Lecture - 12

Energy Policy

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Outline

- ✓ Energy issues and global energy policy
- ✓ Energy policy process
- ✓ Energy policy goals/objective
- ✓ Energy regulation
- ✓ Energy policy instruments

Energy issues and global energy policy

The energy issues for developing countries

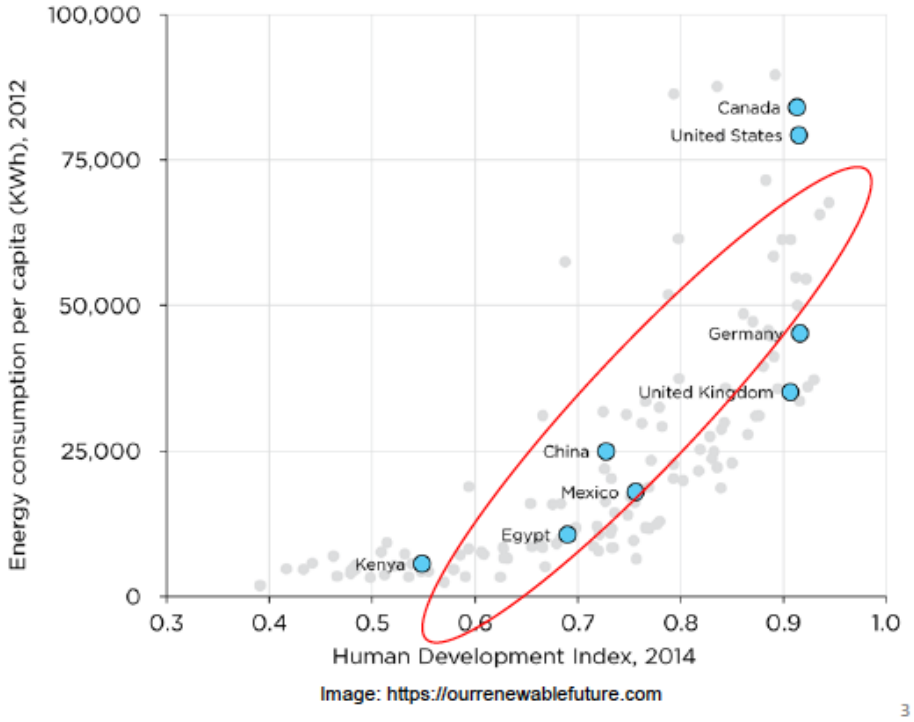
The main challenges in the energy sector still lie in ensuring

- ✓ universal access to electricity, and clean cooking and heating options for all households;
- ✓ energy security to support economic growth;
- ✓ sustainability across the dimensions of financial viability, effective operation and maintenance of infrastructure, resilience to climate change and extreme events, climate mitigation via lower-carbon use, health, and environmental impacts; and
- ✓ sector governance, including regulations, utilities' performance, and private sector participation.

Source: ADB

Energy and development

- Energy use directly linked with human development index
- HDI is based on:
  - life expectancy
  - education
  - income



Source: Behnam Zakeri, TU Wien

Energy access

- No access to electricity:

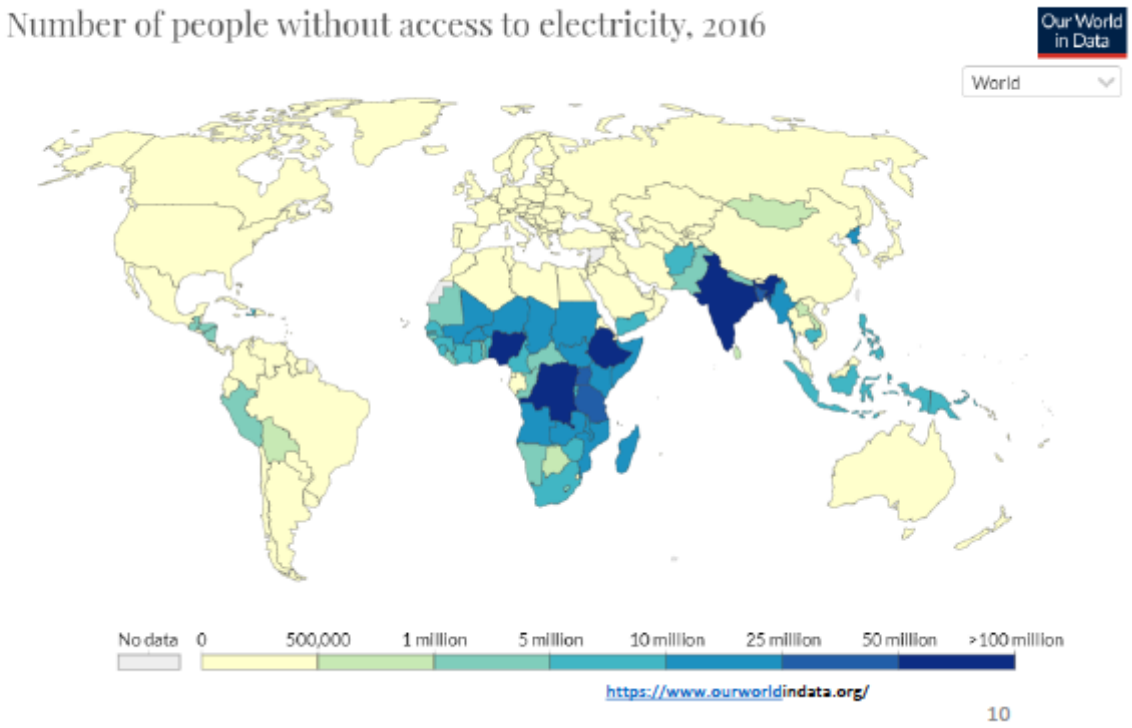
Almost 940 million people

- Not being able to pay the bill

(80 million people in Europe can't afford paying heating bills)

- The situation improving

in some regions yet a lot to do



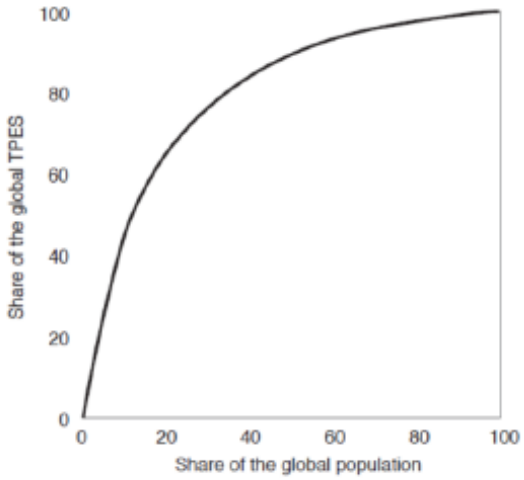
Source: Behnam Zakeri, TU Wien

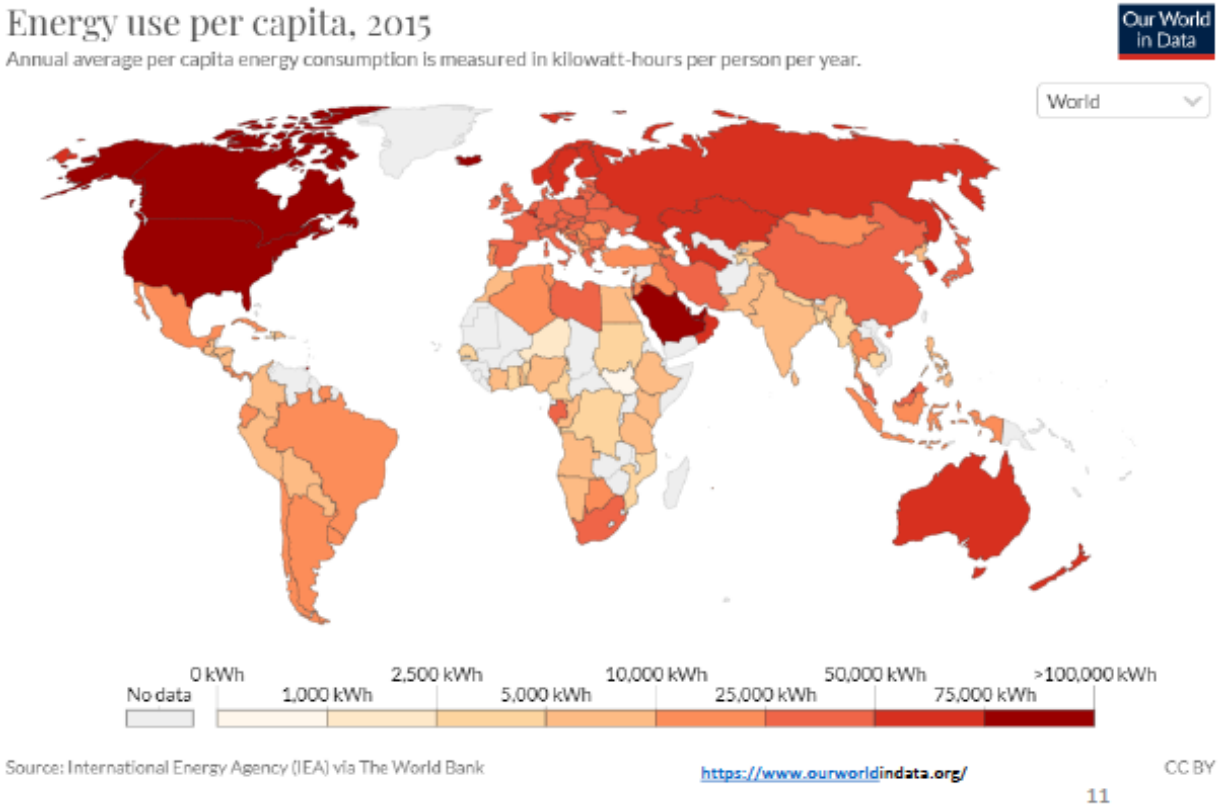
Energy justice

20-80% Dilemma:

20% of world population uses

80% of energy resources





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Source: Behnam Zakeri, TU Wien

Energy poverty: lack of access to affordable, modern energy

- **Cookstove Smoke, the biggest environmental threat:**

3.5 million people die each year from indoor air pollution from wood and biomass cookstoves (women and children) India 705 and China 612 million people lack clean fuel for cooking/heating. 3.5 billion (40% of the world) do not have access to clean fuels for cooking

- **Energy Scarcity while there is plenty**

Energy-rich country like Nigeria has 82.4 million with no Access to electricity and 117.8 million rely on wood and biomass

Source: Behnam Zakeri, TU Wien

Different views on energy transitions

Topic	Post-Industrialized world	Economies in transition
Access to energy	Basic need	Luxury
Cost of energy	Affordable/cheap	Expensive
Reliability of energy	Reliable (convenient)	Unreliable
Choice of energy	Possible based on different tariffs and environmental impact	No option
Energy security	Regional/international cooperation	National independence
Energy sustainability	Driven by environmental dimension	Driven by economic aspect
Energy policy makers	Providing options based on public interest (Green movements)	Preventing system collapse and social unrest
Energy and climate change	Public policy, driver for change	Sever impacts, caused by industrialized world
International climate agreements	The way to resolve the global problem	A new way of limiting national sovereignty and development

Source: Behnam Zakeri, TU Wien

Key term and mechanism of global energy policy

Key Terms

Policy
Set of ideas or plans used for making decisions, especially in politics, economics, or business

Politics
Process of determining who gets what, when, and how

Political Power
Ability to change (or prevent change) to conditions and processes shaping policy

Typical Policy Attributes

Jurisdictional Boundary
Defined scope of a policy

Record of Decision
Formal record of decisions that govern oversight and implementation of a policy

Enforcement Provision
Identification of the ramifications that may occur in cases of policy non-compliance

Assigned Authority
Identification of who has the ability to oversee the policy

Covered Entity
Identification of who is subject to the policy and who may be exempt

Compliance Obligation
Specifications regarding how the policy is to be enforced

Examples of Policy Mechanisms

Subsidy
A sum of money granted by the government or a public body to assist an industry or business

Rebate
Partial refund to someone after paying for goods or services in order to make the sale more attractive; does not require filing of taxes

Loan
When the government guarantees loans issued by banks or makes loans from its own loan office

Tax Credit
An amount of money that certain taxpayers can subtract from the taxes they owe

Grant
A sum of money granted by the government or a public body for a defined purpose

Carbon Tax
Puts a price on emissions to encourage consumers, businesses, and governments to produce less of them

1970: **Treaty on the Non-Proliferation of Nuclear Weapons (NPT)**	• Aims to prevent the spread of nuclear weapons and weapons technology • Promotes cooperation in the peaceful uses of nuclear energy
1973: **MARPOL (International Convention for the Prevention of Pollution from Ships)**	• Convention adopted by the International Maritime Organization (IMO), a specialized agency of the United Nations • Covered the prevention of pollution of the marine environment by ships from operational or accidental causes
1987: **Montreal Protocol**	• International treaty designed to protect the ozone layer • Phases out the production of numerous substances that are responsible for ozone depletion
1988: **Intergovernmental Panel on Climate Change (IPCC)**	• Created by the United Nations Environment Programme and the World Meteorological Organization • Goal is to provide governments at all levels with scientific information to develop climate policies • Provides comprehensive Assessment Reports for governments
1997: **Kyoto Protocol**	• Operationalizes the United Nations Framework Convention on Climate Change • Commits industrialized countries and economies in transition to limit and reduce greenhouse gas (GHG) emissions in accordance with agreed individual targets • Legally binding agreement with specific targets but no time frame
2015: **Sustainable Development Goals**	• A collection of seventeen interlinked objectives from the United Nations • Serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future."
2015: **Paris Agreement**	• Legally binding international treaty • Sets out a global framework to hold "the increase of global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the increase to 1.5°C above pre-industrial levels" • Calls on all nations to develop Nationally Determined Contributions to reduce GHGs, not just developed nations

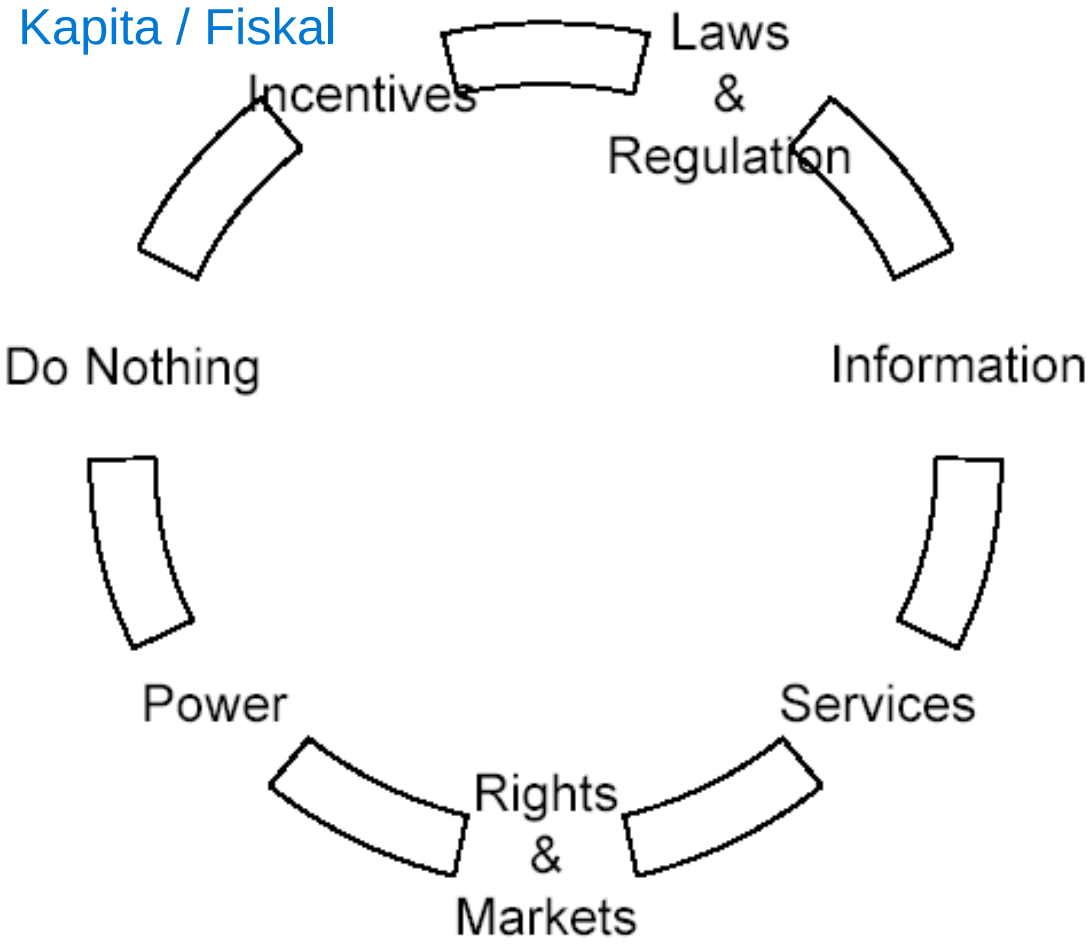
Source: Stanford Univ

Energy transition vs. transformation

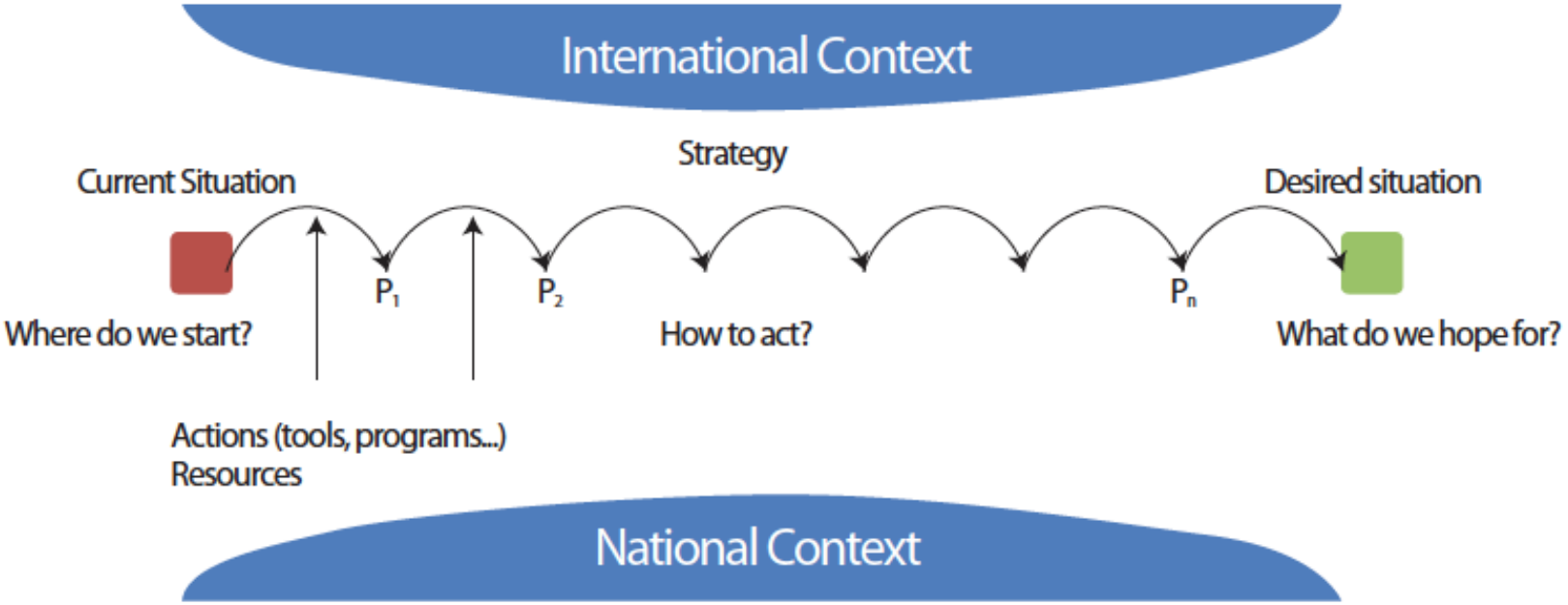
- “Change to physical forms and systems can be denoted as transformations, and that changes to large socio technical systems be denoted as transitions” (Child and Breyer, 2017).
- “Energy transition refers to the shift from fossil fuels to renewable energy sources, while energy transformation refers to the broader implications of this shift in the economy, society, policy.” (IRENA, 2019)

Energy policy process

Tools of government



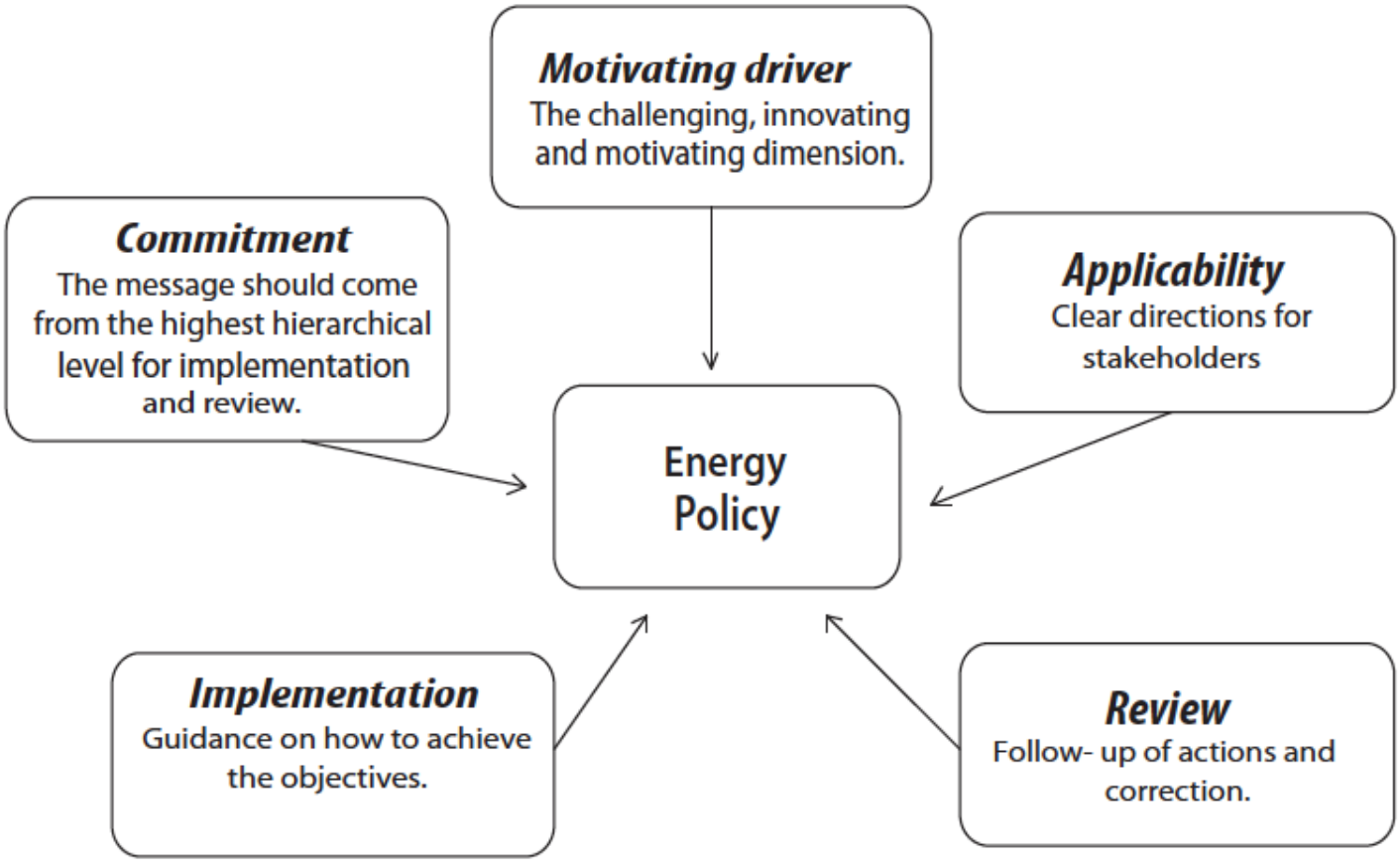
Main elements for defining a public policy



Source: OLADE *et al.*, 2003, p. 145[3]

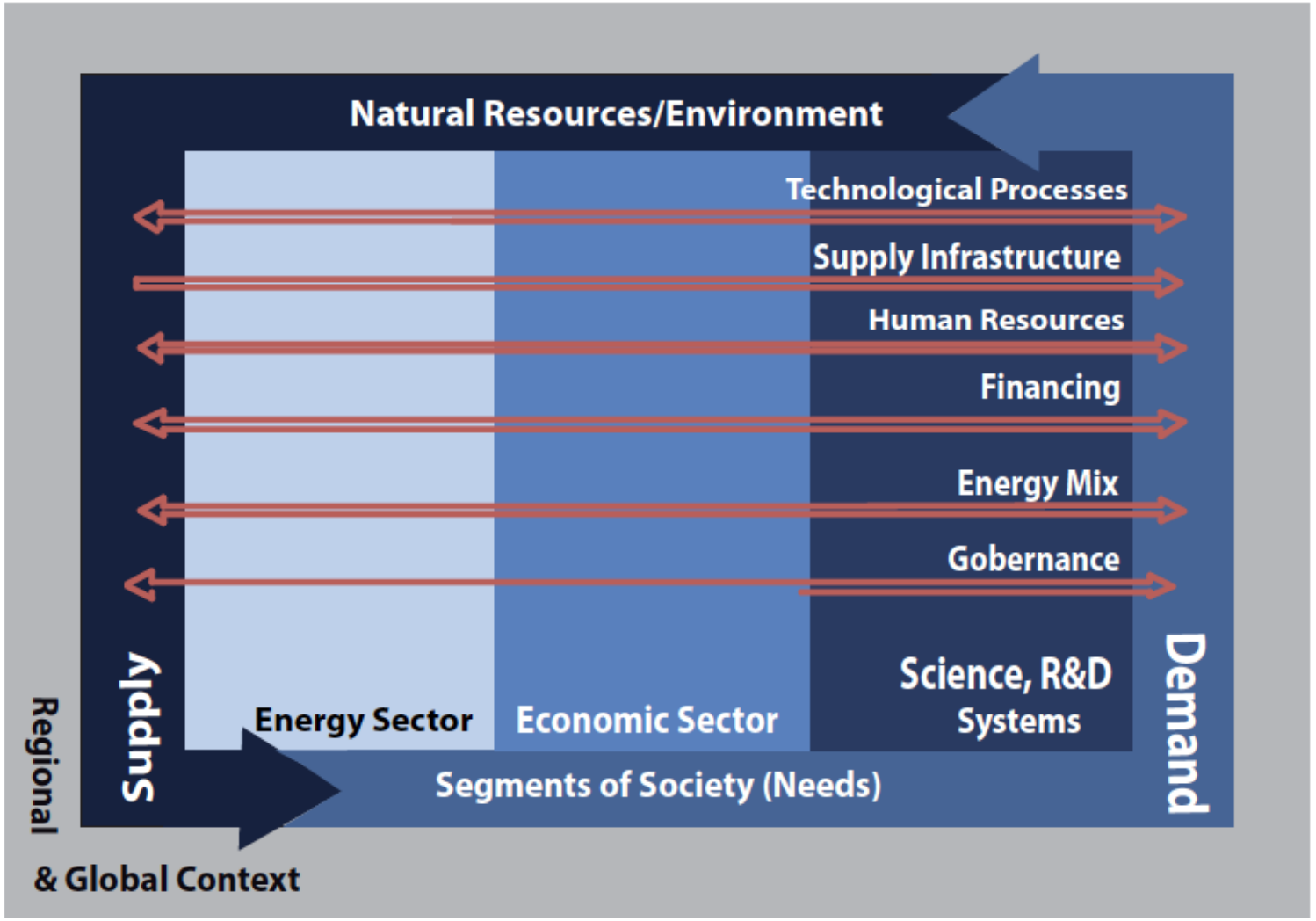
Source: OLADE, 2016

Key features of an energy policy



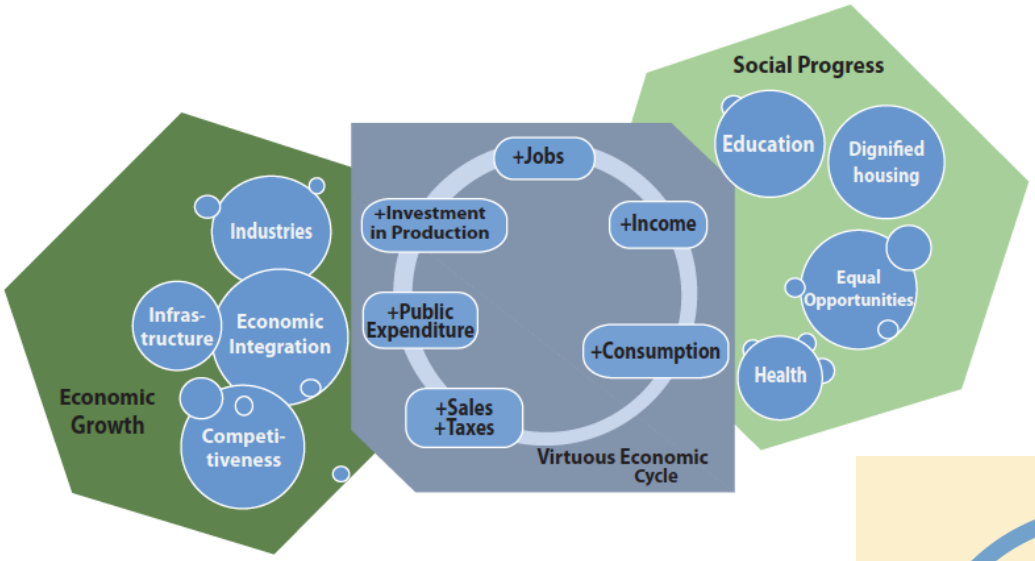
Source: OLADE, 2016

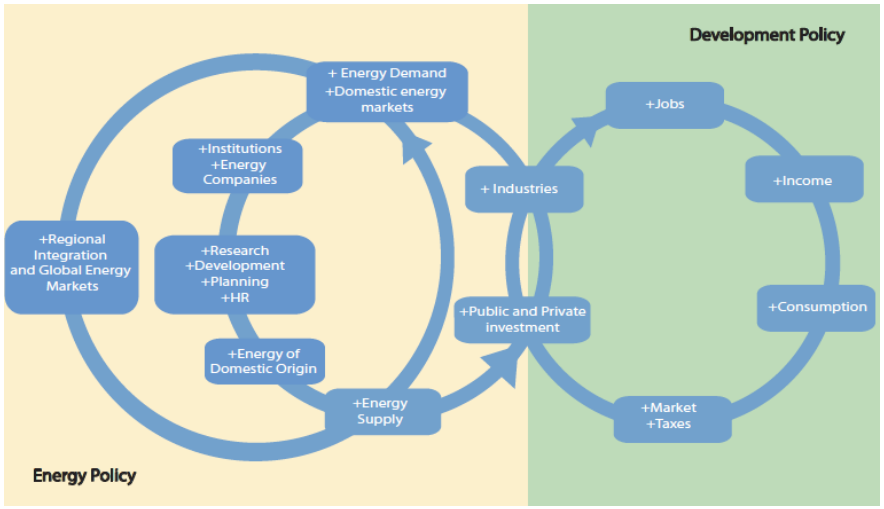
A systemic approach to the energy industry



Source: OLADE, 2016

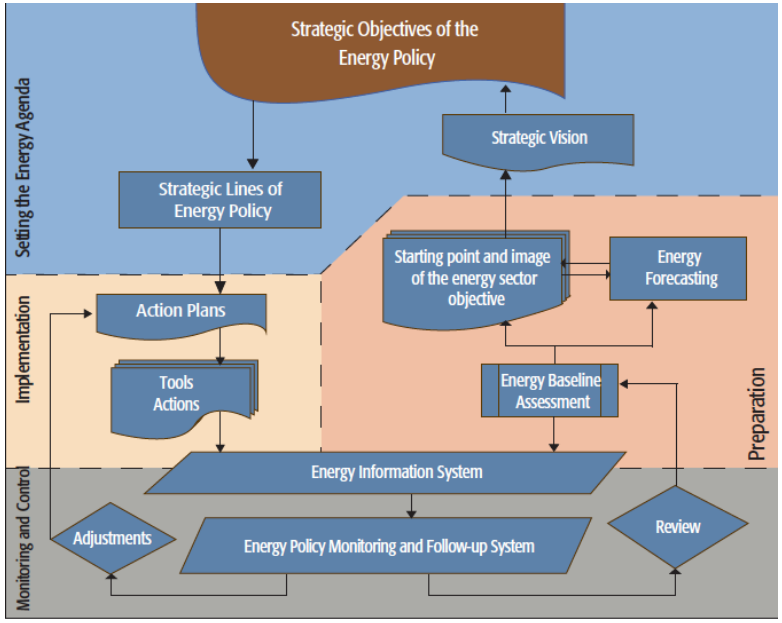
Economic cycle and its relation to energy policy





Source: OLADE, 2016

The Policy process with sections to be included in an energy policy



Step	Process	Outcome	*Question Answered*
1	Baseline Assessment	Building a Target Situation/ Image	What is the status of the energy sector? Supply, (sectoral) demand, Investment, pricing, regulatory framework, energy sector
2	Objectives	General objectives, specific objectives	What is to be achieved by implementing the policy?
		Prioritizing objectives	What is the order of priority of the objectives in achieving the policy vision?
3	Action Plan	Strategic Line	How do we intend to go from the current situation to the desired situation?
		Tool	How will the strategic lines be made operational?
		Action	What activities can put the proposed tools into practice? Or: What actions are needed to obtain a particular tool?
4	Monitoring and Review	Monitoring and Review System	How is implementation of the energy policy tools progressing? What have we learned and how can we improve?

Source: OLADE, 2016

Energy policy goals/objectives

SUSTAINABLE DEVELOPMENT GOALS

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

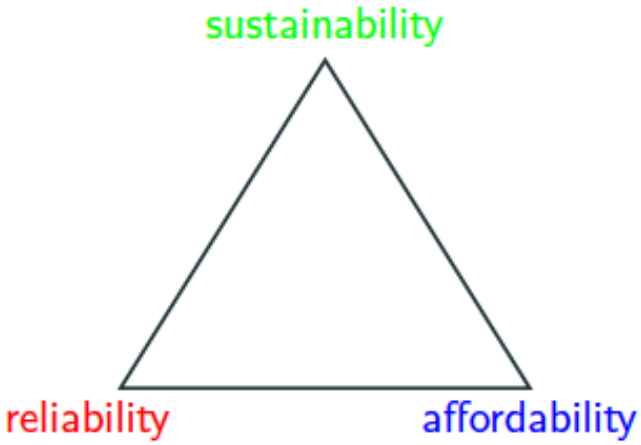
Objective of Energy Policy

- must be develop to meet the many interrelated and often conflicting overall national objectives as effectively as possible;

- promote economic development and growth, increase energy security, least cost of energy supply, improve the environment, energy sustainability (trilemma).

Element of Sustainable Development/Trilemma

What should a well-functioning energy system look like? We design with respect to three goals:



- **Sustainability**: Respect environmental constraints (greenhouse gases, air quality, preservation of wildlife), as well as social and political constraints (public acceptance of transmission lines, onshore wind, nuclear power)
- **Reliability**: Ensure energy services are delivered whenever needed, even when the wind isn't blowing and the sun isn't shining, and even when components fail
- **Affordability**: Deliver energy at a reasonable cost

Some of these policy targets can come into **conflict** - an **energy trilemma**.

Energy regulation

Why Regulate?

- Avoid monopoly
- Regulation: exclusive teritories, setting rate/tariff etc
- Who ragulates: Regulatory Commission or Gov.
- Regulatory process: rolemaking, rate cases, certificate cases, service standard, complaint cases

What is energy markets regulatory system?

- The energy markets regulatory system comprises the institutions and markets involved in the production, supply and consumption of energy and related services. It includes regulatory and non-regulatory measures supporting policy objectives including: reliability and security, competition, efficiency, access and affordability.
- The energy markets regulatory system includes the legislation, policy, rules and regulations for:
  - ✓ Electricity: generation, storage, transmission, distribution and retailing.
  - ✓ Gas: production, storage, transmission, distribution and retailing of natural gas and LPG.
  - ✓ Energy efficiency: provision of energy efficiency product standards and information for energy consumers.
  - ✓ Liquid fuel markets: importation, production, storage, distribution and retailing of refined oil products and other liquid fuel.

Why the energy markets system requires regulation

Natural monopolies	Economic regulation of electricity and natural gas network services with natural monopoly characteristics is warranted to prevent excessive prices and inefficiencies. Economic regulation seeks outcomes consistent with those in competitive markets, by promoting efficient allocation of costs and setting prices at a level that limits excessive profits but encourages efficiency improvements and appropriate investment.
Fuel quality	The chemical composition and performance of petrol is standardised and regulated for the protection of consumers and the environment. A consumer cannot determine the quality of the fuel before purchase (and in many cases, even after purchase), so Government regulation serves both to ensure the fitness of the fuel and to provide a signal of that fitness to consumers.
Gas emergency response	Arrangements to maintain safe pressures in gas transmission pipelines following an unexpected disruption (e.g. a leaking pipe) are regulated because prompt centralised decision-making is required to avoid free-riding and hold-out behaviour.
Common quality of electricity supply	Services that determine the voltage, frequency, and reliability attributes of electricity supply are a necessary part of the electricty system (i.e. are a public good that needs to be paid for). These services require regulation to ensure the services are provided, and to prevent free-riding or hold-out behaviour by market participants.
Information	Competition is strengthened when consumers have access to trusted information and tools to help them make informed decisions. Regulation can be used to reduce information barriers, and re-balance any information asymmetry between suppliers and consumers.

Energy regulation

Three basic principles

- independence,
- transparency, and
- investor and consumer protection.

Regulator tools and resources

- laws,
- financial resources, and
- high quality staff.

Functions of energy regulators :

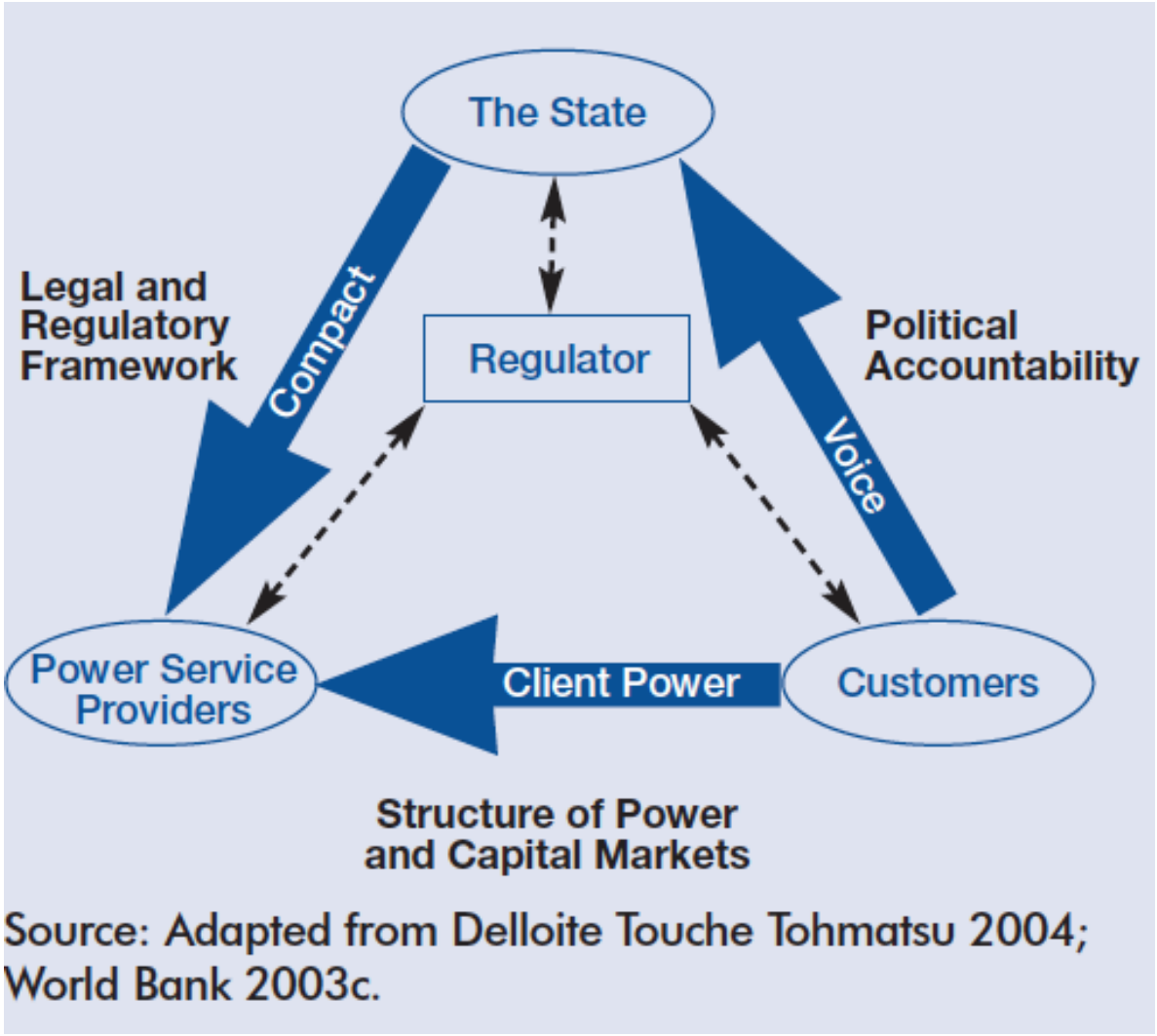
- to monitor competition in the energy market,
- to assist in the implementation and development of national and international energy policy, and
- to assist in the commercial development of energy sectors, particularly with regard to deregulation and wholesale markets.
- policy implementer,
- policeman,
- watchdog,
- instrument of industry accountability,
- communicator, and
- international policy integrator.

Source: Andreas Poullikkas, 2016

Players in energy businesses

- **Upstream oil and gas production.** This is the extraction of oil and gas out of the ground. Energy UK does not represent these activities.
- **Electricity generation.** Our electricity is generated using a range of fuel types at power plants including gas, wind, solar, nuclear, tidal, biomass. Learn more about electricity generation.
- **System operation.** The System Operator manages the actions happening across the energy system, including managing the many balancing markets to ensure system stability. Learn more about how the system works.
- **Transporting energy.** Gas and Electricity Transmission Network Owners move energy via pipes or wires for long distances around the country at high voltages. Electricity Distribution Network Operators (DNOs) and Gas Distribution Networks (GDNs) take energy from the transmission network and deliver it to homes and businesses. Energy UK does not represent DNOs or GDNs. Learn more about the energy networks.
- **Retail suppliers.** Retail suppliers supply electricity and gas to homes and businesses, and are responsible for sending bills and dealing with customer service inquiries, as well as delivering Government schemes including ECO and Warm Homes Discount. More about the energy retail market.

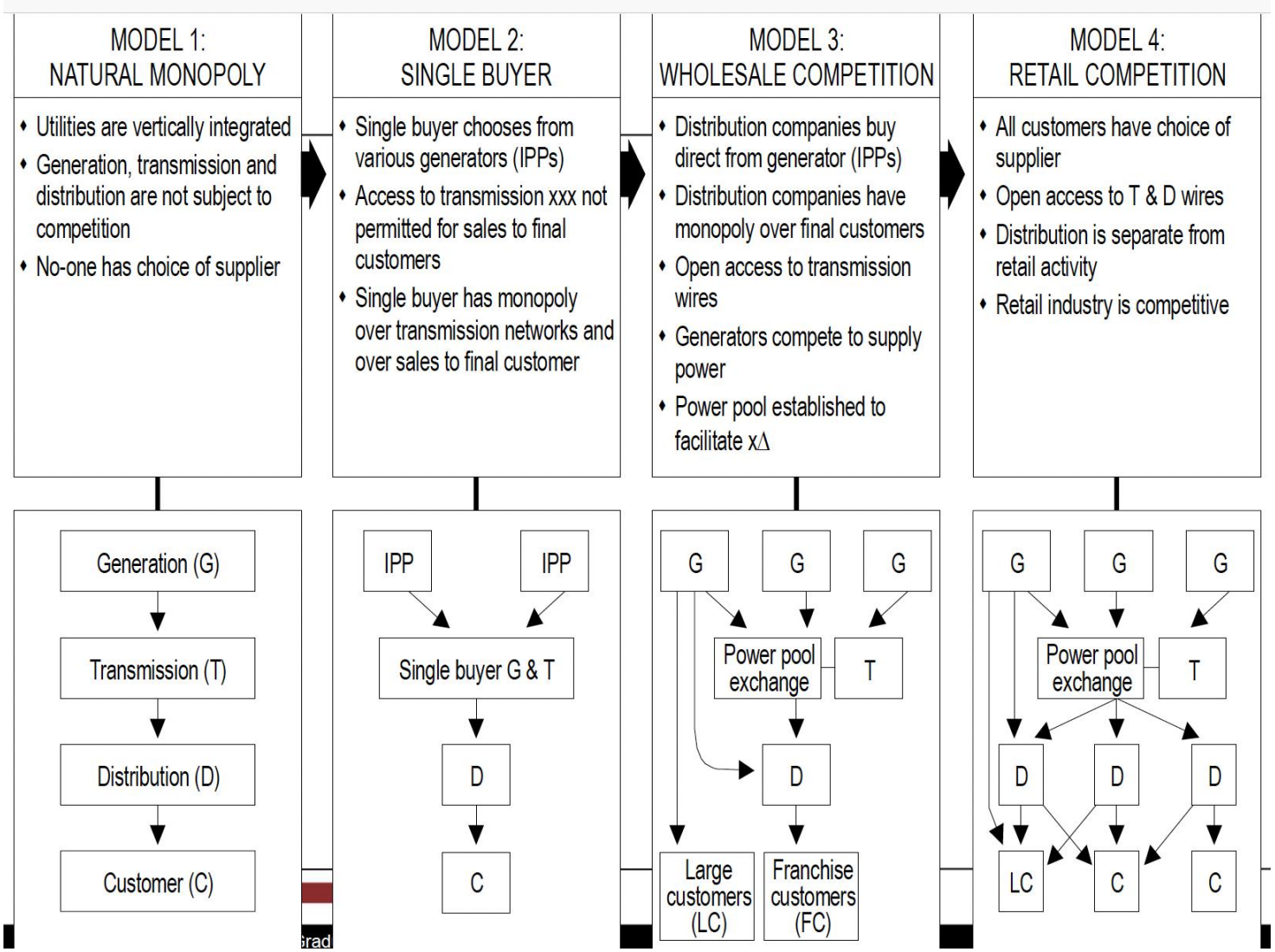
Power market governance framework



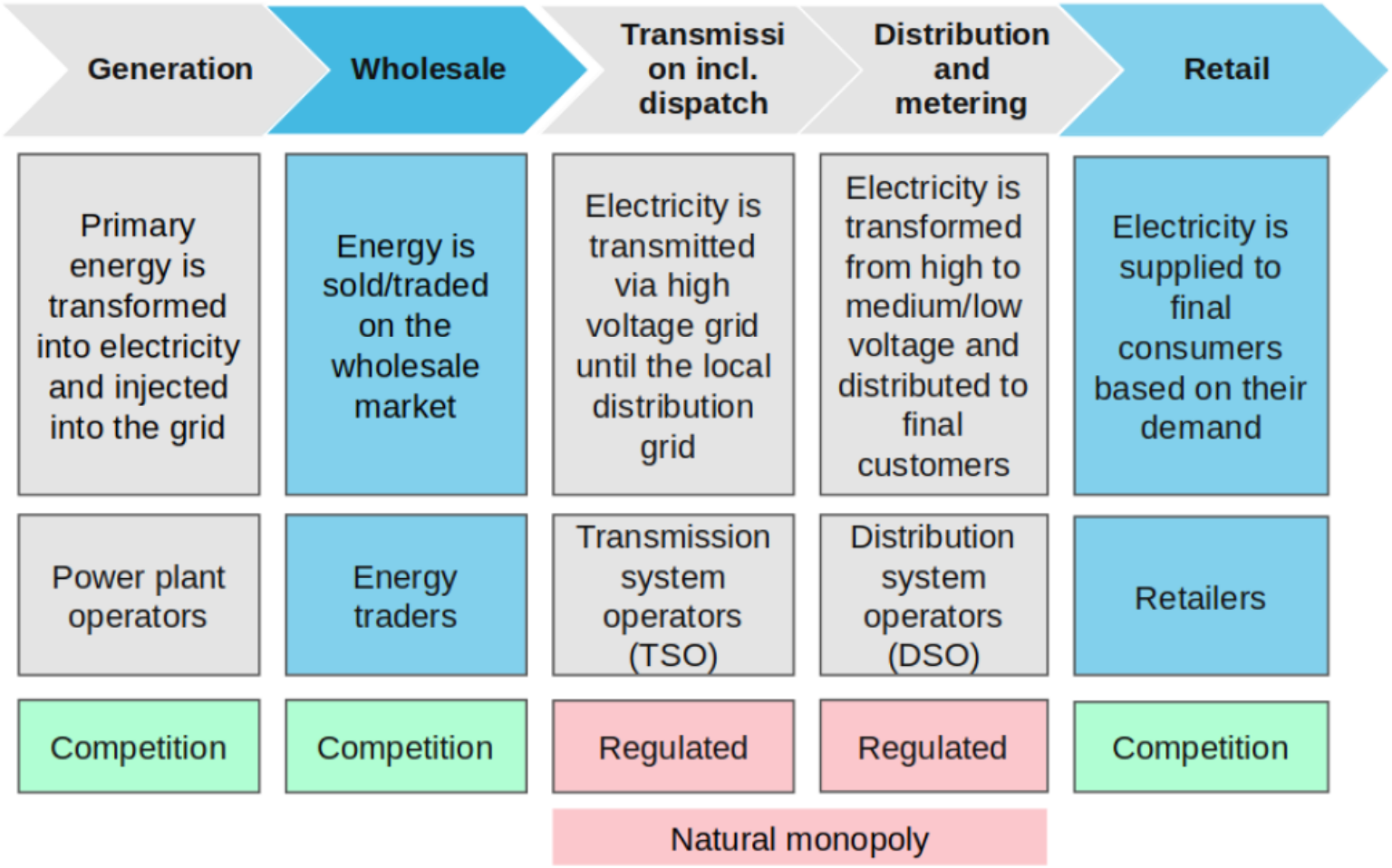
Source: Adapted from Delloite Touche Tohmatsu 2004; World Bank 2003c.

Source: WB, 2006

Power market structures



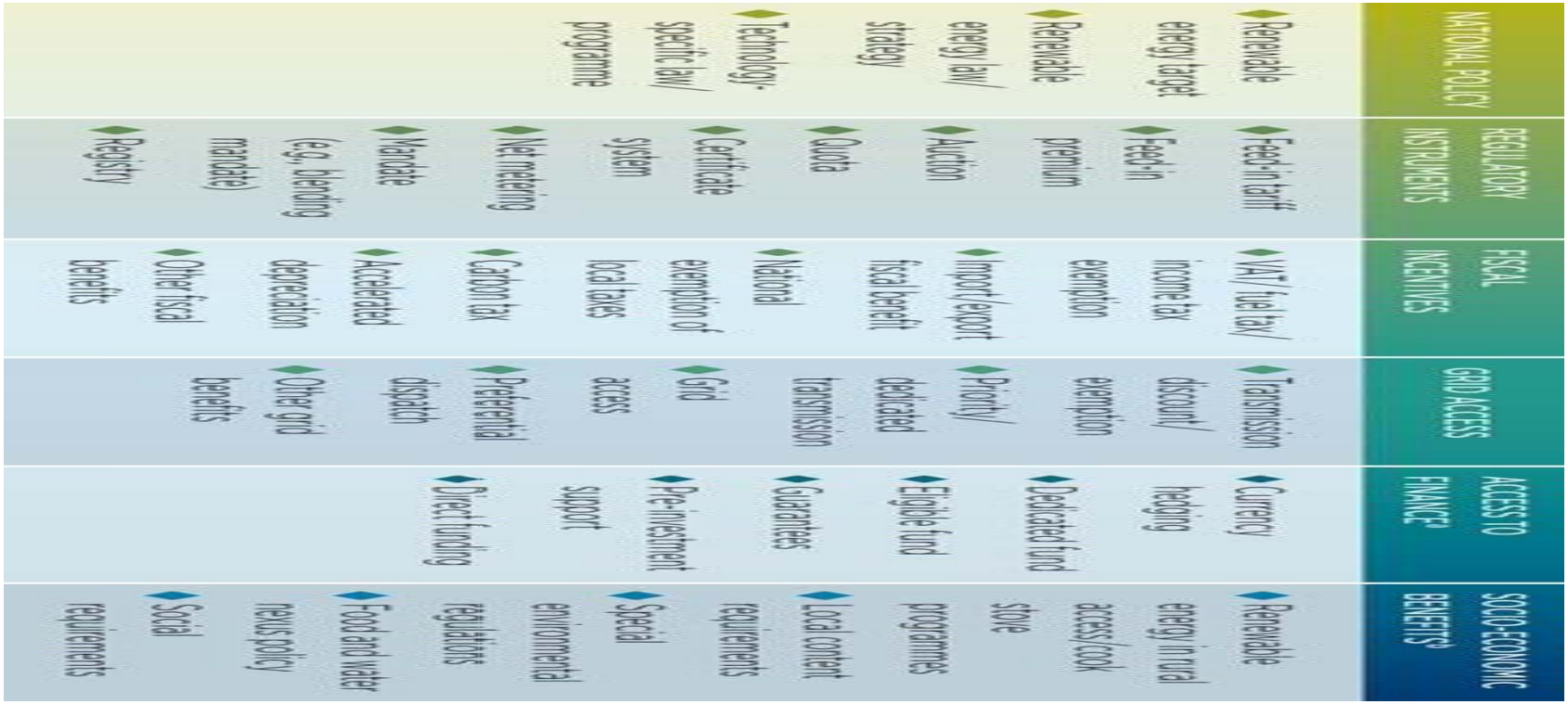
Electricity markets: main actors



Source: TU Berlin

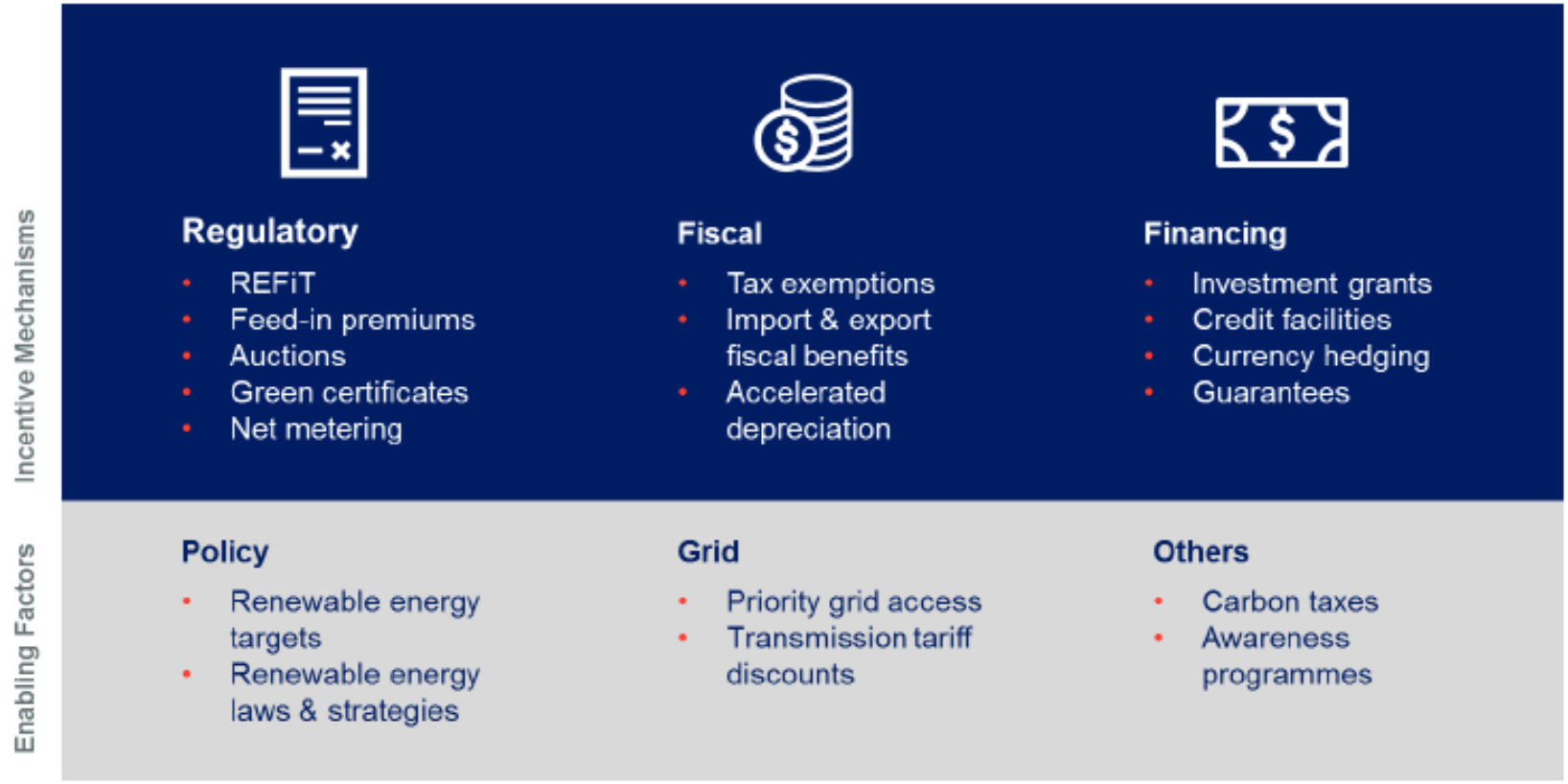
Energy policy instrument

Types of renewable energy policies and measures



Source: IRENA, 2017

Common incentive mechanisms for promotion of renewable energy



Source: Adapted from IRENA (2015)

Source: ESREM

Description of incentive mechansisms for the promotion of renewable enegry

Incentive Mechanism	Description
Regulatory incentive mechanisms	
REFiT and Feed-in premiums	A renewable energy feed-in tariff (REFiT) or premium offers cost-based compensation to renewable energy producers on top of the market price for electricity, typically per kWh produced. This provides price certainty and long-term contracts that may make financing more readily available. The main challenge is getting the tariff or premium level just right, and adjusting it as needed.
Auctions	An auction is a competitive process for procuring renewable energy generation capacity. In an auction, project developers bid against each other to supply energy through long-term contracts. Awards are generally made according to transparent criteria, including price. Auctions are often supported by other instruments, such as guarantees and other fiscal benefits.
Renewable Energy Certificates (or Green Certificates)	Renewable Energy Certificates are a market-based instrument that certifies that a MWh of renewable electricity has been generated. Certificate schemes typically include a quota requirement governing how many certificates end-consumers have to buy based on their consumption. The certificates are issued to generators, who in turn can sell them to end-consumers (typically represented by utilities), creating a new revenue stream to help fund new renewable generation capacity.
Net metering (or net billing)	Net metering (or net energy metering) is an electricity billing mechanism that allows consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. In a net metering scheme, the compensation is given in energy (i.e. in kWh), and the credit can be applied to offset consumption of electricity within the current billing cycle and even in future billing cycles. In net billing, the compensation is monetary.
Fiscal incentive mechanisms	
Tax exemption	Tax incentives for renewable energy projects are typically offered in the form of reductions in sales, energy, value-added or other taxes. They may also be offered as tax credits.
Import & export fiscal benefits	Fiscal import and export benefits can be offered in the form of reduced charges and duties on i) imports of goods and services required for construction of renewable energy power plants and accompanying infrastructure, or ii) export of renewable energy.
Accelerated depreciation	Accelerated depreciation allows greater depreciation in the early years, reducing the tax burden of renewable energy assets.
Financing incentive mechanisms	
Investment grants	Investment grants are offered by governments or other entities (e.g. development partners) to partly or fully finance studies or private capital investments to increase renewable energy generation capacity.
Credit facility	A credit line is a loan that is disbursed by a funder to one or more intermediary financial institutions for them to on-lend to end-borrowers, aiming to address one or more credit market failures and increase lending to renewable energy projects. A credit facility will always consist of one or more credit lines but can also include supportive design elements such as guarantees and technical assistance.
Currency hedging	Currency hedging is a strategy designed to mitigate the impact of currency or foreign exchange risk on international investments returns, such as lending in local currency.
Guarantees	A guarantee is a financial instrument that is similar to an insurance policy. For a fee, it provides financial compensation for the financier if the borrower is not able to pay back.

Source: ESREM

Overview of policies to support energy transition solutions

TECHNO-LOGICAL AVENUE	OBJECTIVE	RECOMMENDATIONS
Renewables (power and direct uses)	Deploy renewable energy in end uses	These policies include regulatory measures that create a market, as well as fiscal and financial incentives to make them more affordable and increase their cost competitiveness compared to fossil-fuel-based solutions.
	Deploy renewable energy in the power sector	The choice of instrument and its design should consider the nature of the solution (*e.g.*, utility scale, distributed, off-grid), the sector's level of development, the power system's organisational structure and broader policy objectives.
Energy conservation and efficiency	Increase energy conservation and efficiency in heating and cooling	Energy efficiency policies such as strict building codes, support for building retrofits and appliance standards are critical for the energy transition in buildings and industrial processes.
	Increase energy conservation in transport	Decarbonising the transport sector, among other measures, requires a shift from energy-intensive modes to low-carbon modes.
Electrification of end uses	Electrify heating and cooling	Targets for renewable power should consider the rising demand from the electrification of end uses, in line with long-term decarbonisation objectives. Moreover, policies and power system design are needed to support electrification in achieving its potential for providing system flexibility.
	Electrify transport	
Green hydrogen	Support the development of green hydrogen	An enabling policy framework should consider four key pillars: a national green hydrogen strategy, priority setting, guarantees of origin and enabling policies.
Sustainable bioenergy	Ensure the sustainable use of bioenergy	Renewable energy is not exempt from sustainability concerns. Some of these concerns include greenhouse gas emissions related to land-use change, and impacts on air and water quality and biodiversity.

Source: IRENA, 2021

TABLE 4.1 Overview of cross-cutting policies to enable the energy transition

OBJECTIVE	EXAMPLES OF MEASURES	COMMENTS
Raise ambition in commitments to the energy transition	Net zero targets can be seen in legislation in Denmark, France, Hungary, New Zealand, Sweden and the United Kingdom.	Targets should go beyond the power sector to include the energy needed for heating and cooling and transport, and for specific solutions and technologies, such as green hydrogen.
Phase out fossil fuels	Many European countries (*e.g.*, Denmark, France, Finland, Hungary, Italy, Portugal, Slovenia, the United Kingdom) have announced a plan to phase out coal power plants by 2030.	A holistic policy framework is necessary to address the issue of fossil fuel as a stranded asset and its socio-economic implications.
Eliminate distortions and incentivise energy transition solutions	Sweden's taxation of fossil fuels.	Policies (that may include fiscal policies such as carbon pricing) should be implemented with careful consideration of broader social and equity issues, particularly for low-income populations.
Facilitate access to finance	The Brazilian Development Bank offers a loan supporting biomass co-generation projects.	Public financing can facilitate the adoption of energy transition solutions. Interventions range from the public ownership of transition-related assets, to unlocking private sector participation and supporting just transition measures.
Foster innovation	Direct funding to research and development in energy transition technologies (*e.g.*, fast-charging infrastructure, green hydrogen linked with industrial use).	Enabling policies can further innovation across various dimensions of technology, infrastructure, financing, business models, market design and regulation, as well as governance and institutional frameworks.
Raise awareness among consumers and citizens in general	The campaign HeatSmart Northampton raises public awareness and promotes the installation of heat pumps in a town in the state of Massachusetts (United States).	Consumers and citizens play a big role in the energy transition: they influence governments and corporations to move faster in their decarbonisation plans and make proactive choices regarding their energy consumption and sources.

Source: IRENA, 2021

Thank You