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Review of policies encouraging renewable energy integration & best practices

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ABSTRACT

This article provides policy-makers and renewable energy project developers with background information and analysis into the successful penetration of renewable energy policies. The analysis emphasizes on the different mechanisms to establish an encouraging regulatory framework for renewable energies and examines examples of both successful and failed experiences, through case studies and analysis of various countries. This analytic survey attempts to shed light on the factors which led to successful implementation of renewable energy depending not only on different countries experience, but also on the different sources and technologies for renewable electricity. The main objectives through the provision of this overview are to help policy implementers learn from each other's experiences and contribute to the efforts to meet indicative renewable energy targets. The methodology applied in this document is to collect all applied mechanisms helping deploying renewable energy projects with a reviewing of study cases analysis for some specific experiences. Then the information are classified and discussed from the financial, fiscal, legislative, political, technological and environmental points of view in order to make it a reference and a guideline for other renewable energy policies studies.

Contents

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1. Introduction

There is no doubt that the world energy demand has recently witnessed a remarkable increase and is expected to reach a growth of 56% between 2010 and 2040 [1]. On the meantime, the energy market is facing much more challenges, such as limitation of fossil fuel reserves, population increase, lack of energy security, economic and urbanization growth, and water scarcity especially for the desert and arid regions.

To overcome this future gap between energy supply and demand, as well as taking into consideration the risks from global climate change due to the greenhouse gas (GHG) emissions and other pollutants from excessive fossil fuel combustion, a lot of attention was oriented to Renewable Energy Sources (RESs) and Energy Efficiency (EE) measures. That is why developing Renewable Energy (RE) project is considered as a huge opportunity not only from the strategic and financial points of view, but also from the technological and environmental ones [2].

On the other side, governments have the biggest role on developing REs through establishing strategic plans and adopting the adequate mechanisms. These policies can affect the price of both conventional and renewable generated electricity not only through subsidy reform and taxes, but also thanks to dedicated funds, power production and grid access related laws [2].

Therefore, among the first steps to elaborate a transition from a conventional power system to a diversified portfolio for electricity generation including RESs using smart grid technologies for a more efficient system, preparing a road map including the regulatory framework and strategies is a key study.

To do so, the deployed strategy for advising on first steps toward an encouraging RE regulatory framework, was to start with a survey of successful and failed experiences of policies around the world to promote renewable energy technologies (RETs), and conclude with the most effective measures and lessons learned.

1.1. Research task objectives

This research task aims at providing an overview about policies deployed and lessons learned, presenting a benchmark for comparison between different countries experience with RE policies in the world.

A literature review of the most relevant publications, reports and scientific papers dealing with policies encouraging RE and a classification of the different types of support (financial, fiscal, political, legislative and technological) are reported in this document.

Through this study, the following objectives are expected to be attained:

- To have a complete and updated picture of the different policies and mechanisms encouraging RESs adopted around the world.
- To understand the reasons behind the success or the failure of each policy and mechanism.
- To learn lessons for future planning and development of policies and mechanisms.

This report is organized as follows. Section 2 presents and classifies the different factors affecting RE development and integration in the grid. Section 3 surveys and compares different international policies. Section 4 summarizes best practices and lists some recommendations. Finally Section 5 concludes this study and opens discussion to the future challenges facing RE integration.

2. Factors affecting renewable energy integration

Successful integration of RE can be only achieved after overcoming varied obstacles. However, there is no single identified factor that can have alone a significant positive effect on RE integration in a country. It is rather the association of benefits from supportive measures that determine the extent to which a renewable technology can be successfully or not exploited. This section summarizes the essential components affecting RE implementation and helping to create a positive environment in which RE exploitation can succeed. These factors are classified, described and discussed below, under the following aspects: financial, fiscal, legislative, political, technological and environmental.

The same classification will be also used in the following sections to evaluate different international practices on policies for RE integration and to conclude with lessons learned.

2.1. Financial aspect

Investment in RE projects requires financial incentives because such projects not only have typically higher capital costs than

conventional energy generation methods, but also are, in some cases, considered to be riskier investment due to technology and resource uncertainties. In fact, comparing to conventional energy production projects, renewables are generally of a smaller scale, and consequently could not benefit from economies of scale.

Usually, once successful RETs are proved, the risks of investing in RE projects will be reduced. Thus, in countries where RETs and Research & Development (R&D) laboratories are well established, there are more financial institutions willing to provide favorable loans for the implementation of RE projects.

The role of governments is also important, especially at the early stages of technology development. For instance, the governments can create the necessary framework and conditions to encourage initial contribution and investment by banks in specific technologies.

Therefore, the financial support is an important factor in influencing the successful integration of RE, which seems to be highly correlated with both political and technological supports. This kind of support and funding can be provided from public or private sources through grants or loans towards capital or operational costs.

2.1.1. Public sector funding

Public sector funds are financial resources used by the government to invest in RE projects. This support can be provided through grants or loans as follows: [3]

- Grants, which are a monetary assistance that does not have to be repaid and that is granted by a government for specified purposes to an eligible recipient.
- Low-interest loans, which are usually given by national or regional financial institutions with public subsidy support.
- Loan guarantees, which are usually provided with public subsidy support.

Those incentives reduce the burden of the initial investment by decreasing equipment costs and addressing market barrier. They also act by levying a small fee or surcharge on electricity rates paid by customers, like in the case of Public Benefits Funds (PBFs), also known as System Benefits Charges (SBCs) and clean energy funds used in the United States of America (USA) [4,5]. Money is usually provided from the state budget or, in the case of loans, from state banks. The total amount of money available in a support program is often capped.

2.1.2. Private sector funding

Private sector funds of RE projects are usually coming from banks and other financial institutions such as venture capital organizations, which are of vital importance to the long-term commercialization of renewables. These funds are categorized as structural funds and favorable loans.

2.1.2.1. Structural funds. Structural funds constitute a financial instrument established by the European Cohesion Policy in order to achieve European Union (EU) RE and EE targets [6]. Besides, they provide support for project development, training and other key measures designed to reduce unemployment and stimulate economic activity, and are targeted towards the most disadvantaged regions [7]. These funds represent about 36% of the total EU budget [6].

2.1.2.2. Favorable loans. The initial barrier which affects the deployment of RE projects is the access to funding, especially for smaller companies to fund pre-feasibility studies for their projects with uncertain resources. To overcome this barrier, preferential loans and guarantees are a very effective method. Favorable (low-interest) loans may also be provided by banks or other private sector financial institutions [8].

2.2. Fiscal aspect

What makes energy produced from RESs noncompetitive to energy produced from conventional sources is the generation cost which is lower for fossil and nuclear power plants. This can be explained through two factors. In fact, most of conventional power plants were not only built with significant subsidies, but also its capital costs have now been covered, which is not the case for RE plants that have higher proportion for capital costs from the total plant cost.

The second factor remains on the non-consideration of external additional costs of energy produced from fossil or nuclear sources. In fact, these costs should include the contribution of conventional sources to pollution caused by Carbon Dioxide, Sulfur Dioxide, Nitrogen Oxides and other emissions and pollutants, or by nuclear waste generation and risks of radioactive contamination.

To address these issues raised by the above factors, some actions started to took place through [7]:

- Providing tax exemptions/reductions or tax incentives to companies or individuals investing in renewables-related goods or services.
- Imposing a carbon or energy taxes on conventional sources of energy, which aim to modify energy consumption levels.

To recapitulate, fiscal support can be ensured in two ways: as positive fiscal arrangements to encourage investment in RE, and as part of wider environmental tax initiatives, which penalize the use of fossil fuel. Both forms of measures are being increasingly used in order to make RES as competitive as conventional energy sources.

2.2.1. Environmental taxes

Environmental taxes are introduced to make adjustment on the total costs of generating power from fossil or non-fossil sources. This instrument plays the role of a market regulator which will lead to a fair competition between power generation technologies by implementing an optimum environmental tax [9].

There are various types of environmental taxes. For instance, they may be levied on energy use, power or heat generation, CO_2, or SO_2 emissions [7]. These taxes act directly by stimulating energy businesses and changing in the economy's production and consumption patterns as well as indirectly through recycling these taxes to benefit RE and other environmental projects.

2.2.2. Tax incentive for investments

Fiscal arrangements can be used to support investments in RE and energy saving projects. In fact, tax exemptions can encourage private individuals and companies to consider investing in RE projects as an attractive financial option. Tax credit appears to be effective as it may equal a subsidy on the investment of about 25–35%, depending on the profit and fiscal status of the company [1]. Tax exemption can also be used on RE equipment and appliances through for instance lease arrangement from banks making financing easy and attractive for all parties [7]. This approach rewards investment in clean technologies, and can also encourage a greater level of awareness among the producers and the users.

2.3. Legislative aspect

Given the nature of RESs, the RE market need clear policies and legal frameworks in order to increase investors' interest. In fact,

due to the generation characteristics of RE and their higher costs compared with other forms of energy, the absence of a guaranteed market for renewable power threatens the financial viability of many RE projects. That's why legislative instruments can help stimulating RE market through different types of mechanisms that are classified in two categories: legislations organizing the power purchase and mechanisms facilitating grid access.

2.3.1. Power purchase legislations

There are different legislative mechanisms that can be adopted to regulate the power purchase and provide support for a guaranteed RE market. But generally there have been two main mechanisms which governments have used: Feed-In Tariffs (FIT) and tendering arrangements. Additionally, there are recent developments in new initiatives to support electricity from renewable sources, which are Renewable Portfolio Standards (RPS), Green Pricing Schemes and Green Certificates. These are all described hereafter.

2.3.1.1. FIT arrangements. The FIT arrangement that offers a fixed and guaranteed price for generated electricity, a continuous availability and stability of the purchase/sale with a purchase obligation by the utilities for a specific long-time period contracts (15–20 years).

The pre–established prices to be paid are generally above-market rates for renewable power fed onto the grid. These tariffs, which may vary depending on the type of resource used, provide renewable generators with a set stream of income from their projects [10].

FIT policies are considered as an advanced form of Production-Based Incentive (PBI), where payments can be determined in three ways based on:

- Actual levelized cost of RE generation which ensures the profitability of RE investments. It is the most common and successful way of applying FIT in the world, especially in Europe.
- Estimated cost of supplying electricity if it were done by means of other supply sources, considering a Locational Marginal Pricing (LMP) formula, or based on utility projections of long-run fossil fuel prices.
- Fixed-price incentive established arbitrarily.

The two last ways were more common in the USA, and have experienced more limited success [10].

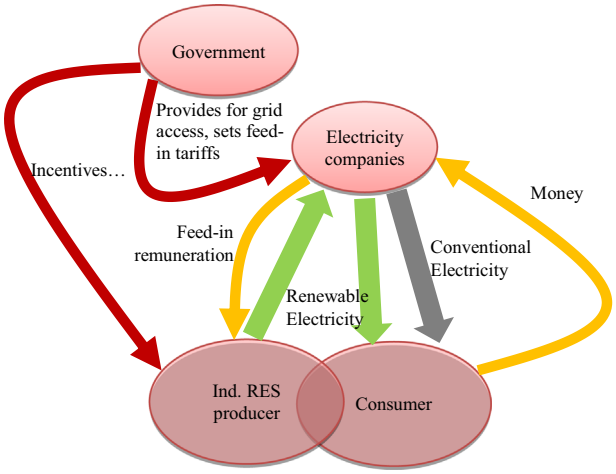

Fig. 1. Scheme of typical Feed-In-Tariff system [4].

Fig. 1 shows a simplified scheme of a typical FIT system [4]. When FIT system is oriented towards households, farms and businesses rather than Independent Power Producer (IPP) businesses, it becomes a Net-Metering program, which generally consists on allowing individual electricity consumers to generate electricity from small RE systems such as Solar Home Systems (SHSs) and feed it into the grid in order to offset their electricity consumption. A single bi-directional meter is required which is capable of registering the flow of electricity in both directions. The advantage of this system is the fact of using the grid as a storage which allows small generators to consume part of their electricity at another time or feed electricity into the grit at peak demand times. Beside this, net metering leads to a reduction in distribution losses and improvement of the voltage profile [11].

2.3.1.2. Tendering arrangements. Competitive bidding is a call for tender process to run competitive auctions for predetermined quantity of renewable electricity and sometimes prefixed sites, under the use of long-term power purchase agreements [12].

This system enables specific RETs to be supported, even those at different stages of technological development, because the tendering system encourages competition within technologies. This has resulted in cost reductions for many of the technologies supported.

However, considering previous experience with this mechanism, government tendering programs offered fewer guarantees to developers comparing to FIT system, due in part to the often uncertain and long time between tenders and the aggressive competition among project developers to win the competitive process [7].

2.3.1.3. Renewable portfolio standards. RPS policies are designed to increase the contribution of RES to the energy mix. In fact, they help increasing production electricity from high-cost sources with a market based approach and administratively effective.

RPS requirements generally rely on private investments, often with government support, to promote RE growth (as opposite to FIT, which use public funds) [13].

The RPS has proved success in fostering renewable electricity production. There are three major reasons for the growing popularity of the RPS [13] [5]:

- Renewable producers benefit from continuous incentives in order to reduce costs. This is achieved by mechanisms that establish continuous cost competition among renewable producers for their share of the RPS.
- The link between targets of RPS market share and government policy, for instance through environmental target (CO_2 reduction).
- Noninvolvement of governments' budget into the extra financial cost of renewables and the selection of winning bids.

2.3.1.4. Green pricing schemes. Green pricing consists on paying a voluntary premium by consumers to support the generation of electricity from RESs. The design can vary from [7]:

- A fixed amount of payment per year for part of 'green' power while receiving some 'brown' or non-renewable power.
- All received power is 'green'.

2.3.1.5. Green certificates. Green certificates are considered as state tool to ensure that a fixed amount of 'green' electricity is generated by obliging producers, distributors or consumers to either produce or buy a certain amount of 'green' electricity. The

interesting aspect about green certificates is trading. In fact, trading help to increase the system efficiency as the obliged entities are free to choose between filling their obligations themselves by being generators or pay another entity to fulfill the quota by buying the production of other generators [14] [15].

This type of system is of particular interest in a union context where trading possibilities are greater than at a purely national level, where the electricity market is small or where one operator monopolizes the local market. The other advantage of this system is that it allows competition between renewable producers as the certificate price will depend on demand and supply of green certificates.

2.3.2. Grid access legislation

Straightforward access to the necessary grid infrastructure is important to success implementation of RE projects. Renewable electricity faces problems of grid access. In fact, RE projects are generally small scale, decentralized, and may be located in rural or remote locations where grid connections are limited or unavailable. In addition, electricity generated from RES is intermittent in nature, especially wind, Photovoltaic (PV) and hydro, and this can attract penalties under some grid access charging tariffs, which favor generators that are able to provide continuous and consistent generation output [7].

In order to achieve the highest level of renewable electricity penetration especially for small scale RE projects, it is important to address carefully problems of grid access and to establish a transparent and economically fair charging system.

2.4. Political aspect

Strong and long-established political support at national, regional or local level is a consistent component in successful penetration of RE. This support includes crucial elements for RE deployments, such as establishing regulatory framework and price support mechanisms, but also ensuring funds for R&D programs at the national level.

All of these policies constitute the basis of an overall national energy plan for RE implementation. One of the most important actions to take in a national plan is the adoption of official targets for the level of renewables uptake. When a government establishes the target, this is an important political message that encourages the deployment of RE. Reaching the goal will consequently increase the market share of renewables, and as a result costs will drop with increased production and a larger infrastructure base.

National energy policies aim to encourage diversity and security of supply, to reduce imports of fuels and to reduce GHG emissions. RE can make an important contribution towards achieving these objectives. That is why some countries started to develop RE support programs earlier than others, usually for country-specific reasons. For example, security of energy supply is given high priority in countries which have few indigenous fossil fuel resources and must rely heavily on imports [7].

The socio-economic benefits of new RE projects are increasingly becoming an important component in political decisions to implement new strategies related to RE and sustainable development. These include not only the role that RE plays in environmental protection, but also its contribution towards economic development, employment and private investment, particularly for rural or remote areas.

Other factor acting in favor of increasing support for RE is the political attitude towards nuclear power, especially where there is a national willingness to use less or none of it. For instance, the creation of the strong anti-nuclear and environmental movements in the 70 s and 80 s and the first big Green political German party in Europe was the catalyst for RE prosperity in Germany [16].

2.5. Technological and environmental aspect

The development of RETs requires support at all stages, research, demonstration and implementation in order to help achieving competitive local industry capabilities in RE.

On the one hand, some RETs at early stage of development in particular, such as Concentrated Solar Power (CSP) need support in order to overcome technological and economic barriers. This support can be ensured through public sector funding programs for R&D. As a result these programs will help to reduce capital and operating costs, improve efficiency and demonstrate long-term reliability of the technology.

In addition, technological support focuses also on demonstration and implementation of new technologies as they mature. In fact, it focuses on existing technologies with enhancing some parts of their processes or offering technical solutions to related challenges, such as storage, intermittence, cooling, cleaning, etc [16].

On the other hand, air ambient quality is being affected in many countries in the world caused by the increase on energy consumption, especially with fossil fuels. In fact, 84% of global CO_2 emissions and 64% of the world's GHG emissions are registered from the energy sector [17]. For these reasons environmental considerations are getting more and more international attention. Since the appearance of the Carbon Footprint concept, environmental pressure is being made for countries that have high amount of carbon emissions which are resulted through generation of energy mostly from coal, gas thermal, and gas combined cycle. This environmental support has a big impact into the drivers for technological support and therefore into the development of RE projects.

3. Comparison of different international policies

Most countries used to adopt a 'policy package' approach, rather than choosing stand-alone policies. Since this mechanism works in the interactive mode, success or failure of one individual policy will depend on the effectiveness of other complementary policies. Besides, several political, social and economic factors contribute to the impact of these policies.

In this section, the most relevant success and failure factors of major policies affecting the implementation of RE projects are reported in order to learn from those experiences and understand their relevance and adaptability with other countries (Appendix A presents more details about updated reforms in some European countries related to RE promotion).

3.1. Financial support

In the previous section, different mechanisms of financial support were presented, where its importance was proved as a factor contributing to successful implementation of RETs. This section provides an overview of the most common financial support mechanisms that have been or are available for RETs around the world and examples which are used in order to highlight how such schemes work in practice.

However, some experiences, such as the Spanish one with wind energy, proved that the need for financial support is not permanent, since it can be reduced gradually as far as the implementation of these projects is successfully done [7]. In fact, when legislative supports as FIT or tendering arrangements are implemented there is progressively less requirement for developers to receive financial support (grants) towards their installations. In a situation where prices

are guaranteed, Investors will have sufficient confidence to develop RE projects without the need for further financial support. Other countries such as Sweden, without a FIT or a tendering system, subsidies are still the main mechanism for supporting wind energy schemes [7].

In addition, the financial support is also highly correlated with the technological support, since it can be established in favor to particular technologies that need initial push to enter the market. For instance, PV installations in their beginning in Germany received financial support through favorable loans schemes [18]. Therefore, the existence of a clear strategy about which legislative mechanism to which type of technology is primordial in order to have an effective and successful financial support.

Table 1 summarizes different international experiences on financial measures for RE development.

Policies have an important impact when it comes to grid-connected technologies, especially when they are complemented by financial and fiscal incentives as already explained by the above listed examples. However, when it comes to stand-alone systems, used for remote village electrification, financial incentives are seen to be the most effective support. Experience from different countries in the Asia-Pacific region showed that initially subsidies have been successful in promoting off-grid RETs [21].

To conclude, the financial support is a complement if either a strong legislative mechanism such as FIT or competitive tendering (like what happened for wind energy) is implemented, or also through the introduction of a taxation system for non-renewable sources of energy combined with a considerable R&D support (like what happened with biomass in Sweden [7]).

3.2. Fiscal support

Fiscal incentives exist to help overcome the financial barriers to deploying renewables. They are presented in several forms varying from exemptions from taxes on imported equipment, to

Table 1
International experience on financial support for RE development.

Factor 1: Financial support	
Country/ Region	**Description and examples**
Australia	**Encouraging measures**: The Australian Ministry for Resources and Energy set up a competitive grant scheme called the Renewable Energy Demonstration Program (REDP) in 2009, which aims at demonstrating the viability of RETs at a large scale, enhancing Australia's international leadership in RE and attracting private sector investment in RE power generation [19] **Comments**: Some grant schemes have proved to be too strict or unrealistic in their award criteria for the market to actually gain access to the funds. For example some grant schemes have required the technology developer to agree to make their Intellectual Properties (IP) available to the public as a condition to receive the fund. This can cause problems at a later stage in accessing private sector funding and in encouraging investors and developers
China	**Discouraging measures**: Eliminating coal subsidies: China cut coal subsidies 40% since 1990, petroleum subsidies fell from 55% in 1990 to 2% in 1995 [20] **Comments**: This might result job losses in fossil fuel and coal industries. However, the Chinese tried to overcome these results by placing solar cell manufacturing sites near to the old coal mines **Encouraging measures**: – Capital subsidies: Rural End User Subsidy [21] – Installation Subsidy: Programs such as the Golden Sun Program which provided capital subsidies for solar PV installation. Off-grid (stand-alone) installations received 70% subsidies while grid-connected installations received 50% subsidies with a limit on overall quantity of systems installed in a given province [21] – Grants such as the Global Environmental Facility (GEF) grants. China received approximately USD 40.22 million from GEF for the China Renewable Energy Scale-Up Program (CRESP) between 2006 and 2011, which aimed at removing barriers to the introduction of cost-effective renewables and increase their market penetration, enough to make a sizable cut in GHG emissions [21] **Comments**: Other countries in Asia have benefited from the GEF grants with their corresponding schemes, such as [21]: – Indonesia: Integrated Micro hydro Development and Application Program (IMIDAP); – Nepal: 'Light for All' movement; – Sri Lanka: Renewable Energy for Rural Economic Development Project (RERED). Chinese policies mainly were designed to boost efficiency and domestic economy instead of boosting the export. They have driven exponentially manufacturing and lowered cost of RE globally, along with a recent push for domestic installation of RE
Europe	**Encouraging measures**: – Public grants, substantial subsidies (on investments, equipment and R&D), and low-interest loans (interest-free loans in the case of Portugal) [7] – Direct financial support, such as the PV Roofs Program in Germany – Structural funds to support project development, training, feasibility studies and other key measures designed to reduce unemployment and stimulate economic activity, and are targeted towards the most disadvantaged regions [8] **Comments**: – Financial support can also have a big impact on the technological support – Regional banks can be the administrator, like in Germany providing national loans to support PV installation. Or, they can be a shareholder in the public-private company established to develop RE projects, like what happened in the case of Navarre wind energy in Spain [22] – Austria, Ireland, Portugal and Spain all made some use of Structural Funds to support RE developments
Nepal	**Encouraging measures:** – Nepal's cost-effective Biogas Support Program (BSP) was implemented by a joint effort between different stakeholders, such as the Government of Nepal (GoN), Netherlands Development Organization, Dutch Development Corporation, Agricultural Development Bank of Nepal and Gobar Gas Company (in Nepal). It consists on subsidies that vary in size according to the remoteness of the region and the size of the plant. Fig. 2 details the BSP total budget and targets per phase [20] **Comments**: – International collaboration between government, organizations, local banks and local utilities can be a successful way to introduce subsidies – Subsidies are very effective at jump-starting the industry, leveraging high quality installations and competition between many suppliers, and increasing the number of recognized biogas companies

accelerated depreciation on capital cost of power plant or tax holidays on generation incomes. The major tax incentive policies are [21]:

- Import Duty/Excise Duty concession
- VAT concession
- Tax credit/Accelerated Depreciation
- Production Tax concession
- Tax Holiday on Generation Income

As presented in the previous section, fiscal support can be classified into environmental taxes and taxes related to investments. Few examples are presented to illustrate these two types of fiscal mechanisms used to support RE projects' deployment.

3.2.1. Environmental taxes

Denmark was one of the first countries in Europe to implement an environmental tax [7]. Energy consumers were charged a CO_2 tax since 1992, with some of the revenue given to generators of electricity from renewable sources.

In Sweden, the introduction of taxes on CO_2 and energy helped the expansion of biomass. The taxes made other options (in particular coal-fired district heating and coal-fired combined heat and power plants) more expensive [22].

3.3. Tax incentives for investments

Tax exemptions or reductions can encourage private individuals and companies to consider investing in RE projects as an attractive financial option. For example, in Germany and Sweden, investment in wind schemes can be offset against tax for individuals, while in Ireland, Netherlands and Spain companies receive tax relief if they invest in RE projects [22]. In Greece, the installation of solar thermal water-heating systems has been stimulated by tax exemptions for households buying RE appliances such as solar water heaters [7]. In the Netherlands, companies and

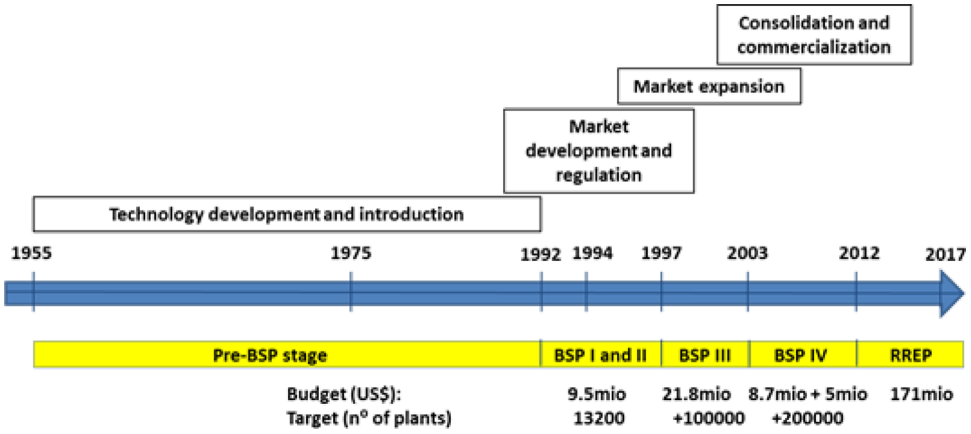

Fig. 2. BSP history and main figures [20].

Table 2
International experience on fiscal support for RE development.

Factor 2: Fiscal support	
Country/ Region	**Description and examples**
Europe	• **Energy-related taxation**, which penalizes the use of fossil fuels or other environmentally damaging activities, applied in Netherlands, Denmark, Finland and Austria **Comments:** Revenues received from energy taxes are partly recycled to support RE, EE and other environmental projects, like in Austria and Denmark In Denmark, tax programs were applied for wind energy, which consists on support by a partial rebate from the Danish electricity tax separated on the following taxes [7]: - Tax that varies for natural gas, unleaded gasoline, diesel fuel and other energy; - Carbon dioxide tax; and - Sulfur dioxide tax. • **Tax exemptions** or reductions for individual investors (especially with wind energy in Germany). In France, lowering the remove of tax on biofuels and making them competitive with high-taxed fossil fuels **Comments:** However this kind of support may have the disadvantage of being unclear in the future • **Tax on revenues:** Policy can also undermine RE market. Spain, for example, has radically reformed its system of support for RE and recently applied a tax on revenues, which may result in a 16% to 18% reduction in the value of wind projects commissioned between 2009 and 2012 [23] **Comments:** This type of retroactive change in policy may also have knock-on effects for a country's ability to attract private investment and may subsequently slow the deployment of RE
India	• 100% depreciation in year 1; • 5-year income tax holidays; • Concessional import duties; and • Excise and sales tax exemption [24]
USA	**Production tax credit** was available for wind, closed-loop biomass and poultry waste. The credit is ideally set at a level that makes it more cost effective to produce electricity from RES than from fossil fuels. Production tax credits are more effective when they are implemented in conjunction with policy that creates a market for renewables, such as the RPS which is more explained in the next section [13] [21] **Comments:** Those tax credits present a disadvantage of being uncertain as to when the law will be repealed. When there is no longer a credit, the company doesn't receive compensation, and it may no longer be profitable to produce electricity from RES

firms which invest in energy saving projects (including RE projects) can benefit from claiming accelerated depreciation of investment in equipment for such projects [1].

To recapitulate fiscal support mechanisms an overview of different experiences is presented in Table 2.

3.4. Legislative support

In the previous section, two types of strategies were presented in order to facilitate accessibility of RE market. The first strategy is the use of pre-established FIT, which motivates RE IPPs. The second type of strategy is the use of bidding systems or certificate markets. This strategy involves letting the market decide the tariff to be paid to the RE IPP based on a bidding system or a certificate market.

3.4.1. Feed-in and tendering arrangements

Based on different experiences with those mechanisms, there is a strong agreement among international RE experts that a FIT system is more effective than a quota system, and that it has generally resulted in lower electricity prices than the quota system [16]. In fact, the countries which were the most successful in increasing their percentage of RE generation in Europe - Germany, Spain and Denmark - have implemented a FIT system. Countries that have implemented quota systems - United Kingdom (UK) and Italy - have been less successful [25].

3.4.2. Net-metering programs

Net-metering programs have been implemented in many countries, such as the USA. The rules vary from program to another, but the basic philosophy is the same, which is to credit participating households according to the offset in consumption, that is essentially a subsidized tariff rate [10].

Net-metering programs typically allow a maximum offset of a zero dollar monthly electricity bill, but some programs allow the credit of excess feed-in to be rolled over to the following month(s). Net-metering programs also typically include a limit on the maximum amount of power that can be generated from a RE system (for example 50 kW) [26].

3.4.3. Green certificates

The countries in Europe which have applied for green certificates are: Belgium, Italy, Poland, Romania, Sweden and the UK. These programs were time-limited except for Poland. Belgium sets minimum prices (which vary across regions), Poland imposes a price (average market price of the previous year) and in Romania prices must fall between €24-42 up to 2012. Only Sweden and the UK do not guarantee prices [27].

Table 3
International experience on legislative support for RE development.

Factor 3: Legislative support	
Country/ Region	**Description and examples**
Brazil	• **FIT: In 2002,** Brazil launched the Program for Encouraging Alternative Sources of Energy (Proinfa), a FIT scheme that drove the development of 52 wind power projects, representing 1300 MW of capacity [28] **Comments:** This program faced several practical issues, such as: – Delays in obtaining environmental licenses; – Land disputes; – Delays in grid connections; – Domestic supply chain problems; – Existence of a cap (originally 1100 MW) which made it uninteresting for companies to enter the market; and – The system was easily gamed by speculators. • **Auction regime:** In 2009, the Brazilian government acknowledged the limits of FIT system and introduced a more streamlined approach, an auction regime administered by the Ministry of Mines and Energy. This system of auctions together with a highly supportive policy of loans and guaranteed purchase contracts from the Brazilian National Development Bank (BNDES) has driven rapid growth of wind power installation to an expected total of 5300 MW in 2013 [28]
Germany	• **Beneficial FIT:** Stromeinspeisungsgesetz for wind turbines: the German feed-in law system: commercially favorable guaranteed FIT with an obligation on utilities to purchase renewable electricity at these tariffs + capital subsidy programs to encourage uptake of the technology [7] [12] **Comments:** In same cases the market reaction faced to this tariff simulation can change from the expectations in both senses. For instance, with PV the German government had to limit application for receiving these new tariffs in 2000 because the amount of money set aside support had been already reached [7]. After that, a new law abolished the 5% cap and introduced a system that allows transmission grid operators to share between themselves the costs of compensation to renewable electricity producers [15] [16] • **Access to the grid:** Policies that oblige utilities to allow straight forward access to the grid for RE producers with a transparent and economically fair charging system for grid access **Comments:** In order not to overburden grid operators in areas where there were high rates of renewables generation with having to purchase at premium prices, a limit of 5% renewable electricity was set from 1998 that applied within each region [7]
India	• **Premium Payment FIT** which consists on guaranteeing RE suppliers an additional payment on top of their energy market or end-use value **FIT mechanism:** It faced one major constraint which is the absence of a viable mechanism to recover the extra cost incurred due to procurement of power at FIT **Comments:** State subsidies to cover excess burden created by FITs have been insufficient, and utilities end up meeting the extra cost from their own revenues. Also RE growth was constrained by limitations in infrastructure, access to finance, and policy inconsistences at state and national level [21]
Ireland, UK and France	• **Tendering/Bidding:** Public authorities organize tenders for given quota of RE supplies or supply capacities, and remunerate winning bids at prices mostly above standard market level [29] **Comments:** The Eole Program in France in 2005. The criticism about the NFFO approach in UK proved valid in practice; contracts awarded to low-bidders did not always translate into projects on the ground. The UK abandoned the NFFO approach after the fourth round of bidding in 1997 [21] • **Feed-In-Tariffs with Contract for Difference:** It is a new mechanism adopted by the British government to replace the classic tendering process mechanism in order to encourage low-carbon electricity projects. It is based on a long-term contract between an electricity generator and a contract counterparty, which will enables the generator to have a constant level of revenues at a pre-agreed price, called strike price. The generators will be paid when the market price for its electricity is below the strike price, and he will pay back the difference when the reference price is above the strike [30]
USA	**Renewable Portfolio Standard (RPS)/ Quota obligation or mandate:** It obligates designated parties to meet minimum RE targets, generally expressed as percentages of total supplies or as an amount of RE capacity, with costs borne by consumers [29]

Table 3 summarizes some examples of legislative mechanisms that were applied in different countries.

3.5. Political support

Without the creation of a favorable legal and regulatory framework RES will be condemned to remain a small niche market. Therefore, a key precondition for the development of REs is a strong political support through smooth bureaucratic application procedures. For example, clear and simple regulations about the licenses required for the building and operation of RE systems are a crucial necessity. All rules should be as simple as possible. Ideally, one comprehensive RES law should contain all the important provisions.

Table 4 gives a few examples of how the political support can play an essential role in RE integration and development.

To conclude, political support includes all the other types of supports such as, financial, legislative and fiscal supports. Indeed, the government is considered the primer actor to set the legal framework, the national targets, and pricing policies and take strategically decisions to support the development of REs.

3.6. Technological and environmental support

3.6.1. R&D support

R&D support programs are typically in the form of grants or loans and in most cases will not be designed with the expectation of financial returns. It is therefore crucial that the program receiving such funds can really be said to be one of R&D that is working to develop identifiable, patentable technologies. This concept could well be applied to RETs, although R&D needs always a high political support through dedicated funds and financial support [19].

3.6.2. Environmental support

Financial and technological incentives could help to achieve quantified emissions and CO_2 reduction relative to each sector (industrial, residential, etc) through crediting mechanisms such as Clean Development Mechanism (CDM) and environmental audits (whether they are general environmental audits or specific for elements such as energy use) [17]. These mechanisms have been used to improve environmental performance to wider markets and improve reputation. Audits are generally used to assess the current environmental performance of a company/industry and to identify measures which could be employed to improve energy use.

One of the main issues identified in the literature on environmental tools is the problem of the provision of funding to those organizations who would undertake audits whether the funding were available or not. This has been undertaken in Denmark, the Netherlands, Canada and Sweden, where assistance is tied to participation in other initiatives such as voluntary schemes [31]. Other schemes require all large energy consumers to undertake audits – this being a feature of schemes used in Portugal, Taiwan, Thailand, Costa Rica, Tunisia and Israel. In other counties, however, implementation of the measures was not that much successful, such as in Egypt, where only 10% of the measures were implemented [27].

Table 4
International experience on political support for RE development.

Factor 4: Political support	
Country/ Region	**Description and examples**
Europe	**National targets:** Through white papers (indicative targets, state funded programs), national plans, etc In Austria and Denmark for example, the strong political support was driven mainly to ensure security of energy supply and to reduce their imports on fossil fuels and the use of coal [18] In Germany, the political support was established in a regional level through: financial support from the government (energy policies, targets and support mechanisms in each region), and grants for research support [20]
New Zeeland	**Targets for RET deployment:** They can be both long term (over a number of years) as well as short term (generally for each), and they vary across countries depending on the needs and feasibility of achieving them Aggressive long-term target of generating 90% electricity from renewable sources by 2025 [21]

Table 5
International experience on technological and environmental support for RE development.

Factor 5: Technological and environmental support	
Country/ Region	**Description and examples**
Australia	**Demonstration programs:** The Renewable Energy Demonstration Program (REDP) is a competitive grant scheme set up by the Australian Ministry for Resources and Energy, to support the development of commercial-scale RE projects, comprising geothermal energy, wave energy, and an integrated mini-grid project involving wind, solar, biodiesel and storage technologies [19]
Europe	The main driver behind most of European countries to develop RE projects was to reduce their CO_2 emissions because of the international pressure on climate change and environment preservation. There is more and more concern about climate change issues and as a substituent using low carbon technologies In Germany for instance, their target to shut down all nuclear power plants by 2022, was another motivating reason behind the huge development of REs in Germany [16] • **Carbon markets:** It is a mechanism created after the Kyoto Protocol in which credits for GHG emissions are traded. This mechanism offers the possibility for developed countries to meet their CO^2 reduction obligations with an indirect way. This can be done by buying surplus credits from other countries, especially developing countries. Indeed it is a win-win situation, as for developing countries it is considered as a financial support and for the developed countries, it helps lowering the cost of meeting their environmental commitments [17] • **International funds:** Climate funds are provided from international and regional entities, such as the World Bank, the Global Environment Facility, and regional development banks and usually assisted from the United Nation Development Programme and the United Nation Environmental Programme. These funds help to finance collaborative R&D to promote the development of new technologies [17]

Table 5 lists some examples of measures taken towards supporting the technological and environmental aspects related to REs development.

4. Summary of actions to do or to avoid

There is definitely no one perfect support scheme for RE development that could be recommended in a general way. The choice depends on different factors such as:

- The current market stage of the technologies,
- The budget available or the means of finance,
- The anticipated RE targets, and
- The feasibility of the technology mix, with regard to the environmental conditions in the respective country.

However, after reviewing different experiences on policies encouraging RE development, a summary of some important actions to do and actions to avoid can be reported.

4.1. Actions for the financial support

4.1.1. Subsidies and grants

For a successful subsidies and grants mechanisms in favor of RE, a strong willingness from the government must be ensured, not only on releasing funds, but also on making them healthy through a recovering costs mechanism in order to maintain sustainability. In fact, if this recovering system is not established, the receiving entities of long-term subsidies will be vulnerable to financially critical situations and will fail to maintain their operational efficiency. Besides, it's important to highlight the role of an appropriate administration of the subsidies, so that the intended targets could be reached.

4.1.2. Loans

Concerning loans, the role of the government is also important for a successful financial support on RE. In fact, the first step from the government in terms of loan recovery like revolving funds or guarantees may help encouraging the bankers to provide more finances to RETs and therefore overcome the risks with investing in RETs. The government can also support incorporating micro finance institutions in loan financing, especially for stand-alone systems. In addition, soft loans and long loan periods are two characteristics that help encouraging investors.

4.2. Actions for legislative support

4.2.1. FIT

There are some advantageous of FIT mechanism that can be summarized, such as:

- Providing a higher price to the generators to stimulate increased supply of RE to the grid;
- Ensuring a shorter payback period for investments which attracts small and medium enterprises;
- Avoiding market monopoly of large corporates by removing the barriers of market entry for small investors;
- Being a flexible system that can be designed for different RETs, market structures, locations and price adjustments, when it is necessary after a fixed period;
- Having a secured return over years for investors which will reduce risks for the projects.

However, tariffs are not always easy to determine at the beginning as it is not always possible to discover the exact costs. To overcome this issue a bedding procedure can be done to discover the price of RES before applying FIT.

Finally, a sustainable mechanism of incremental cost recovery either through budgetary financing or by pass-through to end users by leveraging equal surcharge, may help the utilities in reducing cost burden and encourage them to buy electricity from renewables even after meeting their obligations.

4.2.2. RPS

RPS mechanism is considered to be the least-cost option for RE promotion. It also brings down the early cost of a technology and thereby creates a competitive market for different RETs. Thus, the price of electricity generated from RESs becomes lower. It is also a more sustainable and favorable policy to utilities, since the government's initiatives compensate them for extra costs by means of subsidies. This mechanism works in favor of the creation of Green Certificate Market, which helps liable entities to fulfill portfolio obligations without physically purchasing renewables.

However, it may have a lack of flexibility regarding targets adjustments in the short-time, or promoting different RES even the high-cost ones. In addition, a regional imbalance in pricing of energy can also be caused from RPS mechanism, especially when the concentration of RE projects is made only at locations with high resource efficiency. As a result locations with high generation may get electricity at a lower price while utilities in other places may need to spend more to buy certificates.

4.2.3. Competitive bidding

Competitive bidding mechanism is considered to be the most favorable policy for end consumers and the government, since it reduces the prices through market-based pricing, which promotes the minimum cost technology. However, it may face the risk of unsustainable price bids. In fact, extremely low price of energy acts against the motivation of investors and sends a bad signal to the industry.

4.3. Actions for fiscal support

Tax incentives on investments can reduce operational efficiency. In fact, after getting the benefits of investment tax credit, the owners will lose interest in maintenance and operation of the RE plant, which lowered capacity utilization factors. Therefore a better incentive mechanism may be a production tax credit, which motivates the generators for effective operation of the plant to generate more electricity.

For a successful fiscal support, a structured tax policy with strict enforcement mechanism and a good administration system are needed. They will not only help to make the incentives efficient but also can remove problems associated with tax payments and discourage bad practices.

5. Conclusion and future challenges

This review study provides information not only to support better policy-making, but also to gather and disseminate 'best-practice' information that can help actors on the ground find better solutions for RE projects development.

RE penetration proved its success in many different countries in the world, and it is increasingly becoming a vital component of the energy mix in the future plan for other countries.

However, such fundamental transition will require to face number of challenges with the penetration of certain percentage of RE in a power system. In fact, most of the current energy systems are based on a centralized conception dominated by large

corporations and thus developing decentralized RE systems will be the first barrier to overcome.

In addition, technical challenges will be generated with RE projects such as frequency variations and low power factors caused by the intermittence of RES. Indeed weak grids often cannot cope with the load fluctuation from renewable electricity production. These barriers are reflected on RE market by the high cost of RE projects comparing to conventional energy projects. Nevertheless, cost competitiveness for RES is expected to improve in the coming years thanks to technological development and the economy of scale effect. This links to highlight the studies being conducted to date researching on possibility of energy storage systems through direct way such as more efficient and inexpensive systems (batteries and hydrogen), and indirect way such as electrical vehicles charging.

There is no doubt that improving the infrastructure can be a very expensive solution to cope with RE integration. That is why the current research is being focused on changing the way to manage energy in the system through Smart Grid technologies and Demand Side Management (DSM), which consists on shifting energy demand out of pick load critical time.

Through this article, several examples of successful implementation of RE projects are examined by reporting case studies and analysis of different countries policies and activities. The experiences described will certainly help policy makers and implementers to learn from each other's experiences, and choose the best suitable mechanisms relative to each country specifications.

All examples studied are reported following the same methodology and format, thus creating a guideline for future RE policies implementation for other counties. The factors that led to successful implementation of some RETs were highlighted in this study, but not all will apply in every country. Policy makers need to identify which barriers are likely to be most applicable in their own situation and should prioritize the order in which they are to be addressed according to their own objectives and schedule.

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Appendix A. Policies Overview for Different European Countries

All EU member States have notified their National Renewable Energy Action Plans (NREAP) to the European Committee (EC) by 30 June 2010. They set out the sectorial targets, the technology mix they expect to use, the trajectory they will follow and the measures and reforms they will undertake to overcome the barriers to developing RE. The following table presents an updated list of the different political, fiscal, financial and legislative reforms adopted in some selected EU countries. [32] Table A1.

Table A1

Austria
Target: 34% of RES in gross final energy consumption from 2010-2020 with FIT as a main support scheme
Progress: 23.3% RE share in 2005 and 30.1% in 2010 [33]

Political	Fiscal	Financial	Legislative
Strong political support mainly for the two following reasons: – Socio-economic impacts of job creation and economic benefits of RE – Energy strategy: In order to achieve the 16% target for GHG emissions and the 34% target for RES, a process was initiated in 2009 for the development of the Austrian Energy Strategy. The aim is to stabilise final energy consumption within a future-oriented, efficient and renewable system [34]	– Energy-related taxation on the use of fossil fuels or other environmentally damaging activities as part of their overall energy policy [7] – Revenues received from energy taxes are partly recycled to support RE, EE and other environmental projects [7] – Tax relief: The personal income tax law form part the Austrian federal provinces promotion of energy conservation in housing construction and the modernization of the existing building stock. This concerns not only thermal and heat insulation but also low-cost energy houses and "Passiv-houses" and the use of RES, like heating systems based on biomass or solar installations [34]	– Public grants, subsidies and loans (10-30% through a national environmental support programme), which are supporting lately large solar thermal plants and solar PV installations (in 2013) [34]	– Guaranteed prices [7] – Regional support plans – FIT system, which was updated lately in 2012 (Ökostromverordnung) [34] – Targets encouraging the use of biofuels set through laws: In November 2004, amendment to the Fuel Ordinance: all companies that put fuels in circulation must, from replace 2.5% of the total energy quantity put in circulation with biofuels. From 2007, this percentage increased to 4.3%, and in 2008, the target reached 5.75% [34]

Germany
Target: 18% of RES in gross final energy consumption from 2010-2020 with FIT as a main support scheme
Progress: 5.8% RE share in 2005 and 11% in 2010 [33]

Political	Fiscal	Financial	Legislative
– High level of regional energy policies to support RE development. – Financial support from the government (energy policies, targets and support mechanisms in each region) [7]	– Allowing various tax exemptions for individual investors especially in wind energy. For instance investment in wind schemes can be offset against tax for individuals [7] – The law on the new Energie- und	– Substantial subsidies and low-interest loans were made available to households or industry in solar thermal power [7] – Direct financial support: PV roofs [7] – Capital grants were provided for	– FIT system: commercially favourable guaranteed FIT with an obligation on utilities to purchase renewable electricity. The system is expected to be phased out by 2018 [7] – Policies that oblige utilities to allow

Table A1 (*continued*)

– Grants and research support, such as the 6th Energy Research Programme, which sets out the guiding principles and priorities of the German governments support policy in the field of innovative energy technologies for the coming years, thus laying the groundwork for an environmentally sound, secure and economic restructuring of Germanys energy supply [34] – Structured innovation policies and programs, including Public Private Partnership (PPP) and workforce development (Combined Heat and Power (CHP) Agreements with Industry) [34]	Klimafonds (Energy and Climate Fund –EKFG) while the revenues come mainly from a contractual agreement of the nuclear power plant operators with the German state that skims off part of their extra profits, from parts of the nuclear fuel rod tax and the auctioning of emission allowances as of 2013 [34]	biomass power scheme to expand FITs [7]	straight forward access to the grid for RE producers with a transparent and economically fair charging systems for grid access [7] – Ambitious targets and comprehensive RE laws: On January 2012 the amendment of the Renewable Energy Sources Act, Erneuerbare Energien Gesetz (EEG), which aims at reaching the following minimum shares of renewable energy in electricity supply [34]: • 35% by 2020 • 50% by 2030 • 65% by 2040 • 80% by 2050 – The Biofuels Quota Act: a minimum level of biofuels that must be used in road transport in Germany: 6.25% in 2010. This quota will be increased to 7% by 2020 [34]

Spain
Target: 20% of RES in gross final energy consumption from 2010-2020
Progress: 8.7% RE share in 2005 and 13.8% in 2010 [33]

Political	Fiscal	Financial	Legislative
– National Energy Saving and Efficiency Plan (PAEE) (funds for energy projects at national level) [7] – High level of regional energy plans to support RE development [7]	– The Sustainable Economy Act: Tax benefits for companies receive tax relief if they invest in RE projects. The Act will stimulate R&D and innovation by increasing tax deduction for innovative activities [34] – 7% tax law on electricity generation starting January 2013 attributable to the use of fuels at generation facilities that use any non-consumable RE as a primary energy source, except in the case of hybrid facilities [34]	– Subsidies in the form of capital grants from the PAEE, but this support was reduced during the period 1991-2000 because of its success [7] – The regional bank is, in the case of Navarre wind energy, a shareholder in the public-private company established to develop the region's wind energy resources [7]	– Feed-in support initiative implemented together with capital subsidy programmes, which was lately (in 2011) adjusted by cutting financial support especially for PV projects and focus more on supporting the technical integration of RE installations [34] – Purchase obligation + premium guaranteed prices [7]

Denmark
Target: 30% of RES in gross final energy consumption from 2010-2020 with FIT as a main support scheme
Progress: 17% RE share in 2005 and 22.2% in 2010 [33]

Political	Fiscal	Financial	Legislative
– REs (wind) were considered as an opportunity to contribute towards a more sustainable fuel mix for energy production (especially by reducing coal use) => development of an emerging industry [7] – Implementation of energy action plans started from 1980 s in line with the government's overall carbon dioxide emission reduction targets. In a first step to completely faze out fossil fuels the government targets the drop in the consumption of oil, gas and coal by 33% between 2009 and 2020.The main goal of the Danish 2050 Energy Strategy is to achieve 100% independence from fossil fuel in the national energy mix by 2050 [34] – The Green Growth Agreement: an agreement between political parties establishing a long-term strategy for environmental policy in the agricultural industry. This strategy aims to reduce GHG emissions from agriculture by 800 000 t annually [34]	– Energy-related taxation which is called public service obligation tax on electricity and gas, while tax on oil, gas and coal will be further increased to discourage their use. Beside to other environmentally damaging activities (Denmark was one of the first countries to implement an environmental tax) [34] – Revenue partly 'recycled' to support RE [34]	– Subsidies for R&D and demonstration projects, especially in wind [34] – Subsidies (capital grants-Biomass) [7] – Subsidy should be given to help promote investment in energy efficient use of RE in the production processes of enterprises and industries. In the period 2014 to 2020, the subsidy will be increased to DKK 500 million a year from DKK 250 million in 2013 [34]	– Feed-in law system (wind), which was lately updated in 2009 [34] – Purchase obligation + premium guaranteed prices [7] – Policies that oblige utilities to allow straight forward access to the grid for RE producers with a transparent and economically fair charging systems for grid access [7] – In 2012 new regulations about Net-metering were issue. They consist on completely or partially exemption from paying tariffs, duties, and VAT for the amount of electricity exported to the grid (Public Service Obligation (PSO)) [34]

Table A1 (*continued*)

Finland
Target: 38% of RES in gross final energy consumption from 2010-2020 with FIT as a main support scheme
Progress: 28.5% RE share in 2005 and 33% in 2010 [33]

Political	Fiscal	Financial	Legislative
– National strategy in 1994 aimed to increase biomass use by 25% between 1992 and 2005 [7] – The Action Plan, which provided a further stimulus with a target to increase RE use, including biomass, by 50% between 1995 and 2010 [7] – In 2008, the Finnish government set up a long-term climate and energy strategy, to define the principal objectives and means of Finland's climate and energy policy for the next few decades, within the context of the EU and its objectives [34]	– Energy-related taxation which penalises the use of fossil fuels or other environmentally damaging activities [7] – Revenue partly 'recycled' to support renewable energy [7]	– Subsidies during 2003-2007 to support RE, such as Distributed Energy Systems (DENSY) Program, the Finnish national technology programme. The total budget was estimated to exceed EUR 60 million. The programme focused on system integration and commercial services of distributed generation of power, heating and cooling [34] – Energy Grants for Residential Buildings, which aim to improve the energy economy of residential buildings, by reducing both energy consumption and emissions of GHG, and are also awarded for the inclusion of RES. The grant covers up to 15-25% of the approved costs and is awarded by the local authority [34]	– Feed-in laws were introduced in 2010 and it was open for wind, biogas, timber chip and wood-fuelled power plants. Besides the availability of financial support helped developing the use of biomass [34] – Fixed transmission costs and grid open access to all producers, where transparency and predictability are ensured to producers [7]

France
Target: 23% of RES in gross final energy consumption from 2010-2020 with FIT as a main support scheme
Progress: 10.3% RE share in 2005 and 13.5% in 2010 [33]

Political	Fiscal	Financial	Legislative
– "Le Grenelle de lEnvironnement": In July 2007, the French government established six working groups to address ways to redefine Frances environment policy. The proposed recommendations were then put to public consultation, leading to a set of recommendations that will be put to the French parliament in early [34] – "Campaign SOS Climat": This information campaign aimed to raise public awareness of climate protection issues and to inform them of the positive impact that RE utilisation can have on the climate [34]	– Lowering excise tax on biofuels and making them competitive with high-taxed fossil fuels [7] – Tax credit for acquiring energy production equipment which uses RES, and which is installed in new housing. The credit is equal to 15% of the amount of the purchase price [34]	– The 2009 Finance Law contains various provisions to increase support of RE. For example the Eco-loan: 0% loan for energy-efficient renovation and a zero-interest loan programme for major renovation activities. The aim is for energy savings to allow repayment of the loans capital [34] – France didn't provide additional funding to new wind energy projects over the support of Eole mechanism [7] – Green innovation funding in 2010 to support the French program of investments for the future through R&D and demonstration projects [34]	– Competitive tendering (Eole system 1996) guarantee of the purchase for the tender winner at the price of the bid. (The expansion of wind development can be explained by the very low initial penetration level), however some barriers occurred when the independent developer was not given ready access to the grid, at a reasonable price [34] – From June 2001 France replaced competitive tendering with a system similar to the FIT law, which was adjusted lately in 2011 for electricity from solar PV [34]

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Glossary of terms

Acromyms: Definition

ABEEolica: The Brazilian Wind Energy Association;
BNDES: Brazilian National Development Bank;
BSP: Biogas Support Program;
CDM: Clean Development Mechanism;
CHP: Combined Heat and Power;
CRESP: China Renewable Energy Scale-up Program;
CSP: Concentrated Solar Plant;
DENSY: The Finnish Distributed Energy System Program;
DKK: Danish Krone, Danish Currency;
DSM: Demand Side Management;
EC: European Committee;
EE: Energy Efficiency;
EEG: Erneuerbare Energien Gesetz: The German Renewable Energy Sources Act;
EKFG: Energie- und Klimafonds Energy and Climate Fund;
Eole: The French Program to promote Renewable Energies;
EU: European Union;
EUR: Euro, European Currency;
FIT: Feed-In Tariff;
GEF: Global Environmental Facility;
GHG: GreenHouse Gas;
GoN: Government of Nepal;
IEA: International Energy Agency;
IMIDAP: Integrated Micro hydro Development and Application Program;
IP: Intellectual Properties;
IPP: Independent Power Producer;
LMP: Locational Marginal Pricing;
NFFO: Non-Fossil Fuel Obligation;
NREAP: National Renewable Energy Action Plan;
PAEE: National Energy Saving and Efficiency Plan;
PBF: Public Benefits Funds;
PBI: Production-Based Incentive;
PPP: Public Private Partnership;
Proinfa: Program for Encouraging Alternative Sources of Energy;
PSO: Public Service Obligation;
PV: Photovoltaic;
R&D: Research & Development;
RE: Renewable Energies;
REDP: Renewable Energy Demonstration Program;
RERED: Renewable Energy for Rural Economic Development;
RES: Renewable Energy Sources;
RET: Renewable Energy Technology;
RPS: Renewable Portfolio Standard;
SBC: System Benefits Charges;
SHS: Solar Home System;
UK: United Kingdom;
USA: United States of America;
USD: United States Dollar;
VAT: Value Added Tax.