



Module 3

Introduction to energy regulation

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1. MODULE OBJECTIVES

1.1. Module overview

This module examines the following themes:

- Regulation is primarily designed to address the failure of markets to deliver desired goods, whether these are economic, social or environmental.
- One model of regulation will not fit all energy systems. Whether a system is state-owned or privatized, monopoly or competitive, integrated or unbundled, established or developing will affect the role of the regulator and the degree to which the regulator can intervene in the system. However, various regulatory models can be adopted or adapted to encourage the development of sustainable energy technologies.
- The need to develop sustainable energy policies raises new issues for policy-makers and regulators, including how to integrate possibly conflicting policy goals.
- Regulation is carried out in a number of different ways by different institutions. Each has strengths and weaknesses.
- Similarly, there are different models of regulatory strategy employing a range of incentives and penalties. Practitioners need to be aware of the advantages and disadvantages of these in seeking to encourage the deployment of sustainable energy technologies.

1.2. Module aims

The aims of the present module are listed below:

- To introduce the concept of regulation and provide some different definitions of regulation.
- To show that there is no “ideal” way to regulate.
- To outline the major bodies involved in the regulation of energy.
- To outline the basic methods of regulation.
- To outline the new issues raised by the need to develop sustainable energy.

1.3. Module learning outcomes

The present module attempts to achieve the following learning outcomes:

- To be able to define regulation.
- To understand the role of regulation in a market system.

- To understand that there are different ways to regulate and different bodies that can be involved in regulation.
- To describe some different regulation systems.
- To appreciate some of the basic issues that sustainable energy can raise in relation to regulation.

2. INTRODUCTION

This module addresses the underlying basis for regulation with regard to the energy industries, although it will focus mainly on the electricity industry rather than other energy industries such as gas. It outlines the aims, design and degree of regulation to provide a basic introduction to the main issues and to establish a foundation for the following modules.

It is worth highlighting that the module concentrates on the rationale and the role of the economic regulator, which in turn assumes a degree of liberalization in a system. In a non-liberalized or state-owned system, many of the regulator's functions will be performed by the government.

In most African countries utilities are still state owned, and although many countries have committed themselves to a programme of liberalization and privatization of the electricity sector, only Cameroon, Côte d'Ivoire, Egypt and South Africa, have made significant advances in the liberalization of their electricity sectors.

Similarly, although this paper deals with economic regulation, some of the mechanisms outlined can be employed by environmental regulators to control or limit environmental pollution. While some points may therefore not seem directly relevant, they may have a more general value for different regulators or types of systems.

3. DEFINITION OF REGULATION

What is regulation? The Oxford Dictionary gives a definition for the action of regulating that illustrates well the wide-ranging activities that come under the heading of “regulation”. Regulation is to carry out these actions “in accordance with rules or conventions” or “by-law”.

To regulate: to control, especially by rules, administer, conduct, direct, govern, manage, monitor, order, organize, oversee, restrict, and supervise.

Regulation: rule, in accordance with rules or conventions, by law, commandment, decree, dictate, directive, edict, law order, requirement, restriction, rule, and statute.

— Oxford Dictionary



Review questions

How would you define regulation?

What kind of actions does a regulator undertake?

Make a list of regulatory actions, based on an example in your country.

4. WHY REGULATE?

In very broad terms, regulation seeks to address “market failure” and is deemed necessary to protect consumers, society and/or the environment.

The primary driver for regulation of infrastructure sectors (public service sectors) such as energy is generally to ensure proper competition and to prevent the growth of a dominant group or single utility servicing either function, essentially this is an attempt to keep prices down.

In non-liberalized markets, the degree of regulation is a direct political decision, and is explicitly connected to policy aims. In theory, the introduction of competition has often been seen as a way of reducing regulation. In a pure economic sense, regulation in competitive markets need only be applied where the benefits of doing so act to reduce the cost to the consumer to a greater degree than if the regulation did not exist—for example to limit market abuse. It is often suggested that “competition is the best regulator”, i.e. that effective competition will lead to the most efficient operation of the market as companies are given incentives to serve the needs of consumers.

However, this does not necessarily mean that where competition exists, regulation is no longer necessary. Regulation may be required to ensure effective competition is maintained—for example to prevent anti-competitive behaviour by companies with market power that can harm consumers and competitors. Regulation may also be required to ensure that certain services or goods are provided where competition alone would not secure this.

In general then, markets are regulated to ensure economic efficiency and to mitigate market failures to ensure that socially desirable goods and services are provided or protected. Briefly, the motives for regulation in competitive markets can be listed as:

- Economic efficiency (e.g. the prevention of market abuse);
- Consumer protection (e.g. to keep prices down);
- Environmental protection (e.g. to reduce harmful emissions such as CO₂, SO₂, NO_x, etc);
- Social justice (e.g. to ensure universal supply);
- Security of supply (to keep the lights on).

Most of these motives could also apply to regulation in non-competitive markets.

Some of these motives could be seen as contradictory—for example, keeping prices down may not be compatible with promoting renewable energy technologies,

which can be more expensive than conventional technologies. Policymakers and regulators will have to resolve these issues by taking into account other factors, such as the time scales for which the regulation is designed. In the short term, for example, increased renewable energy generation or energy efficiency activities may increase energy prices, but in the longer term—with both new technologies becoming cheaper (through learning effects) and oil prices rising—they may well lead to reduced prices. Similarly, the social desirability of ensuring universal supply can increase prices, but this has to be balanced against improved quality of life for citizens, e.g. by poverty reduction through employment generation, by health improvement and environmental benefits.

Balancing these issues will undoubtedly be a challenge, and may more appropriately be addressed by politicians and policymakers rather than regulators. However, putting the policies into practice is the job of the regulator, and in practice many choices on measures and rules will refine the balance of the policy aims. So while regulation could be seen as institutionally separate from the political decision of how to balance policy aims, in the real world, it may well fall to regulators to decide on specific issues on a case-by-case basis.

Regulators are also involved in advising policymakers on policy choices, because of their expertise in economics and in the practicalities of devising and monitoring rules to implement policies. They are therefore participants in the debate about policy choice, often with a considerable degree of influence and hence they are not just implementing policy that is made elsewhere.

5. WHAT CAN BE REGULATED: ELECTRICITY SYSTEM STRUCTURES

Electricity industry structures vary widely from country to country. The main variations are in terms of:

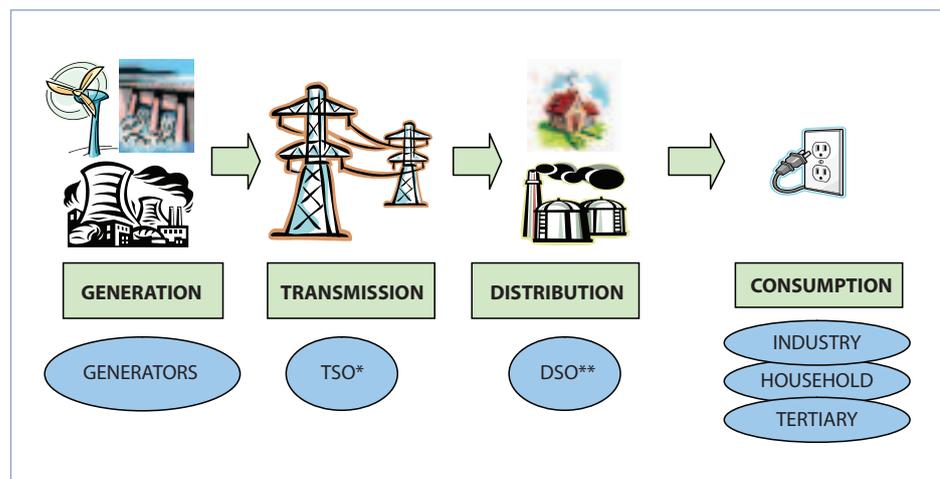
- Level of competition;
- The degree of integration (vertical and/or horizontal);
- Ownership (public or private);
- The degree to which the system is established or developing.

Whatever the electricity industry structure and its state of development, there are essentially four functions that the electricity supply industry is performing:

- Generation;
- Transmission;
- Distribution;
- Supply (often called retail).

Any or all of these functions may be privately or publicly owned. Two or more of them may be contained within the same company (as is often the case in African countries). Generation and supply may be undertaken on a monopoly basis or subject to competition. Transmission and distribution will always be provided on a monopoly basis.

Figure 1. Electricity: from generation to consumption



*Transmission System Operator

**Distribution System Operator

5.1. Competition

In electricity industries, the primary functions where regulated competition applies are in generation and supply, though this can be broken down to create separate markets for smaller functions such as metering.

There are a number of reasons to regulate competition within these two functions, and the priority given to these functions will vary between regulatory regions. The primary driver for regulation of these functions is to ensure proper competition.

Ensuring fair competition with regard to electricity generation requires the creation of a marketplace which is open to both existing generators and which does not induce barriers to deter newcomers. Regulation should prevent the capture of sufficient market power by a single generator or by groups of generators such that prices can be controlled by the entity.

Fair competition is also necessary in the electricity supply function, i.e. the firms who buy from generators and sell to consumers. Significant regulatory issues include consolidation of companies within the function such that one or more companies can come to dominate the function, though this must be balanced with the economy-of-scale advantages that consolidation can bring and the cost reductions that can thus be passed on to the consumer.

5.2. Integration

Companies may be horizontally integrated such that one company controls a significant fraction of the market for one function, for example, all of the supply of electricity to consumers. In a privatized industry such control tends to imply significant market power and this can be undesirable with regard to consumer benefit. Generally, horizontal integration is implicit in state-owned industry.

Companies may also be vertically integrated, that is, with two or more functions under the ownership of one company or agency. Such integration may be valuable to the company but not necessarily to society. Most notably, vertical integration may lead to the company achieving sufficient market power such that other competitors can be disadvantaged, with a corresponding impact on consumer welfare.

Where market power is established, or as part of a privatization process, the separation of selected functions is often required by government or regulators in order to prevent abuse of market power. This “unbundling” of functions into separate and discrete services can take different forms.

In some cases, governments or regulators may be satisfied with a degree of internal separation—for example into separate companies with safeguards to prevent collusion. In other cases, this will not be considered adequate and companies will be required to divest one or more function.

The degree of unbundling within an industry will have significant implications for the potential of companies to exert market power across electricity industry functions. For example, vertical integration of a generation and distribution company can mean preferential treatment by one part of the company for another, to the disadvantage of competitors and to the overall welfare of consumers. For this reason, regulation often prohibits cross-ownership of some functions, or can apply strict controls over ownership to try to prevent firms with interests in multiple functions from gaining competitive advantages. Unbundling of functions can prevent this, provided that strict monitoring occurs to ensure the controls are effective and are not simply for appearance’s sake.

5.3. Ownership

In some countries, there is a mix between public and private ownership, whereas in others the whole industry will be in private hands—for example, some generators may be state owned while others are privately controlled. In such a situation, both may be subject to the competitive market, or one or both entities may not.

The shift of an industry from the public to the private sector may take place in a number of phases. Corporatization involves state-owned industries being turned into businesses (or corporate) units with rather more autonomy and may also be a precursor to privatization. If desired, privatization then occurs, usually accompanied by some change in regulation to govern the new structure. This change in regulation is often referred to as deregulation though it is often perhaps more accurate to say that it is re-regulation.

Privatization may also be accompanied by liberalization—opening up certain markets to competition, although liberalization may also be introduced in some cases even where privatization has not taken place.

5.4. System development

The age and extent of electricity systems has a direct impact on the costs and technical implications of operating and maintaining it. In many African countries, there is still a need for significant investment in order to expand and improve the electricity system. This has a huge cost implication and leads to questions over who will pay for this expansion: the state, the private sector or a combination of the two. Historically, the state has been responsible for the expansion of infrastructure, such as the electricity network but this has led to very low rates of development of the electricity system in many countries and now alternative solutions to injecting the required investment are being sought.

In a “mature” system, networks are already established and are generally geared towards shifting power from large-scale, centralized generating plants to the end user via transmission and distribution lines. In a mature system, with established rules and regulations, creating a favourable environment for sustainable energy can mean the need for many changes which can take time and a lot of industry coordination.

In contrast, less mature systems can develop to accommodate sustainable energy technologies as they retain flexibility by virtue of the fact that they are still growing. In order for an expanding system to integrate the increased use of renewable energy sources, the right incentives and regulations need to be provided, as well as again industry coordination.

Box 1. Some of the challenges for utility regulation in Africa

- Poor financial performance of many state-owned utilities
- Inappropriate pricing (usually as a result of political pressures)
- Managerial and technical deficiencies (regulation is a relatively new concept for many countries)
- Unsustainable subsidies
- Limited public sector finance for new infrastructure
- Limited private sector participation
- Low levels of access to services

Source: Extract from the presentation made at the 2nd AFUR annual conference by Mufor Atanga, AFUR secretary general, March 2005.

6. WHO REGULATES?

The independent or semi-independent specialist utility or energy regulator is becoming a common model for regulation of the energy industries, particularly where these industries have been transferred to the private sector. However, this is not the only model, in some countries—even where the industry has been privatized—a central government department will retain either the whole regulatory function or parts of it.

Three different models for regulation are commonly found in Africa: regulation through a government department, a ministerial agency or a fully independent regulator. Typically, water regulation is vested in a government department (such as the Department of Water Development, under the Ministry of Water, Land and Environment in Uganda), electricity is regulated by a ministerial agency, usually under the Ministry of Energy (such as the NER in South Africa) and only in the telecommunications sector can completely independent regulators commonly be found.

Whether it is a government department or a regulator who has the primary role, there will often be other bodies with a role in regulating the energy industry.

The following bodies can all be involved in regulating the energy industry:

- Central government departments;
- Specialist utility or energy regulatory agencies (including rural electrification and energy efficiency agencies);
- Generalist competition regulators;
- Environmental regulators;
- Local authorities;
- Courts and tribunals.

6.1. Central government departments

Where central government departments are directly involved, they make regulation answerable to elected politicians and hence can increase democratic control and legitimacy. Whether or not this is considered desirable will depend upon different views on the purpose of regulation and role of government. For example, there may be concerns that governments may be willing to compromise economic efficiency to meet other goals—for example, there may be pressures to protect companies from competition to preserve jobs.

6.2. Specialist utility or energy regulators

One of the main arguments made in the favour of specialist utility or energy regulators is that, where the agency enjoys reasonable independence from government, they provide a bulwark against “political interference” which might damage economic efficiency. The main argument against is lack of accountability to the government and parliament. Establishing an independent regulator places considerable power in the hands of an appointed individual, (or a group of individuals where a commission-type structure exists) who may pursue policies that are at odds with government policy or publicly mandated policy goals. These regulators are generally subject to a set of duties provided by legislation, although the legislation may provide for a considerable degree of discretion on the part of the regulator in applying and balancing these duties. Achieving the benefits of independence without sacrificing accountability is thus one of the key challenges.

6.3. Generalist competition regulators

The role of generalist competition regulators is to take action against activities that may hamper competition in any sector of the economy. Typically they will have a role in assessing whether certain mergers should be allowed to proceed and in taking action where companies with market power are found to be acting anti-competitively. In some countries, the specialist utility regulators may have some concurrent powers with the generalist competition regulators.

6.4. Local authorities

Local authorities may have two types of role. Firstly in planning control—e.g. in the siting of energy facilities such as power stations, wind turbines, etc. Secondly, in some countries, local authorities provide municipal electricity and/or heat (district heating) supply—these companies may be regulated by a sector regulator where one exists or they may be largely self-regulatory.

6.5. Courts and tribunals

The position of courts and tribunals can vary somewhat, depending on the particular structure. In some systems they are empowered to act as the point of last appeal on disputes between other regulatory bodies and companies. In other systems, courts and tribunals can be the first point of call concerning company behaviour.

7. TYPES OF REGULATION

Power sector reform in developing countries began over 10 years ago. Usually, the reforms have involved some combination of restructuring, privatization and unbundling. Regulatory reform has also been a key element of the overall process, with countries generally moving away from regulation through a government ministry, most often towards the creation of an “independent regulatory agency”.

The aim of regulatory reform was, and is, to depoliticize regulatory functions such as tariff setting, and improve the transparency of decision-making in the power sector. There are many different types of regulation, and all have their advantages and disadvantages. There is no single solution to suit all countries, so each situation has to be analysed to determine its characteristics and an appropriate regulation system designed and put in place.

This section examines different types of regulation commonly in use, including command and control, self-regulation and incentive-based regulation methods. Roughly speaking command-and-control regulation is imposed by government, self-regulation means the private sector manages its own regulatory scheme, and incentive-based regulation can be considered as regulation in between those two, i.e. carrot-and-stick regulation; “carrot” for the private sector to act, “stick” for the government when policy objectives are not sufficiently met. All of these are described in more detail below. For each type of regulation the advantages and disadvantages are presented.

Finally some other market controls available for regulation purposes are presented, such as trading permits, regulation by contract and competition laws.

7.1. Command and control

Command and control (C&C) regulation is typically the imposition of standards backed up by legal sanctions if the standards are not met. The law is therefore used to define and prohibit certain types of activity or force certain types of action. Standards can be set either through legislation, or by regulators empowered by regulation to define rules.

Advantages

There are a number of strengths in such a direct approach to acceptable behaviour: it can often be implemented quickly, sets out clearly defined limits and shows the government or regulator to be acting decisively.

Disadvantages

However, it can also be a somewhat heavy-handed and complex approach to regulating activities. The problems that can be created by this approach fall into a number of categories:

- **Regulatory capture:** C&C requires the regulator and the regulatee to cooperate, in particular to ensure that information is provided to allow the regulator to carry out its duties. This close relationship can lead to a situation where the regulator can be “captured” by the regulatee, and can begin to operate in their interests, rather than the interests of the public at large.
- **Legalism:** C&C has often been portrayed as complex, inflexible and over-intrusive. It can be difficult to devise precise rules, especially if an industry is undergoing change, and in addition, the direct involvement of politicians can mean that rules are drawn up in response to specific situations or areas of concern, often in a short time scale. This can mean that C&C regulation is not always an effective or forward-looking method of regulating industry.
- **Setting standards:** Sometimes it is difficult to set an appropriate standard—for example, to permit a specified level of pollution or realistic efficiency targets for transmission and distribution systems.
- **Enforcement:** The complexity of the rules and the possibility that their design may not encompass all possible activities, makes enforcement difficult for regulators. In addition, complexity can lead to a situation where attempted enforcement can be challenged in the courts.
- **Innovation:** C&C regulations are often blamed for not being cost effective as being imposed and thus applied by industry without any economical analysis, thus not encouraging innovation

Table 1. Strengths and weaknesses of command and control regulation

Strengths	Weaknesses
Fixed performance standards backed up in law	Close relationship between regulator and business could lead to “regulatory capture”
Clear definition of unacceptable behaviour	Can be complex and legalistic
Seen as politically decisive	Defining acceptable standards can be difficult

7.2. Self-regulation

Self-regulation could be portrayed as DIY (do-it-yourself) command and control. It often takes the form of a business or a trade association developing its own rules of performance, which it also monitors and enforces. There can be some government oversight of the regulation, but as a rule self-regulation is often seen as a way of business taking pre-emptive to avoid government intervention.

Advantages

The advantages of this approach include a high level of commitment from the businesses involved (given that it is in their interests to make the system work as the alternative is government intervention), and the well-informed and comprehensive nature of the rules that are set. It can also be more flexible than governmental C&C as it does not require legislation.

Disadvantages

On the other hand, it can also be seen as undemocratic, closed to outside scrutiny and open to abuse by the very interests who devise the rules. At the very least, self-regulation will always be open to challenge by outside interests who feel that the standards and rules are not primarily geared towards reducing the impacts of undesirable activities.

Table 2. Strengths and weaknesses of self-regulation

Strengths	Weaknesses
Can be well-informed, with a high-level of commitment from firms	Could be self-serving/undemocratic
Cheap for government	Legalism not necessarily avoided
Easy to change to fit circumstances	Weak enforcement
“Realistic” standards created	Independent oversight difficult

7.3. Incentive-based regulation

The aim of incentive-based regimes is to induce a regulated entity to limit or stop an undesirable activity by imposing taxes or granting subsidies—in other words a “carrot and stick” approach to ensure a socially or environmentally desirable end. The scheme of punishment and reward operates in a mechanical way, so reducing the scope for regulatory discretion, which in turn reduces the possibility of regulatory capture. It also allows the company a degree of flexibility in deciding whether to conform to the rule, or to accept the punishment.

An incentive is any policy, rule, pricing mechanism or procedure that seeks to modify the behaviour of persons or companies by changing the marginal costs or marginal benefits associated with particular decisions and activities. It could be said that all regulation is based on incentives in one way or another, as regulation functions through the basic concept of penalties for “bad” behaviour and rewards for “good” behaviour.

Incentive-based regulation tries to reward the utility with increased profits for reducing costs and improving services in a more pronounced fashion than other forms of regulations. The aim is to induce a regulatee to limit or stop an undesirable activity by imposing taxes or granting subsidies—in other words a “carrot and stick” approach to ensure a socially desirable end. To apply incentive-based regulation the general steps are to choose the units of measurement, set the baseline level, choose targets for improvement and/or maintenance and then apply incentives and penalties.

One type of incentive-based regulation is performance-based regulation (PBR), where incentives are tied to improvements in utility performance, price reduction and service quality improvement. There is less reliance on costs and less relationship to earning, with more emphasis on prices. PBR is also more reliant on external performance standards and less sensitive to company specific actions.

The advantages of PBR are that it may help improve plant utilization, reduce operation and maintenance (O&M) costs and improve system reliability. It also sets specific goals for utility management to focus on, can promote demand-side management (DSM) and simulates competition where real competition may not be practical. In general, PBR is also regarded as giving greater flexibility to utilities to make their own choices on how to respond to regulation. The disadvantages of PBR are that by placing emphasis on reducing costs, it may lead to inadequate O&M in an effort to save money. Incentives on certain items and not on others may divert attention to those areas where an incentive is offered to the detriment of other areas which may be equally important. It is also very important to set the rules correctly from the outset. If benchmarks and targets are wrong they could benefit the utility or the customer to the disadvantage of the other party.

However, overall, PBR aims to promote sharing of benefit between the utility and the customers. The utility benefits through incentives and lower costs, leading to higher profits and better return on investments for its shareholders. The customers benefit from lower prices and improved service.

Advantages

The scheme of punishment and reward operates in a mechanical way, so reducing the scope for regulatory discretion, which in turn reduces the possibility of regulatory capture. It also allows the company a degree of flexibility in deciding whether to conform to the rule, or to accept the punishment.

Disadvantages

The incentive-based approach can create rules that are too complicated and inflexible and do not take into account market realities, especially if they are not updated regularly to follow developments in the market. Incentive-based regulation assumes economic rationality, which may not always be the case. In addition, sometimes it is difficult to predict the impact of this type of regulation, for example, “bad” behaviour, e.g. polluting, could be rewarded if the rules are not set correctly.

Table 3. Strengths and weaknesses of incentive-based regulation

Strengths	Weaknesses
Low regulatory discretion	Rules may be complex and inflexible
Allows choice for regulatees	Assumes economic rationality—not always the case
Low enforcement costs	Difficult to predict impact
Encourages technological innovation	May reward polluters

The appropriateness of applying one of these three types of regulation depends on the available competences at regulatory and private sector level, and on the historical relationship between the government and the given sector.

Command and control is usually least appreciated by the private sector because it does not allow for flexibility in its behaviour; governments have applied C&C when the need for change was urgent and time was lacking for sectoral negotiations, or when voluntary commitments from the industry had failed to deliver the desired result. Self-regulation is usually applied when the industry has gathered significant experience and is convinced of the need for regulation. Incentive-based regulation can be regarded as a form of regulation in between C&C and self-regulation, i.e. the private sector is stimulated to change its investments and strategic behaviour allowing for some degree of flexibility (“carrot”), while governments remain in control through possible penalties when targets are not sufficiently met (“stick”).

Different market-based mechanisms have been developed aiming to allow for more flexibility and choice by the private sector in how to deal with targets and policies imposed by governments and regulators. Some types of market-based mechanisms are described below.

7.4. Market controls

There is a range of market-based mechanisms that can be used to regulate activities. Market-based regulations (e.g. regulation by contract) can prove cost-effective, and minimize regulatory interference in the day-to-day operation of companies. Some of the more common market-based mechanisms are outlined below.

Competition laws

These are laws used to control the behaviour of companies to ensure that the market delivers services by limiting undesirable activities such as predatory pricing or cross-subsidization. Competition law can be preferred to command and control regulation because it is less intrusive for companies, and cheaper for the public purse, given that disputes are resolved in court rather than by publicly funded agencies.

However, the laws themselves only establish broad principles, rather than being defined for specific commercial or technical problems. Relying on courts to sort out the details of implementation risks a less than expert judgement than might be the case with decisions taken by a regulatory agency.

Regulation by contract

The government can use its own buying power to specify conditions in contracts with outside businesses. The contractual conditions can be used to drive socially desirable ends, such as a specified proportion of renewable power used in the production of goods. Regulation-by-contract is sometimes regarded as a short-term solution, worth considering when trying to increase regulatory robustness rapidly in the short term, but preferably it should be reinforced and eventually replaced by more permanent regulatory measures.

Regulation-by-contract would be aimed at managing regulatory discretion resulting particularly from weak institutional environments and would be initiated in order to support regulatory independence.

Increasing regulation-by-contract should not be seen as an intention to replace existing regulatory agencies with an alternative mechanism, but rather as a method of complementing their work by enhancing the effectiveness and credibility of the regulator.

Under a regulation-by-contract regime a regulator will potentially have to engage in contract re-negotiations, and hence the regulator's role will increasingly be that of honest broker or even impartial player focused on creating solutions and building consensus between service providers/investors and governments. When designing regulation-by-contract arrangements, increased emphasis should be placed on the issue of pass-through costs, as well as the possible inclusion of re-opener clauses in contracts, although these are generally not favoured.

Tradable permits

This is an increasingly important approach for limiting carbon dioxide emissions following the development of the European Emissions Trading Scheme. A specified level of acceptable emissions is set by the government, and market participants are granted an allocation of allowances up to that limit. The participants can then choose to reduce their emissions below the allocated limit and trade their excess allowances, or to buy allowances to allow them to exceed the limit. In addition, participants may also choose to exceed the limit and pay a penalty rather than buy additional allowances.

Politically, this is an attractive mechanism as it leaves companies free to decide how to behave, so, in theory, achieving the most economically efficient route to reducing emissions. However, the success of the scheme depends on the limits set by governments: with undemanding limits, the price of traded allowances will be low, and there will be little financial incentive for companies to change their practices. In addition, the success of any scheme will depend on enforcement and verification by a regulatory body.

Disclosure regulation

This requires producers to state the source or content of their power product, and has been applied in some countries and states to ensure that information is provided on the generation mix used to produce electricity. The mechanism allows consumers to choose a preferred source of generation (e.g. renewable generation rather than fossil fuel), but it depends on the reliability of the information presented. It also assumes that consumers will make the "right" choice to achieve the desired end.

In Europe the support schemes for renewable energy thus far have mainly been “supply-driven”, i.e. the support stimulated the production of more green energy (“pushing the market”). Disclosure regulation aims to stimulate consumption of more green energy by both industrial and domestic consumers (“pulling the market”).

Consumer demand is rising in different European countries, with the Netherlands having the longest history in demand driven markets, but some evolution has been taking place over the last couple of years in other countries including Germany, France and United Kingdom.

Table 4. Strengths and weaknesses of market-based mechanisms

Strengths	Weaknesses
Firms respond to market not bureaucrats	Uncertainties and transaction costs
Applicable across sectors	Lack of response in crisis
Flexibility	Needs healthy permit market
Low enforcement costs	Can create barriers to entry (disputes resolved by participants)
	Depends a lot on reliability of information

Other regulation mechanisms

Other regulation methods that can be used include direct action by government, regulation through rights and liabilities laws and regulation through public compensation. The advantages and disadvantages of each of these are laid out in the table below.

Table 5. Strengths and weaknesses of other regulation methods

Strengths	Weaknesses
Direct action	States can plan long-term, “acceptable” infrastructure Costly, can involve contentious subsidies
Rights/liabilities law	Low intervention Costs to individuals, evidential and legal difficulties
Public compensation	Firms aware of costs Monitoring performance difficult



Review questions

1. What are the advantages and disadvantages of:
 - (a) Command and control regulation?
 - (b) Self-regulation?
 - (c) Incentive-based regulation?
2. Name some market-based regulation mechanisms.



Discussion questions/exercises

If the trend is towards more regulation by contract, what are the implications for the existing regulatory agencies? And what are the prospects for creating new regulatory agencies in countries and sections where they do not exist?

8. REGULATION ISSUES FOR SUSTAINABLE GENERATION

Energy systems are made up of interacting components (e.g. a generating plant and the transmission system). Separating the main components in this section is therefore a little artificial, and it needs to be remembered that there may be issues which cross over a number of different areas. So, for example, distributed generation obviously raises issues for regulation of transmission and distribution networks, as well as for generation. Some of these issues will be dealt with in later modules—the outline given here is intended as a basic introduction.

8.1. Regulation and generation

In state-owned systems the government still plays an important role in deciding which technologies are used to generate power. In liberalized systems, governments have effectively stepped away from dictating which technologies are chosen. This choice is instead left to the market. However, economic regulation, and the way that the market is designed can still influence this choice.



Review questions

Think about the following questions. To what degree are they true for the current system in your country?

- Do market participation rules discriminate against smaller-scale generation or independent generators because of high transaction costs, or overly punitive penalties for intermittent generation?
- Does the design of the market encourage or hinder new entry?
- Is the market so competitive that it discourages innovation and the development of new generating technologies?
- Does the design of the market encourage demand-side bidding (i.e. is there a value attached to a consumer reducing demand at certain times)?

8.2. Regulation of electricity transmission and distribution

Transmission networks

Transmission networks are the system of connections carrying high voltage electricity from the large generators to the distribution networks and to the largest of electrical consumers. Their upkeep and operation is the business of transmission system operators (TSOs). TSOs are also responsible for the balancing of consumption and generation on the system.

Distribution networks

The conduit between the transmission grid and the majority of electrical consumers is carried out by distribution network operators (DNOs). DNOs are required to ensure, through their networks, that consumers have access to a secure and reliable supply of electricity provided at a minimum feasible cost. Although it is widely acknowledged that minimization of costs can be achieved through the maximization of operational efficiency of the network, regulatory intervention, through efficiency targets and efficiency rewarding mechanisms, is often required to engage DNOs in meaningful efficiency improvement exercises. Currently, energy efficiency targets in the tariff-setting mechanism for transmission and distribution systems are used in only a few countries in sub-Saharan Africa (e.g. Ghana).

Transmission and distribution of electricity are both natural monopolies; it would be far too costly and not very efficient to have more than one transmission and distribution system. Provided there is spare power transfer capacity in the systems, the average cost of both transmitting and distributing electricity reduces as the amount of electricity distributed increases. Thus, the cost of any additional unit of electricity distributed will be both lower than the cost of previous units and lower the average cost per unit.

Natural monopolies may also result from “economies of scope”. These exist where two or more services can be provided more cheaply by one single company than if each service was provided by two separate companies. “Economies of density” play a significant part in making both transmission and distribution network operation natural monopolies. It is much cheaper on a per household basis to have one single network (and network operator) serving a neighbourhood than to have two networks, each serving half of the same neighbourhood, as this avoids duplication of large parts of a network, and thus the costs associated with this.

Both transmission and distribution networks thus need to be regulated to move towards greater efficiency so that overall prices are reduced and that these reductions are passed on to the consumer.

In this context, efficiency can refer to the costs of providing a range of services as well as tasks such as minimizing losses and acting to provide a guarantee of quality of supply to consumers. Increased efficiency can occur in a number of ways, for example:

- Through providing energy services (supplying light and heat rather than just energy);
- As the result of improved management, technical performance and utility practices;
- As the application of improved technology such as new information and communication technology (ICT).

The central incentive for improved network efficiency is the network operator's desire to improve its profits. Properly designed policy frameworks and regulatory mechanisms (i.e. efficiency rewarding tariff setting mechanisms) should be put in place to ensure that the more efficiently the network operates, from an economic and use-of-resources point of view, the greater the company's profit margins are.

To protect the consumer, the regulator can limit the amount of profit the network operator makes from improved efficiency by putting in place a mechanism that acts to pass on some of the value of improvements to the consumer. This process can be improved by the use of benchmarking (also known as comparative regulation), that is, by comparing the performances of separate companies in re-assessing the prices that the DNO is allowed to charge. Regular re-assessments of the prices that the DNOs are allowed to charge are usually used to facilitate this—typically every 4-5 years.

As the efficient operation of the network also has implications for the quality of supply, the regulator may choose to introduce incentives to the TSO or DNO to maintain certain levels of quality of supply and punish the DNO should they fail to achieve these standards.

Whilst many of the basic issues relating to regulation of transmission and distribution are similar, there are important differences relating to sustainable energy that are specific to either kind of network. One issue is the connection of renewable energy generators to networks—typically, though not exclusively, to distribution networks. This requires consideration of the appropriateness of particular regulation relating to connection on either kind of grid and to the issue of equality for all competitors. Consideration must be given to regulation that gives

incentives for the reduction of energy consumption, such as demand-side management, increased energy efficiency and loss reduction.

8.3. Regulation for sustainable energy

The age and extent of electricity systems can have a direct impact on the costs and technical implications of implementing sustainable energy policies. In a “mature” system, networks are already established and are generally geared towards shifting power from large-scale, centralized generating plants to the end user via transmission and distribution lines. In contrast, less mature systems can develop to accommodate sustainable energy technologies as they retain flexibility by virtue of the fact that they are still growing. New technologies can be designed in to the expanding system, and new consumers can be offered services rather than just energy supply.

Regulation can have a direct impact on changes and developments in the system through the provision and regulation of incentives such as support mechanisms (e.g. investment subsidies, tax credits) for renewable power technologies or the operation of demand-side management programmes.

Regulation can also play a less overt role in the technological choices within energy systems by addressing rules and practices which favour the dominant technologies in the system. For example, companies have developed to sell kWh rather than to provide energy services; regulators can take action to encourage the emergence of energy service supply companies, which will in turn improve the energy efficiency of consumers. Similarly, the rules governing connection and performance have developed to support the large-scale, centralized nature of many electricity systems and have therefore tended to exclude the possibility of connecting smaller-scale generation to distribution networks. Regulators can address these imbalances and so provide greater incentives to implement smaller scale, often renewable, generation.

9. EXAMPLES OF REGULATION IN AFRICA

9.1. Energy regulation in Zambia

The regulatory structure for the electricity sector in Zambia is the independent Energy Regulation Board (ERB), which was created under the Energy Regulation Act of April 1995. Some of the provisions in the legislation that contributed to the successful establishment and development of the ERB were the following:

- Establishment of ERB as an independent statutory body and the sole licensing authority for operators in the energy sector.
- ERB Board members (regulators) are appointed on a professional basis, do not represent any stakeholder interests, serve a specified fixed term(s) and the basis for their removal from office is clearly stated in the legislation. Once appointed, the Board operates independently in its decision-making based on the governing legislation.
- There is a provision for earmarked funding for the ERB in the form of a percentage of energy cost passed on to the consumers.

The successful establishment and development of the ERB was a direct consequence of the Zambian Government's deliberate policy and political will to establish an independent regulator. With the policy and legislation in place, the Board was appointed in February 1997 and the ERB became operational immediately. Supported by strong political will and legislation, the ERB embarked on an extensive capacity-building programme and as a result of this extensive capacity-building, ERB quickly developed into a strong regulatory authority with strong expertise, competency, independence and accountability.

The ERB has a mandate to regulate all undertakings in the energy sector, which comprises electricity, petroleum, coal, wood fuel and renewable sources of energy. The ERB regulates through the issue of licences, which stipulate the conditions under which the licence undertakings should operate.

In order to promote the development of renewable energy, the ERB zero-rated licence fees for this subsector. This measure is still ongoing.

For solar energy, there is no regulation for the retailers who sell mostly standard imported PV modules in small shops: the licence is currently applied only to 17 individual companies that install solar equipment.

The ERB regulation for installers specifies 3-4 sets of equipment that can be installed (photovoltaic modules, batteries, fitting), in order to avoid the installation of substandard equipment. Inspections are conducted, but for the moment without penalties. A code of practice for “photovoltaic systems designs and installation” is currently being produced by the Zambia Bureau of Standards. The question of the qualification of installers is also on the agenda and the introduction of competence certificates is under consideration by the ERB.¹ A code of practice can be regarded as a self-regulation for industry to comply with in terms of quality of materials and installation, but usually without the threat of a severe penalty as in command and control regulation. Respect of codes of practice can be used by companies as a marketing tool towards customers, and are supported as such by industrial associations and even governments or regulators.

The ERB also recommended the Government to remove import duty on imported renewable energy products. This measure is also still ongoing but does not apply to solar panel batteries and some other components which are not renewable energy specific.

The National Energy Policy² outlines a list of possible measures with regard to renewable energy, e.g. financial incentives, a dedicated renewable energy agency, training courses and a research and development strategy. At this point the National Energy Policy is not yet translated into legislation, policies and regulations.

For a more detailed account of the establishment of the Zambian ERB, the reader should refer to case study 1, which is attached to this module.

9.2. Water sector reform in Uganda

The water sector in Uganda does not yet have an independent regulator. The primary responsibility for regulation is vested in the Ministry of Water, Land and Environment.³ The present approach is regulation-by-contract, with the Ministry responsible for monitoring performances according to the contracts. However, regulation is complex, with a number of different agencies and bodies involved.

¹The National Energy Policy, Ministry of Energy and Water Development, Zambia, February 2007.

²Photovoltaic Energy Services for Zambia, X. Lamaire, Centre for Management under Regulation, Warwick Business School, April 2006.

³Mr. E. Kisembo, Reform manager, Ministry of Water, Land and Environment, Uganda, 2nd AFUR Annual Conference, March 2005, Kampala, Uganda.

Recognizing the need for promoting the attainment of the Millennium Development Goals (MDGs), the Uganda water sector found it necessary to separate the treatment of urban, commercial town operations from those of rural villages, which had a different framework in place in order to facilitate cross-subsidies, financial support and enhanced access to services.

The following lessons have been learnt from the water sector reform process so far in Uganda:

- Different models have to be used for small rural water operations and larger town water operations.
- Rural water operations make use of private contractors within a management contract framework, while the National Water and Sewerage Corporation (NWSC) takes responsibility in the towns, in terms of a performance contract with the Ministry.
- The present regulatory approach (by contract) does not sufficiently address such issues as tariff setting, contract disputes and capital investment planning.
- A certain amount of self-regulation is taking place in terms of the larger town operations, central government having transferred power to local authorities even though these commonly lack capacity to exercise such powers.
- Key regulatory challenges for the Uganda water sector include the formalizing of an appropriate regulatory framework promoting best practices and fostering confidence among private operators.



Discussion questions/exercises

1. What is the regulatory framework for the power sector in your country?
2. What regulatory mechanisms are being used?
3. Write a short summary of the situation (1-2 pages).

10. CONCLUSION

Regulation is primarily designed to address the failure of markets to deliver desired goods—whether economic, social or environmental. Regulation is the primary tool to address those market distortions and is, when carefully designed, capable of serving a range of policy goals related to energy supply, including improved market functioning, poverty reduction and sustainable development. There is no standard method that works in every situation, therefore the circumstances for different countries and the industries within those countries have to be analysed and the most appropriate regulation method selected accordingly.

LEARNING RESOURCES

Key points covered

Here are the most important points covered in this module:

- The concept of regulation and its main aim: to address the failure of markets to deliver desired goods and services, whether economic, social or environmental.
- There is no “ideal” way to regulate and every country has different circumstances which require their own individual solutions. The type of regulation of the energy industry will depend on the level of maturity of the system, the degree of competition, the degree of integration of the market actors, etc.
- There are a number of bodies involved in the regulation of the energy sector. The most common actors are government departments, Agencies linked to the Ministry of Energy of a country (usually semi-independent) and fully independent regulators.
- An introduction to some of the basic methods of regulation: command and control, incentive-based regulation, self-regulation and market controls.
- An outline of the issues raised by the need to develop sustainable energy and the role of the regulator to change and adapt the electricity system across its four main functions: generation, transmission, distribution and supply.



Answers to review questions

Question: What kind of actions does a regulator undertake?

Answer: Actions a regulator may undertake: set and revise electricity prices, grant generation, transmission, supply and distribution licences, manage energy efficiency programmes, monitor performance of utilities, ensure that the laws regarding energy are being abided by, set rules to maintain quality of supply, set grid codes, set safety standards, promote effective competition.

Question: What are the advantages and disadvantages of:

- (a) Command and control regulation?
- (b) Self-regulation?
- (c) Incentive-based regulation?

Answer: *Command and control regulation.*

Advantages: it can often be implemented quickly, sets out clearly defined limits and shows the government or regulator to be acting decisively. **Disadvantages:** it can be a somewhat heavy-handed and complex approach to regulating activities.

Self-regulation.

Advantages: there is often a high level of commitment from the businesses involved, and the rules that are set are well-informed and of a comprehensive nature. It can also be more flexible than governmental C&C as it does not require legislation. **Disadvantages:** it can be seen as undemocratic, closed to outside scrutiny and open to abuse by the very interests who devise the rules.

Incentive-based regulation.

Advantages: the scheme of punishment and reward operates in a mechanical way, so reducing the scope for regulatory discretion, which in turn reduces the possibility of regulatory capture. It also allows the company a degree of flexibility in deciding whether to conform to the rule, or to accept the punishment. **Disadvantages:** the incentive-based approach can create rules that are too complicated and inflexible and do not take into account market realities. It also assumes economic rationality, which may not always be the case.

Question: Name some market-based regulation mechanisms.

Answer: Market-based regulation mechanisms: competition laws, regulation by contract, tradable permits, disclosure regulation.

**Presentation/suggested discussion topics****Presentation:**

ENERGY REGULATION – Module 3: Introduction to energy regulation

Suggested discussion topics:

1. Compare and contrast different types of regulation, give examples of each from the countries of the students.
2. Which type of regulation is most appropriate for developing countries which have developing power sector systems (electricity in particular)? Discuss.

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- B. Tenenbaum, F. Woolf, Energy and Mining Sector Board Discussion Paper Series, Paper no. 7, May 2003, World Bank.
- Legal and regulatory framework of the electricity supply industry (ESI) in Southern and East Africa, Status report as at February 2005, SAD-ELEC Ltd., Norwegian Water Resources and Energy Directorate, February 2005.

INTERNET RESOURCES

- SERN: www.reeep.org/groups/sern
- Regulatory Assistance Project (RAP): www.raonline.org
- About regulated industry: www.utilityregulation.com
- National Association of Regulatory Utility Commissioners—NARUC: www.naruc.org
- Public Utility Research Center: www.purc.org
- Department of Water Development, Uganda: www.dwd.co.ug
- African Forum of Utility Regulators: www.afurnet.org
- Centre of Regulation and Competition: www.competition-regulation.org.uk
- The Global Regulatory Network (GRN) strengthens regional associations and promotes the understanding of complex regulatory practices: www.globalregulatorynetwork.org

GLOSSARY/DEFINITION OF KEY CONCEPTS

<i>Demand-side management</i>	The planning, implementation and monitoring of utility activities designed to encourage consumers to modify patterns of electricity usage, including the timing and level of electricity demand.
<i>Deregulation</i>	The process of removing or reducing regulation. It is often employed in connection with the liberalization process for privatized industries.
<i>Distribution</i>	The transport of low voltage electricity. This connects the transmission network with the majority of electricity consumers. Management of distribution is a natural monopoly due to the economies of scale inherent to it.
<i>Distributed generation</i>	Essentially any generator which connects directly to the distribution (low voltage) electricity grid rather than the transmission (high voltage) grid.
<i>Distribution network operator</i>	The owner of the physical network providing electricity at low voltages. Generally connects the transmission grid to the majority of consumers, though some larger consumers may connect directly to the transmission grid.
<i>Economies of scope</i>	Economies of scope are conceptually similar to economies of scale, primarily referring to efficiencies associated with demand-side changes, such as increasing or decreasing the scope of distribution of different types of products. In the context of this module they refer to the potential for distribution and transmission system operators to provide two or more services more cheaply than if either was provided by a single company.
<i>Economies of density</i>	Economies of density in the context of this module imply that one single transmission and distribution system as a natural monopoly is the cheapest option for the community that the system covers
<i>Energy services</i>	The provision of energy supply and measures concerned with end-use in a single package.
<i>Generation</i>	Generation of electricity (power) from energy sources. These can be oil, gas, coal, fission, wind, waste, biomass, etc.

<i>Horizontal integration</i>	One company controls a significant fraction of the market for one function, for example, all of the supply of electricity to consumers.
<i>Liberalization</i>	Technically, the removal of restrictions on the movement of capital. It has come to refer to a policy of promoting liberal economics by limiting the role of government in the operation of the market economy. Liberalization can include privatization and deregulation/re-regulation. Typically, it refers to the establishment of an industry structure to allow competition. The process includes the shifting of publicly owned companies into the private sector, such that provision of services is subject to greater competition or, in the case of natural monopolies to greater oversight with regard to economic efficiency.
<i>Monopoly</i>	The situation wherein one company has the market power to control the price or availability of a good or service. If this is unregulated, the company is likely to produce fewer goods or to sell goods more expensively than would be the case in a competitive environment. In practice, a monopoly may refer to an industry where one company has power to control the sector regardless of other companies or it may refer to a sector where only one company exists. It should be noted that outside natural monopolies, few monopolies are absolute and that even dominant companies may be subject to pressures on their price setting or limiting of supply. The effects of monopoly, including natural monopoly, on welfare can be limited by appropriate regulation.
<i>Performance-based regulation</i>	Regulatory approaches rely on the application of financial incentives and disincentives related to specific outputs to induce desired behaviours on the part of regulated companies. PBR links company outputs to revenue and can be applied to achieve benefits such as increased innovation, increased standards for quality of supply, reduced losses and a range of other things which are perhaps otherwise not addressed by regulatory approaches such as rate-of-return.
<i>Price capping</i>	The application of a limit on the prices that a utility may charge in a given regulatory period. A regulator sets the amount with the aim of taking into account the increases in productivity expected of the sector in comparison with the ongoing inflation in the economy as a whole. Price capping will often be used in conjunction with benchmarking in order to allow the regulator to assess more easily the levels of productivity that a company should be achieving.

<i>Price regulation</i>	Regulation wherein utilities are incentivized to maximize their efficiency in order to maximize their profits. Prices are regulated but profits are not. The usual form is to allow prices to rise by an amount related to inflation minus an efficiency factor—if this factor is large enough prices would actually have to fall. The main criticism is that it can allow companies to make unreasonably high profits if the efficiency factor is set too low. It originated in the United Kingdom as RPI-X (retail price index less the expected future productivity gains (the X)). It is usually differentiated from the rate of return regulation.
<i>Privatization</i>	The process of moving a body or institution from ownership in the public sector to ownership in the private sector. This can be carried out using different processes, for example, the sale of shares to the general public or the sale of the whole company to a specific bidder.
<i>Quota mechanism</i>	More generally known as a Renewable Portfolio Standard or as an obligation mechanism.
<i>Regulation</i>	Controlling or directing in accordance to rules, conventions or law.
<i>Supply</i>	The selling of electricity to consumers (also called retail).
<i>Sustainable energy</i>	The term sustainable energy usually encompasses two parts: Renewable energy and energy efficiency.
<i>Tariff mechanism</i>	A mechanism to encourage the growth of renewable energy generating capacity. Notable examples are Denmark and Germany. A tariff mechanism generally provides a particular rate per kWh of electricity generated and guarantees that payments will continue for a fixed or minimum period. The tariff can be fixed beforehand, or can be fixed to reduce in specific gradations over time or can be linked to the average electricity tariff. Also known as a price mechanism.
<i>Transmission</i>	The system of connections carrying high voltage electricity, i.e., transport of high voltage electricity.
<i>Vertical integration</i>	Two or more functions are under the ownership of one company or agency, for example, generation and transmission.

Case study 1.

ZAMBIA ENERGY REGULATION BOARD

CONTENTS

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1. BACKGROUND

Prior to the change of Government in 1991, state-owned companies (usually monopolies) operating under extensive Government control characterized the Zambian economy.

When the current Government assumed power in 1991, new economic liberalization policies were adopted leading to the promulgation of new legislation. In the energy sector, a new ministry responsible for energy was created (the Ministry of Energy and Water Development). The National Energy Policy was formulated and adopted in 1994, followed by enactment of the Electricity Act and the Energy Regulation Act in 1995.

The Energy Regulation Board (ERB) started operating in February 1997 following issuance, by the Minister of Energy, of the statutory instrument No. 6 of 1997, the Energy Regulation Act (Commencement) Order of 27 January 1997. By the year 2000 the ERB had undertaken several capacity-building activities, developed into a strong regulatory authority and was well recognized both by the Zambian stakeholders and the international community.

This case study outlines some of the factors which contributed to the successful establishment and development of the Zambian Energy Regulation Board.

2. POLICY AND REGULATORY FRAMEWORK

The Zambian National Energy Policy of 1994 (NEP 1994) clearly states the Government's intention to liberalize the energy sector. In order to achieve this, the policy identified the need to establish an independent energy regulatory authority.

The Energy Regulation Board was created under the Energy Regulation Act, Chapter 436 of the Laws of Zambia. Some of the provisions in this legislation which contributed to the successful establishment and development of the ERB are as follows:

- Establishment of ERB as an independent statutory body and the sole licensing authority for operators in the energy sector (i.e. electricity, petroleum, renewable energy and other forms of energy).

- ERB Board members (regulators), appointed on a professional basis, do not represent any stakeholder interests, serve a specified fixed term(s) and the basis for their removal from office is clearly stated in the legislation. Once appointed, the Board operates independently in its decision-making based on the governing legislation.
- Provision for earmarked funding in form of a percentage of energy cost passed on to the consumers.

3. INSTITUTIONAL CAPACITY-BUILDING

The successful establishment and development of the ERB was a direct consequence of the Zambian Government's deliberate policy and political will to establish an independent regulator.

With the policy and legislation in place, the Board was appointed in February 1997 and the ERB became operational immediately. At that time, the only other known energy regulator in sub-Saharan Africa was the National Electricity Regulator (NER) of South Africa. NER was equally new and only regulated the electricity sector.

Supported by strong political will and legislation, the ERB embarked on an aggressive capacity-building programme. Some of the notable capacity-building activities carried out were as follows:

- With World Bank funding, some Board members (including the Chairman) attended the 2nd International Training Program on Utility Regulation and Strategy offered by the University of Florida (USA) in June 1997. This course equipped the Board members with useful knowledge on how regulatory institutions function and also provided strategic guidance on how to develop the ERB.
- The ERB engaged short-term international consultants to help with the drafting of temporary licences in order to conform with the requirements of the Energy Regulation Act which required that all operators in the energy sector be licensed by the ERB. The World Bank funded this activity. By December 1997, ERB had licensed the first private electricity company in Zambia, Copperbelt Energy Corporation (CEC). ERB had also issued temporary licences to the state-owned electricity utility company, ZESCO Ltd and all major operators in the Petroleum subsector. This activity enabled ERB to start collecting licence fees from the licensed undertakings.
- By the beginning of 1998, ERB had established a steady cash flow stream from licence fees. This enabled the Board to engage consultants to help with the development of a human resource manual, the organizational structure and the

staff recruitment process. This activity was completed by June 1998 with a staff compliment of about 25. The ERB Board decided to offer a competitive salary structure based on the Zambian private sector average. This way ERB was able to attract qualified professionals from both the private and public sector.

- It is worth noting that none of the recruited members of staff had previous regulatory experience since the profession was new to this part of the world. With funding from the World Bank, international consultants were engaged to train all ERB staff. In addition, all ERB staff were sent on educational tours to various regulatory institutions around the world. Countries visited included Australia, Canada, Jamaica, Philippines, South Africa, United Kingdom and the United States. This activity was executed between June 1998 and December 1998.
- In 1999, the Swedish International Development Agency (Sida) provided funding for further capacity-building activities and logistical support to the ERB. With this funding, more training programmes were conducted and study tours organized to Finland, Norway, South Africa, Sweden and the United Kingdom for all ERB staff. Further, international consultants were attached to the ERB to help with drafting of permanent licences under the same Sida support. By the end of 1999, all staff members had received adequate training, visited other regulatory agencies around the world and could now confidently perform their regulatory functions.
- At the beginning of 2000, USAID funded the twinning arrangement between two United States regulatory agencies and the ERB for an initial period of two years. The assistance also included other capacity-building activities.

As a result of the above-stated capacity-building activities, ERB quickly developed into a strong regulatory authority with strong expertise, competency, independence and accountability. Within the first three years of being established, ERB handled several regulatory functions such as tariff adjustment cases, drafting of technical standards, public hearings, technical support to the Government and licensed all operators in the energy sector.

In order to promote the development of renewable energy, the ERB initiated zero-rated licence fees for this subsector. This measure is still on going. The ERB also recommended to Government to remove import duty on imported renewable energy products. This measure is also still ongoing but does not apply to solar panel batteries and some components which are not renewable energy specific.

As a first mini grid using small hydro in Zengamina is urging ERB to decide on tariff options and principles, ERB is currently considering different tariff setting options for renewable energy applications. At least three more mini grids (using biomass, small hydro and PV) are expected to be operational by 2009. In November 2007 a workshop was organized in Lusaka in order to provide ERB with expert knowledge on tariff setting options and methodologies, as well as to facil-

itate discussion with stakeholders which included communities, civil society, private and public sector (including Ministries of Energy & Water Development, and Finance), ZESCO, the Rural Electrification Authority, ERB, Development Bank of Zambia, UNIDO, UNDP and international cooperating partners.

On the international level, ERB and NER (South Africa) initiated the SADC Regional Electricity Regulatory Authority (RERA). Initial conferences were co-chaired by ERB and NER in 1998 and 2000. The ERB also participated in the launch of the African Forum for Utility Regulators (AFUR) in 2000.

4. FOLLOW-UP ACTIVITIES

The ERB has continued with capacity-building programmes. In 2003, the Government amended the Energy Regulation Act in order to further strengthen the ERB. Some of the key amendments were:

- Stiffer penalties for contravention of the provisions of the act. This has made ERB stronger and more effective.
- Provision for appeal to the High Court of Zambia should a person be refused a licence by ERB. This has made ERB more accountable.
- Additional reporting requirements by licensed undertakings. This has given ERB more authority to enforce compliance.
- Restructuring the composition of the Board and provision for appointment of the Executive Director as chief executive of the Board.

It is the desire of the Government of the Republic of Zambia to strengthen the role and independence of the energy sector regulator. In 2005, the Government engaged a consultant to review and define the relationship between the Government and the ERB. This review is also intended to ensure that the ERB is not only independent but also accountable. The consultant has submitted a draft final report, which Government is currently studying (March 2006). Key elements of the report include:

- Definition of the role of the regulator based on international best practice;
- Definition and separation of policy and regulatory functions;
- Review of the performance of the ERB.

It is the intention of the Government to review the regulatory framework in the future, taking into account the recommendations of this report.

5. CONCLUSIONS/LESSONS LEARNED

The most important lesson from this Zambian ERB case study is that to build a successful independent regulatory authority, a country should ensure that there is strong political will, a clear policy, supporting legislation and appropriate institutional arrangements such as independence, earmarked funding, accountability, credibility, no regulatory capture, competency, regulators appointed on a professional basis and no arbitrary removal of regulators.



renewable
energy
& energy
efficiency
partnership

SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Energy Regulation

Module 3: INTRODUCTION TO ENERGY REGULATION

Module 3



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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Module overview

- Regulation is designed to address market failures
- There are many models of regulation:
 - Command and control
 - Self-regulation
 - Incentive-based regulation, etc.
- Regulation can be carried out by different institutions
- Sustainable energy raises new issues for policymakers and regulatory bodies
- Pros and cons of different types of regulation
- Examples of regulation in Africa

Module 3



SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Module aims

- To introduce the concept of regulation
- To show that there is no “ideal” way to regulate
- To outline some bodies involved in regulation of energy
- To outline some basic methods of regulation
- To outline the new issues raised by the development of sustainable energy

Module 3



SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Module learning outcomes

- To be able to define regulation
- To understand the role of regulation in a market system
- To understand that there are different ways to regulate and different bodies that can be involved in regulation
- To describe and assess the advantages and disadvantages of some common types of electricity regulation such as command-and-control, self-regulation, regulation-by-contract and incentive-based regulation mechanisms.
- To appreciate some of the basic issues that sustainable energy can raise in relation to regulation

Module 3



SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Reminder!

- The aim of this module is to provide general background and information—and to provoke discussion
- No two countries are the same, so there is no single “ideal” solution for energy regulation

Module 3



SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Why regulate?

- To address market failure
- To ensure most efficient allocation of resources
- To ensure proper competition
- To prevent the growth of a dominant group (monopoly)
- To keep prices down (protect the consumer)

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Why regulate? (2)

- Motives for regulation in competitive markets:
 - Economic efficiency
 - Consumer protection
 - Environmental protection
 - Social justice
 - Security of supply
- Most of these could also apply to non-competitive markets

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

What can be regulated?

- The design and degree of regulation depends on the structure of the industry:
 - Public or private
 - Level of competition
 - Degree of integration
 - Ownership
 - Degree to which system is established or developing
- Functions of the electricity system which are regulated:
 - Generation
 - Transmission
 - Distribution
 - Supply (often called retail)

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

What can be regulated? (2)

- Some challenges for the developing electricity structures of Africa:
 - Poor financial performance of state-owned utilities
 - Inappropriate pricing
 - Managerial and technical deficiencies
 - Unsustainable subsidies
 - Limited private sector participation
 - Limited access to investment
 - Low levels of access to services

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Who regulates?

- Government—issues of democratic control and legitimacy
- Independent body—in theory free from political interference, but can lack accountability
- Semi-independent body
- Other bodies that may be involved in regulating an industry:
 - Government departments, energy regulatory agencies, competition regulators, environmental regulators, local authorities, courts and tribunals

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Questions/Activities

“Competition is the best regulator”

Discuss

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types of Regulation

- Command-and-control
- Self-regulation
- Incentive-based regulation
- Market-based controls
- Other:
 - Disclosure
 - Direct government action
 - Rights and liabilities
 - Public compensation

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types: Command and Control

- Imposing rules and standards backed up with criminal sanctions

Strengths	Weaknesses
<ul style="list-style-type: none"> • Fixed performance standards backed up in law • Clear definition of unacceptable behaviour • Seen as politically decisive 	<ul style="list-style-type: none"> • Close relationship between regulator and business could lead to “capture” • Can be complex and legalistic • Defining acceptable standards can be difficult

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types: Self-regulation

- Organization or association setting rules which it monitors and enforces with its members (often to avoid or delay government action)

Strengths	Weaknesses
<ul style="list-style-type: none"> • Can be well-informed, with a high level of commitment from firms • Cheap for government • Easy to change to fit circumstances • “Realistic” standards 	<ul style="list-style-type: none"> • Could be self-serving/undemocratic • Legalism not necessarily avoided • Weak enforcement/independent oversight difficult

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types: Incentive-based Regulation

- The use of taxes or subsidies/grants to encourage compliance

Strengths	Weaknesses
<ul style="list-style-type: none"> • Low regulatory discretion • Allows choice for regulatees • Low enforcement costs 	<ul style="list-style-type: none"> • Rules may be complex and inflexible • Assumes economic rationality – not always the case • Difficult to predict impact • Rewards polluters

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types: Market-based

- Channelling market forces to influence competition (competition laws; tradable permits, disclosure etc)

Strengths	Weaknesses
<ul style="list-style-type: none"> • Firms respond to market not bureaucrats • Applicable across sectors • Flexibility • Low enforcement costs (disputes resolved by participants) 	<ul style="list-style-type: none"> • Uncertainties and transaction costs • Reliability of information • Lack of response in crisis • Needs healthy permit market • Can create barriers to entry

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Types: Other Mechanisms

	Strengths	Weaknesses
<u>Direct action</u>	State can plan long term, “acceptable” infrastructure	Costly, can involve contentious subsidies
<u>Rights/liabilities law</u>	Low intervention	Costs to individuals, evidential and legal difficulties
<u>Public compensation</u>	Firms aware of costs	Monitoring performance difficult

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

Examples for Africa

- Energy regulation in Zambia
 - An independent regulatory body
- Water regulation in Uganda
 - Regulation through a Government Ministry

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**SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA**

Regulatory Issues for Sustainable Energy

- Direct impact on developments in an energy system through the provision and regulation of incentives:
 - Support for renewable energy systems
 - Operation of demand-side management programmes
- Addressing rules and practices that favour one technology over another
- Maintain quality of supply
- Change rules governing connection and performance

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**SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA**

Regulatory Issues for Sustainable Energy (2)

- Generation
 - Market rules for trading electricity
 - New entry
 - Adoption of new technologies, etc.
- Transmission and distribution
 - Ensure efficient operation
 - Connections and costs, etc.
- Supply
 - kWh versus energy services
 - Demand-side management (DMS)

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SUSTAINABLE ENERGY REGULATION AND POLICYMAKING FOR AFRICA

CONCLUSIONS

- Main aim of regulation is to address failure of markets to delivery desired goods and services – whether economic, social or environmental
- Each type of regulation has some advantages and disadvantages
- No two countries are the same, so there is no single “ideal” solution for energy regulation
- Regulation needs careful design to achieve a more sustainable energy system
- Care must be taken went setting the “rules” for regulation
 - To avoid favouring utilities over customers or vice versa
 - To avoid unexpected market distortions

