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Feed-in tariffs for renewable energy: which determination option works for whom?

Case study prepared for GIZ

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List of acronyms

BMUB	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety)
BMWi	Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy)
c/kWh	Cent per kilowatt hour
CO_2	Carbon dioxide
EUR	Euro
FiT	Feed-in tariff
GDP	Gross domestic product
IRP	Integrated Resource Plan
MWh	Megawatt hour
OECD	Organisation for Economic Co-operation and Development
TWh	Terawatt hour

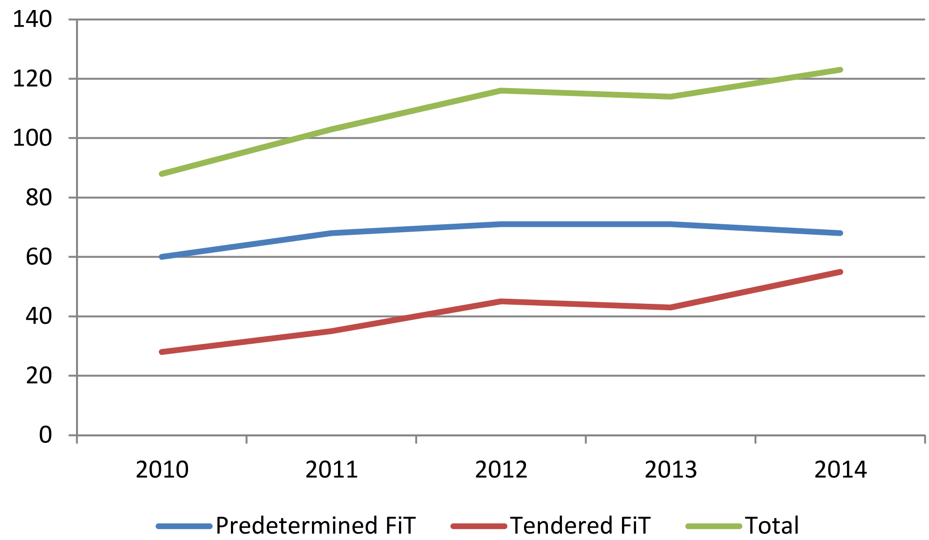
1. Feed-in tariffs (FiTs) as a market instrument to incentivize private investment in renewable energy

Science has provided increasing evidence that, if we are to avoid dangerous climate change, we must reduce greenhouse gas emissions urgently and on an unprecedented scale. The energy sector has a key role to play in this endeavour. In its World Energy Outlook 2012, the International Energy Agency warns that, by 2017, a continuation of current trends in energy infrastructure investment will lock in all CO_2 emissions permissible if a rise in temperature of more than 2°C is to be avoided.

Renewable energies, addressing the supply side, and energy efficiency technologies, addressing the demand side, are among the most important solutions to achieve a transition to sustainability. In recent years, renewable energies have seen impressive growth rates regarding capacity and investment. However, although their cost structure compared to fossil fuel alternatives is improving, most still need additional support to be economically viable.

Several political instruments have been used to support renewable energies, such as quotas, tax instruments and feed-in tariffs (FiTs). The latter have shown to be particularly successful, and have seen increasing implementation in developing and industrialised countries alike, see Figure 1.

Figure 1: Number of countries with renewable energy support policies



Sources: REN21 (2013), REN21 (2014)

Note: The difference between predetermined and tendered FiTs will be explained in Section 2a.

Feed-in tariffs are designed as a preferential price to be paid to the electricity generator per kilowatt hour of generated renewable energy. This price is usually higher than the regular market price for electricity, to cover higher technology costs and risk. Determining a FiT which is high enough to attract investment (that is, to be effective) and low enough to avoid windfall profits (that is, to be efficient) can be a challenging task, and the introduction of effective and efficient FiTs can be subject to intense lobbying. Players in the renewable energy sector are obvious actors, but other players such as established electricity suppliers and energy intensive industries also tend to take influence.

Policy makers need to navigate and manage these partly conflicting interests while also bearing in mind personal or their political party's interests.

This report aims to discuss two methods of FiT determination, predetermining and tendering FiTs, by highlighting the political economy dynamic in their implementation and comparing their advantages and disadvantages in the policy process.

The remainder of the report proceeds as follows. Chapter 2 starts by introducing the technicalities of FiT determination and development over time in more detail. This lays the ground for closer analysis of political economy dynamics in renewable energy support (Chapter 3), including the discussion of policy evolution in two countries, Germany and South Africa. Chapter 4 concludes by contrasting both determination methods with the aim of providing policy makers with guidance on key questions to ask when preparing the decision for a suitable method of FiT determination.

2. The technicalities of FiTs

a. Basic FiT design options

There are two general approaches of FiT determination. They are similar in that they provide a financial reward for every unit of renewable electricity produced but differ in the way the tariffs are determined.

- *Predetermined feed-in tariffs* are defined as '[g]eneration-based payment for electricity, predetermined by policymakers and constantly available to project developers' (Becker and Fischer 2012: 2).
- *Tendered feed-in tariffs* are described as '[g]eneration-based payment for electricity, determined and allocated through tenders in which project developers compete' (Becker and Fischer 2012: 2).

b. Predetermining FiTs

When predetermining feed-in tariffs, governments set technology-specific tariff rates which allow project developers to recover their costs and a reasonable return on their investment. The rates are guaranteed for a certain period (in most schemes, 10-20 years), and project developers gain guaranteed access to the electricity grid.

With this long-term, stable investment framework, feed-in tariffs are among the most widespread and effective support measures today (GIZ 2012, Marques and Fuinhas 2012). Many countries, mostly in the OECD, have experienced the effectiveness of feed-in tariffs. Guaranteeing reasonable profits over a long-term planning horizon, these schemes can act as a major stimulus for renewable electricity generation growth (Haselip 2011). Predetermining the FiT rate provides a maximum of certainty to investors, and, if the rates are attractive enough, a maximum of investment incentive. This can be necessary if otherwise risk would be deemed to high (e.g. when technologies are still very immature) or profits too low (e.g. when technologies are expensive). The German FiTs demonstrated the potential effectiveness of FiTs even when technologies are at an early stage, as was the case for solar PV in the early 2000s. The learning curve unlocked by this policy showed considerable success and substantially lowered the cost of renewable energies.

Predetermining FiTs can, however, also lead to windfall profits. The efficiency thus very much depends on the correct determination of tariff rates. They must be high enough to stimulate investment, but should not lead to excessive rents. Rent-seeking must be checked by the careful adjustment of the initial tariffs to actual project costs, and by the flexibility of the instrument to react to cost developments. This efficient design of tariff rates is indeed very complex. It is further complicated by the fact that most policy-makers, unlike actors in the energy market, are not experts in the technologies and markets they are called on to regulate. The demands on the embedded autonomy and meritocracy of policy-makers are thus very high.

Some of the challenge of determining initial FiT rates can be avoided if the support scheme enables later adjustments to be made. Rates must be flexible enough to allow for unforeseen developments in project costs, such as the sharp fall in the prices of solar photovoltaic panels in 2010. This will also preserve incentives to innovate and to reduce costs. However, the adjustments need to be predictable so that investment security may be ensured. Automatic adjustment formulae applicable only to new projects may mitigate policy risks for investors. Policy changes which adversely affect projects that have already reached financial close may, however, result in a serious loss of investors' trust (Hille et al. 2013). The costs governments can save through such changes in the short term may be outweighed by added risk premiums in the longer term (Rathmann et al. 2011), which may even spill over to other policy areas. The government of Spain, for example, approved retroactive cuts in feed-in tariff levels in early 2013 (ANPIER 2013, Coats 2013). This provoked considerable protest and even threats of legal action by renewable energy companies and associations (ANPIER 2013). These companies had already suffered as a result of hasty changes to a (generous) tariff of 44 c/kWh in 2007, which was reduced incrementally to 12.5 c/kWh in 2011 and abolished altogether in 2012. It should be pointed out, however, that the high initial rate caused the energy sector's deficit to rise steadily to about USD 38 billion in 2013 (González and Rucinski 2013). This, combined with the large government deficit, made it clear that the rate could not be maintained at anything like its initial high level. Despite the reduced support, however, Spanish solar photovoltaic installations still seem to be attractive to investors, investment having continued on a smaller scale (ANPIER 2013).

c. Auctioning FiTs

Tendering, on the other hand, helps policy-makers to determine the efficient level of support by means of a competitive process, thus reducing dependence on biased information. It can be very helpful in correcting information asymmetries between renewable energy project developers and policy-makers by forcing the former to disclose information on the costs associated with planned projects (Azuela and Barroso 2012).

Tendering entails the creation of one or more bidding windows for project developers to bid for the preferential tariff they need to realize their projects. Several bidding rounds allow for systematic policy learning, which is particularly important when policy instruments are new and/or the implementing government needs to build technical experience. Although several bidding rounds can entail the risk of collusion, experience has shown gradually decreasing FiT rates when several bidding rounds were offered (for example in India and South Africa).

Current tenders are designed to prioritise investment at least cost locations, thereby favouring sites with favourable resource conditions. They do not take into account that the localisation of renewable energy sources can have effects on the stability of the grid, and that their proximity to substations or centres of demand impacts on their benefit to the general energy system. They thus do not incentivise the localisation of renewable energy generation at particularly beneficial sites.

Tenders for renewable energy support have resulted in relatively low bids in several countries, such as Peru, China and India (Becker and Fischer 2013, Altenburg et al. 2014). If the number of bidders is sufficiently high, the risk of excessive rents will be reduced significantly. However, while it reduces the risk to the government, tendering increases it for project developers: they have to invest in project proposals without knowing whether they will be able to secure support. This reduces their willingness to invest in site selection, which may have an adverse effect on generation once the project has been realized and increases the risk premium they include in their tariff bids. Furthermore, when project developers are inexperienced or technologies are immature, there is a risk of the developers underestimating the costs and failing to deliver on the projects (GIZ 2012). This can act as a major obstacle to the effectiveness of tender-based support, as happened in the United Kingdom in the 1990s and in China in 2008 (Kreycik et al. 2011, Batlle et al. 2012).

Tendering may nevertheless prove to be the more feasible option for renewable electricity support particularly when policy-makers have little experience of designing appropriate feed-in tariffs. The risk of unfeasibly low bids can be minimized by a number of additional measures, such as those included in India's solar photovoltaic support (Altenburg et al. 2014). To be eligible for the bidding process, project developers must comply with technical and financial qualification criteria and furnish bid bonds, which rise as the level of bids falls (Government of India 2011).

Combining tendering and fixed feed-in tariffs in a sequence can be an option that enables the benefits of both instruments to be reaped while mitigating the risks they entail. Governments can use tenders to elicit information on appropriate tariff rates and use this information to establish a system of fixed feed-in tariffs that lower risk premiums. China, for example, has experimented with a strategy of 'prior tendering' when determining its feed-in tariffs for wind and solar energy (Kreycik et al. 2011, Becker and Fischer 2013). However, tendering is a complex process and the involved transaction costs may be too high when financial resources and human capacities are scarce.

Whichever way of determining FiTs a government uses, it needs to organise political support for the implementation of its renewable energy policy. A sound knowledge of facts and arguments, but also of political economy dynamics (i.e. actors and their interests) in the sector is vital.

3. Political economy of FiTs

a. Collecting arguments to forge coalitions and mitigate opposition

Given the cost decrease many renewable energy technologies have seen in the past years, cost-effectiveness is a sound argument in favour of renewable energy deployment. This can be complemented by stressing other co-benefits. Particularly in countries with narrow electricity reserve margins, renewables can contribute to stabilisation of supply by fast installation of new capacity, and cater for quickly growing demand. When countries import a large share of their electricity, they can contribute to energy independence. Moreover, (small) decentralized power plants can help electrifying rural and remote areas which are not yet connected to the grid, a factor which may be important especially to developing countries. Newly created renewables industries can contribute to job creation and tax revenue generation, and, depending on technology and resource endowment, renewables can simply be the cheapest available option.

As Heising et al. (2014) point out, the identification of such co-benefits requires sober assessment of variable renewables potentials and fit with the national energy system, rather than political arguments which have often been the basis of past renewable energy planning. An integrated energy planning approach needs to consider existing capacities, resource potentials and demand patterns to adequately answer the questions of timing, localisation, type and amount of renewable energy capacity to be built. Renewable energy technologies differ in their specific advantages, and energy planning needs to consider these specificities. Solar photovoltaics, for example, have very short project realisation times (less than a year from plan to operation is possible), while wind energy, given good resource conditions, is among the cheapest renewable energy technologies (Heising et al. 2014). Once a sound and diligent analysis has been conducted, the arguments can be used to forge coalitions and mitigate opposition. In this process, cooperation with central actors in the energy sector and strategy communication play important roles.

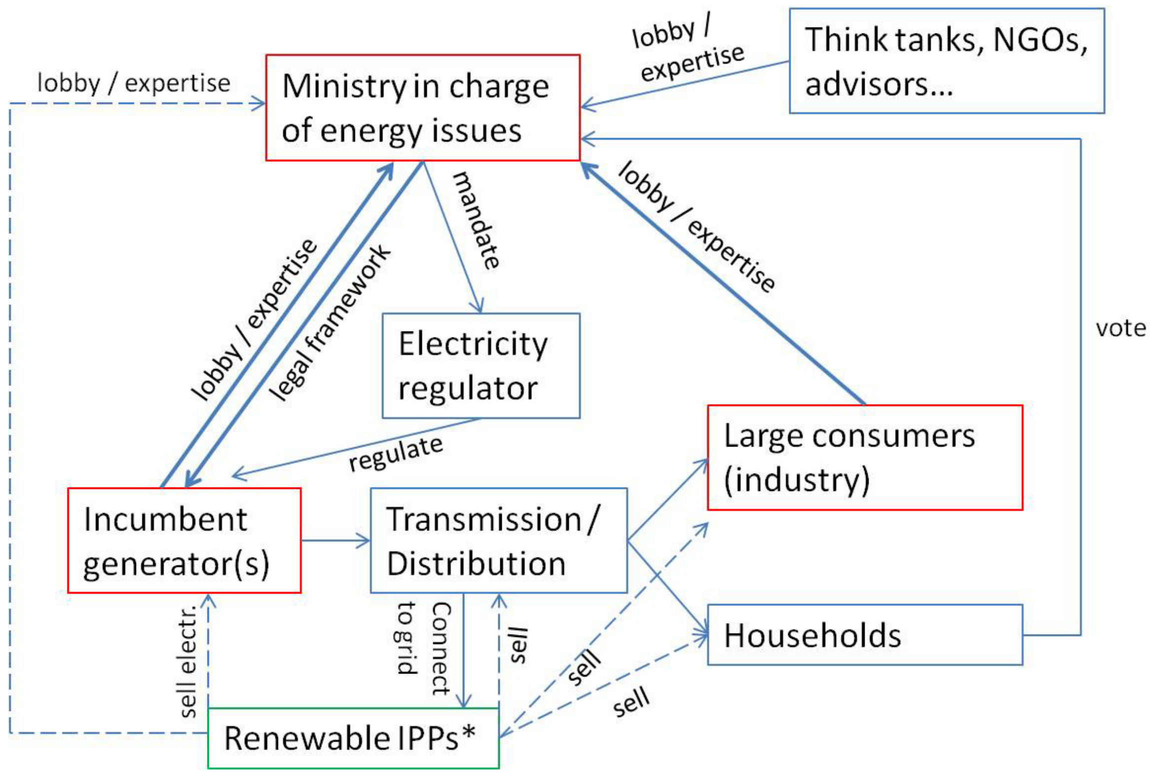
b. Central actors in the electricity sector

To analyse the political economy of a transformation process, it is necessary to get an overview of main actors, their interests, and possibilities of taking influence. The direction and strength of actors' influences need to be assessed, and, where they conflict with policy aims, managed by government. The distribution of power and interests between actors will influence the likelihood of renewable energy support implementation and its design.

The traditional electricity sector tends towards natural monopolies, achieving the lowest long-run average cost when production is permanently concentrated in a single or few enterprises. This originates from the necessity of high ex ante investments particularly in grid infrastructure, but also in large scale generation (Scott and Seth 2013). The subsequent concentration of assets and expertise leads to particularly strong actors which are well situated to influence policy making in their favour.

While main actors in the electricity sector differ between countries, there are similar patterns, see Figure 2.

Figure 2: Actors in the electricity sector (schematic and simplified)



Source: Author’s own
* IPPs = independent power producers

While actor and power constellations and the localization of expertise differ between countries and this depiction can only be schematic, it aims to uncover main actors and the typical character and strength of their influence. Red boxes indicate typical main actors, with bold arrows indicating strong influence. Actors outside the narrowly defined energy system, such as other political parties, are not depicted. Schmid et al. (2015) elaborate on the German case to provide a more detailed picture of the numerous actors involved in a transition to sustainable energy.

The ministry in charge of energy can be a ministry concerned only with energy issues, but energy issues can also be located in a ministry which is also concerned with other issues. The choice of ministry where energy issues are located and the power of this ministry within government will impact on the aims of energy policy making, and may already indicate a direction of the country’s energy strategies and planning. The localization of renewable energy issues in a powerful ministry may strengthen their case, but also water down priorities in favour of other interests. A separate ministry for renewable energy may indicate a high priority of the issue within government, but if said ministry is non-influential as compared to other ministries, renewable energy support may also be sidelined.

Depending on capacities of the ministry in question, energy strategy making is more or less dependent on industry and advisor expertise. This may impact on the influence certain lobby groups can take on energy policy making. Incumbent electricity generators and large consumers are often particularly well placed to provide expertise and to organize in powerful groups which effectively exert pressure on governments to shape policy frameworks in their favour. A growing renewable energy industry can counterbalance this influence, and provide expertise in such issues as grid integration and spacial planning of intermittent generation sources. Otherwise, the interests of incumbent electricity generators are often focused on fossil fuel based, centralised electricity supply. This has been the mode of generation for the past decades in most countries, and incumbents are often heavily invested in related capacities, equipment and infrastructure. In countries with strong demand growth, such as most emerging countries, the conflicts of interests between incumbent electricity providers and newcomers are mitigated. However, this also means that the introduction of renewable energy simply adds capacity to the incumbent system, instead of leading to a systems transition towards sustainability (Baker et al. 2014). This situation differs from most OECD markets, where a growing renewable energy industry tends to crowd incumbents out (Heising et al. 2014).

Large industrial consumers of electricity are usually interested in reliable and cheap electricity supply. This may work in favour of renewable energies once they become cost-competitive with or cheaper than fossil fuel alternatives, and when grid integration, localisation and supply/demand management or storage issues are addressed at scale. Stable electricity supply may also be an argument in favour of renewables where generation reserve margins of incumbent generators are narrow and brown or black outs frequent. Where electricity generation from coal is the cheapest option, and renewables support is financed by higher electricity prices, energy intensive industries are likely to oppose larger shares of renewables in the mix.

Households play an indirect role in renewable energy policy making as consumers of electricity, as voters, and in some countries as small scale producers of renewable electricity (e.g. solar home systems). Their interests depend on preferences for low cost electricity, environmental protection or other policy aims. These preferences can, for example, be identified by household surveys.

FiT Schemes usually include a surcharge paid by end consumers and tend to increase the price for electricity. In political situations where the price of electricity is politically sensitive this can be a barrier to FiTs. The burden on poor households and the fair distribution of additional costs need to be considered with particular care. The global prevalence of fuel and electricity subsidies shows that energy prices can indeed be a political issue. Governments thus need to ensure that renewable energy support policies, while being effective, are also cost-efficient. Both effectiveness and efficiency are strongly influenced by the determination of initial FiT rates, but also by the flexibility of FiT rates in the policy process.

c. Country experience: Germany

Renewable energy policy in Germany is integrated in the broader framework of the '*Energiewende'* (energy transition). The responsibility for this national transformation project is mainly located in the Federal Ministry for Economic Affairs and Energy (BMWi), which is a comparatively influential ministry. This localisation may strengthen the case of renewable energies, but also water down priorities in favour of economic interests. Other ministries are responsible for related issues, such as climate change goals, which are located in the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). For an overview of responsibilities, see Table 1.

Table 1: Overview of 'Energiewende' responsibilities
Source: Sopher (2014) based on Kemfert and Horne (2013)

Federal Ministry	**Responsibilities**
Federal Ministry for Economic Affairs and Energy	Reliable supply of energy, energy efficiency, energy grid
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	Implementation and achievement of climate goals and policies, e.g. emissions trading compliance and jurisdiction over energy efficiency goals and measures
Federal Ministry of Transport and Digital Infrastructure	Energy efficiency in infrastructure and low carbon transportation
Federal Maritime and Hydrographic Agency	Authorization of offshore wind parks
Federal Ministry of Food and Agriculture	Bioenergy consumer protection
Federal Ministry of Finance	Energy taxation and control of KfW bank, which finances renewable energy and energy efficiency projects

The introduction of renewable electricity in the context of the *Energiewende* has brought about winners and losers. In their 2015 study on 'Deep Decarbonization in Germany' Kemfert et al. (2015) highlight the following distributive effects:

- **Incumbent electricity generators lose market shares and profit margins.**
  Two trends have been impacting the four prominent enterprises on the German electricity market, E.On, Vattenfall, RWE and EnBW. First, the German electricity market was liberalised in 1998 to allow for more competition and to lower market concentration. While the four firms shared 84 percent of conventional electricity generation in 2010, their added market share in 2013 amounted to 74 percent. Second, the growth in electricity generation from renewable sources has led to a further reduction of incumbents market power and electricity spot market prices, see Figure 3. Profit margins of existing generation capacities have decreased, leading to strategy changes of the generators, such as a reorganisation of E.On which spun off its fossil fuel based generation to concentrate on renewable energies and energy services.
- **Large industrial consumers benefit from surcharge exemptions and the merit order effect.**
  Energy intensive industries have successfully lobbied the German government for exemptions from the renewable electricity surcharge. While the industrial sector accounts for almost 50 per cent of German electricity consumption, it has to bear only 30 per cent of the surcharge. Private households with an electricity consumption share of roughly one quarter have to bear 35 per cent of the surcharge (Lütkenhorst and Pegels 2014). In addition, industry benefits from the electricity price decreases caused by increasing amounts of renewable electricity fed into the grid ('merit order effect'). The annual benefits from this effect amount to about 500 million EUR (Kemfert et al. 2015).

- **Households and small and medium enterprises pay the additional cost of the *Energiewende.***

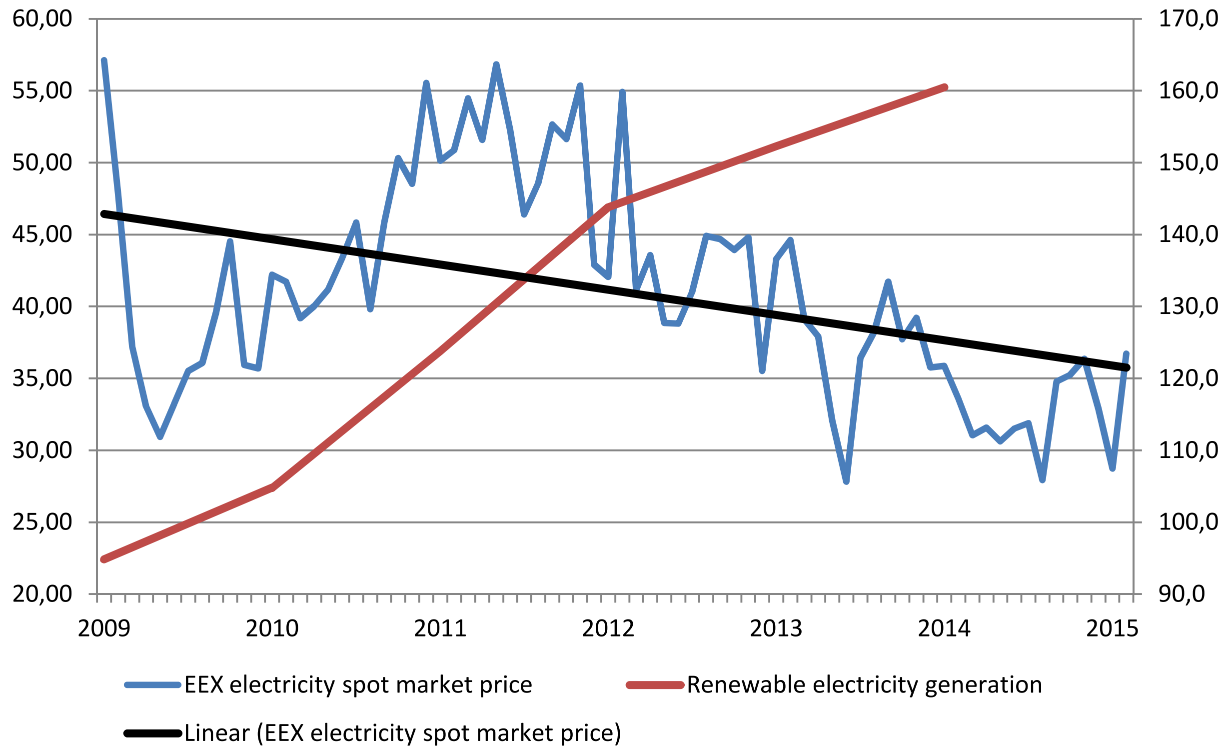
  In 2013 the electricity surcharge – that is to say, the rise in electricity price attributable to the FiTs – for consumers who did not benefit from exemptions amounted to 5.3 ct/kWh, rising to 6.24 ct/kWh in 2014 (Lütkenhorst and Pegels 2014, Kemfert et al. 2015). The additional burden on households and small and medium enterprises due to surcharge exemptions for the largest electricity consuming companies call the equity of the current support system into question and have led to intense discussions (Pegels and Lütkenhorst 2014). Nonetheless, the support of the population for the *Energiewende* as such continues to be high.

- **Renewable electricity producers and municipalities benefit from renewable electricity generation growth.**

  German renewable energy policy has deliberately placed a premium on creating a broad foundation for various renewable energy technologies to develop and become commercially viable. However, this premium seems to have led to a bubble in the German solar PV manufacturing industry. Obviously, the critical challenge is to identify a sufficiently high incentive (subsidy) level for investments to be triggered without creating excessively high rents in terms of windfall profits. This presupposes correct assumptions about future technological learning curves and price trends as a basis for making well-informed decisions about an optimal tariff degression scale. The assumptions in the case of solar PV did not correspond with the considerable cost reductions of PV installations since 2009 (Bundesverband Solarwirtschaft 2013).

  Municipalities were able to benefit from the growing number of renewable energy cooperatives, both in terms of employment generation and tax revenues. According to calculations by Heinbach et al. (2014), the renewable energy sector added a total of 9.3 million EUR of municipal value and 166 jobs in the average model municipality in Germany in 2011.

Figure 3: Wholesale electricity spot market prices in Germany (in blue, trend in black, EUR / MWh, left axis) against renewable electricity generation (in red, TWh, right axis)



Source: based on BMWi (2015b), BMWi (2015a).

d. Country experience: South Africa

The responsibility for South African renewable energy policy is officially located in the Department of Energy, which was created after the split of the former South African Department of Minerals and Energy. This separation of the ministry into a Department of Mineral Resources and a Department of Energy created an opportunity space for moving away from coal and supporting renewable energies (Morris and Martin 2015). However, a second factor was required: renewable energy policy making was strongly supported by the South African National Treasury. In fact, a unit staffed by the Treasury but located at the Department of Energy was key to drafting and implementing the Renewable Energy Independent Power Producer Procurement Programme as the centrepiece of South African renewable energy policy (Morris and Martin 2015: 8).

Renewable energy policy making is embedded in the broader national energy planning, which is laid out in the Integrated Resource Plan (IRP). The IRP is intended to be a living document to plan the specific amounts of generation capacity to be added in the coming twenty years. While there are public stakeholder hearings in the genesis and development of this document, lobby groups seem to have preferential access to the process. The current IRP version, which dates back to 2010 with an update in 2013, was influenced by a ‘technical advisory group’ which consisted of representatives of the coal mining industry, the Energy Intensive Users Group, the state owned electricity generator

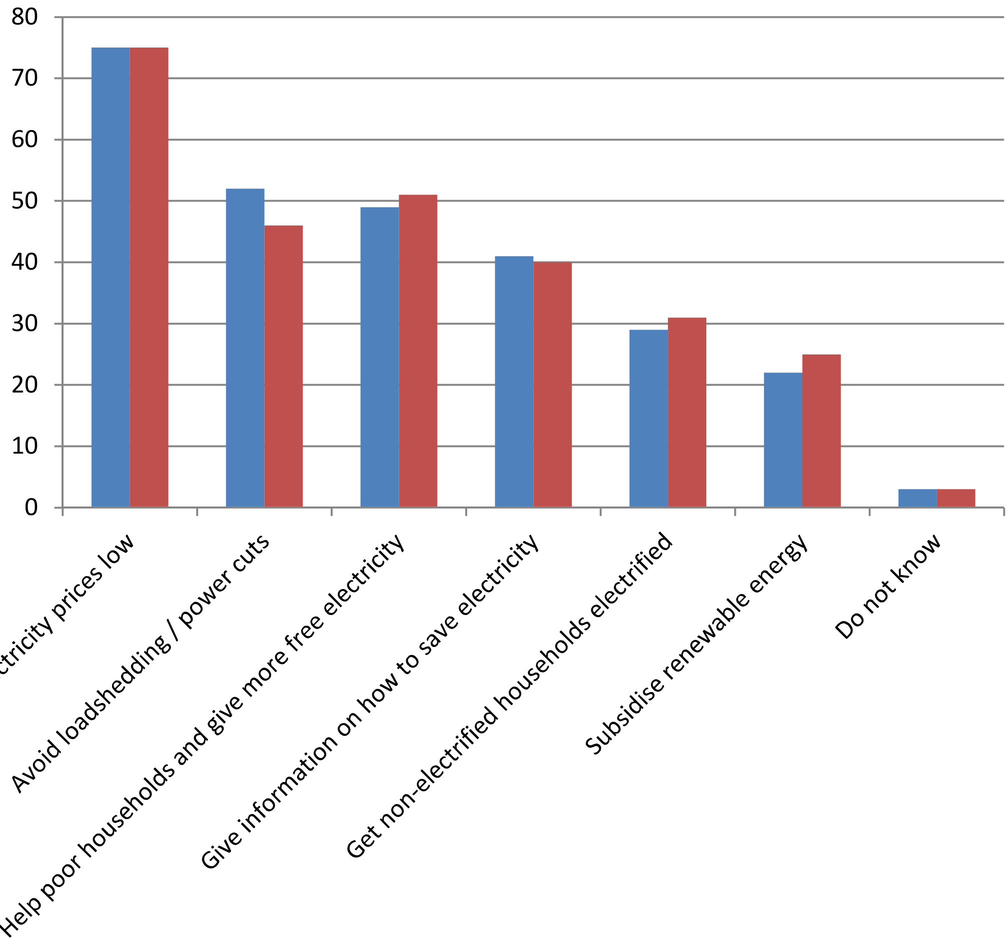
Eskom and government (Baker et al. 2014: 802). While substantive amounts of renewable energy capacity were included in the IRP, the dominance of coal in the South African electricity mix is unchallenged.

Similar to the German case, there are gains and losses from South African renewable energy support policy. However, in this case the distribution of gains and losses is less clear than in the German case.

- **The monopoly position of the incumbent electricity generator Eskom is weakened, but pressure to close the electricity generation gap is lessened, too.**
  With the introduction of independent renewable power producers in the South African energy sector, Eskom loses some of its monopoly power. The successful tendering of renewable capacity is now serving as a role model to also tender fossil fuel based capacity (Greve 2015, Paton 2015). However, Eskom's dominant position in the sector remains largely untouched. Given Eskom's dire financial situation, the delays in the construction of two major new coal fired power stations (Medupi and Kusile), and the narrow electricity reserve margin, the pressure on Eskom to provide stable electricity supply for the country is considerable. This pressure can be somewhat lessened by the quick addition of renewable energy to the national capacity.
- **Large industrial consumers, in particular the members of the energy intensive users group, benefit from more stable electricity supply, but suffer from electricity price increases.**
  South Africa has been experiencing frequent brown outs in the course of its electricity crisis, and quickly scalable renewable energies contribute to easing the generation constraints. Where electricity generation from coal is the cheapest option, and renewables support is financed by higher electricity prices, energy intensive industries are likely to oppose larger shares of renewables in the mix. While South African wind power has been competitive with electricity generation from coal since bidding round 2, solar photovoltaics are still more expensive, despite strong cost reductions (Paton 2015). Since 2011, bids for wind energy tariffs have decreased by 55 per cent, and for solar photovoltaic by 76 per cent.
- **Renewable energy component producers and their employees may be able to benefit from domestic content rules.**
  In the bidding rounds for renewable energy capacity, the South African government included local content requirements for wind power of 25 per cent in the first procurement round (2012-2013), and 40 per cent in the second round (2013-2014), to be raised to 60 per cent in future. This did not seem to discourage foreign investors, who account for most investments (OECD 2015, Paton 2015). With rising requirements, however, more equipment will need to be produced in South Africa, which may attract foreign investments in manufacturing capacity, for example of wind towers or turbine blades.
- **Renewable energy independent power producers benefit from a newly created market.**
  Without the supportive policy, there would hardly be any renewable energy projects in South Africa. Capacity stagnated at very low numbers until the first renewable energy bidding window. The domestic content rules included in the South African policy may in future raise the cost of renewable projects, since project developers cannot source from the cheapest internationally available component suppliers.
- **Households have a preference for renewable energies, but only if electricity is cheap and supply is stable.**

South African households play an indirect role in renewable energy policy making as consumers of electricity and as voters. Their interests can, for example, be identified by household surveys, such as conducted by the South African Department of Energy (see Figure 4). This survey shows that households have a strong preference for electricity prices to be low and affordable, and for electricity supply to be stable. 49 per cent of respondents to the South African Social Attitudes Survey 2012 opined that protesting about the price of electricity was 'Not wrong at all', and a further 20 per cent were of the opinion that it is 'Wrong only sometimes' (Department of Energy 2013). Moreover, the findings indicate that households have a growing preference for renewable energies. Altogether, this indicates that electricity prices are a highly political issue and that the South African government needs to ensure that its renewable energy support policy, while being effective, is also efficient. At the same time, it needs to communicate that renewable energy support has not been responsible for the stark electricity price increases of past years. Instead, a lack of maintenance investment and the high upfront cost of necessary new infrastructure have led to the recent price hikes.

Figure 4: Household preferences for government priorities in electricity supply (in percent), 2011 (blue) and 2012 (red)



Source: Department of Energy (2013)
Note: Multiple responses were possible.

4. Conclusions

Feed-in tariffs (FiTs) are among the most widely used and effective renewable energy support policies globally. When introducing FiTs, governments have the options of predetermining the FiT rates or tendering them. Both options have advantages and disadvantages in terms of their required management capabilities, adaptability to technology cost developments etc. Both options also have implications on the distribution of risk and profit opportunities (or cost) between project developers and electricity consumers. Furthermore, other actors, such as incumbent power producers and energy intensive companies have stakes in the electricity sector. Obviously, this implies a risk of lobbying and political capture. Governments thus need to cater for political economy considerations, that is, they need to consider actor and interest constellations and forge coalitions for policy implementation. Evidence on co-benefits of renewable energies, such as the fast addition of generation capacity in situations of quickly growing demand, enhanced energy independence when countries import a large share of their electricity, and cost-competitiveness, depending on a country's technology and resource endowment, can serve as arguments to persuade central actors.

Both predetermined and tendered FiTs thus have advantages and disadvantages which make them more or less suitable dependent on country conditions. Table 2 attempts to give an overview of relevant questions to assist policy makers in making the choice between tendering or predetermining FiTs. This overview is, of course, not comprehensive and can only provide rough guidance on questions to be considered.

Table 2: Choice of FiT determination method according to country circumstances

	Yes	**No**
Does the government have high technical management capabilities?	predetermine / tender	predetermine
Does the government have high political management capabilities?	predetermine / tender	tender
Is it imperative to minimise the cost to consumers?	tender	predetermine / tender
Are technology costs likely to develop quickly?	tender	predetermine / tender
Is planning certainty for project developers important, e.g. because technology or country risk is high?	predetermine	predetermine / tender
Does the government want to achieve a specific rate of capacity addition, e.g. to reach RE targets?	tender	predetermine / tender
Is there a high risk of adventurous bidding, e.g. because project developers lack experience or they want access to an attractive market?	predetermine / tender, but include penalty payments in tender if projects fail to realise	predetermine / tender
Is there a low number of project developers?	predetermine	predetermine / tender
Are inflation rates high?	predetermine / tender, link FiT rate to inflation rate	predetermine / tender, link FiT rate to inflation rate

Source: Author's own

Like any other subsidy programme, well-designed FiTs require strong management capabilities in the responsible government entities. Technical management capabilities are required for both determination methods, but to varying degrees, with tenders being the more complex option. Predetermined FiTs are the more feasible option when technical management capacities within government do not suffice for managing a tender process. Governments can then consider engaging international consultants or acquiring expertise from international development cooperation.

Political management capabilities are required to keep rent-seeking in check. Corruption and clientelism related issues are an issue for both instruments, but are probably most pronounced in the case of predetermined FiTs, which are more prone to lobbying than a competitive process and can lead to windfall profits. Tendered FiTs are thus more efficient and transparent when rent-seeking may lead to excessive FiT predetermination.

Excessive FiTs go along with an unnecessarily high cost burden to consumers. The impacts of policies on poor consumers are of specific concern to policy makers in developing countries. Negative effects should be avoided, or affected groups of population should receive compensation. In the case of increasing electricity prices caused by FiTs, the introduction of such mitigating measures as electricity lifeline tariffs can be an option. Competition through tenders can contribute to keeping the determination of FiT levels transparent and efficient, and minimise the added cost to consumers. They also ensure the flexibility of FiTs to react to technology cost developments. Project planning certainty, on the other hand, is generally higher with predetermined FiTs, so that risk premiums can be lower.

When governments have set specific renewable energy targets, the rate of capacity addition induced by a policy is of interest. This is easier to steer with tenders, since by definition they predetermine the capacity to be added. Capacity additions under predetermined FiTs are more difficult to predict and depend on the level of FiTs.

Adventurous bidding, that is, bids which are too low to be economically viable, has been an issue in some tendering schemes, notably in India (Altenburg et al. 2014). This risk can be curbed by penalty payments which are due in case the project does not materialize.

If there are only few potential project developers they can coordinate more easily. Tendering may in this case not be the best option: markets often do not function when the number of actors is too small. On the other hand, smaller numbers of actors can also coordinate more easily to exert pressure on governments trying to predetermine FiT rates.

High inflation rates complicate every policy that is based on changing the prices of goods or services. They tend to increase the risk to investors, but in the case of FiTs this risk can be mitigated by linking the FiT rates to inflation rates.

The above given list of questions can assist policy makers in choosing a suitable FiT determination method by providing an overview of key issues to consider. However, it should not be seen as a comprehensive tool. While the determination of an efficient FiT rate can be considered a major renewable energy policy aim, other factors strongly influence policy effectiveness and the attractiveness of the policy scheme for renewable energy investors. Hille et al. (2013: 8) provide an insightful analysis of investor decision making factors, among them profits, country-specific risks and costs (e.g. political and regulatory stability, taxation, corruption levels and bureaucracy), full project costs (e.g. investment costs, consultancy, financing, operation and maintenance), modes of financing (e.g. power purchase agreements, subsidies, credit availability) and local project identification and development (e.g. language barriers, local labour rules, import restrictions). These factors strongly influence transaction costs and risk premiums for investors, and consequently impact on accepted FiT levels. In addition to choosing a FiT determination method which suits the governmental capacity and lowers the risk of windfall profits, governments should therefore strive to positively influence the other factors for decision making of investors.

Correspondingly, policy makers consider efficiency as one factor in their decision for a particular renewable energy policy, but other aims can play a similarly important role. Particularly in developing countries, energy access and the development of local economic benefits come to mind. Renewable energies lend themselves to the electrification of remote rural areas, since their cost of installation is often lower than an extension of the national grid. Including such generation in a national feed-in tariff, however, would require reliable metering equipment and procedures and is likely to involve high verification costs. Other incentive schemes may therefore be more suitable to support rural electrification with renewables. In the case of local economic benefits, many countries have been experimenting with local content requirements for the FiT eligibility of renewable energy projects. The success of such requirements, however, crucially depends on the technical capacities of domestic industries. Where capacities are low and no capacity building takes places, local content requirements simply shift economic rents from international to national manufacturers. They thus raise additional hurdles to project developers without catalysing technological upgrading (Altenburg et al. 2014).

Lastly, a policy never stands in splendid isolation. Whichever combination and design of energy policy measures is chosen, it needs to be analysed for unintended interactions with other policies, and, if necessary, harmonised. One example is the parallel operation of a feed-in tariff for renewable energies and a cap and trade system for carbon emissions. On the one hand, it can be argued that any lowering of carbon emissions induced by a feed-in tariff would lead to the availability of additional certificates, which, once sold, would generate corresponding emissions elsewhere. On the other hand, the political decision of where exactly to fix a cap on emissions may itself be partly influenced by anticipating trends of future renewables capacity. In essence, the parallel operation of feed-in tariffs and emissions trading schemes will crowd out most of the former's emission reduction benefits – not, however, the other benefits it creates, such as energy diversification, or gains in competitiveness and innovation. Similar (positive or negative) interactions may occur with other policy fields, such as trade, agricultural or research policy.

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