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# Legal Frameworks for Renewable Energy

**Policy Analysis for 15 Developing and Emerging Countries**


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# Preface

Renewable energies (RE) hold the key to a climate friendly energy future and an energy supply that is sustainable and secure in the long term. Since the Bonn Renewable Energy Conference in 2004, numerous developed and developing countries have increasingly set targets for the utilisation of renewable energies in meeting their power supply needs. In order to reach their targets, many countries have designed and implemented a variety of policies, strategies and instruments. Our initial assessment was that only a few countries had implemented these comprehensively enough to reach their self-set targets.

To verify our assessment, we compiled a comprehensive overview of the progress made in establishing legal frameworks for renewable energies in 15 partner countries of German development cooperation. This overview is presented here. In some of the countries, GIZ is – on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) – advising partners on creating an enabling environment for renewable energies. Of course, through technical cooperation we can only give advice according to the requirements of our partners. Decisions on electricity tariffs, for example, are often very political and foreign advice can only exert a certain amount of influence. Nevertheless, we must endeavour to continually improve our advisory services, and this report should contribute to this process.

The study is part of the work of the GIZ project on 'Technology cooperation in the energy sector' commissioned by BMZ. In addition to the report, we have also produced a spreadsheet providing comprehensive information on the countries analysed. This is available separately.

We would like to thank Ecofys Germany GmbH for all their hard work on the study, as well as our colleagues in the various partner countries for their invaluable input.

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# Abstract


## Need for Good Practice in RE support Policies

Due to the growing importance of renewable energy on global scale, a need for effective support policies arises in many countries. Often, policy instruments showing good results are highlighted as 'good practice', and thus recommended for adoption in other countries. However, such a transfer of 'good practice policies' often stays behind expectations or leads to failure. Therefore, independent from the type of instrument, it is most important for policy makers to understand:

- Why do policies work (or do not)?
- Which factors of influence are relevant for success or failure?
- How can these factors be isolated and their effect be understood in detail?

For improving RE policy design on an international level, an indicator based approach is required, analysing the functioning principles behind policies immaterial of their respective type (i.e. feed-in tariff, quota etc.), allowing to answer these questions individually for each policy context and set priorities in policy advice accordingly.

## Methodology

The theoretical fundament for this analysis is a simplified concept of the "Policy Design Cycle"[1], originating from the scientific approach of "Theory Based Policy Analysis"[2] . The Policy Design Cycle defines pragmatic categories for consistency and effectiveness of RE support schemes in different national contexts, allowing policy makers to derive concrete action out of a complex set of influencing factors.

The methodology is valid for any policy type. The Policy Design Cycle defines five levels of general design criteria to be considered for consistent and thus effective renewable energy sources support policies:

1. definition of renewable energy sources targets;
2. definition of a strategy for reaching the targets;
3. definition of concrete measures for implementing the strategy;
4. enforcement and monitoring;
5. evaluation of compliance.

The Policy Design Cycle is not assessing policies in a sense of a ranking between good and less good practice, but it helps to determine and evaluate their general functioning principles, which, if complying with the criteria given, facilitate good results under any policy approach and country context.

## Theory and Practice

To further illustrate current approaches and related difficulties in RE policy making, the study gives a brief overview on the ten most common types of policy instruments, highlighting differences in theory and practice and the general role of barriers.


1 a scientific approach developed under the European Union project AID-EE.

2 developed by Blumstein et al. (1998).

## Analysis of RE policies in 15 countries

According to the Policy Design Cycle, country analysis is based on an indicator-based, comparison-focused approach, assembling all available data in standardised form.
Core part of the study is a complex, spreadsheet based data structure. The country specific text chapters must be read as accompanying framework, on the one hand explaining the methodological approach, on the other hand summarizing key information of the current situation in the respective countries.

Based on the data structure, the current status of renewable energy support in fifteen countries (Brazil, Chile, China, Egypt, Ethiopia, Ghana, India, Indonesia, Kenya, Mongolia, Morocco, Philippines, South Africa, Thailand, and Tunisia) is examined. In addition, for ten of the fifteen countries (Brazil, Egypt, Ghana, India, Indonesia, Kenya, Morocco, Philippines, South Africa, and Tunisia) the study performs policy analyses and identifies potential future fields of action to help improve local renewable energy support.

Purpose of the data structure and the accompanying text is to provide an insight into each country's individual stage of RE policy making, structured along a homogeneous set of criteria. The aim of the study is neither an assessment of good or bad policy approaches nor a ranking of market attractiveness. The overarching purpose is to create a more systematic approach for understanding stages of RE policies in heterogeneous contexts, to be applied and adequately interpreted by competent users.

In addition, the country data provide a rich stock of information for mutual learning on RE policies, both on successful individual approaches designed according to country specific situations (e.g. the auctioning of RE capacity in Brazil) and on differing motivations of countries where to set their focus on RE (e.g. Ethiopia prioritizing electrification as such) or the origin of deadlocks for RE legislation (e.g. unresolved conflicts between RE tariffs and possible price effects in various countries).

Key questions (maturity of the policy framework, degree of successful implementation, successful financing, condition of the electricity network, as well as potential barriers) allow isolate information serving as indicators for market development. An overview matrix with filter options, both on a country and indicator level, provides a synthesis of all information, which allows a detailed comparison of most relevant aspects. Nevertheless, the user has to be aware that despite the standardized approach most data must be read in a qualitative sense, i.e. not being comparable 1:1, and thus requiring additional interpretation according to the context of their use.

## Main conclusions

The main result of the study consists of a structured mapping of individual strengths and weaknesses of RE policies against the respective background of a country, i.e. their success in comparison to each country's individual ambition. This is supportive to strategic considerations on setting focus in international collaboration and on how to prioritize further potential activities. A main conclusion derived from country data gathered in this context, and compared to the Policy Design Cycle, is that in none of the country examples all levels have been addressed. With respect to the single levels, the study shows that RE target setting is part of policies of nearly all countries examined, but considerably varying in the degree of ambition.

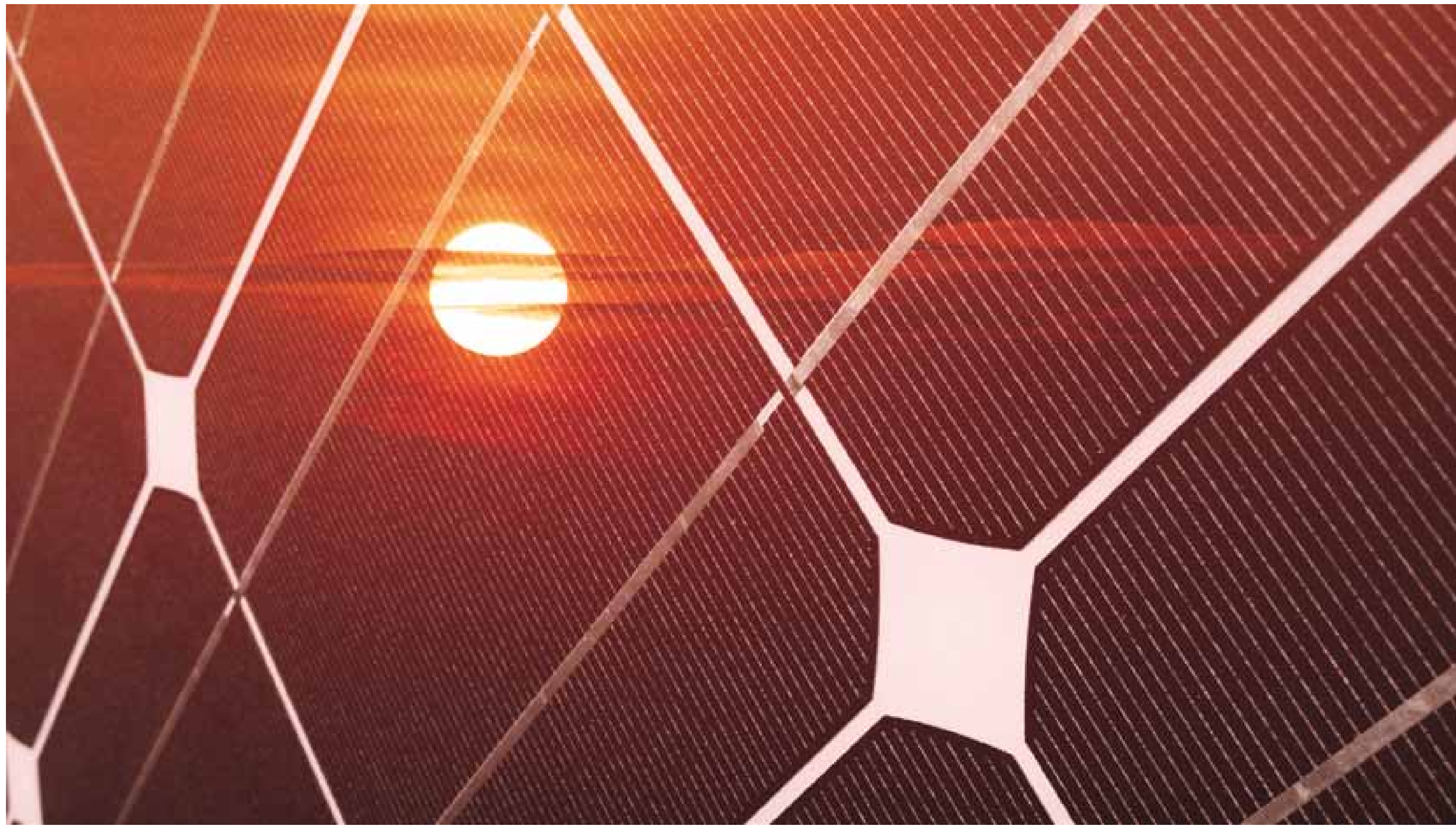
Most countries have established some type of RE support instrument. Options chosen vary considerably, most common are public tendering, tax rebates, and feed in tariffs. Most of these instruments are facing (sometimes massive) implementation problems and, where ambitious targets are in place, they will not lead to their compliance.

As a consequence, international policy support activities, currently often focusing on design and implementation of concrete instruments, might be more effective where analyzing in the first place and at broader level if the instrument chosen for a country fits to its target/level of ambition and other influencing factors.

Commonly, failure of instruments does not only result from insufficient design of a single policy instrument, but goes in fact beyond: major gaps concerning a consistent political strategy to reach the respective target can be detected in most of the countries examined. This applies especially if interference with other policy areas occurs, e.g. cost for RE conflicting with social welfare policies focusing on low energy prices.

Stakeholder commitment across several policy areas is required to establish a modus operandi on how to deal with structural changes due to RE deployment. Although often evident, these gaps are not sufficiently in the focus of further political action. Therefore, international action should develop a broader focus to address such strategy gaps.

Financing of policy approaches is a general problem throughout many countries. Even if a government's commitment to RE goes far enough to accept certain related price increases, the overall amount of cost due to paradigm shifts in the energy system (e.g. grid infrastructure investments) may exceed available funding. Further advice should be provided especially on the option of financing RE support policies through the mechanism of NAMAs (National Appropriate Mitigation Actions).



# Introduction

Due to the growing importance of renewable energy on global scale, a need for effective support policies arises in many countries. Experts often take so-called “good practice examples”, which promise high effectiveness and efficiency, as the basis to design similar polices for other countries, hoping that they would work as successfully in the target country as in the country of origin. Yet, the practical transfer of these policies is often very problematic and, in many cases, even leads to complete failure. This is because each country has a unique political, economic, and social setting that heavily influences the functionality and impact of policies. There are different administrative structures, varying stakeholder interests, different market conditions, or simply contrary political goals that affect the success or failure of a policy. In addition, many papers that have been prepared in recent years lacked the possibility to effectively compare parameters that are essential for successful renewable energy support because their text-based nature limited authors in addressing all relevant aspects.

This study does not try to take best practice examples as the basic principle for its argumentation. Rather, it builds up on an indicator-based, comparison-focused approach, assembling all available data in standardised form. Core part of the study is a complex, spreadsheet based data structure.[3] Therefore, the following text should be understood just as an accompanying framework, on the one hand explaining the methodological approach, and on the other hand summarizing key information of the current situation in the respective countries.

3 The spreadsheet based data structure can be downloaded on the GIZ homepage via this link: http://www.giz.de/Themen/de/4552.htm

Purpose of the data structure and the accompanying text is to provide an insight into each country’s individual stage of RE policy making, structured along a homogeneous set of criteria. To prevent misinterpretations, it must be highlighted at this point that the aim of the study is neither an assessment of good or bad policy approaches nor a ranking of market attractiveness. The overarching purpose is to create a more systematic approach for understanding stages of RE policies in heterogeneous contexts, to be applied and adequately interpreted by competent users.

Key questions (maturity of the policy framework, degree of successful implementation, successful financing, condition of the electricity network, as well as potential barriers) allow the isolation of information that can serve as indicators for market development. Moreover, an overview matrix with filter options, both on a country and indicator level, provides a synthesis of all information, which allows a detailed comparison of most relevant aspects. Nevertheless, the user has to be aware that despite the standardized approach most data are still not comparable 1:1, i.e. the result is qualitative analysis requiring additional interpretation according to the context of their use.

Based on the information collected in the spread-sheet, the following text describes the current status of renewable energy support in fifteen developing and newly industrialized countries, which are Brazil, Chile, China, Egypt, Ethiopia, Ghana, India, Indonesia, Kenya, Mongolia, Morocco, Philippines, South Africa, Thailand, and Tunisia. In addition, for ten of the fifteen countries (Brazil, Egypt, Ghana, India, Indonesia, Kenya, Morocco, Philippines, South Africa, and Tunisia) the study performs policy analyses and identifies potential future fields of action to help improve the local renewable energy support. These recommendations are tailored to the work of the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) in these areas.

The first chapter gives the reader an understanding of how to use the data structure for policy analysis. It includes the explanation of the methodological approach of the study, the Policy Design Cycle, and explores the opportunities this theoretical model offers to provide policy advice.

In the second chapter, the study provides an introductory overview of the most common and successful policies for renewable energy support, including descriptions of prominent instruments such as feed in tariffs (FiTs), renewable portfolio standards/quotas (RPS), or schemes of public competitive bidding. This section functions as an insight for readers into the availability of existing policies and discloses their theoretical functionality. A synoptical table then presents advantages and disadvantages of the presented policy options. An additional subchapter portrays barriers on RE support instruments that policymakers usually need to address in the design of renewable energy policies. Such challenges – the subsidizing of fossil fuels, technical problems, or a monopolized electricity market, for instance – occur in many emerging renewable energy markets.

The third chapter focuses on the presentation of the information and conclusions found in the research on the selected countries. Split into two major subchapters, the first part presents the information composed in the spreadsheet, providing a comprehensive table with the entire collected data. The spreadsheet itself with its functionality for sorting, filtering, and comparing data can be found in the annex to this document. In the second part, the raw data of the spreadsheet is converted into a textual format, providing 15 separate country chapters that include summaries of the findings of these countries. For ten countries, separate subchapters disclose policy analyses and recommendations that identify gaps and conclusions on future requirements for renewable energy development in the respective countries. The conclusions also point at possible future areas of GIZ engagement in the promotion of sound policy frameworks.

The fourth chapter summarizes the findings of the study and draws conclusions on the scope of potential further international activities as provided by GIZ.

Gaps in data availability are visualized in the data structure. In contradiction to a merely text based study, they can be used in a constructive way (such as by pointing at future needs for information gathering) and additional information can be filled in any time without changing the overall structure.

# 1

# How to use the data structure for policy analysis

## 1.1 Understanding the methodological approach

The main difficulty for all stakeholders involved in policy design is to understand:

a) Why do policies work (or do not)?
b) What are the main influencing factors?
c) How can these be isolated and their relevance be understood?

These questions have to be answered individually for each policy to determine which action makes sense and how priorities are to be set. As this analysis of many different aspects may become rather complex, the application of the Policy Design Cycle (details see below) facilitates the structuring of this process. The methodology is valid for any policy and country contexts. Each policy can be analysed along five steps of compliance. If all five steps are considered to full degree, any policy - regardless of type or scope – is consistent in itself and therefore able to lead to effective results.

In most countries and regarding most existing policies (sometimes even successful ones) the steps of the Policy Design Cycle are not fully covered. Applying the methodology allows to identify gaps and to better understand inconsistencies. Subsequent to this analysis, specific answers can be elaborated on steps a country should take towards an improved, consistent RE support system.

## 1.2 The Policy Design Cycle

The theoretical fundament for this analysis work is a simplified concept of the "Policy Design Cycle", a scientific approach developed under the European Union (EU) project AID-EE. The Policy Design Cycle itself has its origin in the concept of "Theory Based Policy Analysis", developed by Blumstein et al. (1998). The Policy Design Cycle defines pragmatic categories for consistency and effectiveness of RE support schemes in different national contexts.

The Policy Design Cycle is not assessing policies in a sense of a ranking between good and less good practice, but it identifies the general functioning principles, which, if addressed completely, will lead to good results under any policy approach.

Therefore, the Policy Design Cycle defines five levels of general design criteria to be considered for consistent and thus effective renewable energy sources support policies:

1 definition of renewable energy sources targets;
2 definition of a strategy for reaching the target;
3 definition of concrete measures for implementing the strategy;
4 enforcement and monitoring;
5 evaluation of compliance.

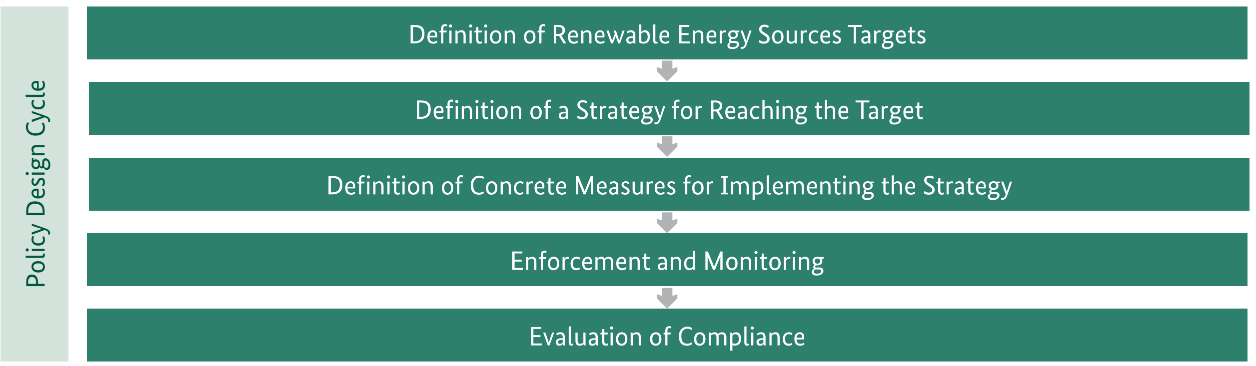



Figure 1: Structure of the Policy Design Cycle

In addition, as an important precondition a sound barrier analysis needs to be performed before starting the process. As long as policy-makers do not remove these barriers or address them properly, all following steps will be negatively affected. Assessment of the respective policy approach will attest a low degree of maturity.

When policy makers design policies according to the Policy Design Cycle, they need to take into account the follow criteria:

1 **Definition of renewable energy sources targets:**
Targets are a key element for determining the expectations to any policy instrument. A target reflects an explicit vision of policy makers to develop RE. A strong target should therefore be ambitious, but at the same time realistic. To generate an impact, a target has to be specific, measurable, and time-bound (e. g. double the share of renewable energy in electricity production from 12 % to 25 % by 2020 compared to 1990). It should be as concrete as possible when defining the expected impact (e. g. generation targets are more explicit regarding measurable effects than capacity targets).

2 **Definition of a strategy for reaching the target:**
A well designed strategy has to provide precise answers on how to achieve the targets. Both the technical and economic potentials of RE and appropriate technologies for using them in the most efficient way need to be identified, same as stakeholders to be involved. Necessary tasks and resources must be defined, taking into consideration deficiencies of current work programs and institutional structures. It is important to consider possible antagonistic interests in other policy areas (e. g. budget effects) and define a modus operandi to prevent deadlocks.

3 **Definition of concrete measures for implementing the strategy:**
Taking into account the analysis of existing barriers (precondition) and having dealt with them under a strategy (level 2), suitable policy instruments for reaching the targets (level 1), need to be developed. The instruments should be complementary to each other and form a consistent package. Appropriate administrative structures for implementation need to be developed. Staff needs to be well instructed and supportive to the instrument. All other relevant stakeholders need to be involved in a discussion process of the planned policy, even those who might be opposed. Their remarks should be taken into account.

4 **Enforcement and monitoring:**
A legal and institutional infrastructure for enforcement and ensuring compliance needs to be established. A robust structure for monitoring (independent institution with access to all relevant data, following a transparent process subject to public reporting) has to be established already in the set-up phase of the instruments.

5 **Evaluation of compliance:**
In addition to monitoring, a regular (e. g. every 3-4 years) evaluation of the results achieved has to be performed. The assessment process must be transparent, independent and fair. It should be executed by an independent institution not tied to any of the stakeholders involved (i. e. not from administration, utilities etc.). The results of the evaluation should be used in a defined and prompt amendment process of the policy.

### Example: Germany's RE Feed-In Law (EEG)

The German Renewable Energy Act (EEG) is one of very few policies in which all steps of the Policy Design Cycle have been applied consequently. This is one of the reasons why it ranges among the most successful RE support policies worldwide, independent from the type of instrument, the law contains both, the support scheme as such and strategic legislation. Germany passed the act in 2000 and revised it regularly in subsequent years to respond to changes in the market and to RE technology improvements. Applying the Policy Design Cycle, the law shows the following features:

**Step 1:** Germany has set medium-term as well as long-term RE targets, which all focus on the relative share of RE in electricity consumption. By 2020, Germany aims to consume at least 35 % of its electricity from RE sources. By 2050, this share should rise to 80 %.

**Step 2:** The EEG, contains relevant strategic elements on how to meet targets with the instrument of a feed in tariff. On potentially conflictive issues, default procedures are defined, e.g. a maximum duration of administrative procedures, a standardized methodology for assessment of ecological impact, a partition mode of potential RE sites among municipalities, a cost sharing mechanism among involved parties, etc.

**Step 3:** The feed-in tariff, i.e. the support instrument as such, legally guarantees a minimum tariff specific to each RE technology. Any power producer will receive it over a 15/20-year period and has a legally guaranteed grid access under a standardized procedure. RE has priority to conventional sources, i.e. all RE electricity generated is actually fed in. To finance the instrument, consumers pay a surcharge on the electricity price. For cost control and stimulation of competitiveness, a degression of tariffs for newly installed appliances takes place each year.

**Step 4:** The law comprises continuous monitoring processes, such as an independent examination of price effects. The working group on RE-statistics AGEE-Stat, an independent expert body commissioned by the Federal Ministries of Economy and of the Environment, records data and delivers statistics for renewable energy.

**Step 5:** The law prescribes an independent evaluation of its effects: target achievement, technology developments, tapping of potentials etc. have to be examined every 3-4 years, leading to regular official revisions of the law (and a.o. to tariff adjustments if required).
As a result, the main success factor of the EEG is not merely the amount of tariffs paid. Of even importance, the law is consistent due to complementarity of its modules. It works effectively, tackling even controversial issues by a default modus operandi, and thus providing a high degree of investment security.

## 1.3 Giving Policy Advice Based on the Methodology

Applying the Policy Design Cycle on a country's RE policy might show the following typical situation:

1. **Step 1:** The country has set itself an ambitious RE target, acknowledging in general the positive effects RE may have on its energy supply.
2. **Step 2:** The country has issued a policy paper, called energy strategy, drafting the transition towards higher RE shares.
3. **Step 3:** The country has a policy instrument in place but experience has shown that deployment figures are far below the amount required for target achievement.
4. **Step 4:** No official monitoring process is in place.
5. **Step 5:** No independent evaluation process is established, but government analysis shows that investment security is too low due to missing legal status of the instrument, the amount of financial support is too low due to expected negative price effects, and administrative procedures are unclear and lengthy.

Giving advice on improving such situation should not limit itself to mending the perceived deficiencies of the support instrument. Rather, a thorough gap analysis of all steps of the Policy Design Cycle should be performed first. For this purpose, all available information on the RE support system and accompanying general information on the energy market must be gathered and then be allocated to one of the steps of the Policy Design Cycle. As the availability and quality of information may vary considerably per country, information gaps as such must also be taken into account as weaknesses regarding coverage of the steps of the design cycle.

In the above example, it becomes obvious that not only the instrument (i.e. step 3) is designed in an inappropriate way, but rather the strategy (step 2) has significant weaknesses. Providing financial support to RE on the one hand but fearing price increases on the other hand is likely to lead to a deadlock. Therefore, under a thorough strategy, e.g. a corridor for price development could be defined, accompanied by calculating expected positive welfare effects of RE, to raise acceptance. The introduction of proper monitoring procedures (step 4) can additionally facilitate this. Similarly, default administrative procedures should be defined under a strategy.

Transferring this into reality is definitely far more complex than these examples. Giving advice must therefore always follow the individual reflections of experts dealing with a given set of information. The gap analysis will not deliver a blueprint for defining required action (and must not be misunderstood in this way), but it will help qualified users to better structure and understand this multitude of influencing factors, and define appropriate next steps and priorities of action.

# 2

# Theoretical Overview: Existing RE Support Instruments

With respect to step 3 of the Policy Design Cycle, the choice of an appropriate support instrument, a couple of common approaches are to be distinguished. It must be remarked that these approaches differ considerably in theory and practice. Furthermore in practice not only one, but a mix of instruments might be implemented. Depending on the local initial situation, the costs of fossil fuels and renewable energy technologies and the respective strategy, a country may implement one instrument with the aim to substitute it by another after a predefined period.

Here, an overview on the theoretical features of the ten most common support instruments is provided. Some reference is given to examples where the instrument is applied in practice. While the first 6 instruments display primary measures, the last 4 (2.7 through 2.10) are complementary measures that support stronger instruments.

## 2.1 Feed-in Tariffs

The key feature of a feed-in tariff is a guaranteed payment of a fixed (minimum) price per kilowatt-hour (kWh) to renewable energy power producers. The most relevant design criteria for an effective feed-in tariff are:

- Guaranteed and preferential grid access and dispatch of electricity from renewable energies
- Sufficient minimum feed-in tariffs
- Legal security for beneficiaries, as for instance the amount of feed-in tariffs guaranteed by law over a sufficient period over which the tariff is paid (at least to amortize investment cost; preferably it should cover the life time of the equipment)
- Individual feed-in tariffs for each renewable energy technology
- Cost reduction potential (degression)

An additional precondition that applies to other policies as well is a timely and transparent permission process.

Typical advantages of well-designed feed-in tariffs are:

- high effectiveness;
- investment security/bankability due to guaranteed return on investment and long term perspectives;
- high stimulation of dynamic (domestic) markets for renewable energy equipment and encouragement of technical innovation, job creation and increased efficiency/cost reduction potentials.

Disadvantages are direct cost effects increasing the electricity price for end consumers or the need of considerable funding from state budget. Furthermore disadvantages are the difficulty to predict, to control and especially to timely adjust the penetration speed. A too slow adjustment of too high tariffs may effect in unforeseen (and unwanted) relative and absolute participation of the different variable sources, higher than expected direct and indirect costs as well as local and systematic grid stability effects. This may also result in effects on energy planning, price signals and incentives in the conventional electricity markets. A belated adjustment may be harsh on a still developing industry sector that formerly enjoyed excessive growth rates. Therefore feed-in tariffs are rather difficult to design and numerous aspects need to be considered.

Feed in tariffs seem to work best in countries where the long-term reliability and continuity of public policies as well as the legal security for individual and relatively small investors are relatively high. A regulating authority guaranteeing a levelled playing field for all power producers should be in place.

In practice, feed-in tariffs often do not fulfil some or even all of the criteria given above. Currently 87 states have introduced feed-in tariffs[4], but only about a dozen of them have significant impact on RE deployment. The most evident deficiency of such feed-in regimes is the amount of tariffs, considered insufficient by investors. In fact, other aspects influencing investment security (e.g. missing legal status or limited grid access) are often neglected.

One of the most prominent examples of a well working feed-in tariff is the German EEG – see section 2.2. Of the countries examined in this study, China, parts of India, Indonesia, Kenya, Mongolia, and Thailand have a feed-in tariff in place, but only in Mongolia and Thailand at the status of a law.

4 REN21 Global Status Report 2011

## 2.2 Renewable Portfolio Standards or Quotas

Quota obligations, also called renewable obligations or renewable portfolio standards impose a minimum share of RE in the overall electricity mix. Governments can impose this obligation on consumers, retailers, or producers of power. A quota obligation system is often combined with tradable green certificates (see below), although this does not necessarily have to be the case. Financial support for the producers of renewable energy electricity is often provided through penalty payments that parties need to pay in case of non-compliance. The financial value of electricity from renewable energy sources (or green certificates) is determined by the level of the quota obligation, the size and allocation of the penalty, and the duration of renewable energy power being eligible under the quota system. Appropriate fine-tuning of a quota obligation system is of utmost importance for effective promotion of electricity from renewable energy sources. If the quota obligation is set too low, or if the penalty is too weak or not enforced, there will be only insufficient stimulation to initiate new renewable energy power projects.

Obligation levels need to be set well in advance and the quota itself needs to cover a sufficient period in order to guarantee future demand for renewable energy. Penalties need to be significantly above green certificate prices and enforcement should be guaranteed. In an oligopolistic market, the penalty can lose its effectiveness if obliged parties manage to negotiate contracts for certificate purchase that foresee the recycling to be paid to them. As a result, a large share of the penalty paid by the obliged party is returned to its budget.

In order to have markets functioning well, market design, size and competition are key parameters. If there are too many barriers on the supply side (e.g. grid access, siting problems), no real supply can be generated. This in turn could result in high prices for only few projects realised.

Most prominent examples for successfully working quota systems are Sweden and Norway, both combining their approaches with tradable RE certificates (see below) and moving to a joint (i.e. cross border) system as of 2012. The main success factor for these systems is a very shallow supply curve, i.e. a high availability of relatively cheap (compared to non RE capacity) RE potentials.
Of the countries examined in this study, Chile is applying a quota obligation system, same as parts of China and India. In the Philippines, it is planned but has not been implemented yet.

## 2.3 Tradable Renewable Energy Certificates

Renewable energy quota obligations often use tradable renewable energy certificates (REC) as additional feature to stimulate cost efficient solutions among renewable portfolio standards/quotas (also see above). Obligated parties (e.g. utilities) generate renewable energy certificates for the amount of kWh produced. If more electricity from renewable energy sources is produced above the minimum requirements of the quota, exceeding certificates can be sold to other parties which have not yet fulfilled their quota targets. This is attractive when the certificate price is lower than:

- the development cost for own projects and
- the penalty for non compliance, i.e. ideally least cost options for RE electricity deployment are developed first.

However, as explained above, if the quota obligation is set too low, the penalty is too low or not enforced; no trading of renewable energy certificates will take place. The value of RE electricity in the market will be low, causing insufficient stimulation of new projects.

## 2.4 Net Metering

Net metering aims at encouraging customer investment in renewable energy technologies. Usually it entails small renewable energy facilities, e.g. photovoltaics (PV), wind and home fuel cells. "Net" refers to the basic mechanism: electricity meters record both electricity consumption and electricity provision by consumers. What remains after deductions (electricity surplus or consumption) is the basis for the actual electricity bill. This way, consumers can balance their consumption and production of electricity and end up with a balanced account (and thus a balanced bill) or even receive a retail credit. This credit can either be billed on a monthly basis or include a monthly roll over of kWh credits.

Net metering is most feasible when generation cost of photovoltaics electricity (or other small renewable energy sources) is equal or even cheaper than the average retail price (based on productivity and/or supported by public subsidies).

On the one hand, net metering is technically easy to realise, because it works solely as an accounting procedure and requires no special metering. On the other hand, this mode of renewable energy incentive places the burdens of pioneering renewable energy primarily upon fragmented consumers, who do not have the bargaining power when negotiating with utilities (e.g. grid operator, energy producer).

Net metering regulations vary strongly from country to country, mainly with respect to the period within which credits can be used for compensation of purchased electricity (e.g. relating to varying seasonal peaks).

The most prominent example of a net metering scheme is that of California for photovoltaic power, where it is combined with other support instruments. Of the countries examined in this study, it is currently discussed in Morocco, Brazil and the Philippines.

## 2.5 Public Investment, Loan or Financing

In certain contexts, renewable energy projects can be financed directly through state authorities. This can e.g. make sense for the erection of demonstration or reference projects with a risk and payback structure not viable for commercial investors. Under monopolistic energy market conditions, renewable energy investments are often in fact public investments, e.g. when subsidised energy prices do not allow genuine investment by the utility.

However, for broader sector deployment, attractiveness to commercial investors is inevitable. Under competitive conditions, public investment is generally less efficient than private sector engagement. Therefore public investment should be restricted to those areas where markets have not yet developed or cannot deliver an appropriate technical framework for projects (e.g. grid infrastructure), and policy should rather create favourable legal conditions for private investment.

In practice, public investment is the most unspecific way of promoting RE, in fact limiting activities to single projects. Of the countries examined in this study, public investment has been practiced in some form in Brazil, China, Chile, Egypt, Ethiopia, Ghana, India, South Africa, and Thailand.

## 2.6 Public Competitive Bidding

National governments (or other institutions, e.g. obligated parties under a quota system) often aim at developing renewable energy potentials (e.g. potential sites for wind farms) under a tendering scheme. A call for tender asks project developers to submit bids to develop renewable energy projects. Tenders usually specify the capacity and/or production to be achieved and can be technology- or even project/site-specific. Winning parties are usually offered standard long-term purchase contracts while the price is determined competitively within the tender procedure. In such schemes to accomplish investment security for private investors it is important to announce long-term tenders including the specific amount for each technology that will be put out for tender each year.

The advantage of such system is site development according to cost efficiency criteria. On the other hand, competition of bidders may result in price dumping and subsequent delays or shortfalls of site developments, as specific site risks are not fully calculable beforehand. To minimize possible negative impacts, strict development requirements need to be imposed on bidders, leading to iteration of tenders if performance is insufficient.

Examples for public competitive bidding represented in this study are Egypt, Morocco, Tunisia, and South Africa.

## 2.7 Capital Subsidies, Grants, Rebates

Interest rates and repayment periods of loans have a major impact on the overall cost of renewable energy sources projects. Especially new technologies, smaller projects or project developers without a proven track-record often experience difficulties in obtaining commercial loans at reasonable conditions. Governments can increase commercial viability of projects significantly by offering capital subsidies, rebates, low interest loans or loan guarantees.

Such funding for specific technologies is offered either directly through state-owned banks or through subsidies to commercial banks. It can also be provided by international development banks or through international climate funds. The loans are characterised by reduced interest rates and/or longer repayment periods and can be combined with a rebate on the last amortization rates (e.g. depending on performance criteria) or other direct capital subsidies.

Governments can also only offer loan guarantees for certain projects. In that case, the government guarantees debt repayment to the lending bank, thus reducing risk and hence interest rate (e.g. 1 to 2 %), debt term and debt service conditions of the loan.

In practice capital subsidies for RE remain often quite unspecific regarding their actual impact. They are easy to introduce by government decision in tax regimes where a broad variety of exemptions already exists. Therefore, they are common in practice, but in most cases lack effectiveness as not based on detailed analysis of specific economic parameters for RE investment.

In the countries examined in this study, capital subsidies are applied to some degree in Chile, China, Ghana, India, Indonesia, South Africa, Thailand, and Tunisia.

## 2.8 Investment or Other Tax Credits

Investment tax exemptions (also called tax relief or tax credits) reduce the tax burden of a project. An investment tax exemption is linked to installed production capacity, initially increasing the overall performance of a project independent of its subsequent performance (compare below: production tax credits). Its effect is similar to that of an investment subsidy, which is paid up-front on the basis of installed capacity.

In project finance, an investment tax exemption has a favourable impact on the debt/equity structure under the same debt service requirements. Investment tax credits provide a high incentive for developing of new projects, but do not take into account operation over lifetime, in the worst case leading to a waste of public funding due to underperforming or non operational projects. I.e. at least at an aggregated level, the economic efficiency (amount of funding compared to result achieved) of investment subsidies is less favourable than in those schemes aiming at performance of the projects. In addition, like all tax credits, such schemes depend on government budgets and are thus subject to frequent political negotiations and annual budget constraints. Frequent policy changes increase risks in the project development phase and hinder the development of a renewable energy industry.

Alternatively, fiscal incentives could be announced and be guaranteed for a couple of years in advance. They could theoretically be financed through a surcharge on energy consumption, which adapts automatically to the amount of support paid, like it is done in some feed-in schemes. This would increase stability and reduce regulatory risk, but on the other hand limit governmental influence on the budget. Therefore, it is to be considered rather as a theoretical design option.

Additionally the specific reduction or exemption of import duties may lead to a decreased up-front investment and can therefore form a complementary measure to support RE.

## 2.9 Sales, Energy or Excise Tax or VAT Reduction

Except for investment or production tax credits, governments can politically improve the competitiveness of projects by reducing the related consumption taxes (value added tax (VAT) or energy tax). Flexible/accelerated depreciation schemes allow writing off a project faster (or differently) than usually would be allowed. Doing so, the tax benefit of depreciation can be maximised by the equity provider, provided this equity provider has a net income that is large enough to absorb this tax deduction. In general, an accelerated depreciation scheme will result in a higher overall net present value of the project.

In practice, the same applies to sales, energy or excise tax/VAT reductions as to capital subsidies (see above): they are easy to introduce but often very unspecific, and often adopted together with the first.
Of the countries examined in this study, China, Egypt, Ghana, India, Indonesia, Morocco, South Africa, and Thailand have in place some kind of tax reductions.

## 2.10 Energy Production Payments or Tax Credits

Electricity production tax exemptions (also called tax relief or tax credits) or similar payments (e.g. premiums) reduce the cost of a project in relation to the amount of electricity production. Economic performance and thus return on investment/bankability is increased, i.e. the equity provider is the beneficiary.

While an investment tax exemption (see above) has a favourable impact on the debt/equity structure of project finance under the same debt service requirements, the production tax exemption has not. The two key advantages of such schemes are a) simple and direct additional funding of projects and b) its incentive for generating a maximum of renewable energy. However, the success of the system fully depends on (annual) availability of state funding, irrelevant of energy policy targets or other framework. For example, the Production Tax Credit in the United States has stimulated considerable deployment of especially wind energy, but continuous success has been impaired by the stop-and-go nature of the policy.

**Overview of most prominent support policy options for renewable energy**

| | Notable advantages | Notable disadvantages |
|---|---|---|
| **Feed-in tariff** | ▪ High effectiveness<br>▪ High investment security<br>▪ Strong market dynamic | ▪ Higher electricity prices<br>▪ Difficult policy-design (e.g. difficult control of penetration speed; false design may lead to over- or under-estimated expansion rates |
| **Renewable Portfolio Standard /Quota** | ▪ Strong market-orientation<br>▪ Less government intervention<br>▪ Easier policy-design than FiT | ▪ Lower effectiveness than FiT particularly in case of a weak penalty system<br>▪ Not necessarily cheaper than FiT |
| **Capital Subsidies/ Grants/Rebates** | ▪ Facilitates investment in renewable energy projects | |
| **Investment or other tax credits** | ▪ Reduces investment cost<br>▪ Suitable for utility-scale investments | ▪ May keep power producers from operating plant if tax credits are only available for investment (not for operation)<br>▪ Less attractive to small-scale investors |
| **Tradable Renewable Energy Certificates (REC)** | ▪ Allows power producers achieve higher share of RE in their electricity mix through trading<br>▪ Helps green power producers receive additional benefits | ▪ May keep power producers from investing in RE themselves |
| **Energy production payments or tax credits** | ▪ Fair to high effectiveness<br>▪ Can complement investment tax credits | ▪ Lower investment security than FiT as weaker legal basis |
| **Net metering** | ▪ Less complex than FiT<br>▪ Lower cost than FiT | ▪ Lower financial benefit than FiT<br>▪ Not suitable for utility-scale installations |
| **Public investment, loan or financing** | ▪ Facilitates investment in renewable energy projects | |
| **Public Competitive Bidding** | ▪ Strong market-orientation<br>▪ Competitive prices<br>▪ Check on capacity addition | ▪ Applicants may bid too low to win the tender; may lead to non-completion of project or bankruptcy |

Overview of renewable energy support policies in assessed countries

| | Regulatory Policies | | | | Fiscal Incentives | | | | Public Financing | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Feed-in tariff | Renewable Portfolio Standard/Quota | Net metering | Tradable Renewable Energy Certificates | Capital Subsidies, Grants, or Rebates | Investment or production tax credits | Reductions in sales, energy, Co2, VAT, or other taxes | Energy production payment | Public investment, loans, or grants | Public Competitive Bidding |
| Brazil | | | | | | | ● | | ● | ● |
| Chile | | ● | | | ● | | ● | | ● | |
| China | ● | ● | | | ● | | | ● | ● | ● |
| Egypt | | | | | ● | | ● | | ● | ● |
| Ethiopia | | | | | | | ● | | | |
| Ghana | | | | | | | ● | | | |
| India | ● | ● | | | ● | ● | ● | | ● | ● |
| Indonesia | ● | | | | ● | ● | ● | | ● | ● |
| Kenya | ● | | | | | | ● | | | |
| Mongolia | ● | | | | | | | | | ● |
| Morocco | | | ● | | | | | | ● | ● |
| Philippines | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| South Africa | ● | | | ● | ● | | | | | ● |
| Thailand | ● | | | | ● | | ● | | ● | |
| Tunisia | | | | | ● | | ● | | ● | |

## 2.11 The Role of Barriers on RE Deployment

Concluding this section on types of RE support instruments in theory, it must be stressed that irrelevant of the type of instrument, RE support can only work if fundamental barriers to RE are targeted, such as:

- Subsidised electricity prices, making the support of renewable energy appear too costly;
- Subsidies for fossil fuels, leaving RE at non competitive level;
- Monopolized electricity markets, which prevent or impede new power producers from entering the market;
- Strong intervention of the government in the electricity markets (as for instance, in the form of public utilities which enjoy unfair advantages compared to private actors);
- Inexperienced stakeholders and the unawareness among policy makers of the economic, social, and environmental benefits of renewable energy support. Often stakeholders consider renewable energy an expensive investment without acknowledging the short- and long term benefits of it;
- Absence of banks able to provide investors with loans to invest in renewable energy power projects, which usually have higher incremental cost (lack of bankability);
- A lack of clearly allocated institutional responsibility (e.g. many different actors involved in the implementation of policies or realization of projects). If there is no political agreement among stakeholders about objectives and procedures, institutional disagreement can impede or slow down a fast promotion of renewable energy;
- Technical issues, such as a grid that is incapable of absorbing increasing shares of fluctuating power from renewable energy sources or a grid that cannot provide enough control energy;
- Civil opposition against renewable energy, often caused through competing interests in land use (e.g. using biomass for power production vs. food production); some large-scale renewable energy power plants also cause environmental destruction and can have negative influence on people's lives (large hydropower dams, for instance).

# 3

# Country Profiles: Spreadsheet Data, Summaries, Analysis

This study chose fifteen developing and newly industrialized countries for examination. These are Brazil, Chile, China, Egypt, Ethiopia, Ghana, India, Indonesia, Kenya, Mongolia, Morocco, Philippines, South Africa, Thailand and Tunisia. The relevant criterion for this selection was the current, past, and (planned) future involvement of GIZ in supporting frameworks for the promotion of renewable energy in these countries.

This study also examines 10 of the 15 countries in detail, performing policy analyses and pointing out to potential future fields of action to improve the support of renewable energy in these countries: Brazil, Egypt, Ghana, India, Indonesia, Kenya, Morocco, Philippines, South Africa, and Tunisia. They have been selected for deeper analysis due to the good access and high availability of information on renewable energy in these countries. Moreover, much of the work of the German Federal Ministry for Economic Cooperation and Development (BMZ) in development cooperation focuses on these states.

## 3.1 Spreadsheet Analysis

The underlying source for identifying conditions for the successful promotion of renewable energy in electricity production is a complex, spreadsheet based data structure. This spreadsheet collected relevant data to determine successful promotion of renewable energy for all 15 countries and structured them along five categories:

1. Indicators for the maturity of the policy framework (policy-focused)
2. Indicators for the degree of successful implementation (policy-, market-focused)
3. Indicators for successful financing (financial)
4. Indicators for the condition of the electricity network (technical, market-focused)
5. Indicators for potential barriers (financial)

Following the methodology of the Policy Design Cycle, structuring the data along these indicator-based categories enables the reader to isolate information that serve as indicators for the development of the renewable energy market and in particular, for the maturity of the existing support policies.

The category "Indicators for the maturity of the policy framework" is policy-focused and looks at the existence and definition of renewable energy targets, the existence and types of support instruments, the existence of a renewable energy strategy, and provides the reader with information on the status of the renewable energy market (capacity/share of renewable energy installations).

The category "Indicators for the degree of successful implementation" is a market and policy-focused section of questions, concentrating on indicators that reveal the successful implementation of a policy framework. Questions include the legal status of the support instrument, the capacity added under the instrument, the existence of local suppliers for renewable energy technology, and the degree of decentralisation of power production.

The category "Indicators for successful financing" looks at the measures countries implemented to absorb the cost that occur with the support of renewable energy. Such measures often include the use of international financial means, the introduction of taxes, or apportionment procedures.

The category "Indicators for the condition of the electricity network" provides information on the interconnection of the national grid, electrification, and institutional responsibilities in the electricity market.

Eventually, it is also important to ask about potential barriers that exist in a country that might impede a successful promotion of renewable energy in power generation. The category "Indicators for potential barriers" therefore looks at financial questions, which are often among the most crucial conditions for investors. They include data on the existence of import duties on renewable energy equipment, interest rates, inflation, and possible price increases that occur with renewable energy support.

The spreadsheet is composed of the attached spreadsheet-based tool. Apart from forming the basis for subsequent policy analysis and policy recommendations the tool allows the reader to filter and compare specific aspects of framework conditions for renewable energy in the analysed countries. In combination with the textual analysis, the spreadsheet provides a tool for easily identifying fields of action for the respective government, but more importantly in this context, it helps to identify possible areas of engagement for GIZ.

### 3.1.1 Spreadsheet Data

| Indicators for the maturity of the policy framework | | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|---|
| | **RE target** | No | Yes | Yes | Yes | Yes | Yes | Yes |
| | **Definition of target** | No generation-based target.<br>2020 (cap): Hydro: 121.6 GW (incl. 6.5 GW of small hydro); Wind: 11.5 GW; Biomass: 9.2 GW. | 2024 (gen): 10 % (non-technology specific; excl. large hydro). Until 2014: 5 %, then incremental increase by 0.5 % until 2024.<br>No capacity based target. | 2020 (gen): 3 % (non-technology specific; excluding large hydro).<br>2020 (cap): Hydro: 430 GW; Wind: 200 GW; Biomass: 30 GW; Solar 50 GW. | 2020 (gen): Hydro: 6 %; Wind 12 %; Solar/Biomass/Geothermal: 2 %.<br>2020 (cap): Wind: 7.2 GW | No generation-based target.<br>2013 (cap): Wind: 0.8 GW; 2015: Hydro: 10 GW; 2018: 0.45 GW Geothermal. | 2020 (gen): 10 % (non-technology specific; including small hydro).<br>2015 (cap): Hydro: 2.3 GW; Wind 0.05 GW. | No national generation-based target (RPS on state level; 1-14 % in 2010/2011).<br>2012 (cap): Hydro: 54.6 GW; Wind: 17.6 GW; Biomass: 3.2 GW. |
| | **Extent to which target is fulfilled** | Auctions are entirely within schedule. | 8 % in the first year of renewable energy portfolio standard (2010) = 3 % more than the binding quota of 5 % | For 2010, the New Energy-objective (RE + nuclear) of 10 % came short of 1.7 %. | Currently the share is between 10 and 12 %, strongly depending on the water reserves. | zero (in 1st year), everything still under construction or planning | Not yet begun, but VRA announced investments as of 2011 in PV and wind | Only four states met their target for the 2009/10 period |
| | **Current share of RES in electricity** | 2010 (gen): 86.3 %<br>2010 (cap): Hydro: 86.7 GW; Wind: 0.8 GW; Biomass: 4.5 GW. | 2010 (gen): 8 % (38 % incl. large hydro/ conventional RE)<br>2010 (cap): Hydro: 0.2 GW; Wind: 0.2 GW; Biomass: 0.2 GW. | 2010 (gen): 17 %<br>2010 (cap): Hydro: 213.4 GW; Wind: 44.7 GW (14 GW not operational); Biomass: 4 GW; Solar: 0.6 GW. | 2010 (gen): 10.1 %<br>2010 (cap): Hydro: 2.8 GW; Wind: 0.5 GW; Solar: 0.01 GW. | 2010 (gen): 98 %<br>2010 (cap): Hydro: 2 GW | 2010 (gen): 68.8 % (1 % excl. Large hydro)<br>2010 (cap): Hydro: 1.2 GW | 2008 (gen): 15.5 %<br>2011 (cap): Hydro: 41.8 GW; Wind: 14.9 GW; Biomass: 2.8 GW. |
| | **Regulatory support scheme for RE** | Yes | Yes | Yes | No | No | No | Yes |

| Indicators for the maturity of the policy framework | | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|---|
| | **RE target** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | **Definition of target** | 2025 (gen): 15% (non-technology specific; excluding large hydro).<br>2025 (cap): Hydro: 0.5 GW (small hydro only); Wind: 0.25 GW; Solar: 0.87 GW; Biomass: 0.81 GW; Geothermal: 9.6 GW. | No generation-based target.<br>2030 (cap): Geothermal: 4 GW. | 2020 (gen): 20 % (non-technology specific).<br>2020 (cap): Wind: 2 GW; Solar: 2 GW ; Hydro 2 GW (= 42 % of capacity). | 2020 (gen): 20-25 % (non-technology specific).<br>No capacity-based target. | No generation-based target.<br>2020 (cap): Hydro: 6.9 GW; Wind: 1.9 GW; Solar: 0.3 GW; Biomass: 0.3 GW; Geothermal: 3.5 GW. | 2030 (gen): 9 % (non-technology specific); Hydro: 5 %.<br>2030 (cap): Hydro: 7.7 GW; Wind: 9.2 GW; Solar: 9.6 GW. | 2022 (gen): 14 % (non-technology specific)<br>2022 (cap): Wind: 0.7 GW; Solar: 0.5 GW; Biomass: 3.7 GW. | 2016/´30 (gen): 11 %/25 % (non-technology specific)<br>2016/´30 (cap): Wind: 0.5/2.7 GW; Solar: 0.3/ 1.7 GW; 0.25/0.3 GW other |
| | **Extent to which target is fulfilled** | At the moment (2010), energy supply mix comprises: 49.7 % oil, 20.1 % gas, 24.5 % coal and 5.7 % renewable energy | Partly. Capacity not doubled. Focus on geothermal through Geothermal Development Company. | 45 % for 2012, 30 % for 2020 | Existing installations are predominantly small hydro and PV plants. 50 MW wind park is under construction. | Targets only recently defined | in 2009 approx. 300 GWh were generated by renewables | 1,816 MW of targeted capacity already exists. | 1.5 % of inst. Cap. Provided by wind energy plus a little contribution of grid-connected PV |
| | **Current share of RES in electricity** | 2009 (gen): 8.8 %<br>2009 (cap): Hydro: 3.5 GW (including 0.01 GW of small hydro) | 2008 (gen): 61.6 %<br>2010 (cap): Hydro: 0.8 GW; Geothermal: 0.2 GW. | 2010 (gen): 15.4 % (incl. large hydro)<br>2009 (cap): Hydro: 1.3 GW; Wind: 2.5 GW. | 2010 (gen): 4.6 %<br>2010 (cap): <0.1 GW | 2010 (gen): 26.2 %<br>2010 (cap): Hydro: 3.4 GW; Biomass: 0.1 GW; Geothermal 2.0 GW. | 2010 (gen): 5 % (incl. large hydro)<br>2010 (cap): Hydro: 2.1 GW; Biomass: 0.1 GW. | 2010 (gen): 7.8 %<br>2008 (cap): Hydro: 3.5 GW; Solar: 0.03 GW; Biomass: 1.6 GW. | 2010 (gen): 1.6 %<br>2010 (cap): Hydro: 0.06 GW; Wind: 0.05 GW. |
| | **Regulatory support scheme for RE** | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |

| Indicators for the maturity of the policy framework | | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|---|
| | **Type of support schemes in place** | Public competitive bidding, Public investment, loans or financing, Net metering (PV) | Public investment, loans or financing, Investment or other tax credits, Capital subsidies, grants or rebates, Renewable portfolio standards or quota | Public competitive bidding, Public investment, loans or financing, Energy production payments or tax credits, Sales, energy or excise tax or VAT reduction, Investment or other tax credits, Capital subsidies, grants or rebates, Renewable portfolio standards or quota, Feed-in tariff | Public competitive bidding, Public investment, loans or financing, Sales, energy or excise tax or VAT reduction | Public investment, loans or financing, Sales, energy or excise tax or VAT reduction | Public investment, loans or financing, Sales, energy or excise tax or VAT reduction, Capital subsidies, grants or rebates | Public investment, loans or financing, Energy production payments or tax credits, Tradable RE certificates, Sales, energy or excise tax or VAT reduction, Investment or other tax credits, Capital subsidies, grants or rebates, Renewable portfolio standards or quota, Feed-in tariff |
| | **Detailed measures of support implemented** | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below |
| | **Name of support scheme** | • Electric Power Auctions: „Leilões de Energia“ (2008, 2009, 2010, 2011)<br>• PROINFA (2004) | • Ley 20.257 (RE standard and obligation - quota)<br>• Ley 19.940 (access of small generators to electricity market, and exemption from transmission tolls)<br>• Ley 19.657 (geother-mal concessions, under revision)<br>• Ley 20.365 (tax credits for solar thermal systems) | • Renewable Energy Law (2005 and April 2010)<br>• Feed-in tariffs (2009, 2010, 2011)<br>• Various other laws | • Existing wind projects were supported through grants and low cost loans;<br>• Other support is listed in the DRAFT RE law<br>• The first tender for a wind park will be closed in Nov 2011; the introduction of a FiT scheme will only take place after the outcomes of tenders have been evaluated | • NAMA plan;<br>• FiT Proclamation still draft (not yet in place); duty exemption on RE equipment. | • National Electrification Scheme and RE Fund - if the Law is passed.<br>• Small programmes for PV in private homes and public buildings. | • Electricity Act, 2003<br>• Tariff Policy Act (2006)<br>• CERC Tariff for RES Regulations (2009)<br>• Tariff for RES Regulations/Orders specified by SERCs<br>• RPO-REC Framework |

| | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|
| **Type of support schemes in place** | Sales, energy or excise tax or VAT reduction, Investment or other tax credits, Capital subsidies, grants or rebates, Feed-in tariff | Investment or other tax credits, Feed-in tariff | Net metering, Sales, energy or excise tax or VAT reduction | Public competitive bidding, Feed-in tariff | Details not available | Public competitive bidding, Public investment, loans or financing, Sales, energy or excise tax or VAT reduction, Capital subsidies, grants or rebates, Feed-in tariff | Public competitive bidding, Public investment, loans or financing, Sales, energy or excise tax or VAT reduction, Capital subsidies, grants or rebates, Feed-in tariff | Investment or other tax credits, Capital subsidies, grants or rebates, Feed-in tariff |
| **Detailed measures of support implemented** | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below | Compare indicators below |
| **Name of support scheme** | • Energy Law (30/2007)<br>• Geothermal Law (27/2003)<br>• Ministerial Decree No. 1122 K/30/MEM/2002<br>• Ministerial Regulation No. 002/2006<br>• Ministerial Regulation No. 269-12/26/600.3/2008<br>• Special Allocation Fund (DAK) for rural electrification | • Feed-in Tariffs Policy | • Law 13.09 - auto-production (type of net metering)<br>• Future tendering through ONE and MASEN | • Renewable Energy Law | • No regulatory support scheme in place yet<br>• Feed-in Tariff to be implemented soon. | • Public Competitive Bidding (2011)<br>• Feed-in Tariff Refit (2009), abandoned | • Feed-in premium for renewable power "Adder" (2007)<br>• Small and Very Small Power Purchase Agreements (2006)<br>• ESCO Venture Capital Fund | • Law No. 2004-72/ Law No. 2009-7 on Energy Efficiency<br>• Decree 2009/362 on Renewable Energy and Energy Efficiency Premiums |

| | | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|---|
| Indicators for the maturity of the policy framework | **Name of support scheme** | | | | | | | |
| | **Frame-work/ strategic policy** | • 2010-2019 PDE<br>• Plan for Energy Expan-sion/Plano Decenal de Expansão de Energia (Ministry of Mines and Energy)- Strategic Energy Plan/ Plano Nacio-nal de Ener-gia (Ministry of Mines and Energy) | • (Non-Con-ventional Renewable Energy Law: Ley 20.257) | • Renewable Energy Law (2005 and April 2010)<br>• Five Year-Plans | • National Energy Strategy (2008) | • Last formal energy policy from 1994<br>• Growth and Transfor-mation Plan 2010-2015<br>• NAMA Plan | • Strategic National Energy Plan 2006-20<br>• Ghana Nati-onal Energy Policy | • Electricity Act of 2003;<br>• India Energy Policy (IEP) 2006;<br>• 11th Five-Year Plan |
| | **Financial volume of sup-port scheme** | Since auc-tions are the normal way of contracting, there is no special support scheme | Not applicable to RE quota. However, seve-ral incentive mechanisms are in place to attend specific barriers. | Surcharge of CNY 0.008/ kWh since 1 Dec 2011. | | | | Does not exist as such, but: Offgrid solar PV projects investment support is 30 % capital subsidy (on the base price declared by MNRE), if the project is located in remote, back-ward districts the capital subsidy incre-ases to 70-90 %. |

| | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|
| **Name of support scheme** | • Village Empower-ment Pro-gram (Green PNPM)al Regulation No. 269-12/26/600. 3/2008 | | | | | | | |
| **Frame-work/ strategic policy** | • National Energy Management<br>• 2011 Master Plan for the Accele-ration and Expansion of Indonesian Economic Growth<br>• Energy Law of 2007<br>• Blueprint Energy Policy (2005) | • Energy Act of 2006<br>• Sessional Paper No. 4 on Energy of 2004 | • Loi No. 13.09 (2009) for renewable energies -<br>• Loi 2-94-503 for the electricity sector.<br>• A new frame-work is under consideration | • National Renewable Energy Pro-gram (2005)<br>• National Renewable Energy Law (2007) | • National Renewa-ble Energy Program<br>• Philippine Energy Plan<br>• Renewable Energy Act<br>• New and Renewa-ble Energy Programme (1997/2000) | • White Paper on Renewa-ble Energy<br>• Integrated Energy Plan<br>• Integrated Resource Plan 2010-2030 | • National Renewable Energies Development Plan | • National Energy Efficiency and Renewa-ble Energy Programme 2008-2011<br>• Tunisian Solar Plan |
| **Financial volume of sup-port scheme** | 621.25 billion IDR ~ 69 million USD (including the establishment of self-suf-ficient energy villages) | See above, consult document if necessary. | The "Energy Development Fund" is equipped with 1 Billion $. It is used by the government to support the development of the energy sector in multifold way: e.g. recapi-talisation of ONE, incentive scheme for energy effici-ency etc. | | FIT Allowance (0.3c) x Current Consumption (59b KWH) = USD 172 million | | 33 MUSD is allocated from Government's ENCON FUND to the ESCO fund. 233 MUSD allocated from Government's ENCON FUND for soft loans-revolving fund. 1.7 MUSD for investment grants for biogas, MSW, solar hot water projects. | In terms of inst. Cap., the only notable contribution comes from wind energy. For wind energy the legal frame-work is a net-metering mechanism, so consumers reduce their electricity bill. |

| Indicators for the degree of successful implementation | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|
| **Support scheme determined by law** | No | No | Yes | Yes | no details available | No | Yes |
| **Capacity added under support scheme** | Details not available | 0-2500 MW | more than 10000 MW | Details not available | 0-2500 MW | Details not available | Details not available |
| **Local suppliers of RE-technology** | Yes | No | Yes | | Yes | | Yes |
| **Name of suppliers** | Correia Camargo (Hydro),Koblitz (Hydro and Biomass),Wobben (Wind),Tecsis (Wind) | | Goldwind, Dongfang, Suntech, Yingli | | A new turbine manufacturer for small hydro power is also currently setting up | | PV, Hydro, components for all technologies |
| **Degree of decentralization** | Low | Low | Low | Middle | Low | Low | Middle |
| **Additional comments (1)** | | Law 19.940 opens up spot market for smaller electricity companies and systems, ensuring the right to connect to distribution networks, exempting them from main transm. tolls (inst. smaller 20 MW). Decree allows small producers to negotiate independently. | | | Large hydro is the main focus; offshore is not relevant (landlocked country); Biomass power requires IPP (e.g. sugar industry), which is neglected by the government; Solar PV is only off-grid so far. | | 4 opt. for selling RE: 1. to the distribution company at tariff fixed by SERC, 2. selling RECs at power exchanges & ELEC to distribution company; 3. selling ELEC & RECs at power exchanges, 4. selling electricity to Third Party and/or Captive User |

| Indicators for the degree of successful implementation | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|
| **Support scheme determined by law** | No | Yes | No | Yes | no details available | no details available | Yes | No |
| **Capacity added under support scheme** | Details not available | 0-2500 MW | Details not available | 0-2500 MW | Details not available | 0-2500 MW | 0-2500 MW | Details not available |
| **Local suppliers of RE-technology** | Yes | Yes | Yes | No | Yes | No | Yes | Yes |
| **Name of suppliers** | ProWater (hydropower), PT LEN (solar PV) | | PV modules (200 kWp per year), Cables, SWH (2) | | First Philec (Solar Home Systems, just starting) | | Wattanapisarn Company, Bangkok Solar Co., Ltd., and others ... | |
| **Degree of decentralization** | Middle | Low | Low | Low | Middle | Low | Low | Middle |
| **Additional comments (1)** | | | Incentives for establishing companies in industrial zones (e.g. Oujda) | The first private investment in RE is a 50 MW wind park by the Mongolian private company Newcom. | | | There is an extra "adder" in 3 provinces in Southern Thailand and for electricity from renewable energy for diesel oil replacement. | |

| | | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|---|
| Indicators for successful financing | Financing scheme in place | Apporti-onment procedure | Apporti-onment procedure | CDM, Appor-tionment procedure | International Donor, CDM | Details not available | Details not available | Details not available |
| Indicators for the condition of the electricity network | National intercon-nection grid | Yes | No | No | Yes | Yes | No | Yes |
| | Additio-nal com-ments (2) | Sistema Interligado Nacional (SIN) | There are two mayor interconnec-ted systems (SIC, SING), which how-ever are not interconnec-ted to each other. The two smaller systems (Aysen, Magallenes) consist of several isola-ted systems | Grid system is fragmented into six regi-onal power grid clusters, all of which operate rather inde-pendently. Interregional interconnec-tions are weak. Cross-regional trade of electricity in 2009 represented only 4 % of the total electricity production. | The grid is subdivided into six geographi-cal zones, namely Cairo, Canal, Delta, Alexandria and West Delta, Middle Egypt and Upper Egypt. The country's entire territory is covered. Some iso-lated ISPs exist. | The national power utility maintains two different power supply systems: the inter-connected system (ICS = national grid) and the self-contained system (SCS = several isolated area grids). | But the transmission network at 69, 161 and 225 kV voltage levels is intercon-nected. | Four out of five regional grids are intercon-nected (NEWNE grid), one southern grid is discon-nected, but con-nection is envisaged latest by 2017 |
| | Percen-tage of popula-tion con-nected to the grid | 98 % (2010) | ca. 98 % | 11.5 Million people were without access to electricity in 2009 compared to a popula-tion of 1,319 Millions. Thus the percentage of people with no access to electricity is 0.87 %. | 99.5 % | According to the govern-ment, 41 % have access, which means a distribution line passes through or nearby the municipality. The estimated number of households with electricity connection is about 14 %, but only 1-2 % in rural areas. | 54 % (2010) | 64.5 % (2008) |

| | | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|---|
| Indicators for successful financing | Financing scheme in place | International Donor, Taxes | Apporti-onment procedure | International Donor | CDM | Details not available | International Donor, Appor-tionment procedure | Taxes | International Donor, Taxes |
| Indicators for the condition of the electricity network | National intercon-nection grid | No | Yes | Yes | Yes | No | Yes | No | Yes |
| | Additio-nal com-ments (2) | • One main grid on Java-Bali<br>• PLN operates more than 5,233 power plants with a combined capacity of 24,960 MW (an average plant size is about 5 MW)<br>• fragmented country makes a compre-hensive grid difficult and expensive to construct | There is a national high voltage grid, there are inter-connectors to neighbouring countries | | Import of electricity from Russia for frequency stabilisation during evening peak load. There are also some inter-connection grids between Mongolia and China. | There are three main islands grids (Luzon, Visayas, Mindanao), of which Luzon and Visayas are integra-ted, Mindano not, the main islands in the Visayas are interconnected to each other | The transmis-sion system in South Africa consists of high voltage overhead power lines. Voltages on this transmis-sion grid range between 132 kV and 765 kV. | Interconnec-tion line exists to hydro power plant in Laos. | |
| | Percen-tage of popula-tion con-nected to the grid | 2009 - 66 % | 55-60 % urban, 5-1- % rural, national 20-25 % | rural electri-fication 96.5 % in 2009; overall approx. 98 % | In Mongolia there are 678 thousand households, and nearly 400 thousand households are connected to the grid (60 %). Out of 333 counties of 21 provinces 318 counties are connected to transmission lines. | 70 % | Approx. 73 % (2008), The government aims to achieve universal access to electricity by 2012. | >98 % | 99.5 % |

| | | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|---|
| Indicators for the condition of the electricity network | **State owned power grid** | No | No | Yes | Yes | Yes | Yes | Yes |
| | **Additional comments (3)** | ONS (state owned) realizes dispatch, grid is owned by various companies, and energy producers are another group of market players. | Electricity market completely privatised and liberalised (unbundled) since 1982. However, transmission sector is considered a natural monopoly, and is therefore regulated. | Two state owned grid companies: "State Grid Corporation of China" (SGCC) and "China Southern Power Grid" (CSPG) | EEHC continues to own over 90 % of Egypt's generating capacity. Transmission and distribution remain a monopoly under the EEHC umbrella; vertical and horizontal unbundling of generation, transmission and distribution took place in 2001. | | GRIDCO is the grid operator (transmission). ECG is the largest distributor. VRA-NED, distributor for northern Ghana is still part of VRA, but a lower customer base. | The Power Grid Corporation of India Ltd (PGCIL) is the largest transmission company in India. Similarly, in distribution, the state-level corporations or boards (SEBs) own nearly 95 % of the distribution network. |
| | **National regulatory body** | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | **Additional comments (4)** | Electric Energy Agency (ANEEL) | Comisión Nacional de Energía, CNE | State Electricity Regulatory Commission (SERC) | Egyptian Electric Utility and Consumer Protection Regulatory Authority | Ethiopian Electric Agency | Public Utilities and Regulatory Commission (PURC) | Central Electricity Regulatory Commission (CERC) |
| Indicators for potential barriers | **Import duties for RE equipment** | No | Yes | Yes | Yes | No | no details available | Yes |

| Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|
| Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |
| PT Perusahaan Listrik Negara (PLN) - monopoly operator of transmission and distribution | See above | "ONE" produces around 28 %, IPP-JLEC around 45 % and Gas-CC-Tahaddart 22 % of electricity and is the grid operator on HV-level. | Central Energy System (CES): unbundled Western Energy System (WES) and Eastern Energy System (EES): bundled | The Electric Power Industry Reform Act 2001 laid the foundation for the unbundling of grid and generation. The process of generator disposal from the grid owner is still ongoing | Eskom owns, operates and maintains the national transmission grid on both the generation and the transmission level, distribution level is highly fragmented with roughly 180 licensed municipal distributors | EGAT owns and operates the transmission lines, whereas the distribution grid is owned and operated by Provincial Electricity Authority (PEA). | Grid operator is STEG |
| Yes | Yes | No | Yes | Yes | Yes | Yes | No |
| Power Market Regulator (Bapeptal - Badan Pengatur Pasar Tenaga Listrik) | Energy Regulatory Commission | MEMEE, Ministry of Energy, Mines, Water and Environment; EU and WB are working with MEMEE for an independent regulator | The Energy Regulatory Authority | Energy Regulatory Commission | National Energy Regulator South Africa (NERSA) | Energy Regulatory Commission | |
| Yes | No | Yes | No | Yes | Yes | Yes | No |

**Indicators for potential barriers**

| Indicators for potential barriers | Brazil | Chile | China | Egypt | Ethiopia | Ghana | India |
|---|---|---|---|---|---|---|---|
| **Additional comments (5)** | Only not nationally available technologies are exempted from import taxes. For wind power, only turbines with nominal power above 1.8 MW may be imported. | | In May 2010, China removed import duties on wind and hydro equipment. | The duties for RE equipment have been lowered to 2 %. | Since 2010 there is an exemption for RE components, but customs officials are not sufficiently aware of this and try to charge duties, especially for parts which can also be used for other purposes. | | In general: from 5 % to 40 %. For most RE-Technology it's reduced to 5 %. Geothermal-ground-source heat pumps are exempted from basic customs duty and special additional duty. |
| **Interest rate** | 12 % | 5 % | 6 % | 9 % | more than 15 % | 13 % | 12% |
| **Annual inflation** | 7 % | 1 % | 6 % | 12 % | more than 15 % | 9 % | 9 % |
| **Rate of liberalization[5]** | 60-80 % | 80-100 % | 0-20 % | 0-20 % | 0-20 % | 0-20 % | 60-80 % |
| **Price increase because of RE support** | No | No | Yes | Yes | Yes | Details not available | Yes |
| **Additional comments (6)** | As renewable sources compete with all other sources in auctions, there are no special price effects from renewables. | No increase expected (according to different simulations). | Pressure from the government to improve the grid leads to investments of US$585bn between 2009 and 2020 by SGCC and RMB500bn yuan (US$77.24bn, as of 24. June 2011) from CSPG between 2011 and 2015. | | Price increases due to higher generation costs of all forthcoming RES plants compared to existing large HPP. | | |
| **ROI conventional power supply** | Details not available | 10 % | Details not available | Details not available | Details not available | Details not available | more than 15 % |

Table 2: Overview of the spreadsheet data of all studied countries[6].

| Indicators for potential barriers | Indonesia | Kenya | Morocco | Mongolia | Philippines | South Africa | Thailand | Tunisia |
|---|---|---|---|---|---|---|---|---|
| **Additional comments (5)** | Ministry of Finance Regulation No. 21/2010 and 24/2010 | | Within the framework with EU, import duties will be reduced step by step | | Duty free importation of RE machinery, equipment and materials within the first 10 years | | Most of the equipment has been imported from another country; however, if there is an application for BOI status, there is some tax exemption. | |
| **Interest rate** | 7 % | more than 15 % | 12 % | 12 % | 1% | 6% | 7 % | 5 % |
| **Annual inflation** | 6 % | 12 % | 2 % | 5 % | 1 % | 4 % | 4% | 3 % |
| **Rate of liberalization[5]** | Details not available | 20-40 % | 20-40 % | 0-20 % | Details not available | 0-20 % | 40-60 % | 0-20 % |
| **Price increase because of RE support** | No | Yes | See below | Yes | No | Yes | Yes | No |
| **Additional comments (6)** | The expansion of RE in the energy mix is mostly supported by the government. The govt provides subsidy and/or grants for some technologies. The govt is also responsible to enact some regulations so that RE utilization/mandatory prevails | Without having proper studies available, a price decrease might be expected. It depends on the caps in the FiT, and the price per unit. Least Cost Power Development Plan of Govt suggests costs of alternatives at 11-12 US-cent/kWh in the long run. Many RES are cheaper. | Grid extension will be done by ONE's budget with support of bi- and multilateral donors. | The RE law foresees a Renewable Energy Fund but this fund is not yet in place. | Absorption capacity of grid still under review therefore no estimate for additional grid costs available | | Feed-in tariff is calculated considering the caps for different technologies-additional renewable energy projects will require new caps and new calculation of the feed-in tariffs. | |
| **ROI conventional power supply** | Details not available | more than 15 % | Details not available | Details not available | 12 % | more than 15 % | 15 % | Details not available |

The spreadsheet based data structure can be downloaded on the GIZ homepage via this link: http://www.giz.de/Themen/de/4552.htm.

5 As a proxy for independent market access we use the share of private sector (´private law companies´) in the electricity sector.
6 For more details on the information provided in this table, refer to the textual analysis in the following chapter (3.2).

## 3.2 Textual Analysis

To provide an easy to read and more detailed version of the data collected in the spreadsheet, this chapter extracts the most important information of the spreadsheet and complements it with additional information. Summaries of the findings are provided in each of the 15 country chapters, while for 10 countries this chapter performs policy analyses and identifies provisions on future need for action.

### 3.2.1 Brazil

#### 3.2.1.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2010) | 80.0 %* | 0.4 % | <0.1 % | 5.9 % | <0.1 % | <0.1 % | **548.8 TWh** |
| Capacity (2010) | 86.7 GW * | 0.8 GW | <0.01 GW | 4.5 GW | <0.01 GW | <0.01 GW | **109.6 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2020) | n/d | n/d | n/d | n/d | n/d | n/d | **n/d** |
| Capacity (2020) | 121.6 GW + | 11.5 GW | n/d | 9.2 GW | n/d | n/d | **171.1 GW** |

*including small hydro (capacity: 3.8 GW) and power/capacity from Itaipu hydro dam. +including 6.5 GW of small hydro.

**Introduction/Overview**
Brazil already has – through large hydropower - a remarkable RE share in power generation, but is facing a specific challenge: its dependence on large hydropower and the resulting, weather-dependent fluctuations in power output. Policy makers have therefore envisaged a diversification of the national electricity mix, among others by promoting alternative renewable energy technologies. However, Brazil has also been investing in fossil fuel-based and nuclear power to respond to its quickly rising power demand. As the main political focus is set on reducing the dependence on large hydro, other RE are only partly benefitting – and in this setup directly competing with fossil and nuclear. Depending on the market situation, this may lead to decreasing RE shares and growing importance of the non RE sector.

**Electricity Mix/Targets**
In 2010, Brazil's electricity generation mix consisted of 80.0 % large hydro, 5.9 % biomass, 3.2 % oil, 2.9 % natural gas, 2.8 % nuclear, 1.5 % coal, and 0.4 % wind. The total renewable energy capacity amounted to roughly 92.1 GW including large hydropower or 9.1 GW excluding large hydro. In 2010 Brazil's total installed capacity from all sources added up to 109.6 GW.

By 2020, Brazil aims to have installed a total RE capacity of 142.3 GW, of which large hydropower shall comprise 115.1 GW, wind power 11.5 GW, biomass power 9.2 GW, and small hydropower 6.5 GW. The country enacted a relative target of 16 % from non-large hydro RE sources in power capacity by the same target year (compared to 8 % in 2010; the relative share of large hydro shall thus be diminished from 75 % to 67 %).

**Strategy/Instruments**
The central strategic goals of Brazilian energy policy are to diversify the country's generation mix by reducing the dependence on large hydropower and its power output volatility, and to achieve a cost-efficient increase of generation capacity. To achieve this goal, in recent years Brazil has preferred low-cost options, e.g. using wind, biomass, and small hydropower under favourable conditions. Plans for Energy Expansion are published regularly, representing strategic framework policies for the development of the energy sector. The most recent one is the Plano Decenal de Expansão de Energia 2020. Similar to previous versions, it defines capacity-based RE goals (see above) as well as interim goals. RE are addressed comprehensively and their expansion is highlighted as top priority for national energy policy. Importantly, the plan aims at phasing out of fossil fuel power plant construction until 2014. It foresees a specific budget of Euro (EUR) 68 billion (BRL 165 billion) for the expansion of RE power production in the period between 2011 and 2020.

Earlier, in 2002, Brazil implemented the PROINFA support scheme for wind, biomass and small hydropower (Programa de Incentivo às Fontes Alternativas de Energia Eléctrica/Incentive Program for Alternative Sources of Electric Energy). Almost all existing wind power capacity and a current project pipeline, which was to be completed in 2011, have been commissioned under this policy. The program initially envisioned the construction of 3.3 GW of additional RE capacity until 2007, and was later extended to 3.6 GW to be completed by 2011 (1.4 GW wind, 1.1 GW biomass, and 1.1 GW small hydro). RE power is sold under purchase agreements of 20 years to the public power utility Electrobrás.

In 2008 and 2009 respectively, Brazil passed Electric Power Auctions schemes (Leilões de Energia) for biomass and wind energy. Under both policies, producers and utilities enter long-term power purchase agreements, lasting 15 years for biomass and 20 years for wind power. Tariffs are determined in the competitive process of a public auction. Since the start of both programs more than 3.8 GW of wind energy have been commissioned. Additional tenders worth several GW are scheduled for the future. The first wind parks that receive funding under this program were planned to start operation on 1 January 2012.

In 2003, Brazil initiated an electrification program called "Luz para todos" (Light for All), which aimed to provide access to electricity for 10 million people within five years. The program achieved its goal in 2009; as of 2010 a total of 12 million people have benefitted from the program.

Additionally, various tax incentives, loans and grants as well as reduced import duties on RE equipment are in place.
Currently, no regulative support policy is in place for solar or geothermal RE power.

**Achievements**
Between 2005 and 2010, large hydropower capacity increased by roughly 7 GW, medium hydropower by 2 GW, wind power by 0.9 GW, and small hydro power by 0.1 GW, totalling 10 GW. Almost all of the existing biomass power

capacity has been added in this period. Today, Brazil has the fourth largest RE power capacity worldwide and is the second largest market for biomass power. Brazil is also a leading player in ethanol and biodiesel production.

In the same period, Brazil added 10 GW, the same amount as from RE, of fossil fuel-based thermal power capacity. Another 12 GW of additional non-RE capacity (fossil and nuclear) is scheduled to come operational until 2015.

**Electricity Market/Barriers/Attractiveness**

Since the 1990s, Brazil has carried out two major reforms to liberalise its electricity sector. While formerly state-owned utilities and power producers have traditionally been dominating the market, an increasing number of private actors have entered both production and distribution of power. Today, about 40 % of all power producers are private. The four big public utilities Eletrobrás, CESP, Cemig, and COpel, dominate the remaining share of production. The public agency Agência Nacional de Energia Elétrica (ANEEL) is responsible for regulating and controlling generation, transmission, and distribution of power.

The liberalization of the power market has enabled RE producers to participate in the market. Bureaucratic obstacles in the licensing process were affecting the initial phase but have been removed in the meantime. Moreover, due to the extension and improvement of the national grid, the integration of large amounts of RE (including wind power) is no longer regarded as major challenge to grid stability. Yet, there is still 15 to 17 % of all electricity lost during transmission, leaving huge potential for further improvement and efficiency increase.

Due to its attractive policies for wind, biomass and hydropower, as well as its growing economy, Brazil has been able to attract many national and international companies to invest in RE power projects. Today, the nation ranks among the top five countries worldwide with respect to RE investment. The country has been able to build up a strong domestic wind power industry. Ernst & Young's Renewable Energy Country Attractiveness Indices of August 2011 rated Brazil the 11th most attractive market in terms of RE.

RE support in Brazil has not negatively affected electricity prices, particularly as the auctioning process is leading to competitive power purchase agreements for biomass and wind power projects. For instance, in an auction of August 2011, the average price per Megawatt hour (MWh) for the commissioned wind power plants was 41€, i.e. lower than the average tariff awarded to a hydropower and two natural gas power plants in an auction of the same month. Moreover, Brazil's strong currency has reduced cost for imported RE equipment over the last years. As a result, wind power has become one of the cheapest power sources in Brazil. Kilowatt hour (KWh) prices paid for wind energy currently are the cheapest worldwide.

**GIZ Activities and Experience**

In Brazil, GIZ has been active in the Technical Assistance program "Renewable Energy and Energy Efficiency", which supports the implementation of Brazilian policies. Core activities (in collaboration with Eletrobrás and Empresa de Pesquisa Energética [EPE]) are capacity development measures for governmental institutions and technical experts, assistance in the implementation of national programs and the support for demonstration projects. For example, several solar PV pilot projects have been realized, among them a 1 MW PV system on the roof of the Petrobas Electrosul headquarters in Florianopolis. An important lesson learned from these activities was that knowledge about PV is still quite limited, even among energy experts. Additionally, GIZ has organized events to raise awareness for RE, developed a marketing strategy for solar electricity and a solar label, which indicates the amount of generated solar power for the end-user. Brazil has defined targets for different RE technologies and implemented effective support instruments. Even though these instruments only apply to specific technologies and depend on governmental action they have led to a fast construction of new capacity and guaranteed competitive electricity prices. In elaborating a successful strategy, Brazil's achievements are ambivalent. On the one hand, the government's overall concept on transformation of its power sector is consistent and implies the necessary regulative and technical adaption to allow higher RE penetration in power supply. On the other hand, Brazil's overall energy policy is not in line with the effort taken in the power sector, particularly as the country is increasingly investing in domestic oil and natural gas resources.

### 3.2.1.2 Policy Analysis and Expected Need for Action

| | Current status of Brazil in the support of renewable energy | | | | |
|---|---|---|---|---|---|
| **Instruments** | No regulatory policy; public competitive bidding, tax reductions, public investments/loans/grants | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Likely, targets not too ambitious yet | | | | |

Due to Brazil's very high share of hydropower in power generation, the country does not face pressure to transform its electricity supply to a more sustainable basis. The incentive to specifically invest in RE is comparatively low. As a result, Brazil's ambitions in the definition of RE targets have been moderate. Between 2010 and 2020, the targeted RE share in total capacity is to remain constant at 83 % but investments in large hydropower will decrease to the advantage of wind, biomass, and small- and medium hydro capacity. Brazil aims to stop investments in fossil fuel-based and nuclear power plant construction in the mid-term (in 2013 and 2015 respectively).

In terms of power sector reforms, Brazil has built an attractive regulatory and technical environment facilitating target achievement. First, liberalisation of the electricity market has allowed new power producers to enter the market and compete with public power producers; today's increasing competition in the Brazilian power market reduces the market influence of the four public utilities. Secondly, Brazil has improved and extended its power grid over the last ten years, having established the technical basis for integrating RE electricity into the power system. The country's focus on centralized electricity production (large hydropower dams and biomass power plants; wind farms are mostly built near to power consumption centres) has also helped Brazil evade addressing much of the issues that occur with an extensive use of decentralised power production. Thirdly, the Brazilian government has focused on providing support to competitive RE technologies only. While this strategy rules out support for other RE technologies, it has helped avoid higher electricity prices often occurring under regimes of fixed tariffs or subsidies. Moreover, as auctioning power plant concessions has been a common procedure in Brazil for a long time, policy makers did not need to design a new and complex regulatory bill, circumventing political conflict and delay that might arise from such a process.

The strategy to support hydro, wind and biomass power only, however, implies disadvantages as well. When considering Brazil's excellent solar power potential, for instance, the country might miss an important opportunity. The Energy Expansion Plan 2020 does not foresee investments in grid-connected solar power capacity and does not address the technology as a potential energy source. From a short-term economic perspective the argument of higher cost of PV and concentrated solar power (CSP) might be relevant, particularly as there are already some competitive RE technologies. Yet, considering that many experts forecast solar power to be the cheapest technology on the long run and that the global PV industry already provides roughly 350 000 jobs today, Brazil might fall short of the long-term economic and structural advantages that evolve with early investments (local expertise, a strong industry, domestic equipment production etc.). In addition, Brazil could miss the opportunity to be a potential regional supplier of solar power equipment for South America.

While Brazil renounced the construction of fossil fuel based and nuclear power plants after 2013 and 2015 respectively and aims to focus on the expansion of RE in power supply, it is still investing heavily in the exploitation of fossil fuels for export purposes and their use in other sectors. Between 2010 and 2020, the share of fossil fuels in final energy demand will even increase by 0.8 % to 48.2 %. Moreover, Brazil aims to become a major oil and natural gas exporter in the future by exploiting reservoirs in the South Atlantic Ocean. With this strategy, Brazil creates additional competitors to the RE sector, potentially weakening its market position.

Brazil's RE strategy is also attracting opposition from environmental organizations and the local population. Large hydropower dams, for instance, have destroyed vegetation and the habitats of indigenous people. The massive use of biomass for power and fuel production also accelerates deforestation of the rainforest and drives food prices up.

As a result, there are still challenges that Brazil faces on its way to consistent RE support, even if remarkable achievements have already been made. It will be necessary to establish a well designed monitoring system allowing integrated planning of power capacity in response to increasing power demand. As Brazil's economy and population is growing quickly, future power demand might exceed current projections and additional capacity might become necessary. Over the last few years, several adjustments for the projected need of additional capacity became necessary, including the doubling of the wind power capacity goal from 6 GW to 11.5 GW by 2019/2020. Moreover, the Plan for Energy Expansion expects final energy consumption to grow by more than 55 % between 2011 and 2020. Therefore, there is a strong need for tools allowing early identification of additional capacity demand and an according adjustment of support policies.

Brazil should give solar power a more important standing in the future. While to a great extent, it is comprehensible that an emerging economy is concerned about cost of energy supply, Brazil also needs to envision long-term technological developments and the potentials it has for using solar power in electricity production. As module prices for photovoltaic installations are dropping quickly and a domestic solar industry potentially employs ten thousands of people (as in China, the United States or Germany, for instance), Brazil should also envision this technology as an eligible energy source. Positively, the regulation authority ANEEL has started the elaboration of a feed-in regulation for photovoltaic installations with a capacity up to 1 megawatt (MW).

Since there are great wind potentials in the poor Northeast of the country, a focus in capacity installation on this region could bring important social and economic development to this region.

From the perspective of the Policy Design Cycle, policymakers in Brazil could address the following issues to improve framework conditions for the renewable energy electricity market.

- Given the tremendous dynamics in Brazil's growing energy demand, developing improved planning and monitoring tools to keep track of the country's rising energy demand is important. This will help to ensure ambitious but realistic target setting. Adapt auctioning policies flexibly so that planned renewable energy capacity can meet demand.

- With respect to the rapidly growing energy demand, supporting renewable energy technologies apart from hydro, wind, and biomass power should be considered too. This will allow Brazil to maintain its high share of renewable energy in power production in the future. To provide regulative and financial support for solar power in order to spur electrification is an additional aspect.

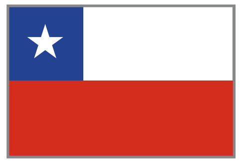
- Increase the use of renewable energy in non-power and non-transport sector (e.g. heating and cooling) to decrease the use of fossil fuels in primary energy.

- Address technical issues, such as by improving grid infrastructure to decrease electricity loss.

Existing GIZ activities partly address the above mentioned challenges. However, GIZ might consider engaging in complementary areas, such as improving the information basis on demand forecast, strategy and adaptation of instruments.

## 3.2.2 Chile

### 3.2.2.1 Summary



| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 0.8 %* | 0.6 % | <0.1 % | 0.8 % | <0.1 % | <0.1 % | 56.7 TWh |
| Capacity (10/2011) | 0.2 GW * | 0.2 GW | <0.01 GW | 0.2 GW | <0.01 GW | <0.01 GW | 17.0 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2024) | 10 % (non-technology specific; excl. large hydro) | | | | | | n/d |
| Capacity (2024) | n/d | n/d | n/d | n/d | n/d | n/d | n/d |

* excluding large hydro >20 MW, 5.7 GW incl. large hydro.

#### Introduction/Overview

Chile is one of Latin America's advanced countries with regard to RE support, having implemented a renewable portfolio standard as its major regulatory support mechanism – an instrument that only a few transition economies use to support RE in electricity production. The country also passed some additional minor RE policies. However, Chile is missing a comprehensive strategy that would encompass a long-term RE vision for electricity supply.

#### Electricity Mix/Targets

In 2010, Chile produced 2.3 % of its electricity from non-conventional renewable energy sources, consisting of 0.8 % small hydro, 0.8 % biomass, 0.6 % wind, and a marginal share of other renewable sources[7]. The total renewable energy capacity excluding large hydropower plants with capacities over 20 MW amounted to roughly 0.6 GW in October 2011. The country's total installed capacity was 17.0 GW, most of it provided by coal and natural gas power plants, diesel/other fuels generators, and large hydropower plants.

By 2024, Chile aims at increasing the share of 'non-conventional' RE (i.e. other than large hydro) in power production to 10 %. If this objective was reached, it would represent a four-fold increase compared to the current share of renewable energy. There are no technology-specific or capacity-related targets in place.

7 According to Law 20.257 Chile classifies non-conventional renewable energy (Energías Renovables No Convencionales, ERNC) as all renewable energy excluding large hydropower (>20 MW). The share of renewable energy including large hydropower in electricity production was 38 % in 2010.

#### Strategy/Instruments

Facing a projected average annual growth rate of 5.4 per cent in power demand between 2007 and 2030, Chile will need to add capacity of roughly 600 MW per year to keep pace with demand. This represents a considerable challenge to power producers, who need to invest in new plants, and to public authorities in charge of planning future power capacity. However, the upgrading of the generation system also represents an excellent opportunity for Chile to increase its investment in renewable energy.

The central support instrument to make use of this opportunity is the so-called Non-Conventional Renewable Energy Law (Ley 20.257) – a RE quota obligation for power producers that Chile passed in 2008 and came into effect in 2010. It requires all utilities with a capacity of more than 200 MW to generate 5 % of their electricity from non-conventional renewable energy sources from 2010 onwards. Affected utilities are allowed to trade with third-party companies and non-compliance is sanctioned with a surcharge on every megawatt hour (MWh) not obtained from non-conventional renewable sources. Between 2010 and 2014, the quota remains constant at 5 %. It increases by 0.5 % annually to reach 10 % by 2024. In 2010, the new centre-right government even announced to raise this target to 20 % by 2020 although the government has not yet provided a legal framework for this announcement.

By introducing an RE quota obligation as its major regulatory policy, Chile is an exception among emerging economies, which often opt for a mix of policies or feed-in tariffs. However, considering the market liberal economic tradition of the country the quota obligation suits into the structure of the electricity system and the energy policy.

Chile also passed some additional minor laws for the promotion of renewable energy such as the Ley 19.940, which grants small generators access to the electricity market and exempts them from transmission tolls, and Ley 19.657 on geothermal concessions (currently under revision).

#### Achievements

In 2010, all utilities were able to fulfil the portfolio standard reaching a share of 8 % from renewable energy in their electricity generation mix.[8] Most of the electricity was produced by small hydropower (<20 MW of capacity), wind and biomass plants. Between 2007 and 2011, Chile installed an additional capacity of 0.34 GW of non-conventional renewable energy capacity (added renewable energy capacity including large hydro: 0.62 GW).

#### Electricity Market/Barriers/Attractiveness

Since 1982, the Chilean energy market is completely liberalised, providing a high level of competition, market-oriented electricity prices, and very limited government intervention. Today, there are 31 utilities, 5 transmission companies, and 36 distributing companies.

8 Only utilities with a capacity greater than 200 MW are obliged to fulfil the renewable portfolio standard. These utilities reached the mandate even though the national share of renewable energy is only 2.3 %.

Access to electricity reaches almost 100 %. There are two large interconnected grids (Sistema Interconectado Central (SIC) and Sistema Interconectado del Norte Grande (SING), which represent 99 % of all subsystems, and two grids of smaller size in the more remote parts of the country.

Attractiveness to investors can be assessed to be fair. One critical barrier has been the rather low investment security that the Chilean quota regime provides. Other than under feed-in laws, there is no determined tariff, which power producers can rely on for their renewable energy electricity. While this leads to more market-oriented prices, it is more difficult for investors to determine the profitability of the plants. In addition, Chile already has a very high market concentration that makes it difficult for new competitors to enter the market.

Another barrier exists for solar power investors. To date, the Chilean government has refrained from introducing a support policy for photovoltaic or concentrated solar power, particularly due to the argument of high cost. Chile's electricity prices are among the highest in Latin America, resulting from limited domestic energy carriers and subsequent needs for import, in electricity production mainly covered by natural gas from Argentina. As a result, Chile focuses only on RE technologies competitive to existing power generation (therefore choosing a renewable portfolio standard as main support instrument). In the long term, however, the use of solar power could be beneficial for the country, particularly because of its excellent potential in the north of the country (both for photovoltaics and concentrated solar power). If applied, experts expect cost for PV and CSP to decrease rapidly, accompanied by good employment opportunities in the solar industry same as benefits from decentralized electricity production. To tap this potential, Chile would need to introduce policies rewarding solar power investors with higher investment security and higher financial compensation. A feed-in law or a net-metering policy could be an option; yet, legislators could also modify the existing quota to be technology-specific. By setting individual targets for each renewable energy source Chile could incentivize stronger investments in solar power.

#### GIZ Activities and Experience

GIZ has developed many activities in Chile on consulting level. It has supported projects on RE electricity for hydro, wind, solar (photovoltaics and CSP), bio- and geothermal energy. Among them are analysis of potentials, the setup of wind and solar measurement stations, processing of data for subsequent use by ministries, various potentiality maps, pre-feasibility studies, site surveys, environmental impact assessments, assistance for ministries for preparation of several pilot projects, etc.). With regard to policy advice, GIZ has helped to analyse and improve detailed regulatory frameworks, support public relations, and facilitate capacity building in the public sector. Furthermore, it is currently developing mid- and long term energy scenarios (reflecting economic efficiency, energy security, and environmental factors). Lessons learned from these activities include that there is remarkable interest from the private sector to develop projects and there is huge potential for further engagement in this sector.

### 3.2.3 China

#### 3.2.3.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2009) | 15.7 %* | 0.7 % | <0.1 % | 0.6 % | <0.1 % | <0.1 % | 3663 TWh |
| Capacity (2010) | 213.4 GW | 31.1 GW* | 0.9 GW | 4 GW | <0.1 GW | n/a | 974 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2020) | 3 % (non-technology specific; excluding large hydro) | | | | | | n/d |
| Capacity (2020)+ | 300 GW | 150 GW | 50 GW | 30 GW | n/d | n/d | n/d# |

* an additional 13.6 GW were not connected to the grid +hydro, wind, solar targets were recently increased, but have not been legally laid down yet. #1,700 GW estimated.

**Introduction/Overview**
Due to China's ambitious and comprehensive renewable energy strategy implemented in the last ten years, the country is today one of the world's fastest growing renewable energy markets and is home to one of the strongest renewable energy industries. Based on a variety of instruments to support renewable energy in the electricity and heat sector (mainly consisting of public grants and loans, but also feed-in tariffs), particularly hydro-, wind-, and biomass power, have been prospering in the past. Yet, in spite of these developments, China's energy sector is not on the way to become entirely green. Rather, by taking into consideration the tremendously rising energy demand and huge investments in conventional power capacity, under current policies renewable energy will play a minor role in the country's future electricity generation mix.

**Electricity Mix/Targets**
In 2009, China produced 17.0 % of its electricity from renewable energy sources, consisting of 15.7 % large hydro, 0.7 % wind, 0.6 % biomass, and a marginal share of other renewable sources. Coal has been the dominant source for electricity supply with a share of roughly 80 %. Total renewable energy capacity (including large hydropower) in 2010 amounted to 249 GW. The country's total installed capacity was 974 GW.

By 2020, China targets to increase the share of non-large hydro renewable energy to 3 % (from 1.3 % in 2009) of all electricity generation. China also set capacity-related goals for each renewable energy technology, of which hydro and wind power will receive the greatest attention. Within 10 years, the country aims to install an additional 87 GW of (large) hydro and 119 GW of wind power to reach capacities of 300 GW and 150 GW respectively. Both targets were increased to 430 GW and 200 GW recently but have not yet been officially communicated or legally laid down. Solar power shall provide 50 GW and biomass power 30 GW of capacity by 2020.

China also defined targets for final energy consumption from "non-conventional renewable energy sources" (which include renewable energy and nuclear power). Standing at 8.3 % in 2010, an increase to 15 % by 2020 is targeted.

**Strategy/Instruments**
Since 2005, China has a clear and comprehensive renewable energy strategy claiming a leading role for the country in renewable energy promotion. The centrepiece of this strategy is the Renewable Energy Law of 2005, which acts as a framework for the long-term promotion of renewable energy. It regulates the priority of renewable energy over electricity from conventional sources and defines the country's renewable energy targets. Since its revision in 2010, operators are now legally obliged (rather than "requested" as worded in the early version of the law) to give priority to dispatch power from renewable energy and are confronted with penalties in case of non-compliance. The law also puts special focus on the support of rural off-grid renewable electricity generation and mandates the National Energy Administration to define annual targets for renewable energy power generation. The Renewable Energy Law also aims at the heating sector by increasing the dissemination of solar thermal installations.

Besides the Renewable Energy Law, the 11th and 12th Five-Year Plans are further important strategic papers for the support of renewable energy. Both plans explicitly consider RE promotion a fundamental pillar to become a knowledge-based economy in the future and to boost growth, as well as to help create and strengthen the domestic renewable energy industry.

To implement its strategy and goals, China has enacted a diverse portfolio of specific measures. In 2009, 2010, and 2011, respectively, feed-in tariffs for on-shore wind, biomass, and photovoltaics were enacted. Both the feed-in laws for on-shore wind and biomass have proven to work relatively successful. Experience for the nation-wide photovoltaics feed-in tariff, on the other hand, is still lacking as the law is effective only for a few months yet. Other important laws in place are capital subsidies, a wide range of tax credits and reductions, public funds and loans, a policy that removes import duties from wind and hydro technological equipment, a renewables premium, public competitive bidding, and investment in research and development.

**Achievements**
After capacity additions of roughly 120 GW or a relative increase of 92 % between 2005 and end of 2010, China today has a total installed renewable energy capacity of 250 GW thus being the world's largest RE market. Hydro and wind power are particularly strong sectors, representing 98 % of the capacity.

Comparing China to other emerging economies and considering the tremendous need for overall power capacity additions to satisfy its increasing demand, the country's past achievements and future goals must be considered impressive and ambitious. Since 2005, when renewable energy (excluding hydro) was almost non-existent in the country, China has doubled its installed renewable energy capacity every year. There is no other country in the world, aiming at similar amounts of added RE capacity. However, investments in power production from coal even surpass those in renewable energy by far. Therefore, the share of renewables (excluding large hydro) will remain at low level. Since some years, China is also the world's largest CO2 emitter with 7,032 million tons of CO2 emitted in 2008. Estimating that this amount will increase even more dramatically in the future and considering the country's overall energy strategy – even though ambitious in terms of renewable energy – it is not in sight that China will soon have a low carbon energy supply.

**Electricity Market/Barriers/Attractiveness**
Despite the wide range of existing renewable energy policies, China is facing some significant barriers that slow down or impede the dissemination of renewable energy. On the one hand, the highly regulated energy market, dominated by five public power companies, allows national authorities easily to implement political goals, making RE promotion very effective so far. However, on the other hand, the absence of private market players and competition can lead to increasing inefficiency and higher production cost. Coal, for instance, available in huge quantities in the country, is heavily subsidised just as well as electricity prices, which do not reflect market prices and are kept artificially low by the government. In 2007, the average electricity price for residential costumers was Yuán (CNY) 0.42/kWh (0.047 EUR/kWh[9]). China also collects a surcharge on its electricity price of CNY 0.008/kWh (0.0088 EUR/kWh) from all electricity consumers (except from agricultural users in Tibet) to finance renewable energy.

Serious problems result from the current Chinese power grid. Fragmented into six regional clusters with relatively weak interconnectivity, cross-regional trade of electricity represents only 4 % of the total electricity output. As a result, wind turbines in less-developed regions equivalent to a capacity of roughly 2 GW are either not connected to any grid or out of function as their electricity output cannot be absorbed and transmitted. Moreover, 11 GW of wind power capacity had not received commercial certification from licensing authorities by year-end 2010. China will invest CNY 1 trillion (EUR 115 billion) between 2009 and 2020 in the improvement of the grid (building interconnections, overhauling existing lanes, connecting rural areas).

RE market attractiveness is high. Supported by its far-reaching long-term policies, international investors currently consider China the world's most attractive country for renewable energy investments, according to the most recent Ernst & Young Renewable Energy Country Attractiveness Indices. Notwithstanding existing problems in licensing processes, the country attracted a record $49 billion of new financial investments in renewable energy in 2010 compared to only $25 billion flowing into the United States, which ranked second.

In addition, the country's huge investments in renewable energy over the past few years have led to a lift-off of the domestic renewable energy industry, which today counts to the strongest in the world. Mentioned as one of the "seven strategic industries" in the 12th Five-Year Plan, the renewable energy industry is a key sector for spurring economic growth and creating jobs. Notably, the Chinese photovoltaics industry has evolved to play a dominating role in the world market; also, the flourishing wind industry is increasing its global market share. Both sectors are mainly under control by public enterprises.

**GIZ Activities and Experience**
Activities of GIZ in China include wind power research and the support of training centres in cooperation with Chinese agencies. GIZ also offers advisory services to government departments responsible for expanding wind energy in China. In addition, GIZ has carried out a project to improve the use of biomass in biogas plants. Activities included technical and institutional improvement of pilot projects, capacity building, and systematic knowledge management on province level. GIZ has supported improvement of national regulations via policy advice (to alter existing regulations towards performance-based subsidies). GIZ experience has shown that the success of renewable energy projects heavily depends on the motivation of local public actors.

9 1 EUR = 9 CNY



### 3.2.4 Egypt

#### 3.2.4.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2009) | 9.3 % | 0.8 % | <0.1 % | <0.1 % | <0.1 % | <0.1 % | **139 TWh** |
| Capacity (2009) | 2.8 GW | 0.5 GW | 0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | **22.8 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2020) | 5.8 % | 12 % | 2.2 % | n/d | | | **n/d** |
| Capacity (2020) | n/d | 7.2 GW | n/d | n/d | n/d | n/d | **n/d** |

**Introduction/Overview**
Largely reliant on fossil fuels in power production and experiencing a rapidly increasing power demand, Egypt has taken some steps on RE promotion during the last few years. Wind energy has received great attention by the Egyptian government, but there is also increasing public interest in using the country's excellent solar potential. However, legislation in the past has mostly targeted large-scale installations while policy makers have left aside or even prevented the support of electricity generation from appliances of smaller size. If Egypt wants to achieve its renewable energy targets for 2020, however, providing support for both, small- and large-scale installations will be necessary.

**Electricity Mix/Targets**
In 2009, Egypt generated 10 % of its electricity from renewable energy sources. Hydropower plants produced 9.3 %, wind plants 0.8 %, while natural gas power plants covered the large majority of the remaining 90 %. There are also some small heavy fuel oil-based power plants. Total RE capacity amounted to roughly 3.3 GW in 2009; total installed capacity in the country was 22.8 GW.

By 2020, Egypt aims to produce 12 % of all electricity from wind power, 5.8 % from hydropower, and 2.2 % from solar energy (PV and CSP), which in total would represent a share of 20 %. The country did not define specific capacity-focused goals except for wind power, which shall supply 7.2 GW of capacity by the target year. There is also a medium-term goal for solar power: by 2017, concentrated solar power and photovoltaic installations shall provide 0.15 GW of capacity, whereas CSP will play a more important role, representing 87 % of this amount.

Egypt also implemented a goal for the share of renewable energy in primary energy, aiming to achieve 14 % by 2020.

### Strategy/Instruments

Between 1981 and 2005, the country's energy demand has increased by almost 5 % annually and the country has responded to this challenge by intensifying the use of fossil fuels in electricity supply. However, with the National Energy Strategy of 2008 Egypt tries to reverse this development by reducing the use of natural gas and oil in power production and promoting renewable energy. Particularly, wind power receives much attention by the strategy as the country has excellent wind potentials (mainly in the Western Bank of Gulf of Suez). The strategy sets generation- and capacity-based targets for the year 2020 (see above) and calls for the elaboration of two regulatory policies for RE support, namely a public competitive bidding scheme for wind projects and a feed-in tariff. Both policies are to be implemented in two phases, whereas the tendering system was established first and the feed-in tariff announced to be implemented after a period of review. The strategy includes some minor provision on energy saving and energy efficiency and calls for a reform of the electricity sector.

In July 2009, shortly after the approval of the National Energy Strategy, the Supreme Council of Energy introduced a system of public competitive bidding for large-size installations. Under this law, the Egyptian government opened a first round of tenders worth several hundred megawatts of capacity and allowed potential investors to hand in proposals for wind projects in the country. Successful projects receive long-term power purchase agreements of between 20 and 25 years by the national transmission company. The law also enables producers to sell certificates that result from the reduction of emissions of these plants. Evaluation criteria include privilege for local components.

As of end-2011, the National Energy Strategy has not entered the second phase yet and no feed-in tariff is in place accordingly. However, the Egyptian Electric Utility & Consumer Protection Regulatory Authority (EGYPTERA) has developed a feed-in tariff for small wind parks (<40-50 MW) and small PV installations (<30 kW), that is currently being examined in the Ministry of Electricity and Energy. Likely it will come into force in the middle or in the second semester of 2012. The feed-in tariff takes into account the prices that achieved in the projects that have been commissioned under the tendering system.

There are also some tax reductions available for renewable energy equipment and spare parts from customs duties and sales taxes, as well as grants and loans for renewable energy projects. In August 2011, the cabinet decided to implement a fund for renewable energy. Inter-ministerial committees are currently discussing various concepts for the fund.

### Achievements

Since 2004, Egypt has added roughly 0.45 GW of new wind power capacity, making it the most advanced country in Africa and in the Middle East in grid-connected wind power generation. The Zafarana Wind Farm holds the largest share of these capacity additions, growing from 2004's 0.14 GW to today's 0.52 GW. Additional wind projects of 0.54 GW are scheduled to come into operation until 2014 and projects of another 0.58 GW are already financed. There are tenders announced for more than 1 GW of capacity.

Egypt has invested in concentrated solar power plants. In 2010, the Kuraymat Integrated Solar Combined Cycle Power Plant with a solar thermal power capacity of 0.02 GW became operational. The plant combines natural gas combustion with thermal solar power. There are also some similar projects currently under consideration or in more advanced stages of development.

Regarding other renewable energy technologies, progress has been limited. Hydropower, for instance, has not received large investments in recent years; most of its potential is already used. Furthermore, photovoltaic was just slightly expanded, achieving a total capacity of 0.01 GW in 2009. Potentials of other renewable energy technologies have not been examined in depth yet.

### Electricity Market/Barriers/Attractiveness

Since vertical and horizontal unbundling of generation, transmission, and distribution of power in Egypt took place in 2001, there is no legal monopoly in the Egyptian electricity market any more. However, a reality check reveals that the state-owned Egyptian Electricity Holding Company (EEHC) still owns and controls more than 90 % of the market. As the country's six largest energy producers, the transmission company, and the nine utilities are all part of EEHC, in fact the holding has control over all sectors in the electricity system. Some market actors operate in isolated or semi-connected areas.

The national power grid is supplying Egypt's entire territory. As a result, electrification is very high, providing 99.5 % of the population access to electricity. In terms of integrating the targeted quantities of renewable energy electricity into the transmission network, the National Renewable Energy Agency (NREA) claims that the grid should not encounter major problems. Currently, the transmission company is conducting studies on future impacts of renewable energy integration with a special focus on wind power.

Authorities have not yet reported negative effects on electricity prices. To lower investment and operation cost, Egypt has registered the Zafarana wind farm as a Clean Development Mechanism (CDM) project in cooperation with Japan, Denmark, Germany and Spain. The Hurghada wind farm also receives support under the CDM mechanism, co-financed by Germany, Japan, Spain, EC and the European Investment Bank.

In terms of attractiveness, Egypt does not offer many opportunities for renewable energy investments yet. Besides the projects allocated under the regime of public competitive bidding and some large-scale CSP projects, there is a particular lack of incentives for small-scale power projects. Furthermore, political instability in 2011 has affected the investment climate.

### GIZ Activities and Experience

GIZ is very active in supporting renewable energy related projects in Egypt, currently being involved in four major projects:

- JCEE (energy policy support for the Ministry of Energy);
- RCREEE (regional centre for renewable energy and energy efficiency);
- MED-EMIP (support on policy level for renewable energy and energy efficiency; EU International Services program);
- MED-ENEC (energy efficiency in the building sector; EU International Services program).

With respect to the support of wind power in electricity production, GIZ has elaborated three individual support policies, including a competitive bidding scheme, a feed-in tariff for small wind farms, and public project development, such as joint ventures with the private sector. GIZ has supported the development of the "Wind Energy Yield Forecast System". Past and current policy advice includes the elaboration of a renewable energy master plan (with a focus on wind and solar), the establishment of a "Certificate of Origin" system, the establishment of an Energy Consumers Association, and capacity building activities. GIZ also assisted in the organizational development of EGYPTERA, NREA, and the cabinet's bureau for energy efficiency. Besides promoting energy saving campaigns and several activities to improve intra-governmental communication processes, GIZ has also helped Egypt to make use of international climate support mechanisms by assisting in the elaboration of CDM projects, CDM Programmes of Activity (PoA), and Nationally Appropriate Mitigation Action (NAMA) projects.

### 3.2.4.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | No regulatory policy; capital subsidies, tax reductions, public investments/ loans/grants, sporadic public competitive bidding | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Very unlikely, as neither instruments nor a strategy are in place. | | | | |

Egypt has defined renewable energy targets, aiming to expand wind power ambitiously and to increase the overall share of renewable energy in power production. However, the country has not yet defined a comprehensive strategy to reach these targets, particularly concerning effective policy instruments and a legal reform of the electricity market (including liberalization, cutting subsidies, etc.). The instruments currently in place will probably not lead to target compliance. Additionally, there is no regulatory framework for the promotion of small-scale power projects.

Egypt has formulated a 20 % RE goal in electricity production by 2020, being composed of 12 % from wind power, 5.8 % from hydropower, and 2.2 % from solar energy (PV and CSP). While policy makers also set a capacity-based objective for wind power (7.2 GW by 2020), no such capacity-related goal exists for solar power (the capacity of hydropower will probably remain at today's level, particularly since its potential is already largely exploited). Considering that a 2.2 % share from solar power by 2020 would at least require about 1.67 GW[10] of capacity (if provided by CSP only; a higher share of PV would afford additional capacity due to the lower capacity factor), it is questionable if Egypt can install such a large amount without adequate capacity planning. Although at present, NREA plans to build a CSP project with a capacity of 100 MW until 2017 and some other projects are under preparation (in cooperation with the EU and other international donors and banks), many more projects need to be developed within the next years to assure the installation of the necessary capacity. Additionally, this process will need to be done at much higher pace than in the past.

10 Assuming an output of 5 TWh and capacity factor of 34 %.

Egypt will therefore need to undertake more comprehensive capacity planning for both PV and CSP (as it does for wind) and improve corresponding policies in order to achieve the 2020-goal for solar. This could include a strong, legally established public tendering scheme which seeks attracting private investments through regular auctions and which provides sufficient investment security. The same applies to wind power: while wind power development has been advancing faster than solar power in the past, the goal of 7.2 GW by 2020 remains a huge challenge: Egypt will need to install more than 650 MW of wind power capacity annually between 2010 and 2020. To achieve the goal, Egypt will need to open up new areas for wind development, improve tendering, facilitate administrative process and attract an increasing number of private investors.

Egypt will likely be forced to foster the installation of small-scale PV appliances and wind power parks of smaller size as well in order to meet its objectives. This could be achieved by complementing tendering of large-scale projects with the announced feed-in tariff, which is expected to be enacted in mid or the second semester of 2012. Additional financial incentives such as low-interest loans, grants, and extra tax incentives that allow investors to reduce cost could be important accompanying measures.

Future legislation will have to address two additional challenges:

1) The government announced to use experience from public competitive bidding to determine the amount of feed-in. Generally, this can be helpful, but tariffs achieved in auctioning often represent the lowest level of possible prices and cannot be applied to other projects without adjustment. Due to strong competition in tenders, projects often turn out to be on the edge of profitability. Moreover, tenders normally target regions with very good RE conditions. In a feed-in tariff, however, policy makers have to ensure that also projects under less favourable circumstances receive an attractive tariff to operate economically. Since EGYPTERA has gained extensive experience during the last two years with the elaboration of the feed-in tariff draft, it can be estimated that the final law will incorporate such considerations.

2) Introducing a feed-in tariff and facilitating the market entrance of independent power producers must go in line with a reform of the Egyptian electricity sector. Subsidised electricity prices and the de-facto monopoly of state-owned companies are key areas to be addressed in this process. Today, fossil fuels as well as electricity prices are heavily subsidized, leading to energy/electricity prices far below normal market levels. Cost transparency is essential to public acceptance of RE. Therefore, for further RE expansion, a clear picture about the real cost of different energy technologies is needed. Moreover, an effective market reform must lead to a levelled playing field for independent power producers with companies under the holding of EEHC (third party access). A successful feed-in tariff will have to set very clear regulations on grid access for independent power producers and guarantee the feed-in of their electricity. The same applies to the Unified Electricity Law, which policy makers are currently revising and which will realistically be implemented in 2013.

The feed-in tariff should also take into account Egypt's excellent potential of solar power. The feed-in tariff that is scheduled to be implemented in 2012 will probably not provide support for solar power but only for small wind parks. Small-scale PV, however, could cover much of the electricity demand in private homes and thus help to decentralize electricity supply. Egypt's strong solar radiation would keep cost largely in line and could help create a domestic solar power industry at the same time. If Egypt took a lead here, its solar industry could function as a future supplier for other countries in the region.

In terms of institutional reform, clearer responsibilities between the ministries will contribute to a more coherent RE policy and thus provide more investment security. Especially conflicting interests between the Ministry of Electricity and Energy and the Ministry of Petroleum should be addressed. GIZ's approach to help strengthen EGYPTERIA as a sectoral institution (and thus avoid being in the line of conflict of both ministries) is an approach to commence bringing together the ministries in RE support.

Finally, effective RE support policies depend on political stability. Due to the current political transformation it is unclear if progress on RE can be achieved in the coming period and thus if the 2020-targets can be met. Officials, however, state that despite the political transformation Egypt will continue its investments in renewable energy.

Concluding, for a broader RE deployment in Egypt, a potential need for action arises on the following issues:

- Pursue the enacting and implementation of the feed-in tariff. The law should allow support of a broader range of renewable energy technologies (than the existing policies) and should include specific support e.g. for PV.
- Design the Unified Electricity Law in a way that a non-discriminatory environment for independent power producers is established. Further liberalize the electricity sector to increase the participation of private actors and decrease subsidies.

GIZ addresses important areas through existing activities (such as in the projects JCEE, RCREEE, MED-EMIP, and MED-ENEC) and will continue participation in these projects. With respect to the Policy Design Cycle, further activity could be directed on a consistent RE strategy, subsequent instruments as well as monitoring and evaluation. For instance, as there is a lack of knowledge about cost of the implementation of a feed-in tariff, GIZ might intensify its engagement in raising awareness and providing detailed information on potential costs of such a policy (e.g. by conducting studies). In this context, GIZ Egypt's activity in consulting stakeholders on adjusting industry electricity prices to increase competitiveness of RE, is another important and helpful activity. Consultancy on how to liberalize the energy sector might be another field of activity, same as on institutional reform.

## 3.2.5 Ethiopia

### 3.2.5.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2010) | 98 % | <0.1 % | <0.1 % | <0.1 % | <0.1 % | <0.1 % | **7.7 TWh** |
| Capacity (2010) | 2 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | **2 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2015) | n/d | n/d | n/d | n/d | n/d | n/d | **n/d** |
| Capacity (2015) | 10 GW | 0.8 GW* | n/d | n/d | 0.45 GW+ | n/d | **n/d** |
| Beyond 2020 | n/d | n/d | n/d | n/d | n/d | n/d | **n/d** |

* by 2013. + by 2018.

#### Introduction/Overview

Ethiopia is one of Africa's poorest countries and at the same time called "Africa's power house" since it strongly promotes hydropower. The country intends to drastically increase electrification and boost economic growth in the future, aiming to increase its current power capacity by a factor of five within five years and wanting to become a net exporter of electricity. Yet, the country's focus on building large hydropower dams leaves aside the promotion of other RE technologies. Its current hydro-focused energy strategy and the lack of adequate instruments represent major barriers to RE sources other than large hydro.

#### Electricity Mix/Targets

Between July 2009 and July 2010, 98 % of all electricity generated in Ethiopia originated from hydropower plants, the rest coming from small fossil fuel based and other RE plants. In other words, the total RE capacity of approx 2 GW (July 2010) is almost equivalent to the overall capacity.

By 2015, the country targets to add an impressive 8 GW of hydropower capacity, mainly by building large-scale hydropower plants. It also aims to increase the current (marginal) wind power capacity to roughly 0.8 GW by 2013 and geothermal capacity to 0.45 GW by 2018. Apart from these energy sources, Ethiopia has not defined any long-term renewable energy targets. Due to the dominance of hydropower, which will soon generate more than 99 % of all power in the country, there are no generation-based targets either.

### Strategy/Instruments

Ethiopia's main energy legislation is the Growth and Transformation Plan 2010/11 – 2014/15. Even though it is conceptualised as an overall economic plan with strategies and goals for a variety of industrial sectors, energy plays an integral part in it. Investments in hydroelectric power, i.e. additional capacity, are the central objectives the government is pursuing for the energy sector. Expansion of RE is highlighted in the plan as the first strategic direction for the energy sector. It also aims at extension of distribution lines, electrification, energy efficiency/energy conservation and limiting wastage of power. It also includes a blending target for ethanol and biodiesel.

Ethiopia elaborated a Nationally Appropriate Mitigation Actions plan (NAMA; agreed under the Copenhagen Accord) where it fortifies its strategy for the promotion of renewable energy towards the United Nations Framework Convention on Climate Change (UNFCCC).

Besides the Growth and Transformation Plan, Ethiopia passed some minor laws that target the promotion of renewable energy: in 2003, the Ethiopian parliament passed the Rural Electrification Fund with the aim to promote rural off-grid electrification. Since 2010, there is an exemption of duty in place for renewable energy equipment. However, most of the country's major energy laws date back to the 1990s. Ethiopia has no feed-in tariff, renewable portfolio standard, or another comparable policy promoting specific renewable energy technologies.

### Achievements

Ethiopia has excellent potentials for energy generation (calculated 45 GW of hydropower capacity). During the last five years, the country was able to tap already some of it by completing 1.4 GW of large-scale hydro projects, bringing the country's total capacity to about 2 GW in 2010. With the assistance of international donors, some low-capacity geothermal power plants and other minor renewable energy projects went online as well.

Another ten large projects with a capacity of 5.6 GW have already been commissioned and are scheduled to start operation in 2015 or earlier. Additionally, Ethiopia plans to build the Grand Ethiopian Renaissance Dam, Africa's largest hydroelectric power plant with a capacity of over 5 GW. If all these plants are built in time, their capacity would exceed the target defined in the Growth and Transformation Plan. Ethiopia also commissioned projects to reach the wind power and geothermal targets.

### Electricity Market/Barriers/Attractiveness

As a low-income developing country, Ethiopia is facing serious technical and structural barriers related to renewable energy. According to the IEA, the electrification rate of the country is very low with only 17 % of the population having access to electricity. In rural areas, coverage even only reaches 1-2 %. Moreover, government influence on the electricity market is strong, through the public Ethiopia Electric Power Corporation. Under this constellation, market access is difficult for new competitors and independent power producers.

The main structural barrier for the promotion of renewable energy other than large hydro in the country is the government's de facto focus on large hydropower (capacity of wind and geothermal power is targeted to increase substantially but there are neither adequate policies, skilled labour force for maintenance, nor much experience with these technologies).

From an economic point of view, the focus on hydropower provides several benefits. As a poor developing country, Ethiopia's primary strategic interest is to spur development and reduce poverty, trying to avoid any negative impact on the national budget. Due to the country's extended system of rivers and lakes, hydropower is the most appropriate energy technology to achieve these goals at moderate cost. Even though it is foreseen that the newly built hydropower stations will lead to slightly higher electricity cost, Ethiopia will be able to bring in additional revenues by exporting of excess electricity to neighbouring countries.

However, this setup represents a central barrier to small-scale decentralised RE. Typically, independent power producers run projects of smaller size and they need additional financial support to operate their facilities economically. Without a liberalised electricity market, adequate policies, and the political will to allow such energy production, there is only little opportunity for small-scale solutions in Ethiopia. Currently, the Ministry of Mines and Energy is elaborating a draft for a feed-in tariff, but it is not known if and when this policy will become effective.

At the same time, the need for and potentials of small-scale energy production are huge: as rural electricity access is almost non-existent, off-grid installations could improve access to electricity in rural areas (where grid connections might be expensive), facilitate the emergence of small businesses, and partly substitute firewood, thus mitigating deforestation.

### GIZ Activities and Experience

The work of GIZ in Ethiopia has focused on policy and strategy development as well as advice on legislation and regulation. GIZ also realizes off-grid pilot projects (currently solar and mini-hydro) and it has supported stakeholders in the planning of a large-scale wind farm. In addition, numerous capacity building measures have been carried out, including the setup of renewable energy centres at four national universities and solar and mini-hydropower training centres. GIZ has also provided institutional support to new solar and hydropower associations.

## 3.2.6 Ghana

### 3.2.6.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 68.8 % | <0.1 % | | | | | 10.2 TWh |
| Capacity (2010) | 1.2 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | 2.2 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Capacity (2015) | 2.3 GW | 0.05 GW* | n/d | n/d | n/d | n/d | 5.0 GW |
| Generation (2020) | n/d | 10 % (non-technology specific; including small hydro) | | | | | n/d |
| Capacity (2020) | n/d | n/d | n/d | n/d | n/d | n/d | n/d |

* by 2013.

#### Introduction/Overview

Ghana has passed two central strategic, energy-related papers in the recent past, both aiming at RE to become more important in the country's electricity mix. While the country already generates much of its electric power from large hydro dams, decentralised, smaller-scale RE entered the political agenda in recent years to develop rural electrification and diversify power supply. Ambitious targets have been formulated and several measures to translate this vision into reality have been suggested, but no concrete policy has come into effect yet.

#### Electricity Mix/Targets

In 2010, Ghana produced 68.8 % of its electricity from hydro energy. The rest, 32.2 %, was produced in thermal power plants combusting oil, diesel, and natural gas. Almost no non-hydro renewable energy power plant was connected to the national grid. RE capacity amounted to 1.2 GW, entirely provided by two large-scale hydropower dams. Thermal power plants nominally accounted for 0.87 GW, but many of these are out of function.

Until 2015, Ghana aims to install an additional 1.1 GW of hydropower to reach 2.3 GW of total hydroelectric generation capacity. Additionally, 0.05 GW of wind power capacity shall be installed by 2013. In the long term, Ghana aims to maximise the share from non-large-hydro renewables (<0.1 GW) in electricity generation from today's nearly 0 to 10 % by 2020. There are no capacity-related goals for this period currently in place.

#### Strategy/Instruments

Ghana has adopted two important framework policies for RE support in electricity production: the Strategic National Energy Plan 2006-20 and the Ghana National Energy Policy of 2010. The Strategic National Energy Plan 2006-20, implemented in 2006, is the country's most important multi-sectoral framework policy. It aims to contribute to the development of a well-functioning energy market and formulates a pathway for the energy sector until 2020. The plan considers RE an important pillar in the country's energy mix, helping to improve rural electrification, decrease the use of firewood for cooking and heating and slow down deforestation. It defines long-term goals for RE share in power production (see above) and aims to achieve a penetration of 30 % of rural electrification with RE technologies by 2020. The plan also includes various recommendations, a.o. the enactment of a feed-in tariff and financial incentives.

The Ghana National Energy Policy of 2010 is the most recent framework policy. Addressing RE deployment, waste-to-energy management, and energy efficiency, it calls for introducing adequate policy instruments for the support of RE in power production. In particular, the paper suggests that the country should put focus on promoting mini hydro, pointing to the country's excellent potentials and identifying more than twenty sites for suitable power generation.

As of mid 2011, no concrete follow-up such as a feed-in tariff or similar regulative policy has been enacted yet. However, the national parliament currently debates about a Renewable Energy Law.

In terms of financial incentives, import duties, and value added tax exemptions exist for wind and solar power generating systems. Reduced import duty of 5 % is applicable to technical equipment for both technologies.

In cooperation with international organizations, Ghana's government has also implemented two programs that target the installation of small PV appliances in households and public buildings. These programs are known as the Renewable Energy Services Programme (RESPRO) and the Ghana Energy Development and Access Project (GEDAP).

#### Achievements

Although future prospects seem good (until 2014 several large hydropower and a large wind power project expect completion), hardly any concrete impact has been achieved until today. There is some success in rural areas where various off-grid, small-scale appliances have been completed with the help of international donors.

The main reasons for currently stagnating RE promotion are the lack of adequate support policies and low purchasing power of the population. In addition, interest rates on bank loans are high and imported equipment is expensive. There is lack of expertise and skilled staff able to install renewable energy power appliances.

#### Electricity Market/Barriers/Attractiveness

Ghana's electricity sector is liberalised but in fact, state-owned companies dominate or have large influence on production, transmission, as well as distribution of power. 87 % of all power capacity is owned by the public company Volta River Authority (VRA), which also controls part of electricity transmission through its subsidiary Volta River Authority - Northern Electricity Department (VRA-NED). The national grid is operated by the state-owned transmission company GRIDCo.

From a technical point of view, the country's grid is characterised by both big challenges and opportunities for the promotion of renewable energy.
On the one hand, the electricity network is poorly established and inefficient, often close to breakdown. Power outages and forced shutdowns are very common in Ghana. Fluctuating RE power output – especially from wind and solar power – adds another challenge to the grid. Major investments in the modernisation of Ghana's transmission network will be needed to bear the input of large amounts of RE electricity. On the other hand, the poor establishment of the grid provides attractive opportunities for off-grid, independent power production in areas not connected so far. As Ghana only has a an electrification rate of 54 %, there are large potentials to use solar, wind, and other natural resources in rural areas to provide people access to electricity. Moreover, off-grid solutions often can be more cost-effective in small villages where a connection to the national grid might be too expensive.

In terms of investment attractiveness, a major obstacle is the lack of an effective policy that would award power producers with cost benefits and a stable environment for investment. In the past, mostly international donors engaged in building RE projects. Private investors, on the contrary, have remained reluctant.

Under these very limited RE activities, no negative effects on the electricity price or national budget could be observed.

### GIZ Activities and Experience

GIZ is currently preparing a policy-related project, which envisages the support of the Ministry of Energy in developing regulations for the implementation of the Renewable Energy Law.

## 3.2.6.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | Tradable RE certificates, tax reductions | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Very unlikely, as neither instruments nor a strategy are in place. | | | | |

Ghana puts focus on increasing the share of small-hydro and wind power. The country has passed two important long-term framework policies on energy, forming the country's strategy in renewable energy promotion and call for structural reforms and the elaboration of support policies. However, to date none of these policies have been implemented, resulting in very little achievements in the promotion of renewable energy.

In terms of defining renewable energy targets Ghana passed a fairly ambitious goal of 10 % from renewable energy in its electricity production by 2020. This goal does not include the share of large hydropower plants, which usually represent a share of between 60-70 % in power generation. There are also capacity-related short-term goals for large-scale hydro and wind power.

Ghana has also invested considerable effort in the past in formulating a roadmap to make its electricity sector more sustainable. The country passed two comprehensive framework policies, the Strategic National Energy Plan 2006-20 and the Ghana National Energy Policy of 2010.

However, from an in-depth perspective, these two papers have not been strong and comprehensive enough to incentivize effective RE promotion. Hence, setting up a renewable energy support strategy does not only mean elaborating ambitious framework policies but also requires concrete instruments for implementing the strategy. Moreover, sufficient funding for RE projects, making use of international cooperation, liberalizing the domestic electricity market, etc. would be further steps under an effective a strategy. Ghana has not tackled these issues so far, i.e. especially in this field a need for future action arises.

In September 2011, a debating process in Parliament about the Renewable Energy Law (this law will introduce a feed-in tariff) has started. Reports say that the policy has the potential to incentivize RE growth effectively. Obviously due to unclear political priorities it has taken five years since the passing of Strategic National Energy Plan 2006-20 to take up this issue (facilitated also through GIZ support on designing the bill). For long, the strongest RE driver has been Ghana's insufficient power supply (frequent power cuts due to droughts affecting large hydropower). Recently, other RE advantages such as rural electrification and combating deforestation entered the political agenda.

The first step towards effective RE support will be a thorough design and implementation of the Renewable Energy Law. This includes guaranteed grid access for independent power producers and connection within an appropriate time span. Producers must receive the determined tariffs, possibly co-financed by a renewable energy fund and international funding. Eventually, it will be of particular importance to create a fair and supportive environment for new market actors to be able to compete with the public utility VRA. This includes the reduction and elimination of subsidies on both production and consumption.

In a second step, it will be necessary to continuously evaluate the functioning of the law, observe price development, adapt tariffs, or make changes to the policy if necessary. Stakeholders must be familiar with its regulations, requiring awareness raising activities. Moreover, the purchase of renewable energy equipment needs to be alleviated.

In a third step, fiscal incentives should be attached to the feed-in tariff, allowing equipment to become affordable to investors and private households. This goes in line with a support for construction companies specialized in renewable energy installations.

These steps must be accompanied by a long-term strategy to successively liberalize the electricity sector. The influence of state-owned company VRA on production and transmission of power needs to be reduced and more private actors allowed participating in the market.

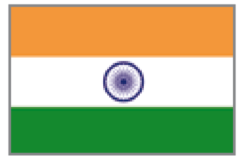
Concluding, an effective RE promotion in Ghana will require a number of further policy related activities. If implemented successfully, benefits like increased reliability of the electricity system, higher electrification and less reliance on firewood and oil will further increase political acceptance. Accordingly, policy makers could envisage the following focus areas in order to meet Ghana's renewable energy goals:

- Pass and implement the Renewable Energy Law. Guarantee favourable and fair conditions for private power producer and improve competition in the market. Reduce both production and consumption subsidies for conventional power sources to create cost transparency for renewables. Ensure sufficient funds to finance the provisions of the law; increase the use of international mechanisms and funds to help finance the system. Continuously improve the law and disseminate information about benefits of the policy.
- Broaden fiscal incentives to renewable energy technologies apart from wind and solar. Elaborate additional incentives, as for instance income tax cuts for producers and consumers of renewable energy. There is a variety of options available.
- Possibly build up partnerships with other countries in Africa, which have already gained experience with feed-in tariffs and build up cooperation. Promote the sharing of information and experience.

After the parliament passes the Renewable Energy Law, the ministry will likely involve GIZ in the promotion and implementation of this framework. The above-mentioned focus areas for policymakers all represent possible areas of activity for GIZ, including work on not only defining targets and a strategy, but also additional support instruments. Apart from the envisaged project to support the implementation of the Renewable Energy Law, future action by GIZ might include, for example, the development of monitoring tools and recommendations with respect to the Renewable Energy Law as well as supporting regional networks to foster knowledge exchange with respect to feed-in tariffs.

## 3.2.7 India

### 3.2.7.1 Summary



| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2008) | 13.8 % | 1.7 % | <0.1 % | 0.2 % | <0.1 % | <0.1 % | **830 TWh** |
| Capacity (8/2011) | 41.8 GW* | 14.9 GW | <0.01 GW | 2.8 GW | <0.01 GW | <0.01 GW | **182 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2012) | n/d | n/d | n/d | n/d | n/d | n/d | **n/d** |
| Capacity (2012) | 54.6 GW | 17.6 GW | <0.1 GW | 3.2 GW | n/d | n/d | **225 GW** |
| Beyond 2020 | n/d | n/d | 20 GW+ | n/d | n/d | n/d | **n/d** |

* large and small hydro. ino federal targets. +by 2022.

#### Introduction/Overview

India, having the second largest population of the world, is facing similar energy challenges like its neighbour China: within the next few decades, tremendous amounts of new generation capacity will be necessary to meet its quickly rising energy demand. At the same time, fighting climate change requires low-carbon energy technologies. India aims to respond to this challenge with its comprehensive renewable energy strategy that puts particular focus on the promotion of hydro, wind, and solar power. However, from an overall perspective, India's energy strategy will not make renewables – although ambitiously supported - a major energy alternative in the country. Rather fossil fuel-dominated power production will shape India's electricity production in the future.

#### Electricity Mix/Targets

In 2008, India produced 15.7 % of its electricity from RE, of which 13.8 % were generated in hydropower-, 1.7 % in wind-, 0.2 % in biomass-, and a marginal share in other renewable energy power plants. The dominant source in India's overall electricity supply was coal with a share of more than two thirds of all generation (68.5 %). Natural gas power plants contributed 10 %, oil-based power plants 4.1 %, and nuclear power plants generated 1.8 %. Total RE capacity (including large hydropower) as of August 2011 amounted to 59.8 GW of grid-connected installed capacity, with only hydro, wind, and biomass (agro-residues and bagasse) power contributing considerable shares. The country's total installed capacity was 182 GW, as of September 2011.

By the end of the current 11th Five-Year Plan in March 2012, India targets to have a total hydro capacity of 54.6 GW, 17.6 GW of wind power capacity, 0.05 GW of solar capacity, and 3.2 GW of biomass capacity. India has not defined any national generation-based targets (there are generation-based targets on state level, varying significantly) and no long-term targets going beyond the year 2020 - except for solar power, which should provide a capacity of 20 GW by 2022.
India aims to increase solar hot water production from 2.8 GWth as of January 2011 to 10.5 GWth by 2017 and 14 GWth by 2022.

### Strategy/Instruments

India laid down its long-term strategy for the energy sector in the Integrated Energy Policy Report of 2006, which addresses the development of the country's energy supply but also outlines measures and long-term perspectives for renewable energy. The general regulative framework for the electricity market is the Electricity Act of 2003, which regulates the access of renewable energy to the electricity grid.

In the 11th Five-Year Plan – the most important source for short-term goals on renewable energy - India set quite ambitious targets for the development of renewable energy by March 2012 (see above). It also includes a 1 GW off-grid capacity objective (0.95 GW wind, 0.05 GW solar) by the same target year. The National Solar Mission encompasses 20 GW of grid-connected, including utility scale and rooftop projects and 2 GW of off-grid capacity by 2022.

The Electricity Act defines a national electricity policy, an electricity tariff policy and a plan for making ideal use of energy resources including RE. In compliance with the specific policy measures, the tariff policy has been notified in 2006. The policy has also specified the role of Regulatory Commissions. They may set the Renewable Purchase Obligation (RPO) targets, taking into consideration the availability of renewable energy resources in the region and its impact on retail tariff. In 2011, in order to encourage the deployment of renewable energy the country has specified the framework for Renewable Energy Certificate Mechanism. The mechanism shall enable the obligated entities meeting their RPO targets through purchase of Renewable Energy Certificates.
Under the provisions of the Electricity Act, 2003, the Central Electricity Regulatory Commission specifies a framework for the determination of a feed-in-tariff for 'inter-state' sale and the purchase of renewable energy. Whereas, for the promotion of renewable energy in respective States i.e. 'intra-state' sale and purchase of renewable energy, the State Electricity Regulatory Commissions' specifies regulation and/or order for determination of a feed-in tariff for electricity generated from wind, small hydro, solar photovoltaics, solar thermal, non-fossil fuel based cogeneration, and biomass-based power projects. The term of the power purchase agreement between the generator and the purchaser shall essentially depend on the framework established by the appropriate commission, e.g. the Central Electricity Regulatory Commission specifies the terms of power purchase agreement as 13 years for all technologies except for small hydro (<5 MW; 35 years) and solar photovoltaics/thermal (25 years). As for the RPO framework, almost 26 State Electricity Regulatory Commissions, exercising their power vested under the Electricity Act, 2003 have specified the targets taking into consideration the availability of renewable energy potential in their States together with its impact on retail tariff. The framework recognises RE Certificates as a valid instrument for fulfilling the RPO target by the 'Obligated Entities'.

In 2002, in order to encourage investments, India introduced an investment tax reduction in the RE sector that allowed investors to claim an 'Accelerated Depreciation Benefit' of up to 80 % of the project cost. Further, in 2008, with an objective to increase the renewable energy injection in the grid, the Ministry of New and Renewable Energy (MNRE) has introduced the 'Generation Based Incentive' Scheme for the wind and solar energy sector, trying to put a stronger focus on linking financial support to operation and maintenance. Both policies are mutually exclusive; investors may avail benefits either under Accelerated Depreciation Benefit or the Generation Based Incentive Scheme. There are also reductions/exemptions on import duties for renewable energy technology.

### Achievements

As of end 2010, India was the world's fifth largest non-hydro renewable energy market with a total renewable energy power capacity of 16.8 GW (54 GW including large-hydro). Representing 10.1 % of the country's total power capacity, these installations contributed to 4.1 % of the overall electricity generation (15.7 % including large-hydro).

In March 2011, four years after the implementation of the 11th five-year plan, additional renewable energy capacity of 10.7 GW was installed, achieving 76 % of the 2012-target. As defined in the plan, wind power has evolved to be the fastest growing of all renewable energy technologies. Overall renewable capacity is growing quickly too, increasing its capacity share by more than 8 % points since the initiation of the 11th plan.

### Electricity Market/Barriers/Attractiveness

Since India has proclaimed to increase the share of RE substantially in its energy mix, the country's energy market has become attractive for both, domestic and international enterprises, to invest in renewable energy projects. Between 2009 and 2010, financial investment rose by 25 % to EUR 2.7 billion with 60 % flowing into wind projects. Moreover, the Indian renewable energy industry is growing rapidly, creating more than ten thousands of jobs in the country. India's largest wind turbine manufacturer Suzlon is now one of the global players, competing with European, Chinese, and U.S. companies. The wind industry employs roughly 10,000 people. There are also more than 10 domestic solar module manufacturers in India, especially due to the ambitious targets set in the Jawaharlal Nehru National Solar Mission act (short: National Solar Mission). The country also has a very strong small-scale hydropower manufacturing industry.

As in many other developing and emerging countries, India is facing some technical challenges related to deployment of renewable energy. The national transmission and distribution networks, for instance, require reinforcement, accompanied by measures to reduce network losses. Currently, approximately 32 % of the electricity is lost during transportation and transmission. In peak seasons, wind power farms in Tamil Tadu (where most wind capacity is installed) are often put off-grid due to limited available grid capacity. Even though the country has established a smart grid task force and strongly invests in grid improvement further efforts might be necessary to overcome these obstacles.

To date, there have been no reports on the effect of renewable energy support on electricity prices or the national budget. Yet, there are funds for solar photovoltaics power projects in rural areas that cover between 30 and 90 % of the investment cost.

### GIZ Activities and Experience

GIZ has been active, for example, in a development partnership between the private biogas company EnviTec and the public company MPPPL. EnviTec has delivered expertise and technology for biomass fermentation, while MPPPL has planned the respective installations and runs them. GIZ has provided contacts, knowledge management and has ensured the relevant supply chain for the project. This has led to local capacities to produce components for large biogas plants, but experience has shown that the realization of projects has been confronted with severe delays, e.g. due to locally specific market structures.

In another program, GIZ promoted vegetable oil motors and biogas motors combined with generators. Activities included intensive consulting for energy committees in villages and the technical development of motor technology. Currently, GIZ supports the establishment of a model system for waste-free electricity supply in 25 communities, which includes the intensive dialogue with the local population and the local public administration.

A third program, which concentrates on rural electricity supply, includes activities such as the development of an operator model for community nets/off-grid systems, market development for renewable energy in the agriculture sector and policy advice for general frameworks (e.g. feed-in tariff).



### 3.2.7.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | Feed-in tariff, renewable portfolio obligation, tradable RE certificates, capital subsidies, investment/production tax credits, tax reductions, public financing, public competitive bidding | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Very likely to achieve short-term targets; unlikely to achieve 2020-solar target. | | | | |

Renewable Energies already play a role in India's power system, although less than in other emerging economies such as China or Brazil. A strategy has been defined on how to reach the targets, based on an integrated policy approach and an ongoing reform of the electricity sector. India has also passed concrete support mechanisms for implementing the strategy even though some of these laws are not designed appropriately to allow an efficient support. India encounters problems with the enforcement of the existing policies. It has a good monitoring system in place.

Besides its target for solar power, India has not defined long-term targets (beyond 2020) for other renewable energy technologies yet. Goals in five-year plans do not exceed its respective time horizons and they neither do in the existing renewable portfolio obligations of the states. Although many observers believe that India will continue on its path of promoting renewables, the lack of long-term goals alienates investors and is one reason for why India is not as successful as China in attracting renewable energy investments.

When analyzing the feasibility of India's existing renewable energy targets, the short-term goals can be considered realistic. The five-year plan's goal for renewable energy capacity additions is largely on track with an achievement rate of almost 76 % one year before the ending of the plan. The achievement of the National Solar Mission's goal of 20 GW of solar capacity by 2022, however, is less likely. According to two studies, India will by far not be able to fulfil this goal (and neither the interim goals) with the current set of policies. One study projects a capacity of only 0.1 GW by 2022; another study estimates 1.8 GW in the next five to six years.

In terms of initiating a comprehensive strategy that guarantees successful long-term RE support, India has established various key elements. First, the Electricity Act of 2003 is an important step towards a functioning renewable energy support as it pushes liberalization and competition in the domestic electricity market. It has helped to unbundle production, transmission and distribution of electricity, rationalize tariffs, and bring transparency into electricity subsidies. An increased number of private actors have been entering the market, resulting in a share of 19 % of private participation in the power generation market. For a continued success of renewable energy promotion, it will be necessary to continue liberalisation of the Indian power market.

Second, the Integrated Energy Policy Report, probably the most important and comprehensive strategic policy, provides well-designed guidelines for the support of renewable energy. It emphasizes the need of renewable energy to increase energy independence, accelerate electrification, and to create jobs. It also cites a renewable energy potential and cost analysis, demands better grid integration, enlargement and enhancement, and stresses the need for better efficiency measures and higher energy savings. All these elements are important for a success in the long run.

With regard to the definition of concrete measures to implement the strategy and achieve the targets, India has a large portfolio of different policies to foster renewable energy which address various different renewable energy technologies and types of support. Among them are feed-in tariffs, renewable portfolio obligations, certificate trading, tax credits, import duty exemptions, auctioning, loans, a biofuels obligation, and a rural electrification program.

However, some problems exist with the implementation of these laws. Due to its organizational structure as a federal republic, Indian states enjoy strong constitutional competency in the power sector. Therefore, states have to implement renewable energy laws – a process that is often not overly effective. Since 2006, almost 26 out of 28 states have introduced renewable purchase obligations for renewables (with quotas between 1 and 14 %). Only 4 states achieved their respective goals in the 2009/2010 period. Earlier, only 3 states had a penalty system in place that sanctions non-compliance with the RPO targets; in all other states not meeting the target remains unsanctioned. However, the states have revised their RPO framework after the introduction of the Renewable Energy Certificate Mechanism. In addition, the implementation of feed-in tariffs has not been accomplished in all states.

Moreover, some policies were found not to be very effective, not meeting the envisaged objective, particularly with regard to the promotion of wind power. It has been observed that investors installed wind farms availing the tax depreciation benefits from the Government, but then lacking proper operation and maintenance, as the way of support provides no incentive for operation. The policy puts heavy focus on investment, trying to increase wind power capacity rapidly, but neglected making sure that these plants were operated properly. In 2007, India's wind farms had an average load factor of 17 % (some regions only have 10 %) which is significantly lower than those of other large wind markets such as the United States, Spain, or Germany (all above 20 %). Although the central government announced the Generation-Based Incentive Scheme which provides for availing the incentive for amount of electricity generated and fed into the electricity grid, most of the applications are still commissioned under the more profitable investment tax reduction policy.

With respect to the National Solar Mission's goal to increase solar capacity up to 20 GW by 2022, the MNRE has announced policy measures for rapid deployment of solar energy in the respective segment. Solar projects worth 620 MW (PV: 150 MW & CSP: 470 MW) have been allotted under Batch I/ Phase I of the National Solar Mission which are under construction. Guidelines, for solar project developers willing to participate in Batch II/ Phase I of the National Solar Mission have been announced by MNRE targeting solar photovoltaic capacity of 350 MW. It can be expected that solar energy will develop into many grid connected and off-grid rooftop applications even on mid and small sizes. Even though the 2009 passed feed-in tariff might help to speed up installations and attract more investments, it remains uncertain if the goal can be achieved without additional effort. As of August 2011, the country only had 0.04 GW of grid-connected photovoltaic systems whereas the solar water heating collector area was approximately 4.67 million square metres.
Nevertheless, India is among the top five nations in terms of wind energy installations. Further, the Jawaharlal Nehru National Solar Mission has given necessary spurt to the Solar Energy segment. The country is witnessing positive results and the State of Rajasthan only, has received application worth 17000 MW for developing the Solar Projects from various project developers. The Central Electricity Regulatory Commission has specified Indian Electricity Grid Code framework encouraging the generation from Wind and Solar Energy Projects.

Further, India is among the few countries that have introduced the Renewable Energy Certificate Mechanism for encouraging the deployment of Renewable Energy. It is likely that such mechanism shall support large-scale deployment of renewable energy and essentially overcome geographical constraints to harness available RE sources. However, the following topics could be possible future actions for Indian policy makers:

- It must be ensured that states implement the policies efficiently and that the envisaged target is achieved. Further, there should be stronger enforcement provisions for non-compliance. Setting of a minimum goal under the portfolio scheme could be a possible first step.

- While portfolio obligations are strongly oriented towards competition and the market, feed-in tariffs are characterised by stronger regulation and fixed tariffs. As India implemented both such policies, the management of their co-existence will be a central challenge.

- In order to encourage investment in the renewable energy sector, the long-term goals should be stated and states should specify long term RPO target lasting until beyond 2020.

- Suitable policy and incentive measures to encourage developers switching from investment-based regime to a generation-based incentives regime so that plants are actually operated and produce electricity. Focus more on generation-based than capacity-based targets.

Existing GIZ activities could be extended along the above mentioned challenges for the Indian government. This includes policy advice on penalty systems, on the co management of feed-in tariffs and portfolio obligations, and on elaborating long-term renewable energy scenarios.

## 3.2.8 Indonesia

### 3.2.8.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2009) | 6.6 % | <0.1 % | <0.1 % | <0.1 % | <2.2 % | <0.1 % | 156.8 TWh |
| Capacity (2009) | 3.5 GW* | <0.01 GW | <0.01 GW | <0.01 GW | 1.1 GW | <0.01 GW | 30.9 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2025) | 15 % (non-technology specific; excluding large hydro) | | | | | | n/d |
| Capacity (2025) | 0.5 GW+ | 0.25 GW | 0.87 GW | 0.81 GW | 9.6 GW | n/d | n/d |

* including 0.01 GW of small hydro. +small hydro only.

#### Introduction/Overview

Indonesia is one of East Asia's quickly growing economies and will need large amounts of power capacity in the future to meet the rising energy demand of its population and industry. As there are excellent potentials for hydro and geothermal power and long experience with these technologies, the country can make use of its great potentials of other RE. Yet, while the Indonesian government already implemented ambitious goals for renewable energy in power production and passed some minor policies for its promotion, the country's general energy policy is still strongly supporting fossil fuels.

#### Electricity Mix/Targets

In 2009, Indonesia produced 8.8 % of its electricity from renewable sources, to which hydropower contributed 6.6 % and geothermal power plants 2.2 %. Other renewable energy technologies did not generate measurable shares. Fossil fuels represented the major sources in power production with coal supplying 27.5 %, natural gas 17.7 %, oil 16.2 %, and diesel 6.7 %. The rest (23 %) was power purchased from private producers (without indication of origin). The total renewable energy capacity as of end 2009 amounted to 4.6 GW, representing only a small amount compared to the country's total capacity of 30.9 GW.

By 2025, Indonesia aims to have installed a total grid-connected renewable energy power capacity of 11.9 GW (excluding large hydro), consisting of 9.5 GW geothermal, 0.87 GW solar, 0.81 GW biomass, 0.5 GW small hydro, and 0.25 GW wind power capacity. The country also passed a non-technology specific generation-based target for electricity production of 15 % by 2025 (excluding large hydro).

In addition, the country aims to achieve a share of 17 % from renewable sources in primary energy by 2025 (up from 5.7 % in 2010).

#### Strategy/Instruments

Indonesia's most important strategic piece of legislation for RE support is the Blueprint of National Energy Management. Passed in 2005, it was the first document of its kind that set both capacity- and generation related long-term targets for renewable energy in power production (see above). Addressing future developments in the whole energy sector, the plan aims to increase energy efficiency and conservation, as well as giving renewable energy sources a more important status in the country's future energy supply. The Energy Law of 2007 follows most of these concepts and ideas.

There are also important provisions in the 2011 Master Plan for the Acceleration and Expansion of Indonesian Economic Growth, particularly concerning financial support for renewable energy. The policy encompasses a planning period of 14 years until 2025. Besides defining general economic strategies, the paper compromises some important provisions on renewable energy of legislative, infrastructural, and financial nature. It demands the revision of the electricity market Law No. 30 to regulate the development of renewable energy and to push liberalization of the market. It also allocates Indonesian rupiah (IDR) 134.6 trillion (EUR 11.2 billion) for renewable energy power plants until 2025.

In terms of concrete instruments and financial incentives, Indonesia has enacted five distinct laws on the promotion of power production from geothermal sources since 2003. These include regulations on permitting exploration and exploitation, duties and taxes, and the purchase of geothermal electricity from private producers by the state-owned utility Perusahaan Listrik Negara (PLN) at a fixed price. Some programs also promote electrification of rural areas and small islands. Additionally, the country enacted import duty exemptions and capital subsidies for renewable energy technologies such as for generators, turbines, solar photovoltaic cells and panels, and other equipment.

Apart from support for geothermal power production and financial incentives, there is no comprehensive policy creating a regulatory framework for other RE support. Only some ministerial decrees allow small enterprises and business entities to conclude RE power purchase agreements up to 10 MW of capacity.

#### Achievements

Without regard to geothermal hydropower, capacity additions from renewable energy sources have been very limited during the past five to ten years. Solar, wind, and biomass power for instance, remain in a one-digit megawatt range although very good potentials exist for all three sources. Geothermal power is the only technology having received significant attention over the last years; its capacity increased by roughly 0.3 GW between 2005 and 2009.

#### Electricity Market/Barriers/Attractiveness

Despite the fact that Indonesia considers RE an important source in its future power supply, the country's overall energy policy is still heavily focused on supporting fossil fuels – both regulatory and financially. Coal-fired power production still is in the political focus and is considered by the government the most effective solution to meet the country's quickly rising energy demand. Several GW of additional coal power capacity are already under construction and await completion within the next years. Moreover, the government substantially subsidises fossil fuels and electricity prices. For 2011 the country has allocated EUR 10.8 billion (IDR

129.7 trillion) for fuel subsidies and EUR 5.5 billion (IDR 65.6 trillion) for electricity subsidy.

Due to Indonesia's geography, the national grid is quite fragmented, leaving one third of its population without electricity. A major grid exists on the Java-Bali islands, but smaller islands only have limited low-voltage networks. This grid structure is a major challenge for RE. Without technical improvements, it will not be able to bear RE integration.

If these barriers are overcome, RE could play a helpful role in electrifying these islands. Renewable energy plants can also function as off-grid solutions by replacing small fossil fuel-based power installations. Currently, diesel generators – expensive and dependent on continuous fuel supply – provide most of the households in remote areas with electrical power. Additionally, connecting remote areas to the electricity grid might not always be economically viable. Off-grid, small-scale renewable energy plants (such as PV or small hydropower installations), would also allow local people to gain access to electricity and substitute the purchase of diesel or gas. The government has already provided some funds for rural electrification and replacing diesel generators.
In 2010, the Indonesian government spent IDR 68.9 billion (EUR 5.6 million) on micro hydro installations and IDR 492.6 billion (EUR 40.2 million) for small-scale solar PV rooftop installations. The total budget allocated to RE and self-sufficient energy villages was IDR 621.25 billion (EUR 50.7 million). Until 2025, Indonesia plans to invest IDR 134.6 trillion (EUR 11.2 billion) for the expansion of renewable energy.

Even though there are excellent potentials in Indonesia for RE, attractiveness for investment has been very limited in the past, particularly due to the absence of a well-functioning support policy. There is not enough incentive for international companies to enter the local market and private investors often cannot afford to buy and operate renewable energy plants. In the past, most of the small-scale renewable energy installations (particularly solar and small hydro) were built with governmental and international funds.

### GIZ Activities and Experience

Since more than 20 years, GIZ supports the development of mini hydropower projects for rural electrification, including capacity building and technical support of local manufacturers.

### 3.2.8.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | (Feed-in tariff), capital subsidies, investment/production tax credits, tax reductions, public investments, public competitive bidding | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Rather unlikely, as there is no clear strategy; for some technologies there is no support instrument in place. | | | | |

Indonesia has defined targets for renewable energy by setting both long-term generation- and capacity-based objectives. However, to achieve these targets, the country would need a comprehensive strategy and adequate instruments – two steps that the government has not yet implemented. While there are various laws for the promotion of geothermal power and some minor regulations for other renewable energy technologies, there is no strategic or policy concept in place that would allow an effective support of other renewable energy technologies. On the contrary, Indonesia still puts heavy emphasis on the promotion of fossil fuels.

With the strategic Blueprint of National Energy Management Indonesia introduced both capacity-related and generation-based goals for renewable energy in power production for the long-term. The paper also includes important other provisions necessary for successful RE support, as it calls for grid and capacity expansion, improvements in energy efficiency, and cutting subsidies. Renewable energy is also mentioned in some other energy policy-related papers, such as the Master Plan for the Acceleration and Expansion of Indonesian Economic Growth. All these plans see renewable energy taking a stronger relative position in the country's future energy supply. In 2011, the Ministry of Energy and Mineral Resources created a Directorate General of New Energy, Renewable and Energy Conservation, acknowledging the growing importance of this energy source.

Despite these achievements, however, Indonesia's RE strategy is not comprehensive yet and will not lead to the projected deployment. None of the existing strategic papers, solely focuses on RE or elaborates concrete strategies for an effective RE promotion. Policy makers still consider fossil fuels as the fundamental pillar of the country's future electricity supply, leading to ongoing subsidies for fossil fuels and electricity, considerable investments in coal-based power capacity, and weak or non-existent renewable energy support policies.

First, the government exercises strong control on electricity prices, allocating considerable annual budgets to keep electricity prices low and promote the exploitation, production, and the export of fossil fuels, particularly coal, oil, and natural gas. In 2011 alone, EUR 15 billion (IDR 182 trillion) were allocated to subsidize fossil fuels and electricity. This has lead to considerable economic disadvantages for RE, requiring cost transparency to be or become competitive.

Second, the Indonesian government continues planning and constructing coal power plants with several GW of capacity. Even though a relative decrease of fossil fuel share in power generation is targeted in the future (to the relative benefit of RE), there will still be a considerable absolute augmentation in capacity due to rising energy demand. When considering current developments and plans in regards to coal and natural gas capacity additions, it is unclear if the 2025 RE targets can be met.

Third, Indonesian stakeholders consider renewable energy more a means to improve rural electrification on the country's smaller islands than a replacement for conventional power capacity. Much of the (fossil fuel-based) power generation capacity is installed on the islands of Java, Bali, and Sumatra, where the government does not intend to let RE play a substantial role in the future. Rather, small-scale PV, biomass plants, and mini- and micro-hydro installations shall help bringing electricity to residents and companies to rural areas. According to existing policies, only geothermal power will substantially extend its position in the future in more developed areas.

As a result of this strategy, existing policies are either obstacles to RE, or unilaterally promoting geothermal power, or provide only weak other RE incentives. The two existing policies, Ministerial Regulation No. 002/2006 on Medium Scale Power Generation and Ministerial Decree No. 1122 K/30/MEM/2002 on Small Distributed Power Generation using Renewable Energy, passed in 2002 and 2006 respectively, are basically ineffective and have only led to capacity increases in a one-digit megawatt range. In addition, rural electrification programs have largely been financed by the government and international donors and do not contain private investment.

With the existing portfolio of instruments, it will be very difficult for Indonesia to reach the targets for 2025. An effective policy mechanism should envisage private investment, as well, opening the market and offering reasonable financial benefit to investors and operators of RE plants. Regional neighbours, such as Thailand, India, or China, for instance, have introduced feed-in tariffs (among other policies). The National Renewable Energy Board has already been negotiating a feed-in tariff with the Energy Regulatory Commission, so it might become a possible option for Indonesia in the future. Importantly, the involved parties need to agree on a sufficient tariff level. In addition, stakeholder acceptance has to be strengthened by better illustrating real cost of RE, possible impact on price levels and highlighting the net effect of long-term benefits (energy independence, faster electrification, employment opportunities, etc.).

Indonesia as an advanced developing country has financed economic growth by fossil fuel exports which might even become more important in the future. However, as the country's population is growing fast and thus its demand for energy, to increase energy security and avoid energy price shocks, a parallel RE development should be a viable option.

With respect to the Policy Design Cycle, quite some further activity is required towards a consistent RE policy. The current focus on fossil fuels and the subsequent subordinate role for RE is in fact a massive initial barrier. The following conclusions point to possible areas of action in order to achieve a more coherent RE framework:

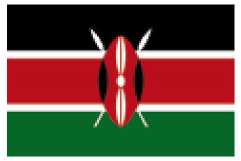
- Elaboration of an effective support mechanism (such as a feed-in tariff) on a strong legal basis that (a) allows reaching the targets set for 2025; (b) provides incentives for both domestic and international firms to invest in the country; (c) allows small-scale investors participate in the market; Creation of a fund for renewable energy, possibly financed by higher taxes on fossil fuels; Use of international financing mechanisms

- Work on reducing/eliminating fossil fuel and electricity price subsidies to give renewable energy the opportunity to compete with these energy sources.

- Use of RE potentials in the remote areas of the country (smaller islands); Promotion of electrification through off-grid power solutions; Improvement of technical performance of the local grid to allow the integration of power from renewable energy installations; Local capacity building and training for construction and operation staff

Apart from existing activities in Indonesia, GIZ could get involved along the lines of the above mentioned challenges. Given the fact that Indonesia does not yet perceive renewable energy power production as a fundamental part of its energy policy, information and advocacy on positive long-term effects of renewable energies might be a promising field of action (for example, by conducting market and feasibility studies as well as studies on possible long-term effects).

## 3.2.9 Kenya



### 3.2.9.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2008) | 40.4 % | n/a | n/a | 4.5 % | 16.7 % | n/a | **7.1 TWh** |
| Capacity (2008) | 0.8 GW | <0.01 GW | | | 0.2 GW | <0.01 GW | **1.3 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2030) | n/d | n/d | n/d | n/d | n/d | n/d | **n/d** |
| Capacity (2030) | n/d | n/d | n/d | n/d | 4 GW* | n/d | **n/d** |

* not binding.

**Introduction/Overview**

Among African countries, Kenya has a rather high share of above 60 % in RE power production. Although Kenya's geographical location offers good potentials for the exploitation of solar and wind energy, the country currently mainly relies on electricity generation from hydro sources. As a result, droughts have been increasingly posing a danger to the reliability of the electricity supply and leading to a growing reliance on diesel generators.

**Electricity Mix/Targets**

Energy generation in Kenya is dominated by hydropower, which accounted for 40 % of the total electricity generated in 2008. When installed capacity is considered, hydropower even accounted for 57 %. The second largest energy source is thermal power generation, mainly from oil power plants, which account for 38 % of generated electricity and 32 % of installed capacity. Geothermal, with a large potential in Kenya, had a share of 17 % of electricity and 11 % of installed capacity. Other RE only contribute 0.3 % of installed capacity, generating 4.5 % of total electricity in 2008.

Kenya does not have an official target for renewable electricity generation. Its' relatively high RE share has developed autonomously, being cost efficient. The Energy Act of 2006 and the currently developed "Vision 2030", mention RE as important for ensuring a safe and independent power production in Kenya, but do not define any concrete targets.

The highest potential is attributed to geothermal energy, which is to be developed explicitly. The state-owned "Geothermal Development Company" plans to realise up to 5 GW of geothermal capacity until 2030.

### Strategy/Instruments

The policy framework for RE in Kenya is mainly defined through the documents "Sessional Paper No. 4 on Energy" (2004) and the Energy Act (2006).

The Ministry of Energy drafts in its "Sessional Paper" a policy framework "to promote equitable access to quality energy services at least cost while protecting the environment". The timeframe of this paper is 2023. Subsequently, in 2006 the Energy Act of 2006 was released and the Energy Regulatory Committee came into effect in 2007.

The "Sessional Paper" as well as the Energy Act underline the importance of renewable energy sources for Kenya for a stable and independent power supply, but no specific RE target is defined. The Energy Act requires that the "Minister shall promote the development and use of renewable energy technologies, including but not limited to biomass, biodiesel, bio ethanol, charcoal, fuel wood, solar, wind, tidal waves, hydropower, biogas and municipal waste". Among other things, a national strategy for RE research is to be developed as well as a framework to enable the efficient and sustainable renewable energy generation, transmission and marketing.

Resulting from the Energy Act, the Ministry of Energy in 2008 issued a policy on RE feed-in tariffs. Originally, feed-in tariffs were introduced for electricity generated from wind, biomass and small hydropower. After revision, since January 2010 they also provide support to geothermal sources and solar electricity generation. Feed-in tariffs are technology specific, but (except for hydropower) do not differentiate between the sizes of the plants. However, the tariffs stated in the policy are maximum tariffs. Tariffs actually paid are subject to negotiations between the individual plant operator and the utility Kenya Power, operating as single buyer on the Kenyan market. It is obliged to connect all renewable energy plants to its grid. Kenya Power also has to guarantee priority purchase, transmission and distribution for renewable electricity. However, the independent power producers must pay all cost for grid expansion and connection. Kenya Power and the plant operator agree on a 20 years power purchase agreement (the timeline was recently extended from previously 15 years).

For renewable technology, a maximum capacity is defined for which the tariff will be guaranteed: for wind, the first cumulative 0.3 GW are supported, 0.2 GW for biomass, 0.1 GW for biogas, 0.2 GW for hydropower, 0.5 GW for geothermal energy, and 0.1 GW for solar.

### Achievements

Until now, the feed-in tariff policy only had limited success due to a number of reasons: legal security is not sufficient as the feed-in tariff framework only has the status of a regulation, i.e. it could be changed any time, put on hold or dismissed, different from a law, which at least requires political majorities. In addition, the tariffs defined in the policy are defined as maximum tariffs, i.e. actual payments can be lower. The plant operator still has to negotiate with a single buyer, i.e. at a weak market position. However, the government is aware of potential improvements and the support scheme is currently under revision.

### Electricity Market/Barriers/Attractiveness

The existence of a national transmission grid and the existence of independent power producers (IPPs) form a good general basis for RE deployment. However, power production is rather centralized, and a paradigm shift towards a more decentralized approach is currently not in sight. In urban areas, about 60 % of the population are connected to the grid, in rural areas only around 4 %. There, RE can contribute to improve this situation, especially in Western Kenya. This might even help to stabilise the grid, facilitating a better match of supply and demand. Both government and private sector show interest in grid integrated RE, and further instruments such as net metering are under discussion.

The current RE support, however, is perceived by potential investors as rather unattractive due to the reasons mentioned above, including potential uncertainty of the framework and the design of the tariffs, which could be improved. Further RE deployment might be encouraged by several driving factors, such as the acknowledged good RE potential, comparably high power prices, dependence on imported fuels, available technical capacity and on general level a relatively good business climate.

So far, there are no reports on existing or potential financial impacts of RE support on electricity prices and the national budget. Some experts assume that under favourable conditions some RE installations could even operate more cheaply than conventional power plants, as observed in Uganda for instance.

### GIZ Activities and Experience

Activities of GIZ in Kenya include involvement in several public private partnerships, which helped construct a pilot biogas plant and supported German companies in entering the Kenyan market. Currently, a public private partnership focuses on flagship projects, which will serve for training and policy advice and include establishing a solar academy in Nairobi. Policy advice has led to the adaption of the feed-in tariff for biogas and currently GIZ provides consultancy for the introduction of net metering.

### 3.2.9.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | Feed-in Tariff, Tax reductions | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | | | | | |

Applying the Policy Design Cycle to the Kenyan situation, one aspect is unusual compared to other countries: although Kenya neither has an RE target nor a strategy on how to deploy RE (i.e. not having addressed the first two steps of the Policy Design Cycle), Kenya does have an existing support policy – a feed-in tariff.

Although Kenya already has a current share of renewables of around 60 %, sustaining and increasing it will be a challenge, especially with regard to the expected strong growth in electricity demand. Meeting this challenge calls for the elaboration of explicit targets and a strategy. Furthermore, large hydropower is affected by climate change, drought, deforestation, and increasingly silting dams, which reduce security of supply. First sign of this vulnerability is the increased use of diesel generators.

The first level of the Policy Design Cycle is the definition of a target. Kenya has not set an official target for reaching a certain share of renewables in a specified year, which means that an important basic step of a RE framework is missing. However, the government does mention the importance of renewable energies for the country in laws and other official documents. In addition, the policy on feed-in tariffs includes an indirect target as it defines how much capacity of each renewable technology will receive support via this support scheme.

Theoretically, the lack of a target means that there cannot be a specific strategy aiming at this target. However, Kenya does have a strategy for reaching (unspecified) higher RE shares: in its "Sessional Paper" on energy from 2004, the Ministry of Energy formulated the strategy to create a more enabling RE environment. The strategy has established

- a rural electrification authority, as renewables are seen as a promising way for rural electrification;
- a geothermal development company;
- reinforcement of the transmission and distribution grid;
- the passing of an Energy Act.

The third step of the Policy Design Cycle, (the implementation of concrete measures for the RE promotion), is covered through the feed-in tariff enforced in 2008 and amended in 2010. Due to the lack of an RE target and a strategy, the effectiveness of the support instrument cannot be measured. However, it is possible to measure performance against the capacity limits per technology set by the feed-in tariff. Originally, the policy foresees a review every three years after publishing, reaffirming that any changes to the policy will not affect plants already in operation, in order to increase predictability of the system.

Regarding the fourth and fifth step of the Policy Design Cycle, monitoring or evaluation is not actually covered, but revision and adaptation activities took place according to the rules fixed in the feed-in tariff. In 2009 it became evident that the feed-in tariff could not trigger RE growth as expected. Only a limited number of independent power producers had applied for the tariff. According to project developers, the tariff was not covering increasing cost for equipment and financing. As a result, the Ministry of Energy conducted a review and a new policy which prolonged contract periods to 20 years. However, as the policy still does not lead to a significant deployment, further and more specific review would be necessary.

A potential target to be formulated should reflect some specific circumstances: the vulnerability of large hydropower, the expected strong growth in electricity demand and the need for electrifying rural areas. Looking at the favourable natural conditions of Kenya, renewable energies have the potential to tackle these challenges. Via the "Vision 2030", the government has already developed a long-term vision, potentially to be amended by a time bound, quantitative target.

Subsequent to the definition of a target, Kenya needs to develop a clear strategy to achieve its goals. The country has already achieved an unbundling of the electricity market and allowed independent power producers. Therefore, the Kenyan strategy should now make better use of private investment. This requires, inter alia, increased know how on integrating RE into the existing grid infrastructure, in combination with a gradual shift to a more decentralised electricity infrastructure, resulting in an increased overall situation.

Improved support instruments should offer favourable conditions to attract private investment also from abroad, and should in addition be attractive for small and medium sized projects. Enforcement and monitoring of the support should be established in a transparent mode. Revision of the current feed-in tariff policy could be amended towards an independent evaluation and result in more effective adaptation.

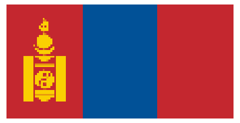
Concluding, for a more effective RE support, a possible need for action might arise in the following areas:

- Define an ambitious but realistic target for renewable energies in Kenya, keeping in mind the currently high share of large hydropower and the expected strong growth of energy demand.
- Design a strategy explicitly aiming at reaching the previously defined target. This strategy should include the required capacity building (including technology and know-how in the field of renewables).
- Improve the current feed-in tariff (for instance, by strengthening the legal status of the policy or by differentiating tariffs according to the size of the installation) and discuss the introduction of further support schemes. Security for investors needs improvement in order to attract necessary investments.

Apart from existing GIZ activities, several potential fields of action remain according to the Policy Design Cycle. For example, given the viable interest in supporting frameworks in Kenya, GIZ might consider engaging in policy advice regarding explicit and ambitious renewable energy targets and the subsequent development of a sound strategy.

## 3.2.10 Mongolia

### 3.2.10.1 Summary



| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 4.2 % | 0.2 % | 0.2 % | <0.1 % | 0 % | 0 % | 3.9 TWh |
| Capacity (2008) | <0.1 GW | | | | | | 0.8 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2020) | 20-25 % (non-technology specific) | | | | | | n/d |
| Capacity (2020) | n/d | n/d | n/d | n/d | n/d | n/d | n/d |

#### Introduction/Overview

Mongolia started some RE support initiatives during the last few years, mainly to speed up rural electrification and reduce dependence on imported oil. Yet, current activities are too limited to lead to a broader RE deployment. Besides the lack of a clear energy strategy for renewables and structural and technical problems in the electricity system, there is also political opposition against renewable energy, mainly due to the abundant supply of cheap domestic coal. Without a clear change in the Mongolian authorities' strategy, renewable energy will probably stay a niche technology in the country.

#### Electricity Mix/Targets

In 2010, Mongolia produced 4.6 % of its electricity from renewable energy sources, whereas small hydropower plants contributed 4.2 % to this share and wind and solar 0.2 % respectively. Other renewable energy sources played no or only a negligible role in the country's power production. Besides some small generation from oil-based generators, coal accounted for more than 95 % of all power generation. The country had a total installed capacity of 0.8 GW in 2008; the capacity of the renewable energy plants was roughly 0.03 GW.

By 2020, Mongolia aims to produce 20-25 % of its electricity from renewable sources, but so far the government has not implemented any technology-specific or capacity-related targets.

#### Strategy/Instruments

Mongolia has no consistent strategy or policy framework for RE support, even though the country initiated a National Renewable Energy Program in 2005. Among others, the program defined goals for 2010 and 2020 (see above), brings up the need for establishing an adequate support instrument for renewable energy, completing the construction of two mid-size hydropower plants, and initiating a 100,000 solar systems program. However, the rather brief document does not specify in detail how these steps can be implemented.

As a consequence of the National Renewable Energy Program, the country passed the Renewable Energy Law in 2007. As the first policy of its kind in Mongolia it aims at recognizing and supporting renewable energy in power generation. The law, drafted with GIZ assistance, implements a feed-in tariff for wind, solar, and small hydropower. Rules for the electricity market in general are set in the Energy Law of 2001. Apart from that, no other policies for RE promotion, such as investment tax credits, import tax reductions, loans, or other financial reliefs, exist. In 2010, the Mongolian Parliament approved a new policy to improve the financial situation of the energy sector and to aim for cost-covering tariffs in 2014, which might help renewable energy to compete with fossil fuel energy.

#### Achievements

So far, Mongolia has installed a small amount of capacity of 0.03 GW, which mainly originates from small hydro and PV installations. Currently, a private company is also building Mongolia's first wind farm with a capacity of 0.05 GW based on international technical guidelines introduced by GIZ. There are also two mid-scale hydropower projects scheduled to be completed within this decade.

Some small-scale RE development has taken place in remote areas, where small-scale, independently produced renewable energy often is the only energy source and thus highly improves the quality of life and productivity of the local people. For instance, after installations of small hydro power plants, the extension of the regional power grid (supported by the German government-owned development bank (KfW) and GIZ), the installation of photovoltaic power plants (financed by the World Bank), and various capacity building activities, 36 % of the electricity in the GIZ focus area, the Zavkhan province, now result from RE. The Energy Regulatory Authority recently agreed on a cost covering feed-in tariff for a stand-alone small hydro power plant in Zavkhan.

#### Electricity Market/Barriers/Attractiveness

Major technical barriers complicate RE deployment, particularly for mid- and large-scale investments. Large parts of Mongolia's grid are inefficient and require modernization. Transmission lines have to cover long distances and operate with a low power load. This leads to high losses and grid instability, hardly allowing additional power fluctuations as e.g. caused by wind turbines or solar installations. Calculations exist which show that only a maximum of 0.1 GW of wind capacity can be connected to the current grid without dangerously destabilizing it. There is a lack of skilled personnel able to maintain and operate renewable energy power plants, complicating RE supply for remote villages with small populations. Additionally, from a regulative perspective, the electricity market is monopolised and tariffs are politically determined at very low level, making it difficult for utilities to work profitably.

Currently international donors are the main investors in renewable energy projects. Attractiveness for private investors is very low due to the state influenced market structure. The elaboration of a comprehensive renewable energy strategy, coupled with structural and technical reforms, allowing to use also private capital, would be important to achieve higher RE shares.

Considering that the sparsely populated country has excellent solar potentials and very good wind potentials and that many Mongolians are nomadic people, opportunities for decentralised, small-scale, off-grid electricity generation are manifold. Electrifying remote areas could thus be a possible area for increased policy focus and future investment.

### GIZ Activities

GIZ in Mongolia has made a substantial contribution to the electrification of the Zavkhan province by accompanying the entire process from design to a financially and technically sustainable operation of energy utilities. This included the introduction of privatisation concepts, business strategies, organizational structures, maintenance concepts, load management models and hydro/diesel hybrid operation. The project has also introduced subsidy schemes and cost covering tariffs for rural areas.

On a national level, GIZ has been involved in drafting laws and regulations, supporting the promotion of renewable energy through feasibility studies and pilot projects, and the development of training programmes for renewable energy, now used by the National Renewable Energy Center (the national technical competence centre), for qualification of developers, operators and service personnel.

## 3.2.11 Morocco

### 3.2.11.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2010) | 12.9 %* | 2.5 % | <0.1 % | <0.1 % | <0.1 % | <0.1 % | 26.5 TWh |
| Capacity (2009) | 1.3 GW | 0.2 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | 6.1 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| Generation (2020) | 20 % | | | | | | n/d |
| Capacity (2020) | 2 GW+ | 2 GW | 2 GW | n/d | n/d | n/d | 14,6 GW |

* see footnote 8 for more details; +0.4 GW of small hydro by 2015.

### Introduction/Overview

Due to geographic conditions (excellent solar radiation and wind potentials, neighbouring to Spain) Morocco generally offers an excellent environment for the expansion of renewable energy and the reduction of the country's dependency on fossil fuels in power production. However, as many of its neighbour countries Morocco has not yet drawn on this potential, particularly as RE support is perceived as a cost driver. Morocco is still lacking a comprehensive renewable energy strategy, which would address support for renewable energy in the long-term. Apart from public tendering for large-scale wind and solar power projects, there is no effective support scheme that would provide a strong incentive for investments in small-scale projects.

### Electricity Mix/Targets

In 2010, renewable energy contributed to 15.4 % of all electricity production in Morocco. Hydropower and wind power were the only significant sources, generating 12.9 %[11] and 2.5 % respectively. The rest consisted of electricity produced in thermal power plants, coal being the dominant fuel with a share of 41 %, followed by natural gas with 11 %, and other fuel/gasoil with 17 %. 14.9 % of all electricity was imported. RE power capacity in 2009 amounted to 1.5 GW; the total installed capacity was 6.1 GW.

By 2020, Morocco aims to produce 20 % of all electricity from renewable energy sources. To

11 In 2010, power production from hydropower plants was exceptionally strong. The share of hydropower averaged at 5.1 % between 2005 and 2010, ranging between 3.3 % and 9.8 %.

achieve this objective, the country seeks to have a total installed renewable energy capacity of 6 GW (or 42 % of the total installed capacity) by the target year, consisting of each 2 GW of solar, wind and hydro power capacity respectively. Morocco also implemented a 0.4 GW target for small hydropower (by 2015) and aims to increase energy efficiency by 12 % by 2020 compared to 2010.

### Strategy/Instruments

By setting an explicit target for the share of renewable energy in installed electricity capacity by 2020, Morocco has made a relevant first step in order to promote renewable energy. The 20 %-/42 %-target by 2020 is ambitious, particularly considering the current share of renewables, which predominantly consists of long existing hydropower plants. As there are excellent wind potentials along the Moroccan Atlantic coast, providing prospective generation sites for wind parks of several GW of capacity, wind power could contribute substantially to reach this goal. Moreover, high solar irradiation offers superior opportunities for solar power plants.

However, target compliance is put into perspective as currently there is no coherent government strategy to achieve the target. Morocco has established two major institutions for RE promotion (the National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) and the Moroccan Agency for Solar Energy, (MASEN)) and passed a Renewable Energy Development Law (Law 13.09) as well as a roadmap for solar energy (the Moroccan Solar Plan). Nevertheless, important strategic issues, prerequisite to target achievement, have not been tackled yet. These include the lack of an effective support mechanism apart from public tendering, the elaboration of the impacts that a higher share of renewable energy would have on the grid, or concrete policies that would support capacity expansion of small-scale installations. Morocco passed a National Energy Strategy in 2011 (not a comprehensive strategy in the sense of the Policy Design Cycle) that provides a roadmap for the country's electricity and overall energy sector until 2030. The document analyses several aspects of renewable energy, including capacity potentials and employment and cost saving opportunities.

Except for public tendering of large-scale wind and solar power projects (the Moroccan Agency for Solar Energy is in charge of tendering the targeted 2 GW of solar power capacity; the public utility ONE will tender 2 GW wind capacity), the option for RE autoproduction is given under the Renewable Energy Development Law 13.09 of 2009. It is based on a preceding law on auto-production and allows independent power producers to generate electricity from renewable sources for their own use (the policy is mainly tailored to large industrial producers; some limited amounts of excess electricity may be fed into the grid). However, since it has come into force, the law has not incentivized a strong growth of renewable energy. Initially, the act aimed to bring wind power capacity to 1.4 GW and photovoltaic and CSP power capacity to 0.04 GW by the end of 2012 (these goals were part of the National Plan for the Development of Renewable Energies and Energy Efficiency, (PNDEREE)) – which was not achieved by far.

What is seen as a barrier to higher commitment of the Moroccan government in introducing a more effective RE support instrument are concerns about electricity prices, which are already relatively high if compared to the average level of income in the country. Existing plans to introduce a feed-in tariff have not been followed any further.

Morocco neither offers to investors attractive fiscal incentives for renewable energy power projects, such as tax or duty reductions on equipment (there is a tax deduction for solar water heating appliances).

### Achievements

Between 2005 and 2010, Morocco installed 0.2 GW of wind and 0.02 GW of hydropower capacity. No grid-connected capacity of other renewable energy technologies has been added.

Currently, there are 0.8 GW of additional wind power capacity under development and another 1 GW under planning. MASEN has also announced first tenders for solar power projects.

### Electricity Market/Barriers/Attractiveness

The Moroccan government carries out a high level of control on the domestic electricity market through the public utility Office National de l'Electricité (ONE), which is both the owner and operator of the transmission and of large parts of the distribution grid. ONE is also a relevant actor in power production and a monopolist from a legal perspective, both regarding its genuine structure (which in large parts is intransparent) and to future government planning. For instance, all renewable energy power plants with capacity above 2 MW require official authorization to consume their self-produced electricity; the same applies to fossil fuelled power plants above 50 MW. Moreover, the coexistence of individual power producers, which de facto come into existence through customer generation and ONE is not properly defined yet.

A main technical barrier to renewable energy deployment in Morocco is the grid structure. While in the northern part of the country the construction of wind power plants has triggered a technical adaption of the grid, the southern part is still not prepared for the integration of fluctuating renewable energy power. Major effort will be necessary to manage higher RE shares by enhancing the network and making use of existing hydro pump storage facilities.

Overall attractiveness for domestic and foreign renewable energy investors is low, especially due to the absence of an effective regulatory support scheme. However, both the tenders for solar and wind power that are currently ongoing and planned for the future could change much of this situation.

In general, there would be good opportunities for the emergence of a wind energy industry that could provide employment and contribute to economic growth. Today, there is already an industrial producer of pylons, companies specializing on construction work of wind turbines, and industrial providers for cabling, electronic equipment and carbon fibres. An increased wind energy deployment would open opportunities for rotor blade manufacturing in Morocco. Currently, there is only one small photovoltaic module provider.

### GIZ Activities and Experience

GIZ activities in Morocco mainly focus on programs that aim to support renewable energy together with energy efficiency, including several studies on the domestic potential of renewable energy (as biomass, photovoltaics, and wind). An envisaged, future project targets fostering participation of local companies in the Moroccan solar plan by strengthening local value chains. With respect to policy consultancy, GIZ has supported the Ministry of Energy in elaborating legislation and regulations on renewable energy and energy efficiency. Furthermore, GIZ has accompanied the transformation of the Moroccan Centre for the Development of Renewable Energies (CDER) to National Agency for Renewable Energy and Energy Efficiency Development (ADEREE) from a centre for renewable energy to an agency, being in charge of both renewable energy and energy efficiency. In addition, a knowledge network for education and applied research has been established, and management processes in the Ministry of Energy have been supported. Lessons learned include that limited knowledge of the involved actors is an obstacle to legislative processes.

### 3.2.11.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | No strong regulatory policy (auto-production); no fiscal incentives; public investments and tendering | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Difficult, particularly in the light of past achievements; weak strategy; public tendering could lead to capacity additions but challenge to achieve targets are tremendous. | | | | |

Morocco has set targets for the share and capacity of renewable energy in the future, but there is neither a comprehensive strategy nor instruments strong enough to achieve these objectives. In the past, RE have been implemented mostly through direct government intervention and investments of the public utility ONE with the support of bi- and multilateral donors. If Morocco wants to achieve its objectives by 2020, however, further policy instruments creating a market for renewable energy technologies will have to be introduced.

In a first step, Morocco will have to establish a comprehensive and concise renewable energy strategy. To tackle current barriers, other policy areas than merely energy policy are to be taken into account. Currently, perception of renewable energy deployment focuses on expected financial burdens, while new business opportunities and options for cost efficiency through a paradigm shift in the energy system remain undetermined. The Moroccan government has not followed plans for a feed-in tariff (or another effective policy instrument) due to the expected negative impact on electricity tariffs, but at the risk of missing the target. A budget/price-neutral option is currently under discussion - a net metering scheme for domestic photovoltaics - but its implementation is still unclear. Experts expect a net metering scheme to be successful, as grid parity can already be reached in Morocco. The main constraint of this approach is limited investment capacity of households. Therefore, the government should create incentives such as a "solar credit" program that would help households being capable to afford investments.

To overcome the perception of renewable energy deployment being a cost driver, it will be useful to examine and disseminate potential benefits for the local economy. For instance, the establishment of rotor blade manufacturing could bring employment and economic advantages. In addition, stakeholders need to conduct a more detailed analysis of economic parameters of different renewable energy generation options (e.g. where and when grid parity can be reached).

Another important aspect is load management. On the one hand, this relates to the overall cost effects of renewable energy, but on the other hand, it prescribes requirements on the grid infrastructure. Further examination is required on the actual impact of fluctuating wind or solar power and an approach for triggering optimised interaction of new and existing power plants (e.g. complementarities of different wind energy sites, pump storage capacities, combination of wind power and CSP, etc.) needs to be elaborated. This information also needs to be reflected in decisions on adapting the grid infrastructure. As in many other countries, an immense challenge is put on the grid infrastructure by rapid increase of electricity demand (e.g. through air conditioning). Energy efficiency should therefore play an important part of the renewable energy strategy, e.g. through integrated supply-and-demand planning in order to reduce both peak load and uncontrolled growth of consumption.

Moreover, planned solar power export from Morocco to the EU and according changes of the grid structure is another important possible factor of influence and needs to be reflected accordingly in a strategy. Ideally, by expanding interconnector capacity between Morocco and Spain, the stability of the Moroccan grid will be increased, allowing higher penetration of fluctuating renewable energy.

If private sector investment shall play an increased role in RE deployment, institutional roles require further clarification, e.g. ONE focusing more on grid management and development, leaving room for independent power producers in RE generation projects. Such redefinition of tasks must also reflect a paradigm shift towards a more decentralised energy system, e.g. when it comes to an increased role of domestic photovoltaics, but also for a better integration of smaller projects.

All aspects described above need to be incorporated into a coherent strategy with appropriate instruments for target achievement, and implemented accordingly. As Morocco's renewable energy potentials are promising and technologies such as solar and wind power are expected to already reach or being close to grid parity, a detailed analysis might show the viability of a feed-in tariff or production tax credits with only limited negative impact on electricity prices. Nevertheless, it is important to first create broader acceptance by improving quantitative data on economic performance of different renewable energy technologies and framework scenarios.

Concluding, further development of the existing legal framework and new promotion schemes is a key (and a potential field of action for GIZ) where it comes to:

- Maintain advisory work on legislation, particularly by promoting a coherent policy strategy. Specific emphasis should be laid on improving data availability of economic performance of renewable energy, accompanied by analysis of domestic benefit and job effects.
- Elaborate a regulatory framework for the support of renewable energy (as for instance a feed-in tariff for wind or net metering for others).
- Clarify institutional responsibilities, combined with advice on optimizing the grid and general generation structure.
- Develop and promote supply and demand monitoring and planning tools.

## 3.2.12 Philippines

### 3.2.12.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 11.5 % | <0.1 % | <0.1 % | <0.1 % | 14.7 % | <0.1 % | 67.7 TWh |
| Capacity (2010) | 3.4 GW | <0.01 GW | <0.01 GW | 0.1 GW | 2.0 GW | <0.01 GW | 16.4 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2020) | n/d | n/d | n/d | n/d | n/d | n/d | 149 TWh |
| Capacity (2020) | 6.9 GW | 1.9 GW | 0.3 GW | 0.3 GW | 3.3 GW | < 0.1 GW | n/d |
| Capacity (2030) | 8.7 GW | 2.4 GW | 0.3 GW | 0.3 GW | 3.5 GW | 0.1 GW | 32.6 GW |

#### Introduction/Overview

The Philippines own the world's second largest geothermal power capacity and typically generate 25-30 % of all electricity from renewable energy sources. This fact is particularly due to investments throughout the 1980s until the early 2000s. To intensify its ambitions and widen political and financial support to other RE sources, the country introduced major strategic policies since 2008. However, much of these recent ambitions have not materialized yet. Only marginal additions of renewable power capacity have come into operation, as the government has not implemented concrete regulatory policies yet. The country is expecting enactment of a feed-in tariff, which had been announced for September 2011.

#### Electricity Mix/Targets

In 2010, the Philippines produced 26.3 % of its electricity from renewable energy sources, mostly geothermal and hydropower with shares of 14.7 % and 11.5 % respectively. Other renewable energy technologies contributed 0.1 %. The rest, almost three fourths of all generated power, originated from fossil sources: coal power plants supplied 34.4 %, natural gas power facilities 28.8 %, and oil-based installations 10.5 %. The total renewable energy capacity in 2010 amounted to roughly 5.4 GW; the total installed capacity was 16.4 GW.

By 2020, the Philippines aim to more than double RE power capacity to 12.7 GW and further increase it to 15.3 GW by 2030. There are additional interim goals for 2015 and 2025. A generation-based target does not exist.

#### Strategy/Instruments

The Philippines have a comprehensive, well-elaborated renewable energy strategy, consisting of several framework policies originating from the 'Act to Promote the Development of Geothermal Resources' of 1978. Since the year 2000, political and financial assistance to other renewable energy technologies, such as wind, solar, biomass, and ocean power have entered the political agenda.

As an overall energy policy, 'The Philippine Energy Plan of 2009' presented a sector road-map until 2030, addressing energy security, pursuing effective implementation of energy sector reforms, and implementing mentoring mechanisms. It highlighted renewable energy as an important pillar in the future energy supply and set goals for the period until 2030. However, it also considers other, non-renewable energy sources as important for the country's future energy supply.

Based on the preceding 'New and Renewable Energy Programme (1997/2000)', in 2008 the 'Renewable Energy Act', a comprehensive policy targeting RE support beyond geothermal and hydropower was passed. It contains fiscal- and non-fiscal incentives for renewable energy projects. Fiscal incentives included exemptions and reductions on income tax, corporate income tax, realty tax, and others. In terms of regulatory support, the act defined priority for purchase, grid connection, and transmission of RE electricity. It mandated the introduction of a feed-in tariff within one year, a net-metering policy, and a renewable portfolio standard for all electricity suppliers to be established within three years. However, until now, none of the announced policies have been implemented yet. The feed-in tariff is scheduled to be enacted within the next months, same as other policies in the pipeline. Tariff levels are expected to be higher than those of neighbouring countries, covering a support period of 20 years. The law will include targets for each RE technology (ranging from 0.1 GW to 0.25 GW). Mainly for reasons of cost control, a revision of the policy is scheduled once a number of projects have been realized.

In addition, the 'National Renewable Energy Program' was passed in 2011. It is the most recent and important framework policy for RE promotion, supporting "the development and optimal use of the country's renewable energy resources". The paper considers renewable energy "an essential part of the country's low emissions development strategy and (...) vital to addressing the challenges of climate change, energy security, and access to energy". The program elaborates detailed strategies on how to reach the targets set by the Renewable Energy Act of 2008. Among other important provisions, it addresses grid integration of RE power, social and economic impacts, as well as creating an attractive environment for a domestic renewable energy industry. It defines various capacity-based renewable energy targets for the year 2030 (see above).

#### Achievements

As concrete support schemes have not been implemented yet, achievements in the past have been limited. Since 2005, 0.1 GW of hydro-capacity and 0.05 GW of additional non-hydro and non-geothermal renewable energy capacity started operation. The capacity of geothermal power plants has slightly decreased in this period.

The relative share of hydro- and geothermal power in generation has dropped significantly, from 32 % in 2009 to 26 % in 2010. This is mainly due to the completion of a coal power plant and increased operation of other fossil fuel-based generation units. In addition, several large hydro power plants were decommissioned in 2011, and many others have been operating at reduced level due to extended drought periods in Mindanao in recent years.

In the 'New and Renewable Energy Program' (see above), covering the period from 2001 to 2011, the government targeted an installed RE capacity of 8.96 GW by 2012, likely to be missed.

However, projects of several hundred megawatts currently in the planning stage expect approval under the future feed-in tariff. If the feed-in law will have the expected effect, the Philippines will add 0.83 GW of additional RE power until 2015.

**Electricity Market/Barriers/Attractiveness**
With the Electric Power Industry Reform Act, in 2001 the Philippines started unbundling electricity transmission and generation. Today, private companies operate the national power grid, which is still owned by the state-owned National Transmission Corporation. Disposal of generation capacity is still executed by the grid owner. Privatization in power generation has reached 81 % and the government aims to increase this share further. From a technical perspective, the grid is not yet in a state to absorb power from the targeted 0.83 GW RE (non-base load, such as solar or wind), examinations are ongoing.

Recorded applications for service contracts under the planned feed-in tariff exceed targets by far. Therefore, a high attractiveness of the domestic renewable energy market to private investors can be expected once the tariff is established. A photovoltaic industry is already emerging in the country. Growth potential of domestic wind turbine manufacturers can be expected under a successful feed-in tariff. However, no final decision has been made yet, and developments all depend on the heights of the tariffs and possible tariff cuts in the future.

Apart from technical and economic issues, huge potentials for decentralised electricity production exist; particularly on smaller islands of the country (only 70 % of the population has access to electricity yet). Current planning for instance does not reflect the country's abundant biomass potential.

**GIZ Activities and Experience**
GIZ activities in Philippines have mainly focused on implementing concrete measures and projects. In terms of developing comprehensive policies, GIZ provided advice to renewable energy development in 2009 and 2010 with a focus on the development of feed-in tariffs, regional exchange on renewable energy policies, and raising awareness by organizing high-level stakeholder symposia. In cooperation with the private sector, GIZ currently implements the program "Renewable Energy in South-East Asia" under the "Renewables – Made in Germany" Initiative of the German Federal Ministry for Economics and Technology. GIZ also envisages further activities on policy development and capacity building. Due to huge potential for renewable energy in the Philippines, there is further demand for policy advice and capacity building.

### 3.2.12.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | (Feed-in tariff), (renewable portfolio standard), (net metering), capital subsidies, investment/production tax credits, tax reductions, energy production payments, public investments, public competitive bidding | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Rather unlikely, as implemented policies are weak. | | | | |

According to the structure of the Policy Design Cycle, the Philippines have defined renewable energy targets, setting specific capacity-related targets for different renewable energy technologies but not setting generation-based goals. The country's strategy on renewable energy promotion is comprehensive and consists of three major policies passed since 2008. However, concrete support mechanisms have not been implemented yet (a feed-in tariff has been announced for autumn 2011).

The Philippines defined technology-specific capacity-based targets for three distinct target periods until 2030, trying to add more than 10 GW of capacity in this period. Generation-based RE goals, which better reflect the relative position of RE among other sources, have not been formulated. According to experts from the country[12], capacity additions foreseen in the National Renewable Energy Program could reach a share of 50 % in RE power production by 2030, mainly based on the traditional renewable energies, hydro and geo-thermal.

Since 2008, the country has enacted three major strategic policies formulating objectives, necessitating electricity sector reforms to allow RE integration, and pursuing the implementation of support instruments. In parallel, the country's energy strategy also envisages strong investment in fossil based capacity to meet the country's rising power demand.

Delays in design and implementation of instruments have kept RE support behind targeted quantities. The Renewable Energy Act of 2008 announced the introduction of a net-metering scheme, a feed-in tariff, and a renewable portfolio standard within six months, one year, and three years respectively, but none of them enacted so far. The feed-in tariff is likely to be the first policy implemented.

The introduction of the feed-in law will allow projects in planning stage to receive financial support under long-term power purchase agreements. However, as capacity of planned projects exceeds by far the volume assigned for the first phase of the feed-in tariff (which ranks between 0.1 GW and 0.25 GW of capacity depending on the technology), the Philippine government might reconsider capacity caps. While this option allows the government to adjust tariffs for reasons of cost control, it might reduce investment security and lead to projects locked in a pipeline.

The proposed feed-in tariff will not provide support for photovoltaic installations of household size (considered too expensive in current stage) but rather focuses on utility scale appliances. However, as the Philippines have excellent solar power potential and as small-scale photovoltaic installations could help to

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promote electrification of abandoned areas, stakeholders might reconsider small PV to become part of the support scheme in the future. Alternatively, the announced net-metering policy could act as a cost neutral test scheme until further experience on actual cost has been gathered. The net-metering policy would need to be accompanied by investment grants or other financial incentives to allow private investors afford the equipment. This might be coupled to promoting off grid electricity.

Concluding, effective RE policy-making will require some action in the near future, such as:

- Ensure on short term a proper implementation of the announced feed-in tariff. Consider supporting small photovoltaics in a future amendment and phase-out capacity ceilings.
- Focus on the evaluation and proper functioning of the feed-in tariff before enacting the net metering and renewable portfolio standard policies as determined in the Renewable Energy Act (management of three distinct RE support policies in parallel is challenging and demands a high level of accuracy and expertise from authorities).
- Promote off-grid solutions in rural areas, particularly on small islands (improve policies on rural electrification, provide loans to investors, promote establishment of local construction firms, perform capacity-building).

Given the challenges mentioned above, existing GIZ policy advice activities could be extended accordingly. In addition, GIZ could conduct market studies and provide technical assistance to grid adjustment/optimisation as well as the elaboration of safeguards for biomass/biofuels development.

## 3.2.13 South Africa

### 3.2.13.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| **Generation (2010)** | 5 %[i] | <0.1 % | <0.1 % | <0.1 % | <0.1 % | <0.1 % | **260 TWh** |
| **Capacity (2010)** | 0.7 GW[#] | <0.01 GW | <0.01 GW | 0.1 GW | <0.01 GW | <0.01 GW | **41.8 GW** |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Biomass | Geothermal | Others | Total |
| **Capacity (2016)** | 0.8 GW[+] | 1.9 GW | 1.7 GW | 0.1 GW | n/d | 0.1 GW | **n/d** |
| **Generation (2030)** | 5%[i] | 9 % (non-technology specific) | | | | | **454 TWh** |
| **Capacity (2030)** | 0.8 GW | 9.2 GW | 9.6 GW | n/d | n/d | n/d | **89.5 GW** |
| **Generation (2050)** | n/d | n/d | 14 %* | n/d | n/d | n/d | **n/d** |

i including hydropower imports from neighbour countries; #including 0.025 small hydro; +including 0.075 GW small hydro; *Solar photovoltaics.

#### Introduction/Overview

South Africa has long announced to make its electricity production more sustainable, moving away from the heavy dependence on coal to a more balanced, sustainable power supply. However, until today the country has not achieved much progress in the promotion of renewable energy, particularly because of lacking adequate support instruments. In addition, the vast coal reserves in the country allow cheap exploitation, representing a major obstacle to renewable energy technologies. Yet, some recent policy initiatives could lead to a RE policy framework in the future.

#### Electricity Mix/Targets

In 2008, in South Africa 5 % of consumed electricity came from renewable energy sources, mainly originating from large hydropower imports from Mozambique and Zambia. Domestic renewable energy power generation did not play a relevant role. With a share of 90 %, coal was the dominant source for electricity production; nuclear power contributed another

5 %. RE capacity in 2010 amounted to roughly 0.8 GW, of which almost 0.7 GW were provided by large hydropower. The total installed capacity was 41.8 GW.

By 2030, South Africa aims to substantially increase the share of non-hydro renewable energy in power generation from today's 0.1 % to 9 %. If the target for hydropower was included (which should remain constant at 5 %, including imports from neighbouring countries), renewable energy would then contribute a total of 14 % to the country's electricity generation. To achieve these generation-based goals, South Africa targets to install roughly 23 GW of additional renewable energy capacity to arrive at 7.7 GW of hydropower, 9.2 GW of wind power, and 9.6 GW of solar power by 2030. Total installed capacity for the target year is expected to be twice as high as today's 89.5 GW.

### Strategy/Instruments

Due to various economic and environmental issues, South Africa has a clear interest in complementing its current fossil-fuel focused power generation with renewable energy. Because of the country's fast economic growth going along with increasing energy demand, huge increases in power capacity become necessary. In 2007 and 2008, South Africa already suffered a power supply crisis due to insufficient power capacity. The state-owned utility Eskom could only react by planned outages among private and industrial customers. As a reaction, South Africa discusses the promotion of independent RE power producers and reduced dependence on Eskom.

Already since 2003, South Africa has initiated several strategic framework policies aiming at RE promotion in the country's electricity sector. The White Paper on Renewable Energy was the first of these policies that solely targeted renewable energy, acknowledging it as an important energy source and aiming to harness it more ambitiously in the future. It defined non-mandatory medium-term targets for renewable energy in the final energy demand by 2013. The Integrated Energy Plan included a broader policy approach and outlined an overall strategy for the country's energy supply and demand. South Africa also enacted an Energy Efficiency Act in 2005 and an Electricity Regulation Act in 2006.

The Integrated Resource Plan 2010-2030 is the most recent and important piece of legislation in terms of renewable energy support and is a subset of the Integrated Energy Plan of 2003. It builds upon the assumption that within the next two decades South Africa will need 57 GW of new power capacity, going along with a diversification of power supply. The plan aims for strongly reducing its relative dependence on coal and promoting alternative forms of electricity generation. To achieve this, it defines long-term generation and capacity based goals for 2030 (see above) and analyzes various policy options, sets out future areas for policy action, and does a cost analysis.

Today, no concrete policies to realise the strategy are in place. A feed-in tariff, introduced in 2009, has never been very successful and abolished again in 2011 (see also below), replaced by a public competitive bidding program. Subsequent uncertainty among investors resulted in very little RE capacity additions. Despite the abrupt policy shifts, however, the first round of the competitive bidding program launched in August 2011 attracted great interest among project developers.

Yet, South Africa is still lacking powerful fiscal policies that offer financial support for investment. Even though policy makers passed some minor renewable energy subsidies, there are no comprehensive programs for reduction of investment tax, import duties or other forms of fiscal incentives.

### Achievements

Due to the lack of effective RE support instruments, power sector investment has followed business as practiced since the early 1970s, building and upgrading coal power plants.

### Electricity Market/Barriers/Attractiveness

Despite South Africa's status as the most developed country in Africa, the electrification rate only reaches 73 %, leaving 3.7 million people without access to electricity. As in many other developing countries, coverage of rural areas is lowest. In terms of liberalization of the electricity sector, South Africa traditionally has a semi-decentralized power distribution sector, with today about 180 different - mostly municipal - companies. Unbundling of generation and transmission has not taken place, both dominated by the de facto-monopolist Eskom, which generates more than 95 % of all electricity and operates the entire national transmission grid.

The heavy reliance of South Africa on coal represents a major challenge for renewable energy. First, the country can exploit its vast coal reserves very cheaply, thus being one of the world's cheapest electricity producers. Second, the structure of its electricity grid, shaped for centralised power generation from coal, provides only little flexibility to fluctuating RE sources above certain limits.

The South African government has planned to pass cost of EUR 0.94 million, resulting from the support of the first 1,000 MW RE capacity, to the customer. Apart from this, there have been no reports on the impact of renewable energy on the national budget or electricity prices. It can be estimated that additional cost has been relatively low due to the small additions achieved during the last years.

In terms of investment attractiveness, South Africa has attracted interest of domestic and international companies after the announcement of the feed-in tariff in 2009. Despite the unexpected move towards a competitive bidding system and a resulting phase of disappointment, investor interest remains high. In the Ernst & Young Renewable Energy Country Attractiveness Indices of August 2011, South Africa ranks 26 out of 35 surveyed countries.

### GIZ Activities

Under the focal area energy and climate, GIZ has recently launched the South African – German Energy Programme (SAGEN). Under the renewable energy component, GIZ supports the establishment of institutional capacities within the Department of Energy, assists in policy formulation and implementation (e.g. of the RE IPP procurement Programme), and advice on grid and system integration of renewable energy (with a particular focus on solar and wind energy). GIZ also supports South Africa in the establishment of a wind energy research and development (R&D) and training centre in the Western Cape Region.

## 3.2.13.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | (Feed-in tariff), tradable RE certificates, capital subsidies, public competitive bidding | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Difficult to determine, as there are only long-term targets for 2030; public competitive bidding only recently implemented (no experience). | | | | |

South Africa has defined generation and capacity based long-term targets as well as generation-related short-term goals. The country also passed important strategic papers on how to promote renewable energy in the country. However, in terms of implementing instruments, policy shifts and a lack of longer term experience do currently not allow to measure target achievement.

In terms of target setting, South Africa has defined capacity-related goals for hydro, wind, and solar power as well as a target for the overall share of renewable energy in electricity generation by 2030.

South Africa has also elaborated several strategies for renewable energy promotion, starting with the White Paper on Renewable Energy in 2003 and the most recent capacity expansion plan, the Integrated Resource Plan of 2010. All these papers target various aspects that are necessary for successful support, such as calling for the introduction of a support policy or promoting research and development.

The first concrete support instrument, the feed-in tariff adopted in early 2009 was accompanied by controversial discussions, culminating sharp tariff cuts. In early 2011, the National Treasury communicated that pre-determination of tariffs was not conform with the country's Public Finance management Act, which lead to abrogation of the feed-in tariff eventually. To replace it, the South African government announced a scheme of public competitive bidding in mid-2011, providing long-term power purchase agreements to successful bidders. The first tender, opened in August 2011, covered various renewable energy technologies.
More than 270 investors have already shown interest. Nevertheless, the announcement of cutting tariffs and abruptly switching to a new support scheme discouraged some of the investors that considered South Africa an attractive RE market. Long-term investment security, based on a stable policy and embedded in a comprehensive strategy, is crucial for investors. South Africa will need to regain credibility and prove reliability of its current policies.
Same as for the feed-in tariff, no support is provided for small-scale (< 1 MW) and off-grid installations. To help increase electrification in rural areas and reduce poverty, in the future South Africa should also consider supporting small-scale projects and off-grid solutions.

The failure of the feed-in tariff and the subsequent system shift are expressions of a lacking strategy under the Policy Design Cycle. Experience with the public bidding scheme is too short to judge if the overall policy has become more consistent.[13]

Currently not addressed sufficiently is e.g. the role of independent power producers. Further elaboration of the electricity sector law should promote further liberalization allowing them barrier-free access to the grid.

Hence, in terms of a consistent RE support policy, South Africa will have to take additional action in order to reach its 2030 targets, especially in the following areas:

- Effective implementation of the public competitive bidding scheme. Ensure proper enforcement of the law to regain trust among investors. The support scheme should be embedded in a long-term strategy.
- Introduction of a support policy for small-installations to allow small producers participate in the market. A feed-in tariff for small capacities could be a possible alternative.
- Curtailed influence of ESKOM and further promotion of independent power production.

13 In this respect, Department of Energy Deputy Director General, Ompi Aphane, stated: "[The involved parties] were not as careful, not as diligent as [they] should have been."



## 3.2.14 Thailand

### 3.2.14.1 Summary

| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 3.9 % | 3.1 % | | | | | 145 TWh |
| Capacity (2008) | 3.5 GW | <0.01 GW | 0.03 GW | 1.6 GW | <0.01 GW | 0.1 GW* | 31 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2022) | n/d | 14 % (non-technology specific) | | | | | 215 TWh |
| Capacity (2022) | n/d | 0.8 GW | 0.5 GW | 4.0 GW | n/d | 0.6 GW+ | 48.4 GW |

* including small hydro. +including small hydro, biogas, solid waste, hydrogen.

**Introduction/Overview**
Thailand is one of the forerunners in the promotion of renewable energy in Southeast Asia, having implemented a comprehensive long-term strategy and a feed-in tariff for renewable energy in electricity production. Due to its good solar irradiation and wide areas of forest and farmlands, excellent potentials for power and heat production from solar and biomass exist. In addition, independent power production is widely established in Thailand, which is an important prerequisite for small- and mid-scale renewable energy generation. However, Thailand is also facing some bureaucratic and financial barriers that have largely impeded a fast dissemination of renewable energy to date.

**Electricity Mix/Targets**
In 2010, renewable energy sources contributed 7 % to Thailand's total electricity generation, of which hydropower generated 3.9 %, and biomass/other renewable sources 3.1 %. Natural gas-fired power plants cover most of Thailand's power consumption (68.1 %); the rest of the electricity consumed originates from coal plants (18.8 %) and electricity imports (5.2 %). The total renewable energy capacity excluding large hydropower plants in 2008 amounted to roughly 1.8 GW, whereas biomass power provided a capacity of 1.6 GW. The country's total installed capacity was 31 GW.

By 2022, Thailand aims at producing 14 % of its electricity from non-large hydro renewable energy by increasing its renewable generation capacity to 0.8 GW of wind power, 0.5 GW of solar power, 4.0 GW of biomass power, 0.3 GW of small hydropower, and 0.3 GW of other renewable sources.

Thailand also defined a 25 % target of primary energy to come from renewable energy by 2022 (up from 2009's 6.4 %).

### Strategy/Instruments

Thailand's central piece of legislation for RE support is the National Renewable Energy Development Plan (REDP). Designed as a strategic paper for the long-term promotion of renewable energy, it was announced in 2008 (passed in 2009) and comprises the period until end 2022. It succeeded an earlier policy that set a target for 2011. The policy defines ambitious targets for renewable energy in electricity (see above), the heating and the transport sector. It comes with several, more specific measures, facilitating the promotion of renewable energy and attracting investors. Among those are a power purchase act, streamlining electricity sales of small generators to the grid operator, an eight-year corporate income tax exemption, which started in 2009, a 50 % tax reduction guaranteed for five years after the initial program ends and the "Adder" cost (Feed-in tariff) for renewable power producers. The policy also provides investment grants and loans.

To achieve the targets set in the National Renewable Energy Development Plan the Thai government has split the plan into three phases, each period defining specific absolute targets (as well as dedicated budgets) for the various renewable energy technologies. In addition to these quantitative commitments, each phase puts special political and financial focus on a certain area: the first phase (2008-2011) aims to promote commercial alternative energy technologies and high potential energy sources such as biofuels, co-generation from biomass and biogas. The second phase (2012-2016) focuses on the development of the alternative energy technology industry, aiming to encourage new alternative energy R&D to achieve economic viability including new technologies for biofuels production and to introduce a model development of Green City to communities for sufficient economy and sustainability development. The third period (2017-2022) aims to enhance utilization of new available alternative energy technologies i.e. hydrogen, bio hydrogenated, (BHD), extend green city models throughout Thai communities and make Thailand a platform for biofuels and alternative energy technology exports in the Association of Southeast Asian Nations (ASEAN) region.

In terms of specific instruments to promote renewable energy in electricity production, Thailand enacted a Small and Very Small Power Purchase Agreements act, which regulated the connection of small producers to the electricity grid and the sale of their electricity. This policy also acts as base for the feed-in tariff for solar, wind, waste, biomass, biogas, mini and macro hydro power, passed in 2007 and amended in 2009. Designed as a premium feed-in tariff, the law regulates the payment of technology-specific premiums on top of a regular electricity tariff. Interestingly, it awards power producers with an extra "adder" for systems installed in three provinces in Southern Thailand as well as for systems generating RE electricity replacing diesel in the Provincial Electricity Authority (PEA) system.

### Achievements

Between 2007 and 2010, contracts for 4.3 GW of renewable energy projects were signed under the provisions of the feed-in tariff. However, only 0.85 GW of capacity became operational so far. The large majority of the added capacity (0.7 GW) came from biomass power plants, commissioned under the premium feed-in tariff. Solar power installations, which accounted for 2.0 GW of all signed contracts, only provided 0.02 GW.

Between 2010 and 2022, the country's largest power producer, the Electricity Generating Authority of Thailand (EGAT), plans to construct 18 renewable energy projects totalling 164.70 MW.

### Electricity Market/Barriers/Attractiveness

Even though the overall policy framework is considered attractive by many investors (the feed-in premium is the most popular policy), some strong barriers for investment remain. More than 3 GW of signed contracts are currently in the pipeline – most of them for solar energy – and delayed due to bureaucratic obstacles. With respect to the population's rather low average income, additional high short-term investment cost of renewable energy represents another impeding momentum. Although the government has announced funding to help creating a renewable energy industry and introduced tax reductions, much of the equipment for renewable energy plants has to be imported at relatively high prices. Especially biomass use is in some cases also leading to controversies: farmers have been protesting against biomass power projects in areas meant for conventional agricultural use.

No clear observations of price increasing effects or negative effects on the public budget (dedicated budgets, see above) due to RE support have been made so far. Generally, Thailand finances renewable energy support by tax revenues and financial means received under the CDM mechanism. Additional cost can be expected for the future due to necessary investments in grid expansion.

Despite the relatively advanced existing RE support, many opportunities for renewable energy investment in Thailand remain untapped. The country's power generation is largely dependent on imported fossil fuels, with roughly 90 % of all production generated in natural gas-, coal- and oil power plants. Calculations say that about 60 % of the total energy demand is originating from imports and domestic resources, soon to be depleted. Thus, price volatility of fossil fuels is an increasing challenge for Thailand's energy supply.

Renewable energy, on the other hand, could be an option to ensure energy security and reduce dependence on foreign energy resources. With relatively good solar irradiation and large domestic biomass resources, as well as high potentials for decentralised power production, there are still various opportunities for the country to achieve its renewable energy targets. The high number of applications for solar power projects under the feed-in tariff has indicated considerable interest of investors. Many jobs have already been created in the construction industry and in the agricultural/biomass sector.

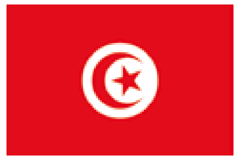
### GIZ Activities

GIZ supports CDM PoA development for a biomass power development programme in Thailand under the Small and Very Small Power Purchase Agreements scheme. Other activities include the support of efficiency improvement of biogas plants and solar thermal hot water systems in Thailand.

In addition, GIZ works on behalf of the initiative "Renewables Made in Germany" of the German Federal Minister of Economics and Technology (BMWi) on renewable energy promotion and Project Development Programme Southeast Asia. Besides, GIZ conducted capacity building among stakeholders and organized network meetings.

## 3.2.15 Tunisia

### 3.2.15.1 Summary



| | Current share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2010) | 0.7 % | 0.9 % | <0.1 % | | | | 11.6 GWh |
| Capacity (2010) | 0.06 GW | 0.05 GW | <0.01 GW | <0.01 GW | <0.01 GW | <0.01 GW | 3.6 GW |

| | Targeted share and capacity of renewable energy | | | | | | All sources |
|---|---|---|---|---|---|---|---|
| | Hydro | Wind | Solar | Bio-mass | Geother-mal | Others | Total |
| Generation (2016/'30) | 11 %/25 % (non-technology specific) | | | | | | n/d |
| Capacity (2016/'30) | n/d | 0.5/2.7 GW | 0.3/1.7 GW | 0.25/0.3 GW | | | n/d |

#### Introduction/Overview

Despite Tunisia's excellent solar power potentials, wind power has received highest political attention by the Tunisian government. Promoted by a couple of financial incentives, mainly consisting of investment tax reductions, and an ambitious strategy to improve energy efficiency in the country, some first renewable energy projects became operational in recent years. Tunisia has set itself quite ambitious targets, but for reaching them, a comprehensive strategy and effective policy instruments are necessary. These policies are currently lacking in Tunisia.

#### Electricity Mix/Targets

In 2010, Tunisia produced 1.6 % of its electricity from renewable energy sources, whereas hydro and wind power were the only sources with significant contribution. 98.7 % of all electricity was generated in natural gas and heavy fuel power plants. The total renewable energy capacity amounted to 0.1 GW; the country's total installed capacity was 3.6 GW.

By 2016, Tunisia aims to augment the share of renewable energy to an ambitious 11 %, which would represent more than an eight-fold increase as of 2009. By 2030, the RE share should rise to 25 %. There are also corresponding capacity-related targets in place: by 2016, total renewable energy capacity shall rise to 1 GW and to 4.7 GW by 2030. In these scenarios Tunisia pays particular attention to the expansion of wind in power production.

In its National Energy Efficiency and Renewable Energy Programme 2008-2011 Tunisia also set short-term targets for 2011 for the share of renewables in total capacity (10 %) and in primary



energy (4 %). There is also an energy efficiency target of 20 % for that year.

#### Strategy/Instruments

Tunisia's renewable energy strategy consists of a couple of renewable energy- and energy efficiency-related framework policies and instruments, dating back to 2004, updated and complemented in subsequent years. These policies target power production from wind, the promotion of solar thermal installations, and the use of photovoltaics in rural areas. While most of them provide investors with grants and tax reductions, there is no comprehensive regulatory policy in place, such as a feed-in tariff or renewable portfolio standard. In addition, most of the existing instruments and strategic plans focus on short- or mid-term periods (until 2011/2016).

In terms of framework policies, the National Energy Efficiency and Renewable Energy Programme 2008-2011 is the most recent and important strategic policy. The programme is based on Law 2004-72 and its amendment, Law 2009-7, both providing regulations on energy efficiency and renewable energy. Tunisia also enacted the Decree 2009/362 on Renewable Energy and Energy Efficiency Premiums, the Tunisian Solar Plan, and established an Energy Efficiency Fund.

Initiated in 2007 and ending in 2011, the National Energy Efficiency and Renewable Energy Programme encompassed a time horizon of four years and targets improvements in energy efficiency and renewable energy. Among others, it intended to promote renewables in rural areas and in the agricultural sector, where they shall replace fossil fuel based power generators and heating applications, increase biogas production, and improve water pumping and desalination. It formulated provisions under which investors were awarded with grants of between 20 to 40 % of the respective project investment cost. The program also allocated funds to research projects.

Law 2009-7 on Energy Efficiency came into effect in 2009 and superseded the Law 2004-72. Representing the most important renewable energy policy, it affirms the country's ambition to promote RE in power generation and to reduce the dependence on natural gas imports from its neighbour Algeria. Since its revision, the law provides some limited form of net metering, regulating the feed-in of independent renewable energy power production to the public utility and grid operator Société Tunisienne d'Electricité et du Gaz (STEG). Primarily, it enables large-scale and industrial producers to use the electricity network to transmit their self-produced power to supply their production facilities or other electricity consuming entities. The law allows the sale of excessive electricity of up to 30 % of the total annual electricity production at a market-oriented price. The Tunisian government determines this price in annual terms.

The Decree 2009/362 on Renewable Energy and Energy Efficiency Premiums is the most recent policy in the context of renewable energy support. The decree specifies the provisions of the Law 2009-7 and introduces a subsidy-focused program providing premiums of between 20 to 40 % of the investment cost to project operators once projects are operational. Among others, there are grants for buildings equipped with solar PV installations, cogeneration facilities, biogas production, and solar thermal water heaters. There are also VAT and import tax reductions and exemptions for renewable energy equipment.

In 2009, the Tunisian government passed the Tunisian Solar Plan, a comprehensive development plan that promotes 40 public-private partnerships in solar and wind power. Additionally, it initiates research projects, the creating of additional institutions, and various energy efficiency projects. The plan is covering the period from 2010 to 2016, financed by private and public funds.

**Achievements**
Between 2004 and 2010, Tunisia installed 0.1 GW of wind power, most of these publically financed projects becoming operational in 2009. By the end of 2011, experts assume that wind power capacity could rise to 0.18 GW. There are additional large-scale projects currently under development or awaiting approval in the application process.

Throughout the last ten years, Tunisia installed more than ten thousand small photovoltaic installations on private homes, often being off-grid solutions. These appliances replaced fossil-fuel generators or were the first power unit in these households. Apart from solar and wind power, however, other renewable technologies have not received much attention or achieved progress in recent years.

**Electricity Market/Barriers/Attractiveness**
Tunisia's electricity market is liberalised but still dominated by the state-owned utility STEG, which produces 76 % of all electricity and provides 86 % of all capacity in the country. As it owns and operates the national grid, too, its actual influence is even higher. As a result, opportunities for individual renewable power producers to enter the market and operate profitably have been comparatively low in Tunisia. The strong influence of the government on the electricity sector has kept electricity prices at a moderate to low level, mainly through subsidizing natural gas.

Electrification almost reaches 100 % in Tunisia. 99.8 % of the urban population and 99 % of the rural population have access to electricity.

As the quantity of renewable energy electricity is still too small to have a real impact on grid stability, the integration of renewable energy does not yet represent a major technical problem. However, if Tunisia aims to increase substantially the share of renewables to 11 and 25 % in the future (see above) technical improvement of the transmission network will become necessary. Particularly, better wind forecasting systems and collaboration of neighbouring transmission system operators should be established in order to prepare the power system to an increased penetration of electricity from renewable energy sources.

In terms of financing and financial attractiveness, most projects completed during the last decade were government financed, and/or supported by international donors. As no effective regulatory policy for the promotion of renewable energy exists yet, the attractiveness for private investors to build and operate alternative power plants is thus still very low. In addition, the current political situation has contributed to increasing uncertainty among potential investors.

**GIZ Activities and Experience**
Concerning renewable energy (both in the electricity and the heat sector) GIZ has realized several solar water heater projects. Moreover, GIZ activities have focused on wind, photovoltaic, CSP and biogas technology. GIZ has developed a national support programme for solar and wind technology and has implemented several pilot projects. With respect to wind technology, site assessment, wind measurement and feasibility studies have been realized as well as pre-feasibility studies for PV and CSP. With the organization of training sessions, mainly for PV, but even for wind and biogas, GIZ has contributed to capacity building at National Agency for Energy Management (ANME), STEG and in the private sector. Lessons learned include the observation that unclear institutional responsibilities often lead to obstacles with respect to quick project realization.

### 3.2.15.2 Policy Analysis and Expected Need for Action

| | | | | | |
|---|---|---|---|---|---|
| **Instruments** | No regulatory policy; capital subsidies, tax reductions, public investments. | | | | |
| **Policy Design Cycle** | Targets | Strategy | Instruments | Monitoring | Evaluation |
| **Target Reaching** | Very unlikely, as no proper renewable energy strategy nor any effective instrument is in place. | | | | |

Tunisia formulated ambitious mid-term and long-term goals for renewable energy, both generation- and capacity-related. However, political action that would go beyond this first step, such as elaborating a comprehensive strategy and implementing concrete policies to achieve a successful support of renewable energy, has not been taken yet. Hence, most of the present and past political effort depended on individual action of the government and international donors, and largely focused on short-term achievements. Currently, there is no effective policy in place that would allow Tunisia promoting renewable energy independent from political intervention.

Tunisia has set up clear, simple and coherent targets. It has four targets in place: a capacity- and a generation-related target, both for 2016 and 2030.

However, a strategy and instruments to reach the targets have not been defined yet. There is no effective policy which would have a big impact on capacity additions from renewable energy sources. Law 2009-7 is a very limited net metering policy, which does not incentivize power production exceeding consumption. Only 30 % of the total produced electricity is allowed to feed-into the grid for a government-defined, market-oriented price; any power above this 30 % surplus is not refunded. The Tunisian Solar Plan supports solar and wind power but is limited to rather small quantities of capacity. Decree 2009/362 addresses financial incentives for renewable energy equipment but does not provide a regulatory, long-term support.

Because of the absence of effective regulatory instruments, past achievements in adding RE capacity have been very limited and mostly lacked participation of the private sector. Most projects have been conducted by the government and were financed by public funds and international donor organisations. Private-only investment that would derive from an attractive policy, however, has been almost non-existent in Tunisia.

Other than many developing and developed countries, Tunisia incorporates energy efficiency and energy saving in its plan, regarding it as a top priority, for both sustainability and energy security reasons. Yet, as for renewables, Tunisia has not implemented comprehensive policies to implement its plans.

To reach its targets and establish a consistent RE support policy, Tunisia needs to provide an attractive regulatory support scheme to investors, as for example a feed-in tariff or a similar policy. Policy makers should put special focus on wind and solar power promotion, allowing the country to use its excellent potentials. In addition, to support other renewable energy technologies, the potential of all renewable energy sources in the country should be analysed, and, where attractive to be included in a support mechanism.

In parallel to financial and organizational support of international donors (e.g. under a NAMA scheme), Tunisia should also tap financial resources of private investors. Considerable capacity increase of renewable energy will depend on increased private sector involvement.

Tunisia already has political institutions in place experienced in renewable energy, such as the ANME. These institutions need to receive further empowerment in the future. In addition, the electricity sector itself requires further reform, particularly by advancing liberalization. The position of independent power producers needs to be strengthened; they should receive equal access to the grid by STEG. A national independent regulatory authority could help to increase transparency in the power sector and strengthen the rights of independent power producers.

In 2011, due to the revolutionary changes, the investment climate declined. For an effective support for renewable energy and progress in developing support policies, regaining political stability is also a precondition.

Concluding, important political and structural action is necessary to start effective support of renewable energy in Tunisia, such as

- Introduction of an effective regulatory policy, to allow renewable energy grow in the country. Focus on the promotion of solar and wind power, but provide incentives for other technologies, too. Maintain independent programs such as initiated in the National Solar Mission (e.g. the PROSOL-ELEC project), but develop regulative support to guarantee long-term success.

- Further liberalization of the electricity market which would provide grid access to independent power producers. Create an independent regulatory authority. Reduce government influence in the power sector and limit subsidizing energy prices.

- Uphold focus on energy efficiency and elaborate corresponding instruments.

- Build up and intensify cooperation with other countries in the region to learn from each other, especially in designing laws and determining tariffs of a feed-in law. Share experience about potential barriers.

- Improve grid infrastructure, introduce meteorological forecast systems and enhance collaboration with neighbouring transmission system operators (TSOs) to better prepare the integration of RE electricity into the power system.

In addition to existing activities, GIZ might consider to extend its policy advice along the lines of the above mentioned challenges. Consultancy to develop a feed-in tariff and strategies to liberalise the electricity market, as well as fostering regional cooperation and information exchange might be considered.

# 4

# Conclusions

Summarizing the findings of this study and drawing some conclusions on the scope of potential further international activities as provided by GIZ, the following aspects are to be highlighted:

1 The data structure, created under this project, has reached a comparatively high level of country information during the research process. Both existing data and those missing provide a structured insight into the respective status of RE policies. This can be used both for administering information and as a comparable overview of policy elements in place or as a gap analysis pointing to potential need for further action. The structure allows future updates and amendments where required.

2 When using the filter options of the data structure, multiple overviews and comparisons can be generated along various requirements. As indicated in the introduction, the results of those queries have to be read not as an absolute result in the sense of a ranking but require some interpretation by qualified users. Their main benefit consists of a structured mapping of individual strengths and weaknesses of RE policies in the respective context of a country. This can be supportive when applying a structured analysis according to the Policy Design Cycle, leading to strategic considerations on setting focus in international collaboration and on how to prioritize potential activities.

3 RE target setting is part of policies of nearly all countries examined in the study. Regarding ambition of the targets, two trends can be distinguished: half of the countries have rather low targets compared to the respective RE potentials, the other half following high ambitions, often likely to be missed.

4 Most countries have established some type of RE support instrument. Options chosen vary considerably, most common are public tendering, tax rebates, and feed-in tariffs. Most of these instruments are facing implementation problems and, where ambitious targets are in place, they will not lead to their compliance. Focus of international support is often put on improving support policies, but perhaps not questioning sufficiently if the instrument approach chosen for the country fits to its targets and other influencing factors.

5 In most countries, a major gap exists concerning consistent strategies to reach the respective target (step 2 of the Policy Design Cycle). This applies especially if interference with other policy areas occurs, e.g. cost for RE conflicting with social welfare policies focusing on low energy prices. Although often evident, these gaps are not sufficiently in the focus of further political action. Therefore, international action should develop a broader focus to address e.g. strategy gaps. Successful RE policy implementation does not only depend on designing the right instruments but also on defining overarching strategies why RE could be beneficial or how to resolve conflicts of interest between different policy areas. Stakeholder commitment across several policy areas is required to establish a modus operandi on how to deal with structural changes due to RE deployment.

6 Strategy gaps often go back to general barriers like subsidized energy prices. If countries have not sufficiently answered for themselves why they should shift their energy supply more towards higher RE shares, accompanied by all necessary paradigm changes in their supplier structure (e.g. monopolists vs. independent power producers and all related barriers to a leveled playing field), it is hardly possible to establish an effective RE support. Providing advice, a wider focus is needed, raising the importance of system changes and highlighting not only the cost but also the benefits of RE in more concrete terms (for the energy sector as well as on overall economic level).

7 An independent monitoring is hardly ever covered by existing RE support policies, but interesting single approaches exist. With respect to general barriers mentioned under 6), more effort on monitoring should be in the focus of further international advice activities, as it will create more transparency on the actual effects of RE deployment and help increasing stakeholder commitment.

8 Similar to monitoring, an independent and regular evaluation is not part of any support system of the countries examined. In some cases, examinations of policies have been executed by public authorities in order to make adjustments. Introducing independent evaluations, following scientific criteria, will increase the outreach of policies and should therefore be on the agenda of further policy advice activities.

9 Financing of policy approaches is a general problem throughout many countries. Even if commitment to RE goes far enough to accept certain related price increases, the overall amount of cost due to paradigm shifts in the energy system (e.g. grid infrastructure investments) may be higher than the available financial volume. An interesting perspective for the future is the option of financing RE support policies through the mechanism of NAMAs (National Appropriate Mitigation Actions). Here, a country introducing legal measures can apply for international funding for the related cost, in return to meeting emission reductions of a certain quantity. Further advice should be provided on this option.

10 Mutual learning among different countries on effective RE policies should be intensified. Doing so, the frequently practiced 'copy-paste-approach' on instruments urgently needs to be replaced by analyzing success factors independent from the type as instrument, as it is facilitated under the Policy Design Cycle. In this sense, the methodological approach of this study should be applied and developed further in the future.

# Appendix

# Glossary

| | |
|---|---|
| **ADEREE** | National Agency for Renewable Energy and Energy Efficiency Development (Morocco) |
| **ANEEL** | Agência Nacional de Energia Elétrica (Brazil) |
| **ANME** | National Agency for Energy Management (Tunisia) |
| **BHD** | Bio Hydrogenated Diesel |
| **BMWi** | Federal Ministry of Economics and Technology (Germany) |
| **BMZ** | Federal Ministry for Economic Cooperation and Development (Germany) |
| **BRL** | Brazil Real |
| **CDER** | Moroccan Centre for the Development of Renewable Energies |
| **CDM** | Clean Development Mechanism |
| **CNE** | Comisión Nacional de Energía (Chile) |
| **CNY** | Chinese Yuán/Renminbi |
| **CO2** | Carbon dioxide |
| **CSP** | Concentrated solar power |
| **CSPG** | China Southern Power Grid |
| **EEG** | German Renewable Energy Act/Erneuerbare-Energien-Gesetz (Germany) |
| **EEHC** | Egyptian Electricity Holding Company |
| **EGAT** | Electricity Generating Authority of Thailand |
| **EGYPTERA** | National Regulatory Authority for Electricity (Egypt) |
| **EPE** | Eletrobrás and Empresa de Pesquisa Energética (Brazil) |
| **EU** | European Union |
| **EUR** | Euro |
| **FiT** | Feed-in tariff |
| **GEDAP** | Ghana Energy Development and Access Project |
| **GIZ** | Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH |
| **GW** | Gigawatt |
| **GWth** | Thermal gigawatt |
| **IDR** | Indonesian Rupiah |
| **IEA** | International Energy Agency |
| **IEP** | India Energy Policy |
| **IPP** | Independent power producer |
| **JCEE** | Egyptian German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection |
| **KfW** | Corporation under public law (Germany) |
| **kWh** | Kilowatt hour |
| **MASEN** | Moroccan Agency for Solar Energy |
| **MED-EMIP** | Euro-Mediterranean Energy Market Integration Project |
| **MED-ENEC** | Energy Efficiency in the Construction Sector in the Mediterranean |
| **MNRE** | Ministry of New and Renewable Energy (India) |
| **MW** | Megawatt |
| **MWh** | Megawatt hour |
| **n/a** | Not available |
| **n/d** | Not defined |
| **NAMA** | Nationally Appropriate Mitigation Action |
| **NREA** | National Renewable Energy Authority (Egypt) |
| **ONE** | Office National de l'Electricité/National Electricity Office (Morocco) |
| **PEA** | Provincial Electricity Authority (Thailand) |
| **PLN** | Perusahaan Listrik Negara (Indonesia) |
| **PNDEREE** | National Plan for the Development of Renewable Energies and Energy Efficiency (Morocco) |
| **PoA** | Programme of Activities |
| **PV** | Photovoltaic |
| **R&D** | Research and Development |
| **RCREEE** | Regional Centre for Renewable Energy & Energy Efficiency (North Africa, Middle East) |
| **RE** | Renewable energy |
| **REC** | Renewable energy certificates |
| **REDP** | National Renewable Energy Development Plan (Thailand) |
| **RESPRO** | Renewable Energy Services Programme (Ghana) |
| **RPO** | Renewable Purchase Obligation (India) |
| **RPS** | Renewable portfolio standard |
| **SAGEN** | South African – German Energy Programme |
| **SERC** | State Electricity Regulatory Commission (India) |
| **SGCC** | State Grid Corporation of China |
| **SIC** | Sistema Interconectado Central (Chile) |
| **SING** | Sistema Interconectado del Norte Grande (Chile) |
| **STEG** | Société Tunisienne d'Electricité et du Gaz (Tunisia) |
| **TSO** | Transmission System Operator |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **VAT** | Value added tax |
| **VRA** | Volta River Authority (Ghana) |
| **VRA-NED** | Volta River Authority - Northern Electricity Department (Ghana) |

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