Bank, 2014

[2] WHO and IEA analysis.

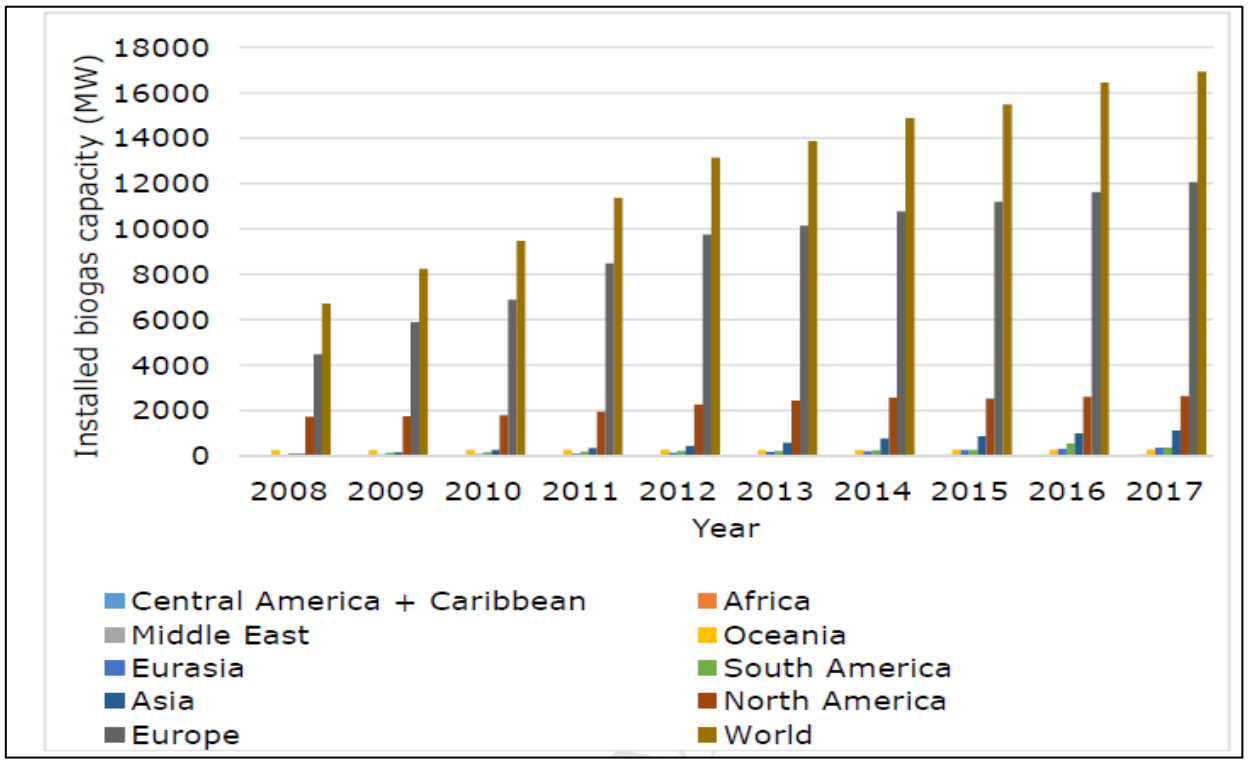
[3] Promotion of Climate-Friendly Cooking in Kenya and Senegal, GIZ, 2019

## 2. Switch from non-renewable biomass for thermal application

| | |
|---|---|
| Reference tool/methodology for additionality condition | AMS-I.E. Switch from non-renewable biomass for thermal applications by the user |
| Existing condition | Penetration of renewable energy based thermal energy technologies (e.g., biogas stoves, solar cookers) is ≤ 5% of the technologies/measures providing similar services in the region |

6. Figure 1 shows the growth of biogas stoves market in different regions.

**Figure 1. Technology adoption of biogas stoves[4]**




7. China is by far the domestic biogas capital of the world, with over 40 million household digesters. By comparison, India, Nepal and Bangladesh estimate 3.8 million, 0.2 million, and 60,000 household digesters respectively. Africa has also been active in small-scale digester construction, with 58,791 domestic digesters as of January 2018 (Africa Biogas 2018). While developing nations have been actively pursuing and are reaping the benefits of domestic biogas installations, uptake of domestic digesters has been stagnant in the developed nations[5].

[4] Biogas in the suburbs: An untapped source of clean energy? Jan 2019

[5] Biogas in the suburbs: An untapped source of clean energy? Jan 2019

8. The technology (biogas stove, solar stoves, etc.) is similar to the ICS discussed above. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 3. Solar water heating systems

| | |
|---|---|
| Reference tool/methodology for additionality condition | Tool 19. Demonstration of additionality of microscale project activities |
| Existing condition | If the penetration is ≤ 5% of the technologies/measures in the region, it is automatically additional |

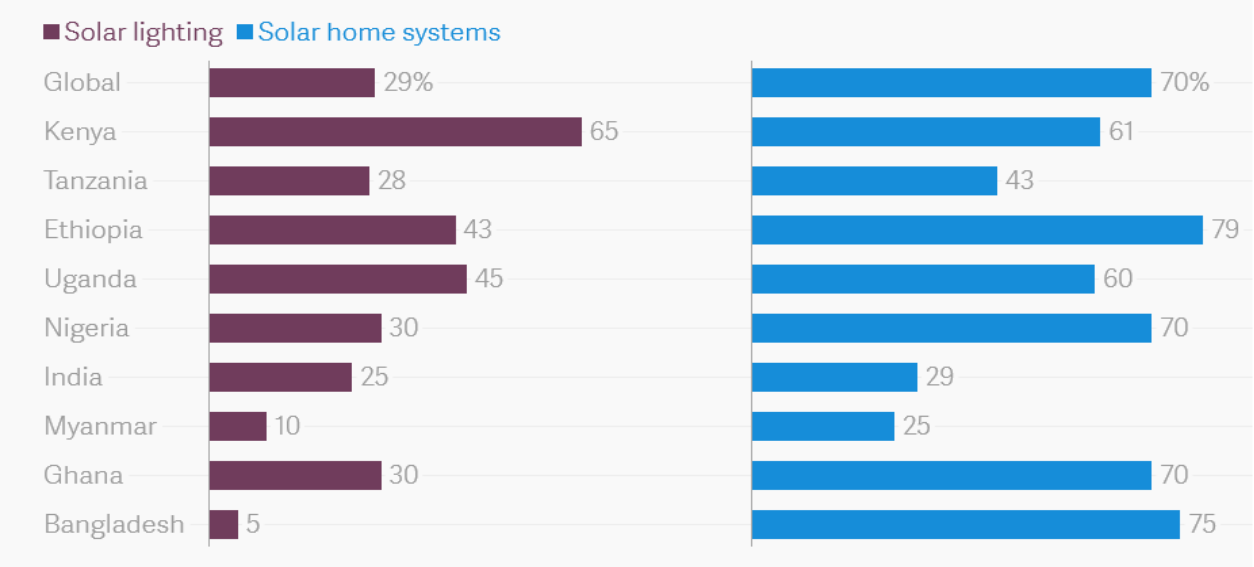
9. The SWH systems (with India scenario) are already discussed in section 1.1 of Appendix 1 As per the findings, the accelerating growth rate approach can be applicable for this technology to assess the additionality in the host country or region.

## 4. Solar lamps

| | |
|---|---|
| Reference tool/methodology for additionality condition | Tool 19. Demonstration of additionality of microscale project activities |
| Existing condition | If the penetration is ≤ 5% of the technologies/measures in the region, it is automatically additional |

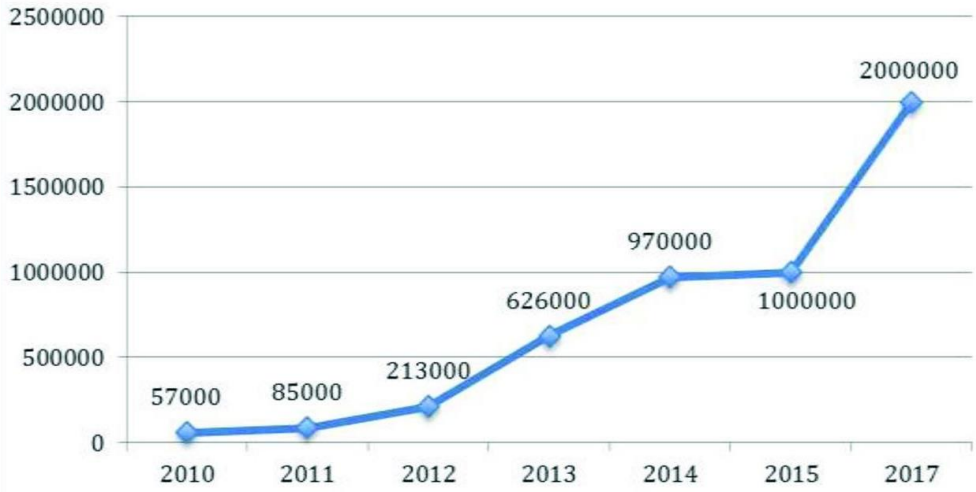
10. The solar lamps technology is also expected to follow the same characteristics as that of SWH systems. Figure 2 shows the share of solar lamps in different regions and figure 2 shows the growth of cumulative solar lantern use in Kenya.

**Figure 2. Solar lighting products in different region[6]**




[6] https://qz.com/africa/1655648/solar-power-in-africa-and-the-mobile-money-advantage/ - last accessed on 07/08/2019

**Figure 3. Growth of solar lanterns in Kenya7**




11. As per the observations, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 5. Electric and hybrid vehicles

| | |
|---|---|
| Reference tool/methodology for additionality condition | AMS-III.C. Emission reductions by electric and hybrid vehicles |
| Existing condition | Market share of project electric/hybrid vehicles is ≤ 5% of the vehicles of the same category (e.g., if project vehicles are electric scooters, then the market share of electric two wheelers is ≤ 5% of all the motorized two wheelers, irrespective of the manufacturer) in the region |

12. The electric vehicles technology (with China scenario) is discussed in the section 1.7 of Appendix 1 above. As per the findings, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 6. E-bikes

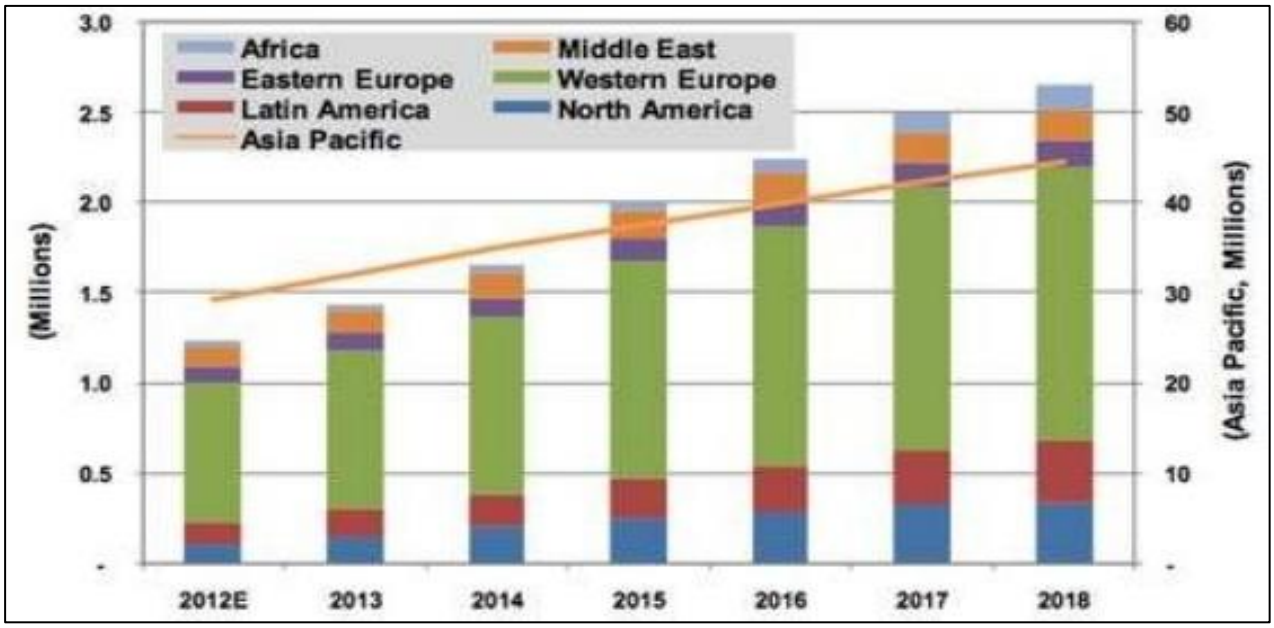
| | |
|---|---|
| Reference tool/methodology for additionality condition | AMS-III.BM. Lightweight two and three wheeled personal transportation |

[7] Pay-As-You-Go: How a business model is helping light millions of rural Kenyan homes with solar, Nov 2018

| | |
|---|---|
| Existing condition | Share (penetration) of e-bikes among the bicycles used in the city is ≤ 5% based on number of annual bicycle trips undertaken in the city or based on the market share |

13. The market for electric bikes and two wheelers is fast growing across the world. Figure 4 shows its global market growth from 2012 – 2018. Further, figure 4 shows the market growth of electric two wheelers in India.

**Figure 4. Electric bikes sales by region[8]**




[8] E-bikes: generating new wave of cyclists, IBPI webinar, June 2014

**Figure 5. Market growth of electric two wheelers in India[9]**


| | | | |
|---|---|---|---|
| E2W | 20000 | 23000 | 54800 |
| E4W | 2000 | 2000 | 1200 |
| Total EVs | **22000** | **25000** | **56000** |

14. The technology is expected to show same characteristics as the electric vehicles discussed above. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 7. Improved efficiency of vehicle fleets

| | |
|---|---|
| Reference tool/methodology for additionality condition | AMS-III.BC. Emission reductions through improved efficiency of vehicle fleets |
| Existing condition | Market penetration rate of each of the planned project measures is < 5% for the types of vehicles included in the fleets. |

15. The technology is expected to show characteristics such as growing market trend similar to the electric vehicles due to stricter environmental norms to mitigate GHG emissions by different countries. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

[9] Society of Manufacturers of Electric Vehicles (SMEV), India

## 8. Implementation of decision support system for hydro power plant optimization

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0052. Increased electricity generation from existing hydropower stations through Decision Support System optimization |
| Existing condition | Common practice check:<br>The CDM project activity is not a common practice if:<br>(a) The project type has not been implemented in the country (or region for large countries);<br>(b) Companies that provide the technology, used in the CDM project activity, have minimal business in the country where the CDM project is being implemented; and<br>(c) Utility managers are unfamiliar with this type of project. |

16. The methodology has not defined any threshold value for the technology diffusion. Also, the level of awareness is used only to assess the common practice of technology. The additionality must be proved only by assessing the prevailing barriers.

17. So, the accelerating growth rate assessment for automatic additionality will not be applicable for this technology in the current context. This accelerating growth rate approach for the demonstration of automatic additionality could be used, if the methodology is amended suitably to accommodate this condition in future.

## 9. Renewable energy power generation in national grids

| | |
|---|---|
| Reference tool/methodology for additionality condition | ACM0002. Grid-connected electricity generation from renewable sources |
| Existing condition | The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the host country is ≤ 2% |

18. The technology has been discussed with examples from solar PV (section 1.10 of Appendix 1 above), CSP technology (section 1.13 of Appendix 1 above) and off-shore wind technology (section 1.15 of Appendix 1 above).

19. As per the findings, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 10. Renewable energy power generation in isolated grids

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0103. Renewable energy power generation in isolated grids |

| | |
|---|---|
| Existing condition | The percentage share of total installed isolated grid power generation capacity of the specific technology in the total installed isolated grid power generation capacity in the host country is ≤ 2% |

20. The technology is expected to show same characteristics as that of the grid connected solar PV and off-shore wind technologies as discussed above. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 11. Increasing the composition of blend in the cement production

| | |
|---|---|
| Reference tool/methodology for additionality condition | ACM0005. Increasing the blend in cement production |
| Existing condition | In order to demonstrate additionality using "First-of-its-kind" barrier, the applicable geographical area shall include the entire domestic market in the host country and the methodology requires information concerning the market share for the blended cement sold in the domestic market in the host country. The project activity shall be considered as the one that applies a technology that is different from any other technologies that are able to deliver the same output (blended cement) if the market share for blended cement in the host country is < 5%. |

21. The methodology clearly defines the calculation of market share. It is stated that, "*The market share shall be calculated as the percentage of the amount of blended cement in the total amount of all cement types produced in the host country ((tons of blended cement/total tons of cement production) x100%) during the last three years prior to: (a) the start date of the CDM project activity; or (b) the start of validation, whatever is earlier. The market share value must be based on reliable and publicly available data sources (e.g., cement manufacturers associations or governmental agencies). Other CDM projects shall be included in this assessment".*

22. Global blended cement use has been increasing since 2005 and was around 25% of global production in 2015[10]. The share of blended cement production out of the total cement production in India was 68% in 2010 and increased to 73% in 2017[11]. The market condition is expected to vary based on the type of blended cement and by the country or region.

23. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

[10] https://www.researchgate.net/figure/Prediction-of-emissions-and-market-share-of-low-clinker-cements_fig3_239563282 - last accessed on 07/08/2019

[11] Low Carbon Technology Roadmap for the Indian Cement Sector: Status Review 2018, WBCSD

## 12. Agricultural waste as feed stock for paper, cardboard and bio oil production

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0057. Avoided emissions from biomass wastes through use as feed stock in pulp and paper, cardboard, fibreboard or bio-oil production |
| Existing condition | Additionality is demonstrated as per Tool 1 "Tool for the demonstration and assessment of additionality". The barrier may also include the following:<br>The raw material is either not used or, in the case of pulp and paper, cardboard or fibreboard, less than 10% of production in the region is based on agricultural waste. |

24. In the developing countries like India, it is reported that only 49% of pulp & paper mills run on the forest-based pulp and the mills that are solely contingent on agro-based residues and recycled fiber have risen to 29% and 22% respectively[12]. In South Africa, around 65% of the country's paper mills depend on recycled fiber for production[13].

25. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region.

## 13. Self-ballasted CFLs

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0113. Distribution of compact fluorescent lamps (CFL) and light-emitting diode (LED) lamps to households |
| Existing condition | Common practice check for CFL:<br>The proposed project activity is considered as "common practice", if the market penetration of CFLs at the households in the geographical area of the project activity is >20%. |

26. The methodology uses technology diffusion level only to assess the common practice status of technology. The additionality must be proved only by assessing the prevailing barriers.

27. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

[12] India's Paper Industry: Productivity and Efficiency, Schumacher, K.; Sathaye, J. 1999.

[13] https://www.engineeringnews.co.za/article/paper-manufacturers-association-of-south-africa-2018-03-30/rep_id:4136 - last accessed on 07/08/2019

## 14. Electric taxiing in airports

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0116. Electric taxiing systems for airplanes |
| Existing condition | Common practice check and additionality<br>Applicable to percentage share of commercial airplanes operating an e-taxi system is ≤ 20 % in the total number of commercial airplanes registered in the host country |

28. The electric taxiing technology was first introduced only in 2003 and the first airline with the electric taxiing system was built in 2012. As of now, only few airlines around the world such as AirFrance (France), EasyJet (Britain), GoAir (India), Interjet (Mexico), etc., have started supporting electric taxiing in their airlines[14].

29. Thus, the accelerating growth rate approach can be applicable for this technology to assess the automatic additionality in the host country or region. In most cases, the technology might be within 2.5% diffusion level and could come under the first-of-its-kind in the host country.

## 15. Energy efficiency improvements in boilers

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0044. Energy efficiency improvement projects – boiler rehabilitation or replacement in industrial and district heating sectors |
| Existing condition | Common practice check<br>The common practice assessment shall determine whether or not and if required when, the existing boilers should be replaced during the project activity period. If more than 33% of the control group uses improved boilers that are similar to the project activity, then the project is not additional. |

30. The methodology uses the technology diffusion level only to assess the common practice status of technology. The additionality must be proved only by assessing the prevailing barriers.

31. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

[14] https://en.wikipedia.org/wiki/EGTS - last accessed on 07/08/2019

## 16. Commercial refrigeration / domestic refrigeration

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0071. Manufacturing and servicing of domestic refrigeration appliances using a low Global Warming Potential (GWP) refrigerant |
| Existing condition | Applicability check:<br>The market share of domestic/small commercial refrigeration appliances, which are produced and sold in the host country and charged with low GWP refrigerants, is below 50 per cent at the time of validation of the project activity |

32. The methodology uses technology diffusion level only to assess the common practice of technology. The additionality must be proved only by assessing the prevailing barriers.

33. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 17. Conversion of single cycle to combined cycle power generation

| | |
|---|---|
| Reference tool/methodology for additionality condition | ACM0007. Conversion from single cycle to combined cycle power generation |
| Existing condition | Common practice check:<br>The project activity is regarded as the common practice if >50% of the assessed power plants operate in combined cycle mode. A power plant is considered to operate in the combined cycle mode if any of its units operate in the combined cycle mode. |

34. The methodology uses technology diffusion level only to assess the common practice of technology. The additionality must be proved only by assessing the prevailing barriers.

35. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 18. Utilizing waste heat to pre heat the raw materials in iron manufacturing

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0066. GHG emission reductions through waste heat utilization for pre-heating of raw materials in sponge iron manufacturing process |
| Existing condition | Common practice check:<br>If at least 50% of sponge iron plants in the geographical area have a pre-heater installed, the |

| | |
|---|---|
| | project activity shall be considered a common practice and as such is not additional. |

36. The methodology uses technology diffusion level only to assess the common practice of technology. The additionality must be proved only by assessing the prevailing barriers.

37. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 19. Establishing high voltage direct current transmission line

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0097. Installation of high voltage direct current power transmission line |
| Existing condition | Common practice check:<br>If no activities similar to the proposed CDM project activity are found in a period of five years preceding the project activity, the project participants can refer to a ten year data vintage for analysis. If no similar project activities are found in the ten-year data as well, the project participants can conclude that the project is not a common practice in the geographical region. |

38. The methodology has not defined any threshold value for the technology diffusion. It uses technology diffusion level only to assess the common practice. The additionality must be proved only by assessing the prevailing barriers.

39. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 20. High speed passenger rail system

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0101. High speed passenger rail systems |
| Existing condition | Common practice check:<br>At country level assessment, the share of domestic passenger km travelled in the existing HSR systems is equal to or less than 20 % of total domestic inter- urban passenger km travelled in the rail systems in the host country |

40. The methodology uses technology diffusion level only to assess the common practice status of technology. The additionality must be proved only by assessing the prevailing barriers.

41. Hence the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 21. Mass rapid transit system (MRTS)

| | |
|---|---|
| Reference tool/methodology for additionality condition | ACM0016. Mass rapid transit projects |
| Existing condition | Common practice check:<br>At country level assessment, if there are fewer than three cities with MRTSs in the country (OR) the share of motorized trips realized in the existing transport systems that are of the same category of public transport as the proposed CDM project activity, is ≤ 20% of the total motorized public transport trips in the host city. |

42. The methodology uses technology diffusion level only to assess the common practice status of technology. The additionality must be proved only by assessing the prevailing barriers.

43. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 22. Bus rapid transit system

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0031. Bus rapid transit projects |
| Existing condition | Common practice check:<br>At country level assessment, if there are fewer than three cities with BRTSs in the country (OR) the share of motorized trips realized in the existing transport systems that are of the same category of public transport as the proposed CDM project activity, is ≤ 20% of the total motorized public transport trips in the host city. |

44. The methodology uses technology diffusion level only to assess the common practice status of technology. The additionality must be proved only by assessing the prevailing barriers.

45. Hence, the accelerating growth rate assessment for the automatic additionality will not be applicable for this technology in its current format. This accelerating growth rate approach for demonstration of the automatic additionality could be used if the methodology is amended suitably to accommodate this condition in future.

## 23. Rural electrification through renewable energy source / grid extension

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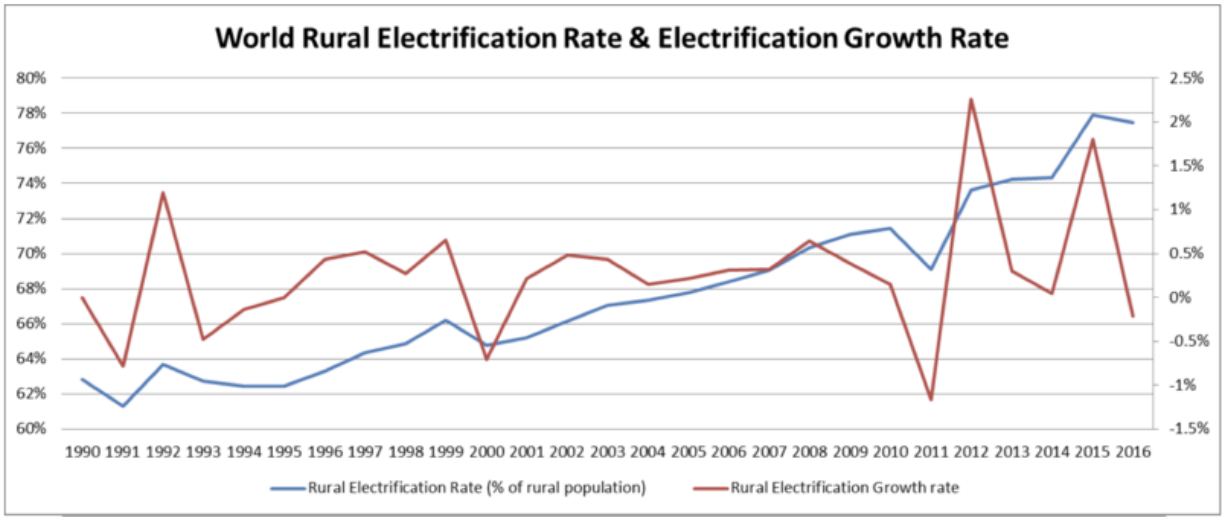
|---|---|
| Reference tool/methodology for additionality condition | Tool 21. Demonstration of additionality of small-scale project activities |
| Existing condition | • Rural electrification rate in the country is below 50%<br>• Rural electrification rate has increased less than 20% over the past 10 years (for grid extension) |

46. The rural electrification has reached more than 50% in most of the developing countries in Asia and South America[15]. The rural electrification is less than 50% in most of the African countries[16] and the average increase in access rate in African countries is expected to be around 1.5 - 2% per year[17].

47. The rural electrification projects are highly capital intensive, require large resources and infrastructure and mostly are under taken by the government authorities. Given these conditions, the electrification rate in a region or country may show different growth scenarios in the developing and the under developed countries. The figure 6 provides the average growth rate of global rural electrification[18].

**Figure 6. Global average rural electrification rate**




48. It can be observed that the average growth rate is fluctuating between 2.5% to -1.5% over the years. Hence, the accelerating growth rate approach for automatic additionality check can be applicable as per the country condition.

[15] IEA, rural electrification, 2016

[16] IEA, rural electrification, 2016

[17] https://www.brookings.edu/blog/africa-in-focus/2019/03/29/figure-of-the-week-electricity-access-in-africa/ - last accessed on 07/08/2019

[18] https://en.wikipedia.org/wiki/Rural_electrification - last accessed on 07/08/2019

## 24. Alternate waste treatment processes

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|---|---|
| Reference tool/methodology for additionality condition | ACM0022. Alternative waste treatment processes |
| Existing condition | Project deemed automatically additional, if<br>• Municipal Solid Waste (MSW) collection coverage is less than 50%<br>• MSW collection coverage is 50–80% for the applicable geographical region and if the waste received by the project composting facility does not have formal (i.e. excluding recycling by the informal sector) segregation of wet and dry waste<br>• < 2% of the collected MSW of the municipality (or the region from where the MSW treated by the project activity is sourced) are treated by composting in the year before the PDD is published for global stakeholder consultation. |

49. The waste collection percentage is less than 50% in the low-income countries (like Kenya, Nepal and Vietnam) and composting of the collected waste is rarely done. In the middle-income countries (e.g., South Africa, India, Thailand, etc.), the waste collection is around 50-80% and the composting has not been successful due to the issues of non-segregation of waste at source[19].

50. The solid waste management projects are highly capital intensive, require large resources and infrastructure and mostly operated through the government authorities. Given these conditions, the waste collection rate in a city or region or country may show different growth scenario in the developing and the under developed countries.

51. Hence, the accelerating growth rate approach for automatic additionality check can be applicable as per the country condition.

## 25. District cooling system

| | |
|---|---|
| Reference tool/methodology for additionality condition | AM0117. Introduction of a new district cooling system |
| Existing condition | The share of the district cooling technologies at the moment of the project registration is < 20 percent of all cooling technologies within the benchmark boundary in terms of cooling output. The share of technologies can be derived from official country reports, third party surveys and/or credible international sources (e.g. International Energy Agency (IEA)) |

[19] What a waste - a global review of solid waste management, WB, 2012

52. The district cooling system is an emerging technology and currently commercialized only in the developed countries especially United States of America and Japan. The market share of district cooling systems in European Union is only is less than 1% of the total present existing European cooling market including residential[20]. Therefore, the technology is expected to be first-of-its-kind in the developing and under developed countries.

53. Hence, the accelerating growth rate approach for automatic additionality can be applicable for this technology. In most cases, the technology might be within 2.5% diffusion level and could come under the first-of-its-kind in the host country.

## 26. Liquefied natural gas (LNG) fuelled buses

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|---|---|
| Reference tool/methodology for additionality condition | AMS-III.AY.: Introduction of LNG buses to existing and new bus routes |
| Existing condition | Demonstrate ex ante that the market share of project buses is ≤ 5% of the buses (not only public transport bus) in the region |

54. Natural gas vehicles are popular in regions or countries where natural gas is abundant and where the government chooses to price compressed natural gas (CNG) lower than gasoline. China has been a leader in the use of LNG vehicles with over 100,000 liquefied natural gas (LNG) powered vehicles on the road as of 2014. In Latin America, almost 90% of natural gas vehicles have bi-fuel engines, allowing these vehicles to run on either gasoline or LNG. In Pakistan, almost every vehicle converted to (or manufactured for) alternative fuel use typically retains the capability of running on gasoline. Pakistan's market share of natural gas vehicles was 61.1% in 2010, followed by Armenia with more than 77% (2014), and Bolivia with 20%. An increasing number of vehicles worldwide are being manufactured to run on natural gas by the major automakers[21].

55. Hence, the accelerating growth rate approach for automatic additionality can be applicable for this technology.

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[20] Renewable smart cooling for urban Europe - EU district cooling market and trends 2014

[21] https://en.wikipedia.org/wiki/Natural_gas_vehicle - last accessed on 07/08/2019

## Document information

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