Regulatory measures and climate change

Background

- The licensees of the energy regulator include the most polluting industrial activities and installations
  - Share of energy industry (excluding transportation) in global green house gas emissions: around 40%
- Energy sector activities and installations are multi-polluters (local and regional air quality, global atmosphere, water resources, waste, site location…)
- Global trend supporting climate policies: CO2 emission pricing, renewable electricity (RES-E) and energy efficiency promotion
- Regulators become involved

Climate change related regulatory tasks

- Promoting the efficient use of energy
  - Same level of GDP with less energy input
- Promoting renewable energy use
  - Fuel switch to zero carbon (wind, photovoltaic) or carbon neutral (biomass) technologies
- Assistance in implementing CO2 pricing regimes
  - Making green house gas emission more expensive
  - (no further discussion in this presentation!)

Regulatory involvement regarding energy efficiency

- Cost reflective pricing
- Promoting loss reduction in fuel conversion
- Incentives for network loss reduction
- Energy saving obligations imposed on energy companies

Cost reflective pricing of energy products and services

- Relative energy prices have a major influence on energy consumption and conservation decisions of customers
- Subsidized energy prices tend to lead to the wasteful use of energy resources
- Cost covering energy prices encourage the careful use of energy resources and improve the profitability of investments into energy conservation
- ERAs play a key role in developing the methodology, setting or approving regulated prices for different energy products and services.
  - pricing of electricity and gas network services
  - gas or oil product prices
  - tariffs for public service obligations (RES-E, vulnerable customer tariffs)

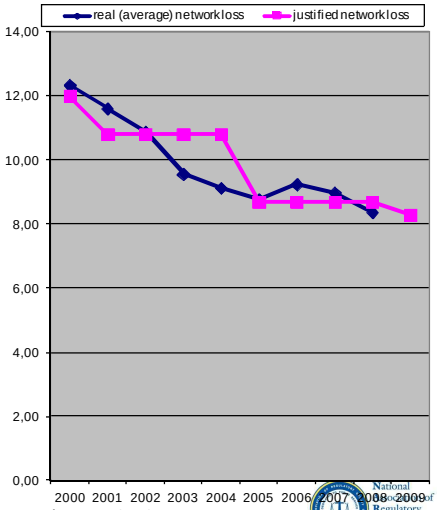
Fuel conversion loss reduction

- Energy transformation loss is significant
- Electricity generating companies and sometimes heat producers are clients/licensees of ERAs': basis for regulatory solutions to promote the application of high energy efficiency transformation technologies
- The ERA might have the authority to set minimum efficiency standards for new generation units entering the market
  - e.g. renewable electricity generation or cogeneration
- Example: the Hungarian regulator used to require a 75% minimum joint efficiency in fuel conversion for cogenerating units to become eligible for an electricity feed in tariff support before July 2011

Network loss reduction

- Transportation of energy also leads to losses
- In case of electricity, network loss especially at the distribution level might account for 10-20 percent of consumption.
- Regulators should encourage network operators (primarily distribution network operators) to be engaged in loss reducing commercial, maintenance and investment activities.
- E.g. justified network loss set on a benchmarking basis allows the company to earn part of the savings from loss reduction.

The development of justified and real network loss in electricity distribution in Hungary, %

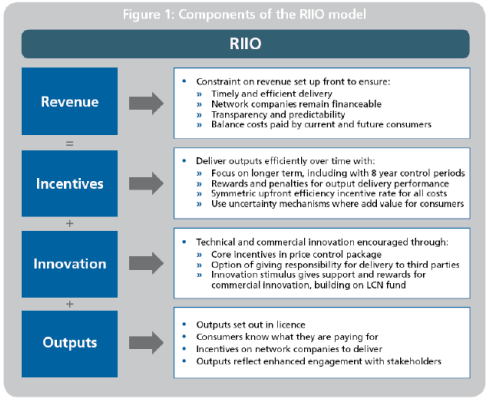


Encourage distribution companies to help the energy saving efforts of end customers

- Potential areas of end customer energy efficiency efforts:
  - To get correct data on own consumption – (smart) metering
  - Replacement of old equipment – light bulbs, fridges, etc
  - Insulation, heat use reduction or switch to renewable fuel
  - To become a ‚prosumer' – household-sized generation (PV)
  - Participate in demand-response programs
- Present incentives of distribution / supply companies are linked to the amount of electricity distributed/ sold
  - E.g. energy-only regulated tariffs for DSOs
  - Counter-incentive for licensees to engage in end customer energy efficiency efforts
- Regulators should replace wrong incentives with good ones!
  - Capacity based tariff components
  - Link company revenue to valuable ‚outputs': service quality, innovation, smart solutions for customers

Examples

A new kind of incentive regulation for electricity distribution companies in the UK: RIIO



New Energy Efficiency Directive of the EU proposes to introduce energy saving obligations for energy distribution / retail companies

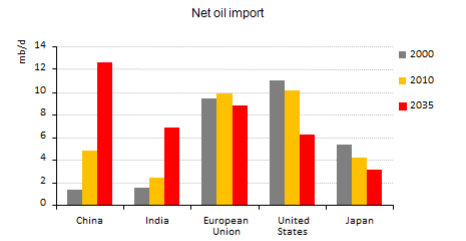
Climate change related regulatory areas

- Promoting the efficient use of energy
  - Same level of GDP with less energy input
- Promoting renewable energy use
  - Fuel switch to zero carbon (wind, photovoltaic) or carbon neutral (biomass) technologies

Economic- and energy policy arguments for RES-E support

Supply security
increasing energy independence

Europe becomes no.1 oil importer by 2015



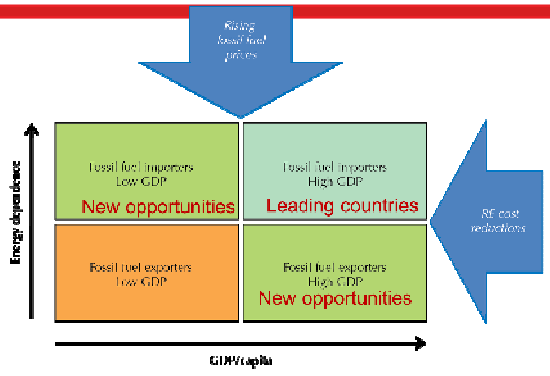
USA: growing domestic production and increasing energy efficiency in transport

Source: IEA WEO 2011

Climate change
avoiding CO_2 emissions

Industrial policy
green jobs and technology export

Not an OECD policy any more

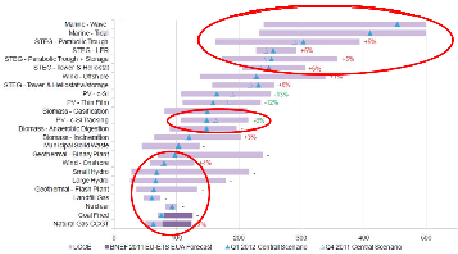


Source: Mueller, IEA, 2012

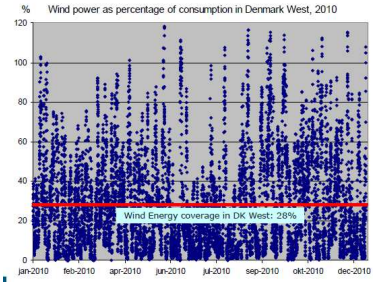
- EU: 20% by 2020; + Energy Community RES obligations
- USA: Renewable portfolio standards
- China: fastest growth in installed RES capacities
- Azerbaijan: gas export promotion
- Saudi Arabia: multi-hundred billion $ RES program

Typical problems

Distance to load
high transmission related cost



Intermittency
additional reserve needs, loop-flows

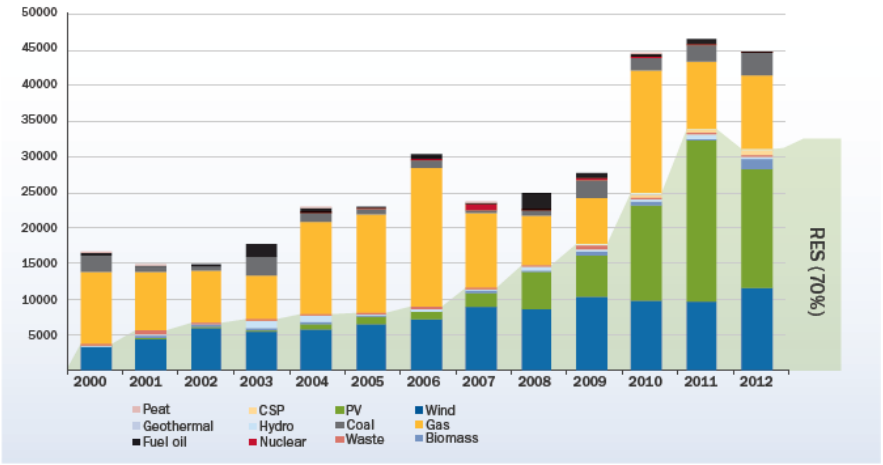


Cost disadvantage
..but fast technology learning

But it is more and more popular…

New built electricity generation in Europe: RES-E + gas

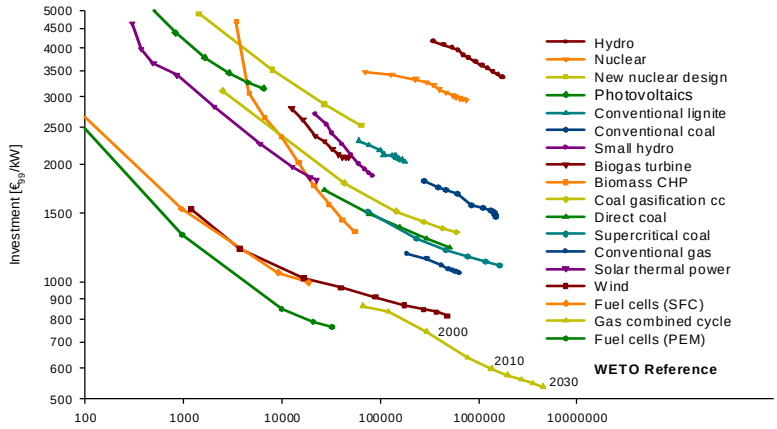
FIGURE 2.1 INSTALLED POWER GENERATING CAPACITY PER YEAR IN MW AND RES SHARE (%)



353 GW of new power capacity has been installed in the EU since 2000. Of this, almost 28% has been wind power, 51% renewables and 91% renewables and gas combined.

Source: European Wind Energy Association (February 2013)

Technology development
(source: WETO I study of DG JRC)



Massive deployment…

Technology learning…

Reduced subsidy needed

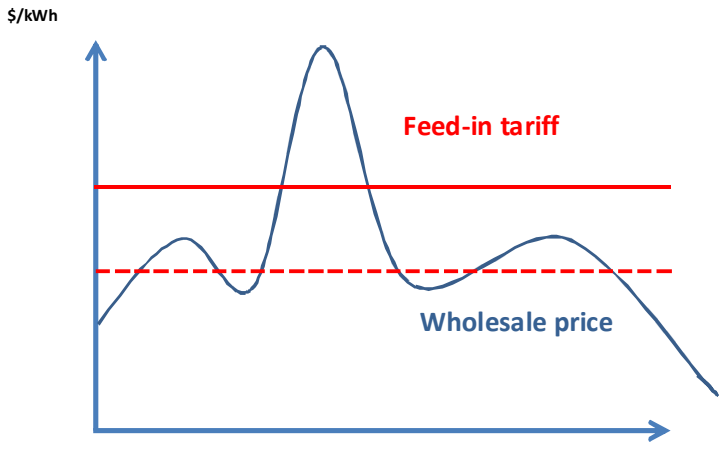
Prominent RES-E related regulatory tasks

1. Contributing to the design of RES-E support schemes (production price support or quota obligation schemes)
2. Regulating grid access and integration for RES-E
3. Licensing and monitoring of the RES-E market
4. RES-E certification
5. Promoting cross-border cooperation in RES-E utilization

A. Support schemes for RES-E generation

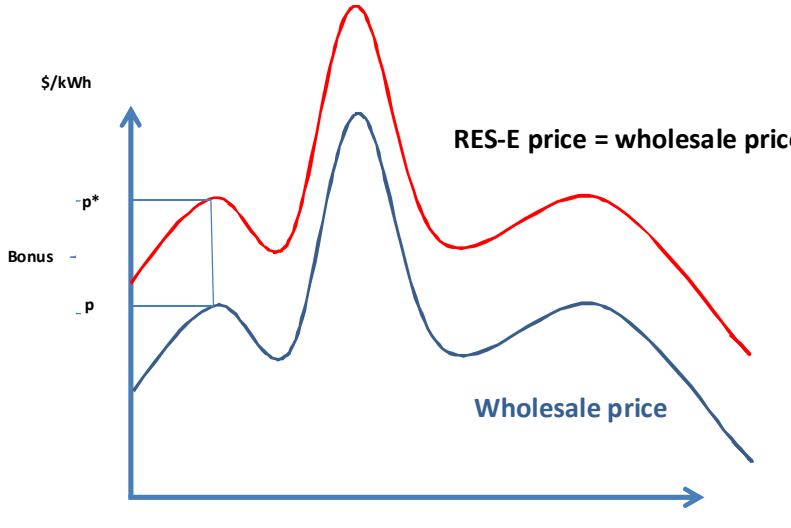
1. Priority dispatch (obligatory take-over) obligation
   – Who is the party to purchase RES-E?
2. Investment support schemes
   – Investment grants, supported investment credits, tax credits (US)
3. Production support schemes:
   1. Feed-in tariff or feed-in bonus schemes (price based)
   2. Tradable green certificate schemes (quantity constrained)

Feed-in tariff scheme



Pros and cons?

Feed-in bonus scheme



Pros and cons?

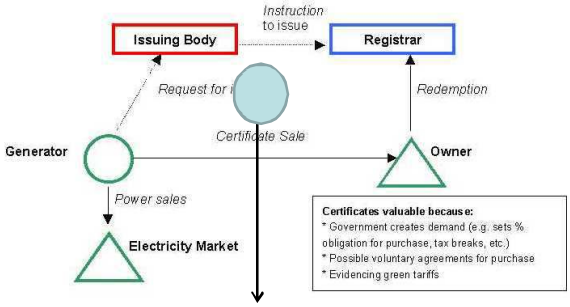
Feed-in tariff differentiation, Turkey

Producers who operate equipment manufactured in Turkey get Schedule II in addition to Schedule I tariffs

Plant Type	Price (US Dollar cent/kWh)		
	Schedule I (10 years)	Schedule II (5 years)	Total
Hydro	7,3	2,3	9,6
Wind	7,3	3,7	11
Geothermal	10,5	-	10,5
Biomass(including landfill gas)	13,3	-	13,3
Solar	13,3	6,7	20

Green certificate trading

- RES-E generators receive a GC for each MWh electricity produced
- GCs can be sold – second product and revenue source!
- Obligation on traders to cover a certain % of their sales with GCs
- Fixed demand for GCs / renewable electricity
- Single price for GC develops – encourages efficient RES-E to enter



An organised market for certificate sales / purchases can develop

RES-E support mechanisms in ERRA countries - 1

Country	Support Mechanism	Supported RES-E
Albania	FIT	Small hydro
Armenia	Supported inv. credit, FIT, quota	Wind, small hydro, biogas
BiH	FIT, RP, quota	Wind, solar PV, small hydro, solid biomass, biogas
Bulgaria	Supported inv. credit, FIT	Wind, solar PV, small hydro, solid biomass, biogas, waste
Croatia	FIT	all
Estonia	RP	Wind, small hydro, solid biomass, biogas, waste
Georgia		
Hungary	Inv. grant, FIT, inv. tax credit	all
Jordan	Inv. tax credit, tender	all
Kosovo	FIT	Wind, solar PV, small hydro, solid biomass, biogas
Latvia	FIT, tender	Wind, solar PV, solar thermal, small hydro, solid biomass, biogas, waste
Lithuania	Inv. grant, FIT, tender	Wind, solar PV, small hydro, solid biomass, biogas, waste

Note: RP – regulated premium, Inv. – investment, GC – tradable RES-E certificate (green certificate), tender – tendering or bidding system, quota – quota obligation

RES-E support mechanisms in ERRA countries - 2

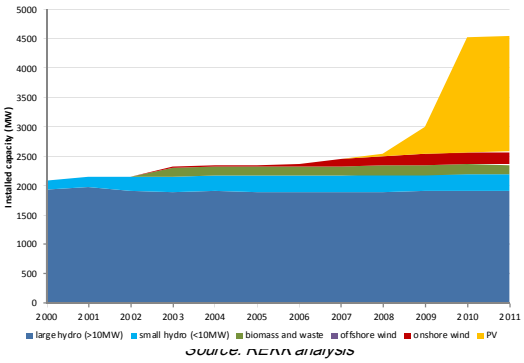
Country	Support Mechanism	Supported RES-E
Macedonia	FIT	Wind, solar PV, small hydro, solid biomass, biogas
Moldova	Individual tariffs	
Mongolia	FIT	Wind, small hydro, solar
Nigeria		
Poland	Inv. grant, supported inv. credit, GC	All
Romania	GC	All
Russia		
Serbia	FIT	Wind, solar PV, small hydro, geothermal, solid biomass, biogas, waste, sewage
Slovakia	FIT, RP	Wind, solar PV, small hydro, geothermal, solid biomass, biogas, waste
Turkey	FIT	All
Ukraine	FIT	Wind, solar PV, small hydro, solid biomass
United Arab Emirates	individual tariffs	Wind, solar PV, solar thermal

Note: RP – regulated premium, Inv. – investment, GC – tradable RES-E certificate (green certificate), tender – tendering or bidding system, quota – quota obligation

Poor RES-E support design might create undesirable investment cycles

- Stress on support budget
- Excess demand for grid connection
- Encourage unplanned regulatory change that undermines credibility
- Czech case:
  - Stop further PV promotion
  - Retroactive taxation of RES-E (28 % on revenues)
  - NREAP target figures as limits on capacity deployment

Growth of installed generation capacities in the Czech Republic

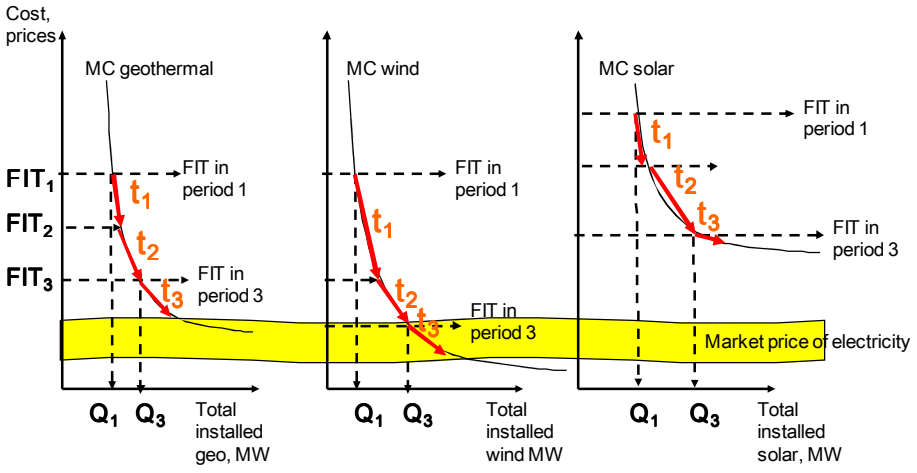


Source: KERA analysis

„Gold rush": effectiveness without cost-efficiency

ERRA Video Presentations 2013 / Peter Kaderjak

Smart design is needed: e.g. learning curves and adjustment of feed-in tariffs



Transparency and flexibility: rate adjustment only for new projects

Asymmetric incentives for RES-E generation *versus* network upgrade

- RES-E generation: fast; attractive; simple incentives
- Network upgrade: slow; complicated; counter-incentives

- But: several grid related issues with RES-E to be solved!
  - Sufficient incentives for transmission and distribution upgrade is key
  - Integrated resource and network planning, e.g. ENTSO-E Ten Years Network Development Plan

B. Grid integration

1. Methods determining the maximum intermittent RES-E capacity to be connected to the grid
   - Network modelling, connection capacity by substation / connection point
2. Methods handling the queue of renewable generation projects waiting for system connection
   - Issue of connection capacity allocation
   - Administrative: first come, first served, first redy, first served (milestones, financial deposits)
   - Market based: tendering connection capacity by substation

Grid integration – cont.

3. Connection cost determination and rules to share it between investors and customers
   - Arguments for connection cost socialisation through network charges?
4. Potential regulatory incentives for DSOs connecting new renewable generators
   - RES-E penetration and energy efficiency improvement might distort DSO profits under traditional regulatory regimes
5. System balancing needs and rules
   - Who should pay for additional reserves and balancing costs?

The queue management process in Turkey

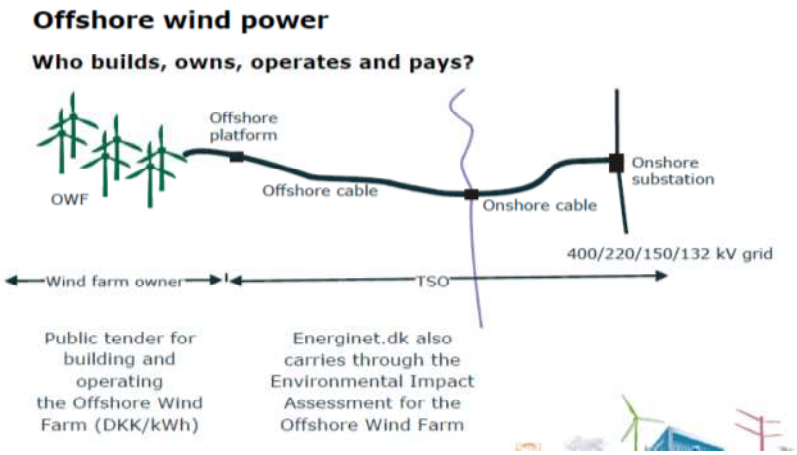
EMRA received 70 GW of wind applications on a single day!

- The queue management process in Turkey includes the following steps:
  - The available capacity for connecting wind generations are published by the TSO (TEİAS).
  - Wind power plant applications are forwarded to EMRA (Turkish Regulatory Agency) for these capacities.
  - These applications are forwarded to TEIAS for studying connection opportunities.
  - TEIAS gives its comment concerning the availability. If the application is alone in the substation, EMRA gives license to those applications.
  - If there are multiple applications, bidding process is done by TEIAS to determine the owner of the capacity.
  - After taking the license, the investor signs a connection agreement with TEIAS.
  - Project will be approved by the Ministry of Energy and Natural Resources; after the realization of the project System Usage Agreement will be done with TEIAS.

(Source: Presentation by Gül Okan & Nurhan Ozan 2011: *Planning for wind and queue management*)

Connection cost financing

Example: Off-shore wind connection financing in Denmark

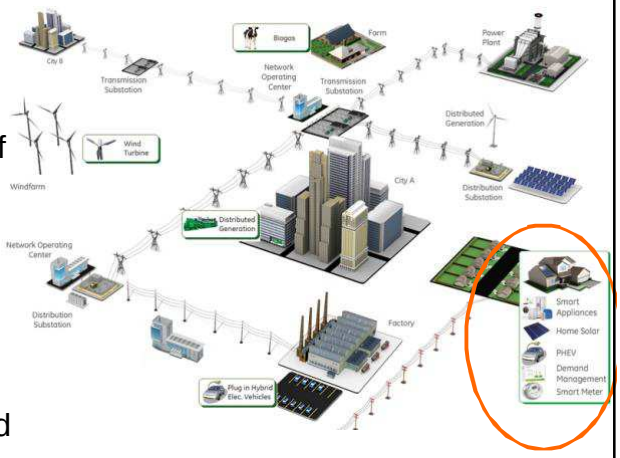


Source: Presentation by Flemming Wibroe at the ERRA training course on RES, Riga, March 2011: *Achieving 20% wind power in the Danish electricity system and moving on to 50%*.

The vision of smart grid infrastructure

Characteristics

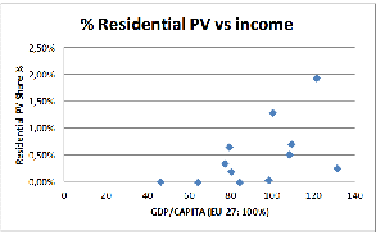
- Decentralised generation
- Bi-directional flow of electricity & information
- Active customers
- Active communication of system operator and system users

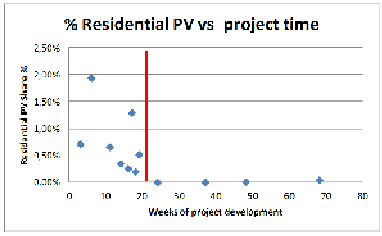


ERRA Video Presentations 2013 / Peter Kaderjak

C. Licensing: how to make it simple and cheap?

- Limit on the time and cost of administrative procedures (e.g. Moldova)
- One-stop-shop licensing (e.g. Germany, Denmark)
- Reduced number of authorities involved in RES-E licensing (e.g. Georgia) - Reduction of corruption opportunities





Source: EPIA: Global Market Outlook 2016;
PV Legal: Reduction of Bureaucratic Barriers for Successful PV Deployment in Europe (2012)

ERRA Video Presentations 2013 / Peter Kaderjak

D. RES-E certification

- Once produced, the path of delivery of renewable electricity cannot be traced physically in the electricity network
- A Green Certificate (GC) is about to prove that a certain amount of electricity has been generated from renewable energy sources
- GCs can be traded under specific regulatory regimes (Green certificate trading)
- Regulatory involvement in green certification is common

Functions of green certification

- Serves as certificate of origin to verify that targets imposed by regulatory authorities or national policies on utilities / suppliers are met
- Proves the eligibility of generators to receive subsidy
- Serves disclosure purposes by providing consumer information on the sources of electricity generation
- Facilitates cross-border trade of RES-E

E. Electricity market integration process can boost RES-E

- Electricity market integration promotes RES-E growth
  - Better spatial distribution of weather-dependent RES-E production
  - Common pool of reserves and storage capacities
- RES-E should get a role when electricity market coupling rules are created
- Harmonized green certification regimes might promote cross border trade in RES-E and thus promote investment

Conclusions

- The promotion of RES-E is a relatively new competence for energy regulators
- Considerable regulatory knowledge and human resources are still to be developed
- A requisite organizational solution can also help the Regulator meet the new expectations in this regard
  - RES certification, licensing and market monitoring
- Fast feedback of market information into the rulemaking process is a must!
  - Regular consultations with ministry and stakeholders

ERRA Video Presentations 2013 / Peter Kaderjak