About the project

This Operational Guide has been prepared by the partnership members within theframe of the SEE project "**From Marginal to Renewable Energy Sources Sites – M2RES**", co-financed by the European Union through the South East Europe 2007-2013 Programme. The project aims to give impetus to the sustainable development of the European Union, generating economic and social value for areas suffering for marginality (landfills, quarries, open cast mines, former military areas, contaminated sites, etc.) and having lost their primary functions. The turning key will be to change them into platforms for the production of renewable energy (photovoltaic, wind, biomass, geothermal, biogas, etc.).

For more information on the project you are invited to visit the project website: **www.m2res.eu**, where a number of Best Practices with relevant and transferable features have been collected across Europe, inside and outside the European Union (USA, Japan, and other RES advanced countries).

About this guide

The Operational Guide called "Developing RES on marginal terrains" was produced in the frame of WP4 "Wide awareness programme for enhancing M2RES investments by increasing the know-how and skills of public administrators" of the M2RES Project, under the responsibility of CRES and with the cooperation of all partners.

This easy-to-read Operational Guide was produced in order to support less-experienced partner regions in raising awareness among public administrations (especially during the first stage of the project) about the potentialities of M2RES applications and persuading policy makers and stakeholders to implement policies/ investments on M2RES. Thanks to this Operational Guide Project partners will communicate to public authorities how deploying RES on marginal areas has in many real cases lead to benefits for the public administrations and citizens involved. Furthermore it will state recommendations on how to implement the approach in the best and most effective way, keeping in mind the past existing experiences.

SOUTH EAST EUROPE
Transnational Cooperation Programme

Project part-financed by the European Union within the European Development fund.

The authors take full responsibility for the information and views presented in this handbook. These views do not represent the views or positions of the European Commission, co-funder of the project. While this work's strong points undoubtedly have benefited from the insights of many others, any errors and omissions rest entirely with the authors.

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DA AREE MARGINALI
A SITI STRATEGICI
PER LA PRODUZIONE
DI ENERGIA RINNOVABILE

M2RES

FROM MARGINAL
TO RENEWABLE
ENERGY SOURCES
SITES

OPERATIONAL GUIDE ON

Developing RES on marginal terrains

April 2013

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1. Introduction

1.1 The aim of this Guide

The M2RES action aims to increase renewable energy technologies (ground PV, wind turbines, geothermal plants, concentrated solar power – CSP – plants, biogas CHP) exploitation in areas that are considered as being marginal or abandoned, or in "zero value" areas, so giving them a new social reconsideration and economic re-qualification. In this frame, this Operational Guide on the «Development of Renewable Energy Sources on Marginal Terrains» aims to demonstrate how deploying RES on marginal areas has in many real cases lead to benefits for the public administrations and citizens involved.

In fact, an approach of this kind can:

- Contribute to achieve the goals set up by the EU policy 2020 about the share of renewable energy production for each member state as well as the contribution of the single regions to the national performance set up by national rules (burden share).
- Relieve the problems encountered by local administrations for the management and remediation of marginal terrains. Costs related to the end of life of a landfill or to the remediation of a contaminated terrain can reach several Million Euros and represent a heavy burden. The implementation of a RES platform can overcome this burden, or at least mitigate it, transforming this way a problem into an opportunity of development and sustainable growth.

- Improve the quality of environment and landscape by recovering degraded areas giving them a social value, by maximizing the use of territorial resources and by avoiding the use of fertile land for energy production.

A second objective of the present Guide is the provision of recommendations on how to implement the approach in the best and most effective way, keeping in mind the past existing (either bad or good) experiences. More precisely, this easy to read Guide intends to be the means through which the following critical issues will be communicated to public authorities:

1. the actual state of the art of M2RES technologies and systems in Europe and of their applications on different typologies of marginal terrains;

2. the existing typologies of RES platforms and common strategic and operative models at their base;

3. reference to technical and economic data related to some exemplary M2RES implementations;

4. the more suitable administrative procedures and regulations for investments in M2RES applications;

5. the potentialities linked with M2RES investments in the SEE countries involved, as well as other relevant issues.

Finally, it important to notice that the Guide is not intended as a tool for the detailed planning of a RES implementation, instead it presents an overview on the opportunities offered by this kind of approach and its diffusion will help to sensitize regional and local authorities and contribute to their adoption of policies and strategies to recover marginal areas through RES applications. Obviously, the actual assessment and optimization of a RES platform depends on the specific characteristics of the site and should be made on a case by case basis.

In particular, the financial and economic aspects should be carefully assessed taking into account many parameters such as: costs for the maintenance/remediation of the site, cost of the technology, availability of grants and/or incentives, potential RES production, return of the investment, etc. In the final part of M2RES, the project partners will establish local task forces to produce several feasibility studies concerning concrete implementations in each participating region and will provide information about key European experts and European companies with established experience and know-how due to their role in the development of M2RES applications around Europe or abroad.

1.2 EU Policy on RES

Europe's demand for energy is increasing in an environment of high and unstable energy prices. Greenhouse gas emissions are rising. Natural reserves of fossil fuels such as oil and gas are concentrated in just a few supplier countries around the world. Climate Change along with an increasing dependency on energy imports are only a few of the risks the European economy is facing today. As energy is the fuel of Europe's economic engine, by switching from fossil fuel, greenhouse gas intensive sources of energy to renewable sources of energy, Europe is able to fully grasp its sustainable potential - in economic, ecologic and social terms.

In 1997 The European Commission proposed that the EU should aim to reach a 12% share of renewable energy by 2010. Directives were adopted in the electricity and transport sectors that set national sectoral targets. In 2006 the EU had reached a 7% share (of gross inland consumption) and the latest progress report indicates that the EU is unlikely to reach either the electricity or transport target for 2010.

More recently, at the summit of EU leaders in March 2007, a comprehensive energy action plan "A Common European Policy for Energy" was adopted, and the EC has agreed specific targets for 2020. The Directive on renewable energy (2009/28/EC, RES Directive), which was published in the Official Journal of the EU and hence became law, entering into force on 25thJune 2009, sets ambitious targets for all Member States, such that the EU will reach a 20% share of energy from renewable sources by 2020 and a 10% share of renewable energy specifically in the transport sector.

The RES Directive not only sets the objective of reaching 20% of the EU's energy consumption through renewable energy sources by 2020, it also incorporates, for the first time, all three sectors (electricity, heating and cooling, transport).It further improves the legal framework for promoting renewable electricity, requires national action plans that establish pathways for the development of RES including bioenergy, creates cooperation mechanisms to help achieve the targets cost effectively and establishes the sustainability criteria for biofuels. The directive should have been transposed into national laws by the Members States by December 2010.

This directive was published as part of the Climate-Energy Legislative Package[1], adopted by the Council on 6th April 2009, which was developed as a demonstration of the EU's commitment to addressing the growing challenges of Climate Change and Sustainable Development, which were vigorously slapped back on the table of world talks at UN Summits in Rio de Janeiro in 1992 and Johannesburg in 2002. The Climate and Energy package includes the following acts:

- Regulation (EC) No 443/2009 - reduction of CO2 emissions from Light Duty Vehicles

1 http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2009:140:SOM:EN:HTML

- Directive 2009/28/EC – Renewable Energy Sources
- Directive 2009/29/EC – Emission Trading Scheme
- Directive 2009/30/EC – Fuel Quality Directive
- Directive 2009/31/EC – Carbon Capture and Storage
- Decision No 406/2009/EC – «Effort sharing».

1.3 Implementation of the RES Directive

The Directive on the promotion of the use of energy from renewable sources (2009/28/EC) sets the objective of reaching 20% of the EU's energy consumption through renewable energy sources by 2020, but also mandatory national targets for the overall share of RES in gross final consumption of energy, as well as a mandatory share of 10% RES in transport for each Member State. More precisely, the national overall share and targets for the share of energy from renewable sources in gross final consumption of energy in 2020 are presented in the Table below.

The RES Directive lays down a number of rules pertaining to administrative procedures, integration of RES in buildings, training and information, certification of installers, access to the electricity grid for RES, infrastructure development,

Table 1. **RES as a share of gross final energy consumption in the EU**
(situation in 2005*, and targets set for 2020)

Country	Share in 2005 (%)	2020 target (share 20%)	Country	Share in 2005 (%)	2020 target (share 20%)
Austria	23.3	34	Latvia	32.6	40
Belgium	2.2	13	Lithuania	15.0	23
Bulgaria	9.4	16	Luxembourg	0.9	11
Cyprus	2.9	13	Malta	0.0	10
Czech Republic	6.1	13	Netherlands	2.4	14
Denmark	17.0	30	Poland	7.2	15
Estonia	18.0	25	Portugal	20.5	31
Finland	28.5	38	Romania	17.8	24
France	10.3	23	Slovak Republic	6.7	14
Germany	5.8	18	Slovenia	16.0	25
Greece	6.9	18	Spain	8.7	20
Hungary	4.3	13	Sweden	39.8	49
Ireland	5.2	17	UK	1.3	15
Italy	5.2	17	**EU27**	**8.5**	**20**

** Source: Eurostat (with normalised hydro)*

sustainability criteria for biofuels and "cooperation mechanisms". Cooperation mechanisms are a new feature whose goal is to allow Member States to achieve a proportion of their target abroad. While Member States are just starting to explore the legal implications of the cooperation mechanisms, it is already clear that Member States intend to do the bulk of the work to reach their renewable targets through domestic actions.

Member States had to submit to the European Commission by 30thJune 2010 their National Renewable Energy Action Plans (NREAP), which set out how each Member State aims to achieve its national target and in the three sectors (electricity, heating and cooling, transport – according to Annex I of the RES Directive). As stipulated in the RES Directive, article 24, the European Commission has created an online Transparency Platform, which makes public information relevant to the implementation of the Directive (including the NREAPs).

In order to carry out the requirements of the RES Directive, a number of documents have subsequently to be issued, either by the European Commission or by the Member States themselves. A selection of these documents which pertain to all renewable energy technologies and which are directly linked to the implementation of the RES Directive are listed below:

December 2010
Member States have to transpose the Directive's provisions into national law & communicate to the Commission how the Directive has been transposed.

31st December 2011
Member States start to report every 2 years (December 2011, 2013, 2015, 2017, 2019, 2021) on progress in reaching national objectives.

in 2012
The European Commission starts to report every two years (2012, 2014, 2016, 2018, 2020, 2022) on progress made in reaching RES Directive's objectives. It may propose corrective actions.

June 2013
Member States who are below the biannual milestones of the indicative trajectory have to submit an amended action plan by June of the following year.

31st December 2014
The European Commission has to report on the evaluation of implementation of the directive (notably on the cooperation mechanisms & review the greenhouse gas emissions threshold in article 17(2)).

2018
Report by the European Commission proposing a Renewable Energy Roadmap for the post-2020 period/may be accompanied by legislative proposals.

2021
Report by the European Commission reviewing the application of this Directive: NREAPs, forecasts, cooperation mechanisms, support schemes, etc.

2. Marginal terrains and their use as RES sites

2.1 Why marginal terrains?

The concept of "marginality" is a little bit complex and needs to be well explained. Marginality, in general, is considered as scarce productivity of an area, or scarce return of investment upon it. OECD provides a definition according to which a marginal area is an area with a low level of quality for agricultural activity and unfit for housing use.

Marginal terrains seem natural areas that are unfit for any human use, because of their geographic and pedologic characteristics. If attention is paid to urban areas, it's easy to note that new marginal areas exist, and they are "by products" of the modern industrial system. Precisely, the focus is on those areas difficult to re-use, whenever impossible, because of the big impact caused by the human intervention: for example, you can consider dumps of urban solid waste in exhaustion or areas heavily polluted by industrial activities.

Often these new marginal areas are included into the city's bound; instead old marginal areas are generally outside cities. Industrial areas no longer in use represent a big problem difficult to solve, because of heavy costs of reclamation necessary for a re-qualification. Regarding new marginal areas, the military ones have to be considered as they are "strategically" located throughout the national territories. Moreover they have lost their military function and their economic importance and nowadays it is customary to cross large lands in a total and desperate state of abandonment.

They are not overseen and their state of marginality depends, first of all, on their specific function and, in second place, on legal-administrative inertia, that often stops any attempts for a new use.

Moreover, marginal areas haven't got any hidden utility for the society, and they very often represent a burden for the community; an area with no significance as its primary use has been carried out. They are like green-brown sarcophagus which none is interested in.

2.2 General identification criteria

Spotting the marginality of a surface is not an easy issue of immediate resolution. Marginal areas can be identified both by economic and environmental point of view, without forgetting the current requirements of reducing to the minimum the ground consumption and the urban sprawl. Beyond the geographical aspect, an area can be considered "marginal" according to its function. A land which has no possibility to be immediately used has instead good chances to be tagged as "marginal".

The marginal utility of an area can be intrinsic, induced or latent. It is "intrinsic" when it is indivisible from the area itself. It can be induced when its use value is cancelled by political choices, non-residential zones due to the presence of infrastructures, or when it is recorded in the register office as a polluted site of national importance. Finally, it is instead "latent" when some areas, sometime of great size, are completely abandoned due to their specific legal standings.

The "marginal", sterile and "zero value" areas are those that for some reasons have no more benefits for the society or even worse, they are a burden for the society. They become "dumps" where often there is a dilemma about what to do once their primary function has been carried out.

The territory or more precisely the cartographic description of the marginal areas are not a vacuum or a blank space; they are sometimes well known and well defined by city urban plans and other times they are to be found in the meander of the explanations and geographical symbols. This is the reason why it is important to start from the recognition of the local urban systems that allow the identification of the areas, their use and especially their regulatory rules.

The higher hierarchical tools are important as well, because they allow the identification of "territorial frame" of great importance for the environment. From the urban tools in force it is possible to identify several territorial elements with the specific characteristics necessary to make them potential "marginal".

A first list of marginal areas is the following:

1. Open cast mines no longer in use
2. Open cast mines reaching the end of their useful life
3. Every kind of landfill out of use
4. Every kind of landfill almost abandoned
5. Degraded areas, lack of vegetation, unclassified as urban areas, areas to be transformed
6. Industrial areas no longer in use
7. Polluted areas to be reclaimed and recorded in the corresponding register officesof various countries as Polluted Sites
8. Arable land never seeded or without vegetation
9. Farm areas unsuitable for arable land, forestry or grazing (class VIII Land Capability Classification)
10. Clear zones, such as the clear zone of infrastructures (streets, railway, gas pipeline, ...), cemetery / airport / radio broadcasting / waste disposal airport clear zone, clear zone around sewage treatment plants and/or accident risk sites,
11. Military areas, either abandoned or almost abandoned
12. Government property areas
13. Areas without landscape, archaeological and environmental restrictions

But a simple list of urban categories is not enough to provide the marginality of a land. The marginality of an area can be the result of a combination of factors and not only a direct and clear derivation from a single factor. Many factors and conditions contribute to "marginality":

- The ground waterproofing contributes to the marginality because obstacles the basic functions of the ground damaging the eco-system;
- The areas jeopardized by a geological point of view can be considered marginal as well;
- The presence of pollutants is an additional element which contributes to the classification of marginality because of the several expensive and long lasting land reclaim needed;
- The presence of economic activities and future uses exclude the area from marginality valuation criteria;
- The presence of safeguarding restrictions points out that the area presents a value for the community and therefore the possible use as marginal area will be excluded;
- Clear areas are interesting for the identification of marginal areas as their specific legal standings limit the presence and the human activi-

ties for some hygienic, sanitary and security problems, but don't exclude other uses;

- The environmental characteristics taken into account are the permeability of the ground, the presence of pollutants and the modification of geological horizon due to geological interventions.

2.3 Marginal areas targeted by M2RES

The project M2RES aims at re-qualifying existing marginal terrains through investments on RES. The main marginal areas considered in the project are:

- landfills
- opencast quarries/mines
- former military sites
- brownfield-contaminated terrains

Other kinds of marginal area can be further included in the above list on the basis of specific local situations in the partner regions (e.g. flood retention zones). A general definition for the different typologies of marginal terrains is provided in the following paragraphs.

2.3.1 Landfills definition

Modern landfills are well-engineered facilities that are located, designed, operated, and monitored to ensure compliance with the current regulations. Solid waste landfills must be designed to protect the environment from contaminants which may be present in the solid waste stream. The landfill siting plan, which prevents the siting of landfills in environmentally sensitive areas, as well as on-site environmental monitoring systems, which monitor for any sign of groundwater contamination and for landfill gas, provides additional safeguards. In addition, many new landfills collect potentially harmful landfill gas emissions and convert the gas into energy[1].

Municipal solid waste landfills (MFWLFs) receive household waste. MSWLFs can also receive non-hazardous sludge, industrial solid waste, and construction and demolition debris. For instance, in the USA all MSWLFs must comply with the federal regulations or equivalent state regulations. Federal MSWLF standards include:

- **Location restrictions** - ensure that landfills are built in suitable geological areas away from faults, wetlands, flood plains, or other restricted areas.
- **Composite liners requirements** - include a flexible membrane (geomembrane) overlaying two feet of compacted clay soil lining the bottom and sides of the landfill, protect groundwater and the underlying soil from leachate releases.
- **Leachate collection and removal systems** - sit on top of the composite liner and removes leachate from the landfill for treatment and disposal.
- **Operating practices** - include compacting and covering waste frequently with several inches of soil help reduces smell, control litter, insects, and rodents; and protect public health.
- **Groundwater monitoring requirements** - requires testing groundwater wells to determine whether waste materials have escaped from the landfill.
- **Closure and post-closure care requirements** - include covering landfills and providing long-term care of closed landfills.
- **Corrective action provisions** - control and clean upof landfill releases achieves groundwater protection standards.
- **Financial assurance** - provides funding for environmental protection during and after landfill closure (i.e., closure and post-closure care).

1 *For more information, visit EPA's Landfill Methane Outreach Program: http://epa.gov/lmop*

Figure 1: Typical views of landfills, restored (left) or not yet restored (right)

Some materials may be banned from disposal in municipal solid waste landfills including common household items such as paints, cleaners/chemicals, motor oil, batteries, and pesticides. Leftover portions of these products are called household hazardous waste. These products, if mishandled, can be dangerous to your health and the environment. Many municipal landfills have a household hazardous waste drop-off station for these materials.

MSWLFs can also receive household appliances (also known as white goods) that are no longer needed. Many of these appliances, such as refrigerators or window air conditioners, rely on ozone-depleting refrigerants and their substitutes. As an example USA federal disposal procedures can be found in "General information on how refrigerants can damage the ozone layer"[1].

Figure 2: A former landfill, after its restoration

2.3.2 Opencast quarries/ mines definition

Open-pit mines that produce building materials and large dimension stones are commonly referred to as quarries. People are unlikely to make a distinction between an open-pit mine and other types of open-cast mines, such as quarries, borrows, placers, and strip mines. Open-pit mines are typically enlarged until either the mineral resource is exhausted, or an increasing ratio between waste and ore makes further mining uneconomic. When this occurs, the exhausted mines are sometimes converted to landfills for disposal of solid wastes. However, some kind of water control is usually required to keep the mine pit from becoming a lake.

Open-pit mines are dug on benches, which describe vertical levels of the hole. These benches are usually on four meters to sixty meters intervals, depending on the size of the machinery in use. Obviously, shallow quarries do not use benches. Walls of the pit are generally dug on an angle less than vertical, to prevent and minimise damage and danger from rock falls. This depends on how weathered the rocks are, on the type of rocks, and on structural weaknesses within the rocks, such as a fault, shears, joints or foliations.

The walls are stepped. The inclined section of the wall is known as the batter, and the flat part of the step is known as the bench or berm. The steps in the walls help prevent rock falls continuing down the entire face of the wall. In some instances additional ground support is required and rock bolts, cable bolts and shotcrete are used. De-watering bores may be used to relieve water pressure by drilling horizontally into the wall, which is often enough to cause failures in the wall by itself.

A haul road is situated at the side of the pit, forming a ramp up which trucks can drive, carrying ore and waste rock. Waste rock is piled up at the surface, near the edge of the open pit. This is known as the waste dump. The waste dump is also tiered and stepped, to minimise degradation.

Ore which has been processed is known as tailings, and is generally a slurry. This is pumped to a tailings dam or settling pond, where the water evaporates. Tailings dams can often be toxic due to the presence of un-extracted sulphide minerals, some forms of toxic minerals in the gangue, and often cyanide which is used to treat gold ore via the cyanide leach process. This toxicity has the potential to negatively impact on the surrounding environment.

1 http://www.epa.gov/ozone

Figure 3: Open-cast, or strip, coal mining at Garzweiler, Germany - © Raimond Spekking / CC-BY-SA-3.0

2.3.3 Former military sites definition

The reduction in Europe of military forces has resulted in an increased number of base closings nationwide. While many of these bases have excellent facilities suitable for a variety of different uses, most real estate professionals and developers do not understand the complex process or laws which influence the acquisition of property at a closed military installation.

A general definition of Military sites is somehow self-referencing, and there is no need for detailed clarifications. These areas can be easily identified on most geographical data sources, so no special indicators are required to pick them out. The number of military sites is usually small, and they are located over state-owned terrains. They can be broadly categorised into:

- Barracks for lodging of troupes, general services, deposits;
- Air bases;
- Naval bases;
- Shooting ranges, large clear zones for bashing and/or troupe movements.

More precisely:

- Sites of the first group have a small/ medium size and are frequently located within or near urban areas. Therefore RES destination for these sites may not be the most suitable because of claims for other uses. Analogous considerations apply for naval bases.

- Former military barracks may be regarded under many aspects as brownfields, so they need the same

kind of interventions as well as the same final uses[1].

- Abandoned air bases - thanks to flat horizon, wider extension, very limited surrounding vegetation, limited reclaim work needed - are very suitable for PV and/or wind plants.

- Shooting ranges lose more frequently their original destination due to urban sprawl, so RES destination competes again with other possible uses.

On the contrary the largest shooting/bashing areas stay in a non-anthropic environment. Their geographical location (e.g. more or less shallow riverbeds, valleys, etc.) still reflects the primary need of safeguard against potential shooting escapes and accidents. Such locations may eventually lack part of the primary needs for effective RES plants, for example distance to electric stations, variable suitability for wind and PV plants, etc.

It is important to mention that, before attempting to acquire property at a former military base, it is necessary to understand the process and legal requirements involved in transferring the property from the government to a new owner. While the existing process is lengthy and complex, changes are being proposed to make the process more realistic. The University "Politecnico di Torino" hosts a special web site devoted to architectural conversion of dismissed military sites[2]. The web site is available in Italian only, but contains a short catalogue of reports and publications on this matter that can be a good starting point for deeper investigations.

2.3.4 Brownfield-contaminated terrains

There is no officially agreed definition of brownfields in the EU, although the usual meaning refers mainly to the following categories:

- areas that underwent a deep transformation related to human activity, notably industrial, and that are now derelict; the soil is totally or partly artificial, hindering re-growth of vegetation; buildings and structures are frequently abandoned and unsafe, precluding any immediate reuse;

- areas more or less contaminated; they don't constitute by themselves an hazard for the surroundings, but actions of cleaning, removal of substances or reclaim are needed to restore their suitability for human activities.

The European CORINE Land Cover nomenclature[3] has not settled a specific category for brownfields or contaminated terrains. Such areas will thus fall within the "artificial surfaces" (more likely industrial/transport or construction/dump).

The European Indicators of Sustainability for municipalities include a set of indexes, among which the B9 refers to sustainable land use. It suggests a broad classification of urban-suburban areas in few simple categories: artificial and urbanised (and also already appointed for urbanisation) areas, brownfields including derelict and contaminated land, virgin land/greenfields, protected areas. It seems hence - by exclusion - that any area not actively used by human related activities and not being a greenfield or a protected area may be quoted - more or less - as a brownfield. In such a view all uncategorised areas in urban surroundings may fall within the brownfield group.

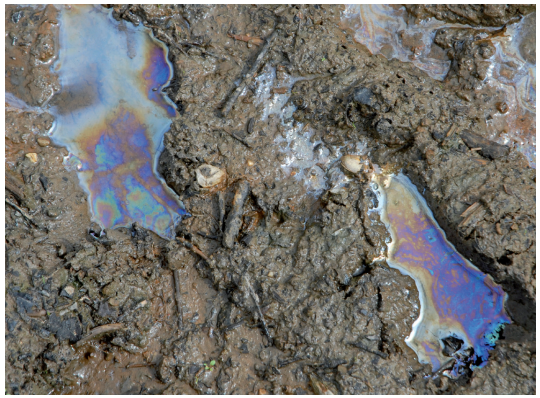


Figure 4: Example of brownfield land at a disused gasworks site after excavation, with soil contamination from removed underground storage tanks.

Unfortunately, the European Sustainability scheme seems no longer in use and has not seen further refinements. Generally, brownfield sites exist in a city's or town's industrial section, on locations with abandoned factories or commercial buildings, or other previously polluting operations. Small brownfields also may be found in many older residential neighbourhoods. For example, many dry cleaning establishments or gas stations produced high levels of subsurface contaminants during prior operations, and the land they occupy might sit idle for decades as a brownfield. Typical contaminants found on contaminated brownfield land include hydrocarbon spillages, solvents, pesticides, heavy metals such as lead (e.g., paints), tributyltins, and asbestos.

Old maps may assist in identifying areas to be tested. Many contaminated brownfield sites remain unused for decades because the cost of cleaning them to safe standards is more than the land would be worth after redevelopment. However, redevelopment has become more common in the first decade of the 21stcentury, due to the scarcity of developable land in highly populated areas. Also, methods for studying contaminated land have become more sophisticated and established.

The US Environmental Protection Agency manages a large set of activities related to brownfields and contaminated areas revitalization, under the

1 *http://www.balticuniv.uu.se/index.php/downloads/doc_view/222-rebuilding-the-city#page=27*

2 *http://www.milarconversion.eu/bibliografia.htm*

3 *http://www.eea.europa.eu/publications/COR0-landcover/at_download/file*

name of EPA Brownfields Programme[1]. Anyway, for the sake of the present guidelines, EPA's brownfield definition is quite in legal terms, and doesn't enlighten the matter. In brief: "brownfield site" means a real property of which the expansion, redevelopment, or reuse may be complicated by the presence - real or potential - of a hazardous substance, pollutant, or contaminant, including petroleum or petroleum by-products, but with relatively low risks[2].

In addition any urban-suburban unused areas impractical for human activities, for agriculture or simply as greenland may be regarded as brownfield-like, for example the ones with proximity to viaducts, interconnections and railways, with high fragmentation, limited road connectivity, not subjected to periodical cleaning, etc.

In the process of cleaning contaminated brownfield sites surprises are sometimes encountered, such as previously unknown underground storage tanks, buried drums or buried railroad tank cars containing wastes. When unexpected circumstances arise, the cost for clean-up increases, and as a result, the cleanup work may be delayed or stopped entirely. To avoid unexpected contamination and increased costs, many developers insist that a site be thoroughly investigated prior to starting remedial cleanup activities.

1 http://www.epa.gov/brownfields

2 http://www.epa.gov/brownfields/overview/glossary.htm

2.4 Example reference models for RES platforms on marginal areas

2.4.1 Landfills

Landfills are marginal terrains both during their useful life, in the preparation works and when waste is orderly stored, and after closure, i.e. during the transition phase before the restoration of the soil, to allow its use for agriculture, industry or others. Obviously, marginality depends strongly by the typology of the stored waste: inert material, urban solid waste or hazardous waste. Hereinafter the focus is on solid urban waste, which is the most common and interesting case for M2RES project.

The most relevant period for the RES energy production is the transition phase after the closure: the surface of the landfill is insulated to protect it from weather factors (rain, wind, sun) and, for a long period that can lasts up to thirty years, is a grassy surface not exploitable for other uses. During that period, the landfill is dormant but its body "breathes" internally, continuously producing biogas from the decomposition of organic material and produces leachate which contains water and various substances that don't enter the gas cycle.

Then, after the closure, both the gas cycle and the liquid cycle (leachate) must be controlled and properly managed to avoid air and soil pollution. On the other hand, the same elements represent potential resources that can be suitably valorized and exploited over thirty years:

- Unused surface;
- Presence of biogas;
- Presence of leachate.

An example M2RES platform model for landfills can comprehend the following components and relative investments:

1. Photovoltaic plants on available surface;

2. (alternatively) concentrated photovoltaic systems or concentrated thermodynamic solar plants in case of a high level of sunstroke and if allowed by the consistence of soil;

3. Production of electric and thermal energy using cogeneration units feed with biogas;

4. Pre-treatment or complete treatment of leachate, to decrease its disposal cost and to better cultivate the body of the landfill through re-injections of treated leachate aimed at optimizing the biogas production;

5. Use of electric energy and heat preferably on site to support the M2RES platform main activities and for further industrial or agricultural activities.

As far as points 1-2-3-4 are concerned, several reference good practices can be found in Europe, instead there are a very few examples referring to point 5, due to various reasons. Among them, the slowness of administrative and bureaucratic burdens, the will of closing the waste cycle to make it less subject to criticism and attacks by citizens and/or environmental organizations, the usual separation between waste management and energy management. The M2RES project has focused the attention of European RES experts and professionals to some good practice that include all the above mentioned five aspects, e.g. the Italian landfill of Peccioli in Tuscany and landfill of Novellara in Emilia-Romagna (see Chapter 4).

Obviously, the success of a M2RES platform model strongly depends from the overall vision of the waste treatment cycle and from its integration with energy production, to achieve environmental and social returns as well as economic returns to allow the sustainability of investments. The M2RES model should be implemented from the very beginning, from the landfill cultivation phase, to synchronize the landfill growth with future investments and plan the future use of surrounding areas for the activities related to the rising RES platform.

Typical features of the above model are the possibility and the suitability of making the production of biogas stable even when the methane generation decreases. As a matter of fact, the

spill of landfill biogas has a bell-shape trend that lasts about fifteen years. In the perspective of a stable M2RES platform, the decreasing production over time should be redeemed through other parallel and integrated biogas sources, preferably coming from waste separate collection when present.

In this case a good model of M2RES platform should foresee, nearby of the landfill site, the presence of biodigesters for the biomass coming from waste treatment cycles, or from by-products of specific cycles/industrial processing, or from agricultural activities and their processing phases. Of course, this entire picture is much more justified if there is a clear target for electricity and heat on site. In the aforementioned Peccioli's example, the generated heat is used for dehydration of the leachate and for district heating of the nearby village. In the case of Novellara, the heat is used to warm up greenhouses for hydroponic cultivation of basil.

Finally, it should be underlined that the above examples can be distinguished by the different solutions adopted for financial provisions. They can include individual shareholdings (the same company that operates the landfill) or, more frequently, PPP (Public Private Partnership) shareholdings, which may also include the participation of individuals or groups of people (as in the case of Peccioli).

2.4.2 Abandoned quarries and opencast mines

The case of abandoned open air quarries is quite different from that of landfills, since no biogas is present. The land is usually reshaped in an irregular way, more or less conforming to the original slope, making an acceptable compromise between re-filling with large amount of material/terrain and re-gaining the natural topography. These interventions can be put in place only when no artificial lake is born in the pit. Quarries partly filled with inert waste, but still showing a flat ground level lower than the surroundings, are particularly suitable for photovoltaic installations, since the PV is more easily hidden from view.

There are also few cases where old gravel pits accompanied with lakes - usually near urban areas - have been recovered to tourism activities. They can take advantage from local RES plants too, usually of solar and/or geothermal kind.

2.4.3 Former military areas

Concerning the military areas, the ones interesting for M2RES applications are those characterized by large surface extension - from 80,000 to 200,000 m2 - and showing a very limited presence of buildings. The lack of buildings frequently represents low commercial value for the area or low rent to be paid for acquiring rights to use the over ground. In addition, such military sites, with few or no buildings, are usually located far from urban areas, in zones having low estate costs. Many examples of that are in Germany, such as the former military airfield near Leipzig in Waldpolenz or the former ammunition depot in Hemau Bavaria.

Presently in Italy, Germany and other countries, PVs are forcibly pushed towards "grid parity" by the elimination of incentives. Photovoltaic systems on the ground are now viable only in the presence of local energy use and by exploiting structural Funds aids, when innovative technologies are adopted. In view of these considerations, and in the framework of medium-term investment forecasts, PV is feasible in agricultural or agro-industrial areas that can use locally the produced energy, whereas it is less suggested in the presence of industrial and commercial activities alone.

Military areas, because of their low market value (often related to the deterioration of the soil as a result of their previous use) can accommodate activities related to agriculture, but not addressed to edible cultivation, such as breeding facilities linked to local bio-digestion plants, which can integrate manure with other non-food crops, greenhouses, hydroponic and aeroponic cultivations, activities of pre-treatment and first processing of agricultural products.

In this context, the military area of Ceggia in Veneto can be taken as a potential best practice. There, the proposal coming from a company in the waste management chain has merged with the proposal by a second investor to install aeroponic greenhouses on three floors, with a total surface area of more than 50,000 m2. The proposed model includes a biodigester of medium size 1-2 MWe, which supplies both heat and CO2 to the adjacent aeroponic greenhouses. They in turn produce biomass from the vegetal residues, which is then supplemented with urban solid waste provided by the local waste managing company. The mix is re-fed to the biodigester, thus closing the cycle.

The model, in the lack of a biodigester nearby the greenhouses, could be re-adapted by planning both photovoltaic panels and a solar thermal collection-storage plant on the greenhouses themselves, providing the necessary energy also during the night. Of the two possible solutions, the one including the biodigesters seems economically more viable.

2.4.4 Brownfields and contaminated areas

Contaminated areas constitute a more complex problem for the implementation of M2RES platforms than other kinds of marginal areas, although frequent forms of special economic incentives exist for these situations, especially when these areas have historical and/or environmental relevance. In Italy a special attention is devoted to the so called SINs (Sites of National Interest). In these cases, the model should be

geared to provide RES investments to reduce environmental impacts.

The natural link between RES and rehabilitation of the site can be realized by exploiting the produced energy, preferably fully coming from local resources, and by allowing the renewable energy part to be functional for new industrial and commercial activities. A representative example concerns the restoring plan of the former foundry in Marghera, Venice, ranked SIN. In this area, the environmental recovery plan leverages on allotments of photovoltaic systems that feed the electro-chemical treatment in situ, with an innovative energy storage system for a whole day-long operation of the decontamination plants, even at night. Co-generators fed by biomass (taken from the waste chain) are foreseen too. They will provide renewable energy in the new industrial areas with less pollution, so being compatible with the new intended use.

3. Applicable RES technologies

3.1 Background

From the very beginning of the M2RES Project, there were five (5) main Renewable Energy technologies (RETs) considered as being most appropriate to be sited in areas defined as marginal lands. These are in brief the following:

Ground photovoltaic: Commonly solar ground-mounted systems involve a steel or aluminium frame, often one that could be adopted for building use, attached to a concrete foundation. Ground mounts also can provide significant electrical power to demanding users. Solar panel systems can also be connected into a grid-tie system, selling energy back to the power grid. This system can also provide easy access to the modules and is generally an affordable solution that can take advantage of open areas.

Concentrated solar power (CSP) systems: Electrical power generation through thermodynamic solar technology has been tested and proven using various solar collection and concentration technologies. The most common technologies are linear parabolic collectors and tower systems.

Biogas CHP (combined heat and power): Combined heat and power (CHP) units also known as cogeneration units, combust digester biogas in an internal combustion engine (ICE) and generate electricity at or near the place where it is required. The excess heat from power generation with internal combustion engines can be used for space heating, water heating, process steam covering industrial steam loads, product drying, or for nearly any other thermal energy need.

Wind turbines (250 – 1000 kW): A 500 kW wind turbine produces enough energy to power 100+ homes. These are not residential turbines but are community-sized wind turbines that produce the right amount of power for school and university campuses, residential developments, farms, municipalities, and a variety of businesses ranging from injection molding factories to extrusion houses. They can also be used in small wind farms for direct grid hook up.

Geothermal Electricity and Combined Heat & Power (CHP): geothermal plants will be considered for areas with the presence of overheating of the shallow subsurface. To produce geothermal energy vapours from the underground hot water sources have to be conveyed and used for the routing of a power generation turbine, and then the steam can be reused for district heating, greenhouse cultivation and spas.

More detailed information on these technologies is provide in the next paragraphs. A rather similar structure is followed for all these technologies, namely at first a description of the currently available technologies for harnessing the source and a short list of the applications of each technology is provided, then their current market development is presented, while an outlook of the future progress of the technology as well as of the market trends is given at the end of each respective session.

3.2 Ground PV systems

In just one hour the sun delivers more energy to Earth than the world uses in an entire year. This solar energy can be utilised in many ways, through the use of photovoltaics (PV), for example. Discovered by Edmond Becquerel in 1839, photovoltaic electricity undergoes its first real application as an energy source for space satellites. Even though certain applications were used for several decennia, the real commercial take-off of photovoltaic electricity connected to the electricity grid started at the dawn of the 21st century.

3.2.1 Technologies and applications

Photovoltaic (PV) cells enable sunlight to be converted directly into electrical energy. Positive and negative charges are separated by radiation energy in the solar cell and collected for use at the two poles of the cell, the same way as in a battery. A specific number of solar cells (e.g. 48) are combined and connected to form one solar module. Thus, the solar module is the heart of a PV system, and the cell is the heart of the solar module.

Over 90 % of the solar cells in use around the world consist of crystalline silicon, which has proven itself over decades of use. In future, thin-film cells (also called "amorphous silicon" cells) will play a more important role thanks to cheaper production materials, more homogenous surfaces and other operative features when compared to crystalline solar cells. The fall in the price of solar silicon in 2009 has significantly reduced the differential between crystalline and thin-film modules. Nevertheless, thin-film technology promises great future potential for extending the range of possible applications for PVs. This is also

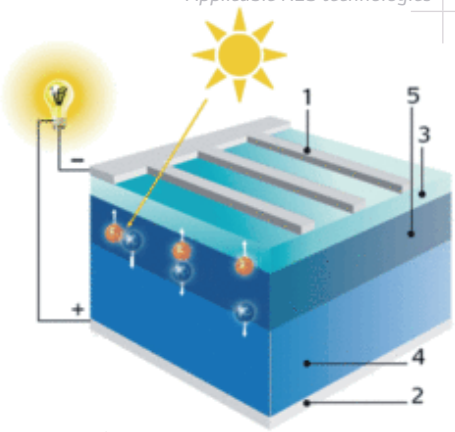


Diagram of a solar cell:
1. *negative electrode,* ***2.*** *positive electrode,*
3. *n-silicon,* ***4.*** *p-silicon,* ***5.*** *barrier layer*
source: www.brightpowergroup.com

true for technologies that are still being researched and tested, such as organic photovoltaics (OPV), which copy photosynthesis processes observed in nature.

Thin-film cells still operate at a lower efficiency factor, so they require a larger installation area to achieve the same output capacity as standard modules. When selecting photovoltaic modules it is therefore important to consider not only basic module costs (price per kilowatt), but also the system costs ("production costs") per kWh produced. Locations exposed to high levels of direct solar radiation make investments in this technology more profitable. Grid-connected solar power systems are currently experiencing the strongest growth worldwide. These systems use inverters to convert solar power into a grid-compatible alternating current and feed it into the public power grid.

Grid-connected photovoltaic systems are available in a wide range of power

classes, ranging from small systems on apartment buildings with an output of 1 kWp (kilowatt peak) and a solar module surface area of approximately 10 square metres, up to large, free-standing systems with outputs of up to 100 MWp (megawatt peak). Small systems with typical outputs of 3 – 4 kWp can be integrated easily into existing buildings. Medium-size systems with outputs ranging from approx. 30 to 100 kWp are often mounted on factory and office buildings, farm buildings, schools, town halls and other public buildings. There are even a few industrial rooftop systems in the megawatt range. However, large systems with outputs from 1 to 60 MW are usually constructed as free-standing systems in open areas.

Photovoltaic systems also make it possible to generate and use electrical energy independently of existing power grids, dispensing with the high cost of constructing power grids over long distances. Solar systems with integrated battery systems are also suitable as back-up systems for regions with unreliable power supplies. The simplest method of off-grid application is to use the direct current generated by the solar energy to operate electrical equipment locally. Photovoltaics can, however, also be used to create off-grid 'island' systems. Such 'mini-grids' can supply electricity to facilities ranging in size from individual buildings up to several small towns. In order to feed the supply into mini-grids, an inverter has to first convert the electricity into alternating current. To ensure that electricity is available when required, even during periods of insufficient solar radiation, it is advisable to integrate a storage module (e.g. battery) into the mini-grid during construction.

A long-term, convenient and cost-effective version of off-grid electricity supply using such island systems could be created by combining photovoltaic systems with wind farms and hydropower plants and/or electricity generators powered by diesel and bio fuels (hybrid systems). PV off-grid systems may make it possible to save on the fuel (e.g. diesel) used to generate electricity in generators in rural areas, fuel that often has to be transported over great distances.

3.2.2 Market development

The photovoltaic industry has experienced strong growth in recent years, and the industry expects global demand to increase further. With 15 GW of newly installed systems – equivalent to a total investment sum of around 50 billion euros – the PVs capacity installed worldwide within a decade it has increased from about 1.5 GW in 2000 to over 39.5 GW in 2010. Over the course of a year, this capacity currently generates around 50 terawatt hours (TWh) of PV electricity. The majority of this capacity, approximately 28 GW, is installed in Europe, making up about 70 % of total installed capacity, followed by Japan (3.7 GW) and the USA (2.6 GW). China plays a role mainly as producer of solar cells

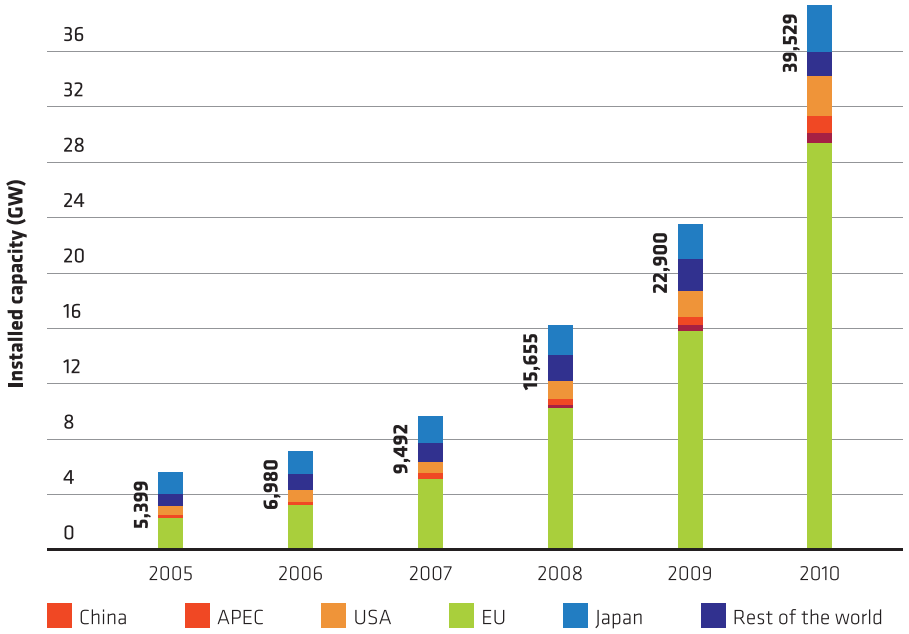


Figure 5: Development of the PV capacity installed worldwide
Source: European Photovoltaic Industry Association (EPIA)

and modules; the installed output there amounts only to ca. 0.7 GW.

For the first time in 2010, Europe's photovoltaic sector installed more new capacity than any other renewable electricity source over the year. EurObserv'ER estimates that 13,023.2 MWp of photovoltaic modules were hooked up to the grid in the EU, which is a 120.1% year-on-year rise (from 5,918.2 MWp in 2009). These new plants raise the European Union's photovoltaic capacity to 29,327.7 MWp. In the off-grid segment, a mere ten megawatts-peak or so were pinpointed in 2010, although some plants may have been overlooked. Lastly, per capita photovoltaic capacity in 2010 stands at 58.5 Wp compared to 32.6 Wp in 2009.

Further significant installation cost reductions came after two consecutive years of cost slashing and provide the explanation for this growth, which confounded all expectations. If we look at the benchmark market, Germany, the installation costs of <100 kWp roof-mounted systems dropped from a mean of just under €4000/kWp early in 2009 to just under €3,000/kWp early in 2010, and to €2,546/kWp early in 2011, according to the German Solar Industry Association (BSW).

Now these cost reductions apply right

across the board to all photovoltaïc markets and have persuaded EPIA that in many countries where electricity generating costs are relatively high, it is a matter of few years before parity between the grid and residential systems is achieved (namely when the cost of producing one photovoltaic kWh equals the retail electricity purchase price). These plummeting costs caught most of the national incentive systems completely unprepared for the disparity between installation costs and incentive levels.

3.2.3 Outlook

Gradually, photovoltaic technologies will be applied to more and more areas of life. The trend towards using solar modules as a design element for buildings will continue, e.g. in the form of semi-transparent modules for glass facades. Design, environmentally friendly energy generation and skilful shading go hand in hand in these systems.

Flexible solar cells, available in crystalline form and as thin-film cells, are opening up new horizons in a wide range of applications. Flexible thin-film modules, which can be integrated into roofing foil and "rolled out" onto house roofs or applied to vehicle roofs and boats, are already available. Many more far-reaching applications, such as integrating solar cells into clothes or tarpaulins are also currently being researched.
Researchers and companies are currently developing processes to reduce module and system costs while increasing the energy yields of solar power plants, which will in turn lead to the wider use of photovoltaic systems. Integrating PV with other renewable energy technologies and off-grid systems optimised to meet specific local requirements will make a decentralised, reliable and cheap electricity supply possible in many areas.

3.3 Concentrated solar power plants

3.3.1 The technology at a glance

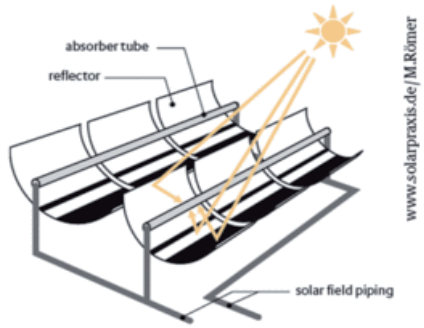
The common basic principle of solar thermal power plants is the use of concentrating parabolic reflector systems in large-scale versions of what are known as solar fields, which direct the solar radiation onto a receiver. The concentrated radiation is then transformed into thermal energy at temperatures ranging from around 200 to over 1,000 degrees (depending on the system). As in a conventional power plant, this thermal energy can then be converted into electricity via steam- or gas-powered turbines, or it can also be used for other industrial processes such as water desalination, cooling or, in the near future, the production of hydrogen.

Due to this principle, solar thermal power plants excel in their ability to store the thermal energy generated in a relatively simple and cost-effective manner, allowing them to generate electricity even during hours of darkness. Consequently, they can make a key contribution to planned, demand-oriented electricity production in a future electricity mix with high proportions of renewable energies.

There are **four different types of concentrating reflector systems** which can be grouped in the following two (2) basic categories:

- **linear concentrating systems**, such as parabolic trough and Fresnel collectors, and
- **point focus concentrating systems**, such as solar towers and dishes (paraboloid).

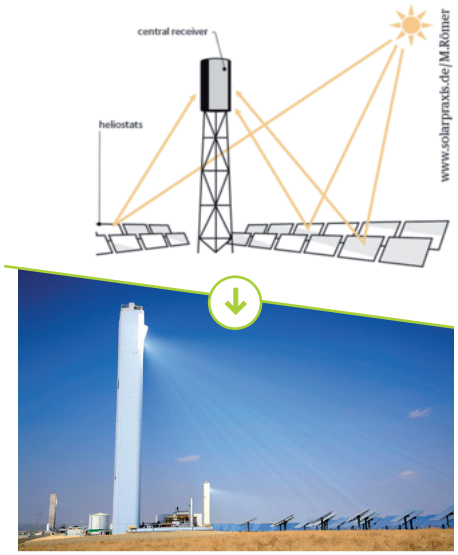
All systems must track the sun in order to be able to concentrate the direct radiation. The various types of power plants are briefly described below.



Functional priciple of a parabolic

Solarlite GmbH: Parabolic through collector

The solar field of a **parabolic trough power plant** consists of numerous parallel rows of collectors, which are made of parabolic reflectors. These concentrate the sunlight onto an absorber tube that runs along the focal line, generating temperatures of approximately 400°C. Circulating thermo-oil serves as a heat transfer medium to conduct the thermal energy to a heat exchanger, where water vapour is generated with a temperature of around 390°C. This is then used to power a steam turbine and generator, the same as in conventional power plants.



Above: *Functional principle of a solar tower.*

Below: *DLR/Lannert. Pilot plant: Solar tower in Julich, Germany.*

Above: *Functional principle of a dish-Stirling system.*

Below: *DLR/Markus Steur. Dish-Stirling system.*

Recent developments, already tested in pilot plants, include the use of a thermal fluid composed by a mixture of non toxic molten salts instead of oil, thus raising the working temperature to 550°C. The higher temperature leads to an increase in the efficiency of thermal to electric energy conversion. Being the thermofluid very cheap, heat storage arrangement can be provided on site, this way extending the operational time by several hours.

The so-called **Fresnel collectors** are also undergoing practical trials. With these collectors, long, only slightly curved reflectors concentrate the solar radiation onto a fixed absorber tube, where water is directly heated and vaporised. As the basic concept of these collectors is simpler in comparison to parabolic troughs, lower investment costs for the reflectors can be expected. However, the comparable annual efficiency will be somewhat lower.

In **solar tower power plants**, solar radiation is concentrated onto a central heat exchanger /absorber by hundreds of automatically positioned reflectors. The significantly higher concentration in comparison to parabolic trough collectors, for example, allows higher temperatures in excess of 1,000°C to be achieved. This enables greater efficiency, particularly when using gas-powered turbines, thereby resulting in lower electricity costs.

For the devices known as **dish-Stirling systems**, a parabolic reflector mirror concentrates the solar radiation onto the receiver of a connected Stirling engine. The engine then converts the thermal energy directly into mechanical work or electricity. These systems can achieve a degree of efficiency in excess of 30%. Prototype systems are undergoing trials at the Plataforma Solar centre in Almería, Spain. Although these systems are suitable for stand-alone operation, they also offer the possibility of interconnecting several individual systems to create a solar farm, thus meeting an electricity demand from ten kW to several MW.

3.3.2 Market development

In order to operate cost-effectively, solar thermal power plants require a high proportion of direct solar radiation, and therefore are typically used in very sunny regions (e.g. southern Europe, North Africa and the south-western USA).

Parabolic trough power plants with a total output capacity of around 350 MW were installed in California from 1984 to 1991. They are still in operation today, having since produced more than 16,000 gigawatt hours (GWh) of electricity. Many years of experience with this type of power plant is a major reason why the majority of power plant projects initiated since 2004 in Spain, the USA and a few countries in North Africa utilise parabolic troughs. However, in the course of the current dynamic market development, many solar tower power plants are also being planned and built, as well as large-scale systems utilising dish-Stirling and Fresnel technology.

The world's first commercial solar tower power plant, PS10, was commissioned near Seville, Spain, in 2007 by Abengoa. It has since been expanded with the addition of PS20, a solar tower plant with double the output capacity. In Guadix in the Spanish province of Granada, three 50 MW parabolic trough plants are in operation or under construction. Each incorporates thermal storage which allows around seven hours of operation even when there is no sun. They supply approximately 600,000 people with electricity. A total capacity of around 800 MW is currently in operation in Spain while another 900 MW is under construction. By 2013, approx. 2,400 MW should be in operation.

A massive expansion of solar thermal power plant capacity is also expected in the USA, where construction of several plants with capacities ranging between 250 and 280 MW was begun in 2010. The total capacity of the projects, which are in various stages of planning and implementation, is approximately 9 GW. German companies have made a considerable contribution to these projects as developers, constructors and suppliers of key components, such as absorber tubes, as well as in engineering and quality assurance.

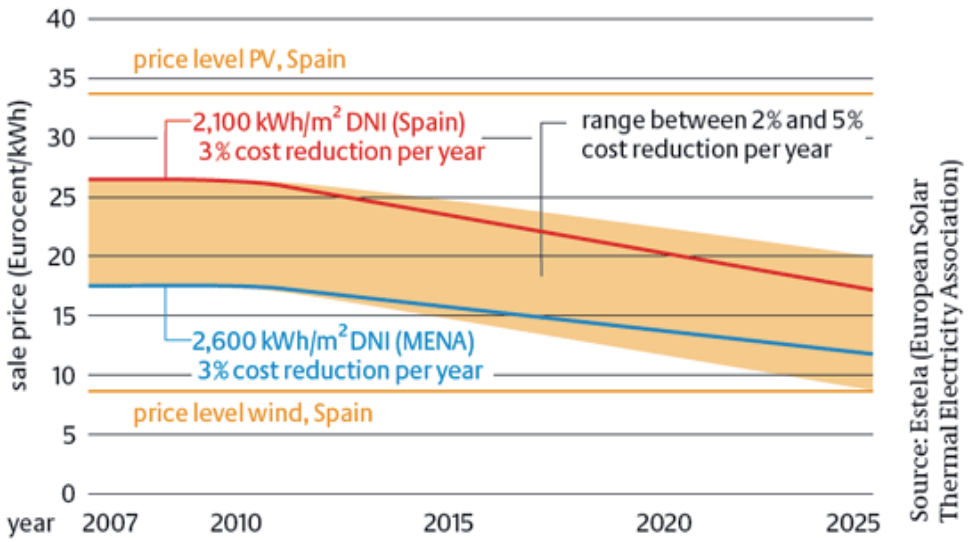


Figure 6: Possible development of the retail price of electricity from solar thermal power plants for regions with differing intensities of direct solar radiation (DNI)

3.3.3 Outlook

Globally, rapid development can currently be observed in the construction of solar thermal power plants, which means that marked cost reductions in the electricity generation price of these systems can be expected. Within the next five to ten years, solar thermal power plants at good locations will be able to compete with electricity from average load power plants, depending on the development of overall costs (purchase and CO2 abatement costs) of fossil fuels.

Figure 6: Possible development of the retail price of electricity from solar thermal power plants for regions with differing intensities of direct solar radiation (DNI)

Solar thermal power plants will play an important role in the global energy supply of the future. Studies have shown that by 2050, approx. 15% of Europe's electricity needs could be met by solar power plants in North Africa and the Middle East. The storage capacity of these power plants offers a significant advantage in the energy mix of the future since it can provide a buffer for other renewable energies subject to more fluctuation such as PV or wind. Imperative for this are an appropriate grid infrastructure for the transport of electricity as well as clearly defined regulations for supplying public electricity grids. Established in 2009 through the cooperation of numerous, large-scale German companies, the Desertec Industrial Initiative has the goal of bringing about the implementation of this concept.

A technical variation still under development is the creation of solar thermal power plants without the concentration of direct solar radiation. In what is known as a solar chimney power plant, air is heated by direct solar radiation beneath a large roofed area, which has an airtight connection to a chimney situated at its centre. The heated air flows upwards through the chimney via air ducts at its base. This current drives one or more wind turbines and the connected generator, which then converts kinetic energy into electrical energy.

3.4 Biogas CHP systems

Biogas, produced by the fermentation of biomass, is utilised worldwide to supply energy in various ways: by burning it in combined heat and power plants for power generation using waste heat (combined heat and power, CHP), as biomethane fed into the natural gas grid after appropriate processing, as fuel for natural gas vehicles or directly for cooking. Germany is both the market and technology leader in the EU, particularly in the area of gasification based on organic waste and renewable sources.

3.4.1 Technologies and applications

Biogas can be extracted from a variety of sources such as organic waste from landfill sites (landfill gas), municipal wastewater (sewage gas), and industrial /domestic / commercial organic waste, as well as from agricultural waste materials and energy crops. The fermenting process of organic substances in an air- and oxygen-free environment uses various anaerobic bacteria, the composition of which depends on their organic feed stock and specific process conditions (temperature and pH level). A decisive factor in the productivity of biogas plants are the microbiological processes that occur during fermentation.

BioConstruct GmbH
source: www.renewables-made-in-germany.com

As a rule, agricultural biogas plants use liquid manure as a base material. Renewable sources such as corn, cereal

crops and other energy plants such as sunflowers, Sudan grass, sugar beets, oil radishes, sweet sorghum, etc., are increasingly being used to increase gas yields. Commercial plants also process wastewater (from purification plants) as well as waste from food production, food scraps, grease traps and slaughterhouse waste. The extracted biogas is primarily a mix of 50–75% methane and 25–45% carbon dioxide as well as trace amounts of water (2–7%) and gases such as hydrogen sulphide, oxygen, ammonia and hydrogen. Aside from the biogas itself, a digestate is created – a mix of water, minerals and organic substances, which have not decomposed.

Figure 7: Schematic diagram of biogas use to generate electricity and heat.

This by-product can be used as a high-grade fertiliser by farmers, thereby closing the nutrient cycle with the cultivation of energy crops, or it can be sold as mineral fertiliser. The stationary use of biogas in combined heat and power plants (CHP plants) for

Schmack Biogas GmbH

generating power and heat (see figure 7) achieves a very high degree of efficiency. The electricity produced can be fed into a public grid or used as an independent power supply for industrial and commercial areas, or even provide power to remote rural settlements with no grid connection. The waste heat can also be utilised in downstream systems to generate additional power, for heating and drying or in the operation of refrigerators. In order to obtain higher power yields from CHP plants, researchers are investigating the use of biogas in fuel cells, which can convert the chemical energy of the processed biogas directly into electricity. Fuel cells have been expensive up to this point, but they work quietly and reach electrical efficiency levels of up to 50%.

If there is no appropriate heat sink at the plant location, the feed-in of biogas into the natural gas grid, after processing into natural gas quality (biomethane, methane content of up to 98 %), is an attractive option. This enables biogas to be used in areas with a high demand for

heat and achieves maximum efficiency by producing power (CHP) at the same time. The decoupling of production and utilisation provides, in principle, an opportunity to use the biogas as fuel for natural gas vehicles. In developing and emerging nations, biogas generated from simple biogas plants is primarily used as an economical alternative to electricity, natural gas or wood for cooking.

3.4.2 Market development

Biogas production rose across the EU in 2009, driven by the EU target of meeting 20% of final energy consumption with renewable energies and the guidelines set forth in EU Directive 2008/98/EC for the handling of waste. On the basis of these political objectives, many countries have introduced incentive programmes for the generation of power from biogas (feed-in tariffs for electricity from biogas, green certificates, tenders or grants for the use of energy crops). Power generation from biogas grew between 2008 and 2009 by almost 18% and accounted for a total of 25,170 gigawatt hours (GWh) in 2009.

Total energy extraction from biogas rose over the same period by some 4.3% to 8,346 ktoe (kilo-tonnes of oil

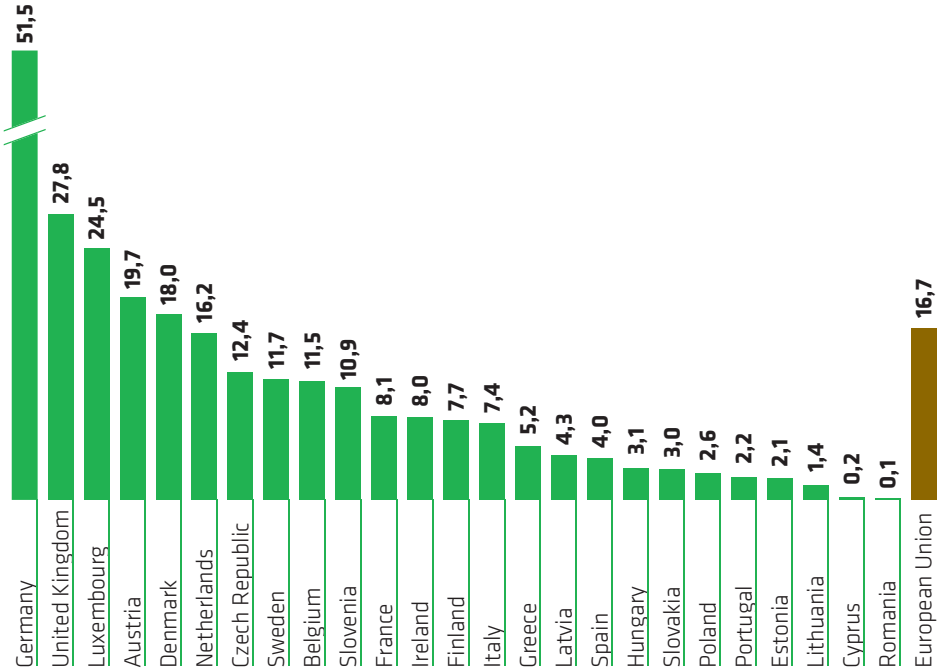


Figure 8: Primary energy production from biogas per capita in the EU in 2009 (toe/1,000 inhabitants)
Source: EurObserv'ER 2010.

equivalent). Around 52% of the plants produced biogas from agricultural waste, while landfills and sewage treatment plants generated 36%, or 12% of the biogas in the EU. In 2009, the largest biogas producers in Europe (in thousands of tonnes of oil equivalent or ktoe) were Germany, the United Kingdom, France, Italy and the Netherlands. Rapid and dynamic growth can be observed in Greece, Slovenia, Slovakia, the Czech Republic and Belgium.

3.4.3 Outlook

Biogas can make a significant contribution to a secure and economical energy supply worldwide. There is excellent potential in currently untapped sources of biomass (residue) and waste as input materials. At the moment, large quantities of raw materials and waste suitable for use in biogas production are being disposed of unused. However, the potential of residues has already been largely exploited in many countries, where the greatest potential is seen in so-called energy crops. With appropriate modifications to agricultural legislation, the inevitable changes to the landscape brought about by the rapid expansion of energy crops could be controlled.

The ability to process biogas into natural gas quality opens the door to a whole range of possible uses of biogas in the natural gas grid and in the field of transport. The market segment of feeding biogas into the natural gas grid is growing steadily.

3.5 Wind turbines

Wind energy has been used in many regions of the world for centuries. Surpassed only by hydroelectric power stations, modern wind power plants are the second most efficient technology in renewable energy systems. After the disappointing year of 2010 on the traditional wind markets of Europe and the USA, the sector is now expecting a comeback of this success story, not least due to impulses from the offshore wind sector. As regards the EU, the presence of several leading manufacturers makes Germany a pioneer in the continuing development of this technology and in increasing capacity worldwide.

DOTI 2009, Matthias Ibeler

3.5.1 Technologies and applications

The yield of wind turbines depends significantly on wind speed. Because winds are stronger and steadier the further they are from the earth's surface, turbines are mounted on towers as high as possible. Local limits on turbine height may thus hamper the exploitation of a turbine's maximum potential efficiency. In some German states, for instance, a 100 m limit on turbine height is common.

Currently, most of the world's turbines are installed on land. In future, their numbers will continue to grow mainly on land, both in Europe and worldwide. But the development of offshore wind farms will become more important over the next few years. Much experience with offshore projects has also already been gained in over 30 offshore wind farms built off the coasts of Great Britain, Denmark, Sweden, Ireland, the Netherlands and Germany. Given the consistent wind conditions and higher average wind speeds at sea, the expected energy yields are up to 35% higher than those on land.

The use of small wind energy turbines (small wind turbines) is also becoming more important. Small wind turbines are defined by the international IEC 61400-2:2006 standard ('Design requirements for small wind turbines'), which describes small wind energy turbines as those with a rotor sweep area of less than 200 square metres at 350 W/m², providing a maximum output of 70 kW. Their towers are usually not higher than 20 metres. Most turbines currently on the market generate outputs in the 5 to 10 kW range. Small wind turbines are especially suitable for providing a basic supply of electricity in regions far from power grids.

REpower Systems AG. Maintenance work on the nacelle of a wind turbine.

3.5.2 Market development

In 2010, the total power output generated using wind energy worldwide increased by 22 % to 194,390 MW. The total number of turbines installed worldwide by the end of 2010 generates 425 terawatt hours (TWh) annually, which is 2.5 % of worldwide electricity demand. Some indicative figures of the wind turbines market progress over the last years are given below.

Due to the investment backlog caused by the global financial crisis, there was a significant slump on the world market for new wind turbines in 2010. At a total of 35,802 MW, around 7 % less were built than in 2009 (38,610 MW). In many countries the construction volume of new turbines decreased from 2009 to 2010. The most significant cutbacks

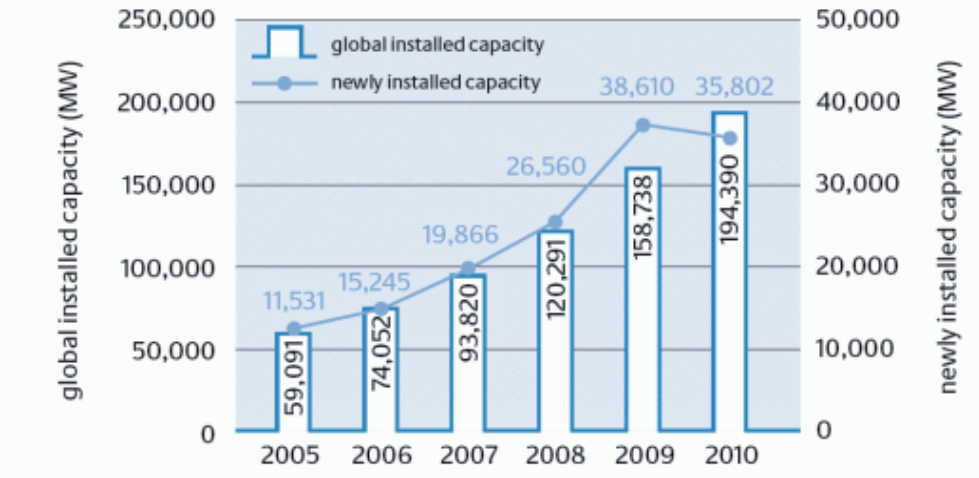


Figure 9: Global installed capacity (MW) / newly installed capacity 2005 – 2010 (in MW).
Source: GWEC Global Wind Statistics 2010

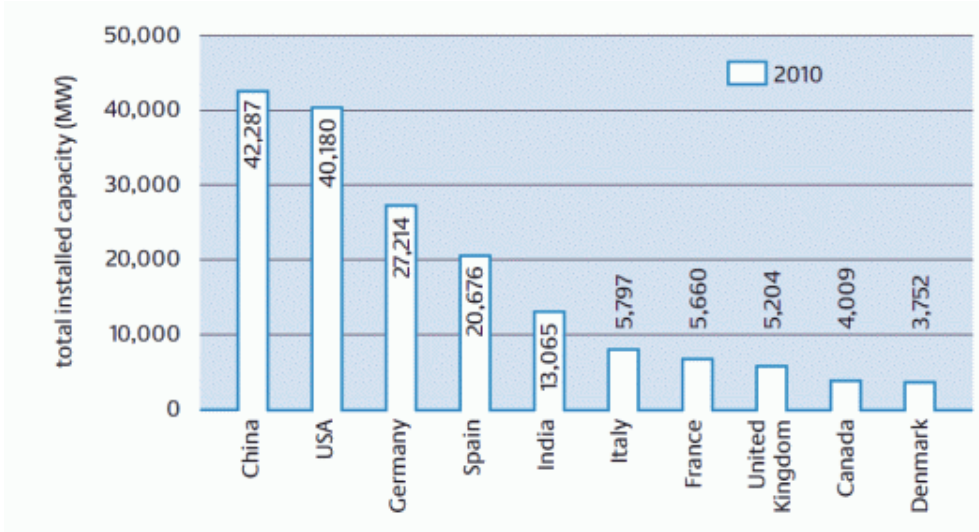


Figure 10: The ten biggest countries by installed capacity (in MW)
Source: GWEC Global Wind Statistics 2010

were reported in the USA (-48%), Spain (-37%) and Germany (-19%), which, with a total of 27,214 MW of installed power, is ranked third worldwide.

The largest growth volume was achieved in China. In 2010, wind turbines with a cumulative capacity of 16,500 MW were installed. China has thus superseded the USA as the leading wind power nation with a total of 42,287 MW. The five largest countries in this ranking (China, USA, Germany, Spain and India) provide 74% of global installed capacity. In relative terms, wind energy has become a main pillar of the electricity supply in many countries and regions. In Denmark, around 21% of the total electricity generated is produced using wind power; in Portugal the figure is about 15%, in Spain 14%, and in Germany 7.5%. By contrast, the proportion of electricity produced using wind power in the USA is still less than 1%.

3.5.3 Outlook

After the slump on the international wind market, a gradual increase is expected for the coming years. In 2020, 12% of the world's electricity supply needs will be met by wind energy. The world wind energy industry association, the Global Wind Energy Council (GWEC), has forecast that more than 34% of the world's power requirements may be generated using climate-friendly wind energy in 2050.
The rate of international growth will depend on overall energy policy conditions, among other things. In years to come, countless new turbines will be built in countries offering a positive regulatory environment for expanding renewable energies. Current growth markets in Europe include Spain, Portugal, Great Britain, France and Italy. Outside of Europe, expanding markets will be located primarily in Asia. However, the Chinese government is aiming to restrict growth, to avoid a disproportionate inflation of the market. Central and Eastern European countries, other Asian nations, Latin America, (North) African countries and the Near and Middle East will also be major future markets. A rise in repowering is also a potential growth factor.

The increasing transnational trade in electricity across Europe, the shift of the energy generation focus away from conventional power plants, and the expansion of renewable energies, in particular of wind energy, has made it necessary to modify the power grid infrastructure, with a focus on optimising the existing network and making it more flexible. Measures to expand the power grid and improve its utilisation, through temperature monitoring, for example, are currently in preparation in Germany. The use of new storage technologies such as compressed air storage (among others), better load management in the private and industrial sectors, and the networking of decentralised power generation into so-called virtual power plants all offer considerable potential for the optimal integration of wind energy.

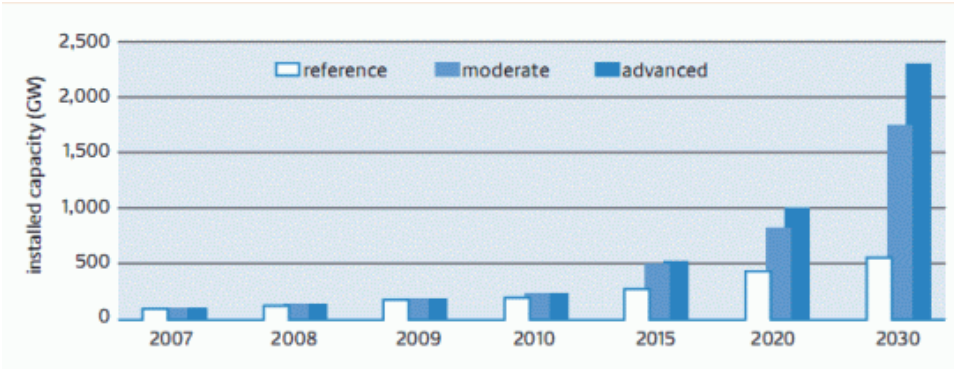


Figure 11: Possible scenarios for the development of total capacity installed worldwide.
Source: GWEC Global Wind Statistics 2010

Virtual power plants can be used to connect regenerative energy generation systems, enabling all the turbines to be managed optimally, both economically and technically. However, it is imperative that the network be further expanded so as to completely integrate renewable energies and ensure security of supply. Another current topic of discussion is methanation. Methane can be synthesised using excess wind energy. It can then be fed into the gas grid and converted back to electricity on demand. This presents an alternative to pure expansion of the power grid.

Ongoing research into (and development of) the wind power concentrates, among other things, on reducing its negative environmental impact (noise and light emission). To achieve these goals, a test project was started in Germany in February 2010 that aimed to reduce light emissions by using an innovative radar system in the turbine to automatically monitor air traffic and regulate illumination. Illumination is designed to reduce the risk of planes or helicopters colliding with turbines.

Illuminated markers are prescribed for wind turbines above a certain height in all countries. However, local residents and drivers can feel disturbed by them, especially in sparsely populated areas, where their blinking is often the only source of light at night, making them very conspicuous. The new kind of radar-controlled aircraft recognition turbines tested can 'recognise' a plane or a helicopter and switch on the legally required lighting for just a few minutes. This technology would make even wind farms comprising many turbines invisible at night.

3.6 Geothermal electricity and CHP plants

Geothermal energy is available around the clock and is not subject to seasonal changes, the weather or climate conditions. In many countries around the world, geothermal energy is already used to generate electricity or used directly in heating networks. Particularly in regions with geologically favourable conditions (e.g. regions in the so-called "Pacific Ring of Fire" and those with volcanic activity and temperatures > 200°C), geothermal energy forms a solid basis for environmentally-friendly, cost-effective and sustainable energy generation.

The geothermal energy available in the Earth's crust originates mainly from radioactive decay processes in the Earth's core or from residual heat from the time of our planet's formation. Some energy from solar radiation is also stored in the Earth's uppermost strata. In countries such as Germany, Italy, Indonesia, the Philippines, Mexico, the USA and Iceland, the use of geothermal energy has been an integral part of energy strategy for many years. Recently, interest in the use of geothermal energy for power generation in Africa, e.g. in Kenya, has increased sharply.

3.6.1 Technologies and applications

Best use of geothermal energy depends on the fluid temperature range and is presented by the Lindal diagram (figure 12). Many direct-use applications exist when the water temperature is below 100°C. Technologies that usually utilize the lowest temperature resources are Geothermal Heat Pumps.

High temperature geothermal medium which has potential for industrial use (mainly for power production) is available as steam or water-steam mixture. Steam and water are separated in a pressure vessel (separator), with the steam piped to the power station where it drives one or more steam turbines to produce electricity. The separated geothermal water (brine) is either utilised in a binary cycle type plant to produce more electricity or is disposed back into the reservoir. The technologies that utilize high temperature resources for power generation are:

- "Dry steam" geothermal power plant (see figure 13 top-left): Dry steam power plants use very hot (>235°C) steam and little water from the geothermal reservoir. The steam goes directly through a pipe to a turbine to spin a generator that produces electricity.

- "Flash steam" geothermal power plant (figure 13, top-right): Presently the common built geothermal power plant with 5 MW to 100 MW installed capacity. Flash steam power plants use hot water (>182°C) from the geothermal reservoir. When the water is pumped to the generator, it is released with the pressure of the

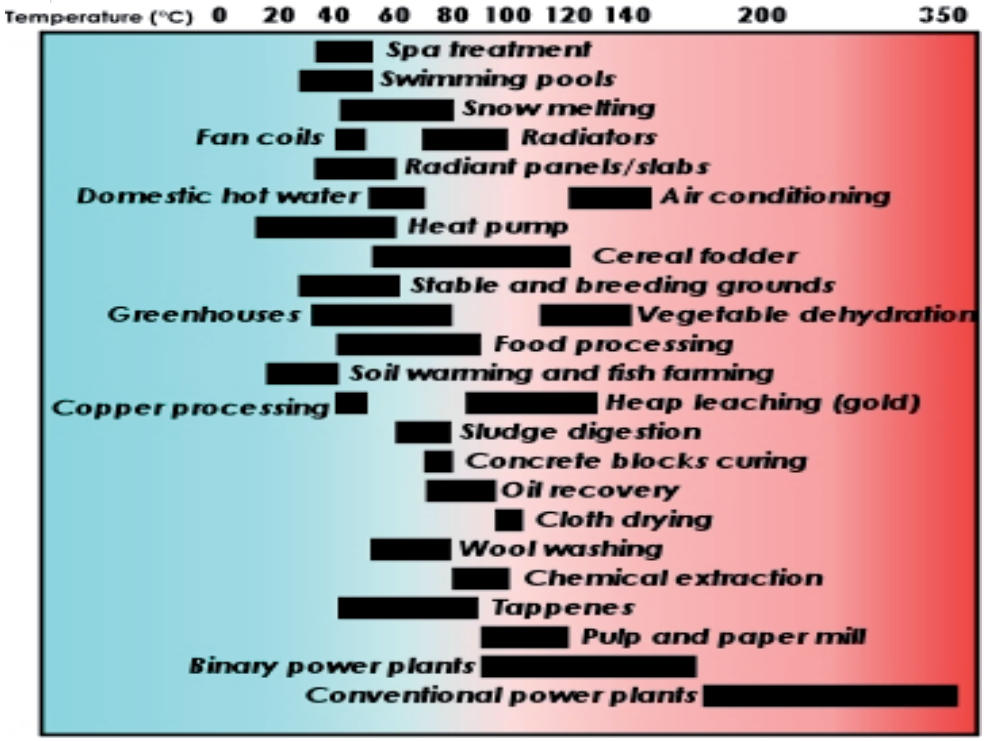


Figure 12: Diagram of particular utilization of geothermal fluids[1]

deep reservoir. The sudden drop in pressure causes some of the water to vaporize to steam, which spins a turbine to generate electricity.

- Binary cycle plants (figure 13 down): In binary systems, hot geothermal fluids are passed through the one side of a heat exchanger to heat a working fluid in a separate adjacent pipe. The working fluid (with a low boiling point) is vaporized and passed through a turbine to generate electricity. An ammonia-water working fluid is also used in what is known as the Kalina Cycle. Makers claim that the Kalina Cycle system boosts geothermal plant efficiency by 20-40% and reduces plant construction costs by 20-30%, thereby lowering the cost of geothermal power generation. The common installed capacity in this type of power plant is 500 kWe to 10 MWe.

- Combined cycle (Flash and Binary): This type consists of the mixture of two above mentioned types (flash and binary) which allow achieving higher efficiency factor of the plant.

1 B. Lindal, "Industrial and other applications of geothermal energy". In: Armstead, H.C.H., ed., Geothermal Energy, UNESCO, Paris, pp.135-148, 1973.

3.6.2 Market development

Most of the plants installed are currently used for heat generation. In 2010, around 50,600 MW of thermal capacity was installed in almost 80 countries worldwide. In the area of electricity generation, a geothermal capacity of just under 10,700 MW was installed in a total of 24 countries in 2010. The largest installed capacity was in the USA, followed by the Philippines, Indonesia, Mexico and Italy.

Growing national energy consumption and increasing fossil fuel prices may make the use of geothermal energy more important in the near future in countries with high geothermal potential. Besides the particularly excellent potential for utilising this form of energy along the "Ring of Fire" around the Pacific Ocean, there is also considerable potential on the islands on the mid-Atlantic ridge (e.g. Iceland). Further "hot spots" can be found in East Africa along the Great African Rift Valley and in parts of the Middle East.

2 Geothermal Technologies Program, U.S. DoE, http://www.eere.energy.gov/ geothermal/technologies.html

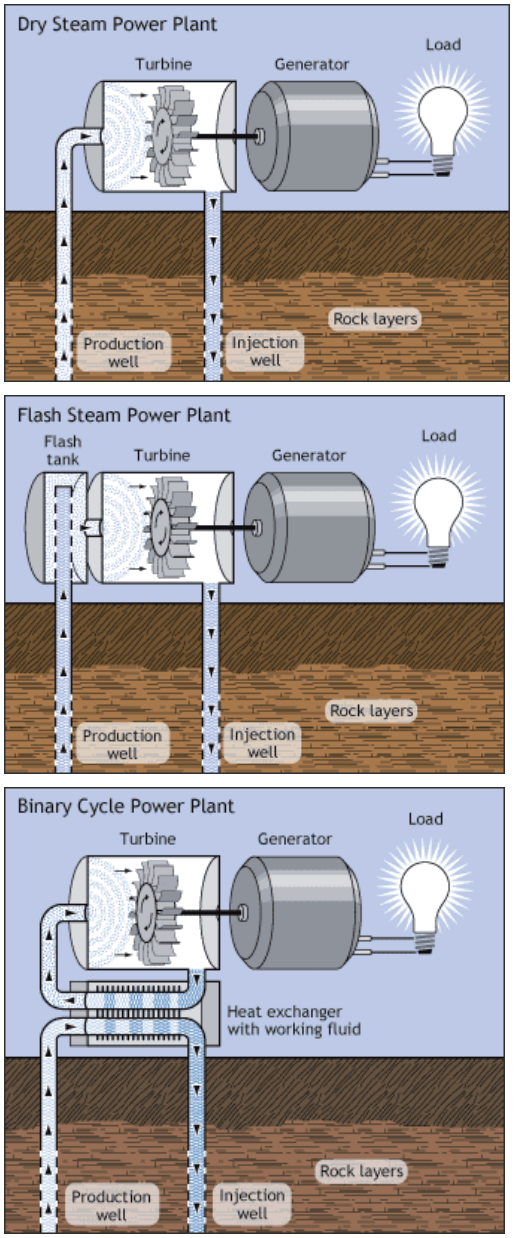


Figure 13: High temperature industrial technologies (Dry steam – top left, Flash steam – top right, Binary cycle - down)[2]

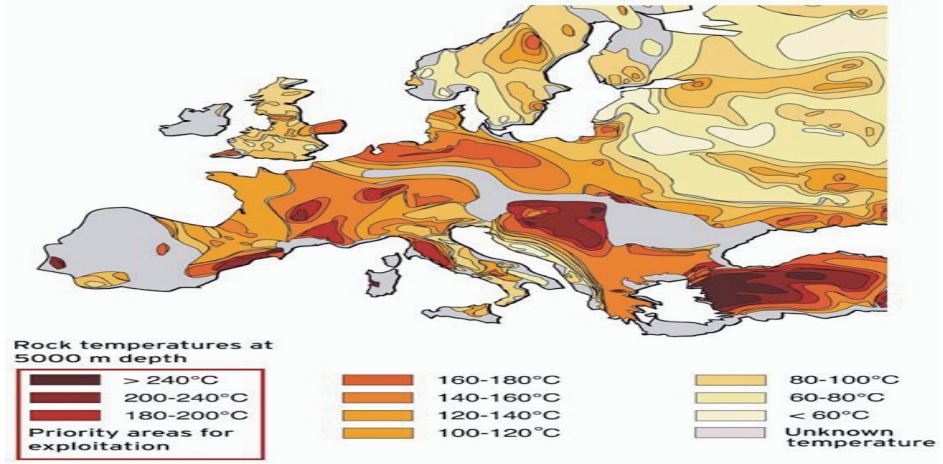


Figure 14: Geothermal resources of Europe – distribution of rock temperatures at 5,000 m depth[3]

3.6.3 Outlook

Currently, geothermal energy is increasingly becoming a 'hot topic' in political discussions on future energy supply. In the face of rising fossil fuel costs, geothermal energy offers secure, long-term availability along with the capacity to meet base load needs. Its flexible range of applications in heating, cooling and electricity generation is also leading to an increase in the number of plants installed worldwide. Because of geological regime - high temperature on surface seldom occurs - the most effective method of resources' exploitation is drilling.

3.7 Other RES

In the case that none of the above technologies seems applicable to a particular M2RES (marginal terrain) site, other renewable energy sources can be considered. The plantation of short rotation wood crops, able to fuel a small electric power plant, is one of them and will be further examined here just as an example. Indeed, large and mildly-contaminated areas can be reclaimed in some cases - or are already in the process of being reclaimed - with the use of short-rotation woods, such as poplar, eucalyptus or willow trees, and their choice depending on climate, humidity and kind of the soil. The crops have a good potential for combined electricity and heat production (CHP).

In fact CHP plants using wooden crops are flourishing in areas where traditionally large amounts of wood residues are readily and economically available (for example in Austria and in Northern Italy). Organic fluid Rankine cycle power plants (0.2 to 3 MWe electric output) are usually adopted, since they exhibit good performance, very reliable operation, low maintenance, acceptable costs, and low atmospheric emissions of hazardous substances. Thermal to electricity efficiency is around 20%. Electric energy generation (operational) costs can be low: about 0.03-0.04 euro/kWh.

3 EEIG "Heat Mining", 2000. European Hot Dry Rock Project.

The practical limitation for the diffusion of such plants is in the availability of sufficient wood crops and/or vegetation residues to be burnt. Even a small (of 350 kW electric output) biomass fuelled power plant, when operating near its nominal power, needs approximately 20 m3 of wood crops per day. Typical production of short-rotation wood is around 5 tons/ha/year. This means that an area of around 15 km2 (say 4 km x 4 km) is needed to give sufficient fuel to operate such a plant. The chances to have marginal areas of such an extension are low, however they may be built "by addition" of smaller marginal areas, if available, in the surrounding of the elected plant site.

Other activities already present on a place (wood industries, cleaning of forests in the nearby) can contribute too in reaching the amount of fuel needed to economically operate such a plant. The main advantage of this solution is that it may offer a viable use of areas not exploitable with other kinds of energy plants (PV or wind). Another advantage is that the produced electric power can be easily modulated according to load profile on the network, so using the local cheaper generation mostly during peak hours, when the cost of imported electricity would be higher.

The places that can benefit the most from this kind of generation are the ones with cold winter climate, because they can satisfy the demand for district heating of buildings. In view of that, the effective value of such combined plants largely exceeds the bare figure given by electric energy production alone. The electric energy density per unit of land area attainable with wood crops is low, about 0.2 GWh/km2/year. This is 1/50 of the typical energy density obtainable with wind turbines and 1/150 of the energy coming from PV panels.

For further information on the use of biomass as fuel for the production of energy the reader may refer to the following sources:

- http://www.iea.org/techno/essentials3.pdf#page=2
- http://un.by/pdf/Study%20Tour%20Biofuel%20Report%20English.pdf
- http://www.turboden.eu/en/products/products-chp.php
- http://www.woodheatsolutions.eu/reports.aspx

4. Best Practice case studies

A number of Best Practices with relevant and transferable features across Europe, the European Union, and the rest of the world (USA, Japan, and other RES advanced countries) have been collected by the M2RES consortium. The information regards best technology solutions for the installation of Renewable Energy Sources (PV, Wind, Biomass, geothermal, biogas, etc.) and on the operative and management models at their base, evidencing the most attractive ones from the economic and environmental points of view.

A rather extensive database has been created by M2RES, which can be found in the Project's website: http://www.m2res.eu/, aiming at spreading the knowledge on successful technical and financial solutions to public and private investors looking for ideas for recovering their marginal terrains in an eco-sustainable way. Some of the most indicative of these "best practices" are presented in the following paragraphs.

4.1 Greece's giant PV projects in former lignite mines

Greece has recently revealed its ambitious plan to start building the world's largest solar park. According to officials, the photovoltaic park is evaluated at a price of nearly 600 million euros ($807 million), with an installed capacity of 200 megawatts (MW) that will be capable of producing of 260,000 MWh of clean electricity per year. Besides this,

the project's electricity output will be "greater than any other photovoltaic park operational in the world until now". Another interesting fact about the new solar park is that it will generate enough energy to power 55,000 homes, reducing greenhouse gas emissions by up to 300,000 tons annually. The site will also have a solar PV manufacturing plant.

Figure 15: Areal view of the 200 MW PV park's planned location[1]

However, the most impressive aspect of this development is that the PV park will be located in the area of some depleted opencast coal mines of the Western Macedonia's Lignite Center, near the city of Kozani, and will be extended in about 530 hectares (see figure 15). The state-run Public Power Corporation (PPC) and its 100% subsidiary PPC Renewables S.A. are searching for a strategic investor for the new project. The strategic partner will jointly participate with PPC in the company "Iliako Velos I S.A.", which is 100% subsidiary of PPC Renewables S.A. and has already submitted the relevant application to the Regulatory Authority of Energy for the issuance of the Production License for a nominal capacity of 200 MW (a relevant announcement has been issued on 13.12.2010).

For this purpose, PPC issued an international tender and 21 consortia (JVs from Greece and other nine countries) had submitted preliminary proposals to develop, construct, and operate the 200 MW project. After that, PPC proceeded with the second and last phase of the tender for the 200 MW photovoltaic project of PPC in Kozani, Western Macedonia, with an invitation sent to the companies that were selected from the previous phase of the tender in order to submit their binding offers for the selection of the strategic partner for three mandatory actions:

1. The construction, operation and maintenance of a 200MW PV park in Western Macedonia.

2. The construction and operation of a plant for solar panels in Western Macedonia.

3. Other energy and technology related actions in Western Macedonia.

The selection of the strategic partner will be made on the basis of the best financial offer and in accordance with the total rating of every bid. It was aimed at having the final offers submitted by the beginning of 2012, in order to select the EPC contractor and have the commencement of the construction in summer 2012. However, the deadline for bids was postponed to November 30, at the request of the 21 consortia, who needed more time to secure project financing. There is a severe lack of liquidity in Greece due to the financial crisis, which has made it difficult for project developers to finance solar projects.

It must be further noticed that PPC is also about to award a contract for the construction of a 50 MW photovoltaic (solar) park in Megalopolis to a Greek engineering company which was declared the lowest bidder in the related tender. The project (an artist's impression of which is given in figure 16 below) will be developed on a 2,000 acres plot within an old opencast lignite mine in the Megalopolis Lignite Center (Peloponnesus region of southern Greece). It has an initial budget of 140 million Euros and is expected to become operational within 14 months from the contract award. Some key figures of these two "big projects" that will be soon installed in exhausted lignite mines by PPC are shown in the Table below.

Figure 16: Artist's impression on the PV park of PPC in Megalopolis[1] *- source: www.ppcr.gr*

	Western Macedonia 200 MW PV Plant	**Megalopolis 50 MW PV Plant**
Project Owner	PPCR	PPCR
Total installed capacity (MW)	200	50
Expected Annual Production Capacity (GWh)	280	70
Expected irradiation (kWh / m²)	1,750	1,750
Start of Operation	2013	2013
Total operating years	20	20
Total construction cost (in m. €)	600	105
FIT (in €)	292.08	392.04
Estimated Annual Revenue (in m. €)	81.78	27.44

1 *PPC Renewables web-site: http://www.ppcr.gr*

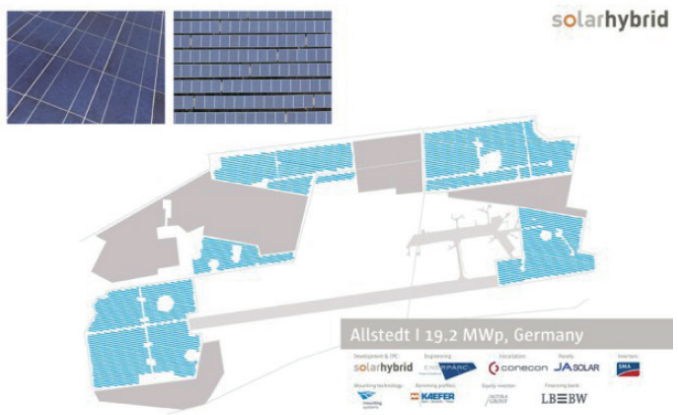


Figure 17: Concept of the photovoltaic power plant in Allstedt in Germany - www.solarserver.com

4.2 Former airfield of Allstedt

The installed solar power plant in Allstedt is an example of successful implementation of renewable energy sources on marginal areas, more precisely in a former military airfield. Trough the know-how transfer and active collaboration of the involved companies it was possible to realize an 18.5 MWpeak solar power plant in an area of 47 ha - in just 11 weeks - that now contributes to the environmental protection by reducing the CO2-emissions.

As general contractor and project developer, solarhybrid AG has constructed the Allstedt I solar power plant on a former military airfield close to Halle (Saale). Four companies, Sohy Allstedt Betriebs 1,3,4,6 GmbH & Co. KG commissioned solarhybrid with an order volume of around 37 million Euros (net) and operate the solar power plant. Proven partners of solarhybrid from previous large-scale projects were involved in the realisation process: Photovoltaic modules from Ja Solar, converters from SMA, frame technology from Mounting Systems, planning by Enerparc, assembly by Conecon.

The Allstedt I solar power plant generates over 18.33 million kilowatt hours (kWh) of clean energy per year, and saves around 256,669 tons of harmful carbon dioxide (CO2) during the 20 years of service. As such the plant will make an important contribution to reducing the greenhouse gas emissions and to the expansion of renewable energies. The total project value is approx. 42 Mio. € (net).

For additional information:
http://www.solarhybrid.ag/Allstedt-I.ref_allstedti.0.html?&L=2

Figure 18: Finished solar power plant in Allstedt after 11 weeks construction time.

4.3 The Case of Ökopark

On the area of the EcoPark Hartberg, the public utility company has been operating a brick factory for decades. After the clay stock has been exhausted in the nineties, the production has finally been closed in 1999. For the further use of the area, that affects 15 hectares, the municipality decided to establish an "impulse-center" with ecological focus. Accordingly, there have settled some businesses within the following years which are most of all working in two sectors – alternative energy as well as waste disposal and recycling. Actually there are existing more than 30 businesses at the area of the EcoPark Hartberg – the former area of the brick factory.

The EcoPark is based on an innovative Three-Pillar-Concept which consists of a network of independent environmental businesses, a centre for applied research as well as experience- and exhibition units. The symbiosis of work, research and teaching is unique in whole Europe because it combines those sectors at one place. This is a future-oriented economic model. The EcoPark practices an ecological circular flow economy and the experience shows that self-sufficiency based on decentralized energy supply concepts works well.

The supply with electricity, heat and cold for the whole EcoPark is CO2 neutral by using central heat- and cooling facilities in the form of a biogas plant, photovoltaic power plants, stirling engine,

Figure 20: Picture of the industrial park at Hartberg source - www.oekopark.at

biomass, and wind energy. There are getting produced 2,500 MWh of heat, 2.100 MWh of electricity and 110 MWh of cold. In the water circulation there is an innovative wastewater as well as a rainwater treatment in use - called "Living Machines". This concept is completed through an ecological was waste management system.

For additional information:
http://www.oekopark.at

4.4 Combination of several RES in the landfill of Novellara Municipality

In the Emilia Romagna region, and more specifically in the municipality of Novellara, an exemplary M2RES type Project has been established a few years ago. The activities performed in this area of Italy are the following:

- Collection and disposal of urban waste in fulfilment of regulations in force;
- Remediation and environmental restoration of waste repositories that reached EOL;
- Monitoring and operation in accordance with environmental regulations in force;
- Selection and pre-treatment of recyclable materials;
- Collection of biogas from organic waste and its use for combined thermal/electric generation;
- Installation and operation of PV parks laid down over waste repositories.

The collection plant comprises a suction piping network ending with vertical intakes distributed almost regularly over the area filled with waste. The network collects the biogas spontaneously produced by anaerobic digestion of the organic fraction of the waste. The system is held in slight under-pressure in order to limit possible leaks of uncombusted methane in the atmosphere. The collected gas – manly a mix of methane and CO2 - is first dehydrated and cleaned by passing through a freezing cell that condensates impurities which possess a higher liquefying temperature. Other way such extraneous substances would limit the maintenance-free working time of the engines used to produce electricity.

The thermoelectric section comprises four generators with 1MW nominal power located inside noise-shielded containers. One of the generators is now reaching its lifetime, so only three will remain in working conditions. The present flow rate of biogas is somehow lowering during years, allowing to feed just two generators at the same time. In this way operation and maintenance can be rotated among the three generators without dropouts. The efficiency of conversion from biogas energy to electric energy is 39%.

The thermal energy coming from the engines is also partly employed, mainly in winter, for warming greenhouses located just outside of the landfill area. The 5000 m^2 covered area hosts mainly hydroponic growth of fresh basil (aromatic leaves) that is quite appreciated in the Italian cuisine. On the whole, the biogas plant confirmed the expectations of the

Parameter	Project estimate	Obtained (2007-2001)
MWh/y produced	22,500	18,500
kWh/m^3	1.70	1.70
m^3/y biogas produced	14,500,000	11,150,000

project, and has been largely profitable so far. The main parameters are summarised below, pointing out that in this type of projects some margins of uncertainty are still present, due to rough knowledge of many factors involved in the process.

On some basins of the landfill, now filled and restored to greenfield, two major lots of photovoltaic panels were installed on ground at different times. A photovoltaic roof on the ground south of the shed (used for selection and packing of recyclable waste) was also built. The first batch, made in late 2010 and early 2011, was installed on the area of the basins identified as #10 - #11 and #9 - #12 (the latter two only partially) that were inactive since October 2001 (see figure 21). The elapsed time of about 10 years from waste filling allowed an acceptable settling of the soil and thus a relatively stable positioning of the support structures holding the PV modules. The final green grass cover was set in 1994.

The bases, both of the fixed PV elements and the tracking ones, are made with pairs of concrete beams, quite cheap and suitable to absorb additional movement of the soil without transferring mechanical stresses to the panels. Some key characteristics of the PV plant are provided in the table below.

The second batch closely matches the former one in terms of ground area, total power, type of installation. The major difference from the first lot consists in the use of polycrystalline PV modules rated 280 Wp, instead of the monocrystalline 180 Wp used in the first batch. The efficiency of the new modules is anyway very close to that of the previous ones (6.95 m2 for 1 kWp). The basins affected by the PV sitting are now #13 - #15 and part of #14 - #16, replenished

Peak power	998 kWp	
Ground area affected	33,000 m²	approximately, including access ways
Average annual solar energy	1,287 kWh/y/kWp	equivalent to hours per year, at the maximum rated power
Total surface area of the PV modules	7080 m²	Preassembled, includes the surface of the modules frames
Panels efficiency	7.1 m²/kWp	PV surface needed to obtain 1 kWp electric power, at nominal irradiation
Type of installation	95% on ground at fixed orientation, 5% on rotating solar tracking plinths	
Yearly electric energy produced	1285 MWh/y	Average yearly estimate, based on meteorological historical data
Ground area needed to produce 1kWh/year	22.6 / 25.7 m²	net / gross (including pathways left between rows)

Figure 21: Aerial photographs of the dump, before installation (left) and after the completion of the first batch of 1 MW photovoltaic ground plant (right)

with waste between end of 2004 and part of 2005. The system is operational from the beginning of 2012.

The photovoltaic on the shed used for recyclable waste collection is laid down on the south side of the roof. The roof surface of about 1,200 m2 was almost entirely used, and counts 1,091 m2 of fully integrated PV modules. The modules are fully integrated, that means they do not extend out of the roof's original shape. This allowed getting a particularly favourable feed-in tariff, because of the lower architectural impact of such a kind of installation. The main data are presented below.

Peak power	155.5 kWp	
Roof area affected	1,200 m²	approximately
Average annual solar energy	1,168 kWh/y/kWp	equivalent to hours per year, at the maximum rated power
Total surface area of the PV modules	1091 m²	Preassembled, includes the surface of the modules frames
Panels efficiency	7.0 m²/kWp	PV surface needed to obtain 1 kWp electric power, at nominal irradiation
Type of installation	Fixed, fully integrated on the roof (the panels do not lean out of the original shape)	
Yearly electric energy produced	87.8 MWh/y	Average yearly estimate, based on meteorological historical data

5. Implementing M2RES projects at municipality, provincial and regional levels

5.1 Potentialities linked with M2RES investments in the SEE countries involved

To test the relevance of the M2RES approach, detailed surveys aimed at assessing the consistence of marginal terrains were carried out for the regions included in the project listed below, in order to estimate the local RES production potential:

- Emilia-Romagna and Veneto, Italy;
- Stajerska, Slovenia;
- Attiki, Greece;
- Sud Muntenia, Romania;
- Észak-Alföld andCentral Hungary, Hungary;
- Burgerland, Austria;
- Littoral, Montenegro.

The considered regions have very differentiated characteristics in terms of population density, industrial or agrarian economy, geographical position, energy production and consumption, use of RES, etc. and can be considered as a good sample of the situation in South East Europe.

The first step was the identification of the information sources for each region, to gather information from them. Generally, data on the various kinds of marginal terrains are owned by different administrations/bodies and it is not always easy to convince them to give the needed information. Moreover, the gathered data are often dispersed, incomplete and/or not properly structured, so their quality is generally poor.

This phase of the project showed that a database containing complete and reliable data is a key point for regional/local administrations wishing to set up an effective M2RES policy. Under this respect, the approach followed by ENEA, in collaboration with the Geologic service of the Emilia-Romagna region, can be considered as a good practice.

The choice made by ENEA was to leverage as much as possible on the existing digital databases of the Regional administration, and particularly on the data banks of the Geologic service, and to collect together all the data in a single GIS platform. The advantage of such an approach is manifold. First of all, some of the terrain's features, which affect the suitability of the areas for the installation of renewable energy sources, such as consistency of ground and underground, slope, etc., are already known at geological level and are digitally mapped. Secondly, a GIS approach greatly simplifies the subsequent steps of intersecting the identified areas with all the necessary exclusion criteria. Finally, a GIS system can be expanded to include additional information when available, and to take into account further criteria beyond the present ones due to the future regulations.

The result was a regional map of all the areas in the region free of constraints for the building-up of renewable energy parks, with location and main features of all identified marginal terrains. Such a map is not yet very accurate for the reasons mentioned before, but is good enough for the present M2RES purposes. Not all the needed data are already available at regional level in digitized format and/or some of them lack important information (e.g. age of landfills, abandonment or not of some military sites, exact perimeter and status of contaminated areas). Moreover, despite formal requests to access official/primary sources of information addressed to the appropriate bodies, such as the nine Provincial Units in charge for the census and reclaim of contaminated sites, not all of them answered promptly. All this information can be easily incorporated when available to produce more and more accurate and reliable maps.

The estimation of the RES production potential from marginal terrains in the various regions depends strongly on the characteristics of each single region, as well as on the quality of available data. The estimated electricity production potential, based on conservative assumptions, range from relatively relevant fractions of the regional electricity demand, e.g. about 5% for Veneto or 3.8% for Attiki, to quite marginal contributions in the case of Burgerland, where the main potential is represented by the exploitation of biomass coming from flood retention zones and brownfield sites, or for Central Hungary, due to the small size and the high level of urbanization. It is worth noting that in all cases M2RES implementations could play an important role in the sustainability of the energy balance of smaller municipalities.

The greatest contributions to the estimates come from landfills and opencast quarries and mines. Exhausted landfills are diffused in all regions, with the exception of Burgerland, where presently there is only one active landfill and some smaller composting sites (mostly for biodegradable waste), and represent a typical site for the implementation of M2RES production. In the post-closure phase, landfills require relevant investments to secure the site, often of several Million Euros, mainly for the capping and for the management of leachate. In many cases, the biogas is already exploited for the production of electricity and thermal energy, but there are margins to improve and to optimize the plant use, especially if the landfill biogas, declining over the time, is coupled with the gas production from the anaerobic digestion of biomass produced locally.

Opencast quarries and mines generally represent the largest areas that can be defined as marginal, with the exception of Central Hungary that is a densely populated region. However, their contribution to the regional energy production potential can be easily overestimated because the mining concession area is generally wider than that effectively exploited. Therefore suitable adjustment coefficients were used to reasonably evaluate their contribution.

Brownfields and former military sites give a smaller contribution to the production potential due to different factors. Information on brownfields and contaminated terrains are particularly dispersed among various registers and/or bodies and it is quite difficult to obtain. Therefore it can be presumed that their contribution to the total potential is underestimated. Former military areas are distributed in all the considered regions and their contribution to the production potential can be relevant. However, even if they are not used any more, very often they are still under the control of military authorities, so that actual available areas are limited to those that have been transferred to local public authorities.

Finally, other kinds of marginal areas can have a relevant role in single regions and were incorporated in the evaluation of the production potential. As examples, in addition to the flood retention zones already mentioned for Burgerland, respective zones nearby motorways, airports and other installations, which in the case of Emilia Romagna account for about 15% of the estimated potential, can be pointed out.

Concerning the energy sources, photovoltaics can be used extensively in all situations where a large surface is available and give the main contribution to the production potential together with the exploitation of biogas from landfills, where it is not already used. In this case, in addition to electricity, considerable amounts of thermal energy are produced. Wind turbines require very

stringent conditions and their contribution to the electricity production is significant only for specific regions (e.g. Attiki) or for peculiar locations (mountains of Emilia-Romagna). Also the biogas produced using biomass available at short distance can play a relevant role, for example when used to integrate and optimize the exploitation of landfill biogas. Finally, geothermal energy is limited to very specific areas where suitable hot fluid is available in the subsoil and, in general, its use has to be assessed case by case.

After the regional surveys, whenever available, facts and figures on marginal areas were collected at national level to allow the extension of the forecasts on the M2RES potential to the countries concerned. As an example, the main results of the forecasts for Italy, Greece, Austria and Montenegro are summarized below. Obviously, these are only indicative forecasts based on existing documents, some of them not very updated, however they can give some suggestions on the relevance of the M2RES approach for the concerned countries and for the South East Europe area.

In Italy, the M2RES production potential can be estimated to about 17,000 GWh/yr against an electricity demand of about 286,300 GWh/yr. The greatest contribution is by far given by opencast quarries, followed by exhausted landfills, where the 85% of it is represented by the exploitation of biogas. In detail:

	GWh/y	demand
Landfills	2,750	0.96%
Opencast quarries	13,000	4.50%
Ex-military areas	660	0.23%
Contaminated areas	680	0.23%
Other areas	300	0.11%

The potential of opencast quarries is probably over estimated for the reasons mentioned before. Considering a reduction factor of 1/3 to take into account a lower occupation of soil, the M2RES potential in Italy can be estimated more than 3% of the electricity demand. The major sources are photovoltaic devices and biogas. The contribution of wind power plays a marginal role as well as geothermal power that can be suitable in very few cases (e.g. in Tuscany) and is mostly already exploited.

In Greece, the M2RES production potential can be estimated to more than 3,000 GWh/yr, against an electricity demand of about 57,000 GWh/yr, more than 2,800 GWh/yr of which is presently covered by renewable sources other than Hydropower (90% wind power). More specifically:

	GWh/y	demand
Landfills	387	0.71%
Opencast quarries	1,432	2.62%
Ex-military areas	422	0.77%
Contaminated areas	780	1.43%

Therefore, the M2RES potential in Greece can cover more than 5.5% of the electricity demand, more than doubling the contribution of the RES. Again, the major contribution to this potential from marginal terrains is given by PV, with relevant rates for wind power, about 10%, and biogas.

Austria's electricity balance presents relevant peculiarities with a total production of about 65,000 GWh/yr, about ¾ of which from renewable sources, mainly water power and biomass. The M2RES production potential, estimated excluding the alpine region due to lack of reliable data, amounts to about 1,095 MWh/y. In detail:

	GWh/y	demand
Landfills	50	0.08%
Opencast quarries	620	0.95%
Contaminated areas	300	0.46%
Flood retention zones	125	0.19%

Therefore, the M2RES potential in Austria can cover about 1.7% of the present electricity demand, with relevant contributions from biomass produced in flood retention zones and biogas. Even in this situation, the M2RES approach can greatly contribute to the economic sustainability of local communities, as demonstrated in the case of Güssing.

Even in Montenegro, which has a much smaller internal electricity demand of about 4,000 GWh/yr, the perspectives of the M2RES approach are quite favorable. Presently the demand is covered by hydro power plants for about 66%, and that source is likely to be further developed in the future. However, the national forecast identified 26 marginal areas that can host renewable energy platforms: 10 landfills, 9 mines/opencast quarries, 3 former military sites, and 3 brownfields/ contaminated terrains. For these sites, forecasts on the potential electricity production have been calculated for photovoltaic devices, biogas and wind power.

Concerning photovoltaic, a total installable PV peak power (polycrystalline devices) 112 MWp has been calculated, corresponding to about 125 GWh/yr. Concerning biogas, the exploitation of the potential of the 4 major landfills can give an electric power of about 0.234 MW, corresponding to about 2.0 GWh/yr plus 0.522 MW of heat power. Wind power turbines can be hosted in 9 sites with a nominal electric power of 3.6 MW, corresponding to about 6.3 GWh/yr. In total, the M2RES potential can cover about 3.3% of the electricity demand.

The macro surveys described above show that the potential energy production for renewable energy source platforms on marginal territories can contribute from a minimum of 1.7% to a maximum of 5.5% to the electricity demand in their respective countries. Moreover, the four countries can be considered as a representative sample of the South East Europe countries. As a result, a conservative estimation of the 3% on average of the electricity demand can be covered by M2RES platforms in the SEE countries. This represents a

non-negligible potential contribution to the achievement of the EU 2020 policy objectives.

5.2 National legislation and requested authorizations for implementation of M2RES projects

According to the article 13 of the EU 2009 Renewable Energy Directive *"Member States shall ensure that any national rules concerning the authorisation, certification and licensing procedures that are applied to plants and associated transmission and distribution network infrastructures for the production of electricity, heating or cooling from renewable energy sources, and to the process of transformation of biomass into biofuels or other energy products, are proportionate and necessary"*. The same European Directive recommends that Member states should ensure that *"simplified and less burdensome authorisation procedures, including through simple notification if allowed by the applicable regulatory framework, are established for smaller projects and for decentralised devices for producing energy from renewable sources, where appropriate"*.

It is more than sure that the administrative procedures for implementing RES projects constitute a key factor for the success of these implementations (or not). Sometimes the procedures are so long and bureaucratic that discourage the potential investors from proceeding with their planned projects. In many cases there is an overlapping of jurisdictions, which increases a lot the complexity of the procedure. On the other hand, the national and/or the regional/local (where it exists) legislation is the one that provides all necessary incentives for the increased share of energy from Renewable Energy Sources in the energy mix of the various countries, such as feed-in tariffs (FIT), tax reductions, investment subsidies, or whatever else has been considered as appropriate.

Therefore, investors should be aware of and possess very precise information on the institutional, legislative, fiscal and financing frameworks which are necessary for the licensing procedures for investments in RES as well as for their participation in various investment programmes before start planning any potential project in the country / region / county of interest. For this purpose, a rather detailed database of the existing national (and local/regional) legislation and the requested authorization procedures for the set up of RES projects (thus, M2RES type projects too) in the SEE countries involved in the M2RES project has been created and is provided in Annex I of the Guide.

For the national / regional / local legislation, apart from the law or presidential / ministerial decree or any other type of norm used locally, there is also information about the field of application and the main provisions of each legislative item. As regards the authorizations, the main documents / studies necessary for obtaining them, as well as some key observations regarding the specific steps of the procedures are also provided.

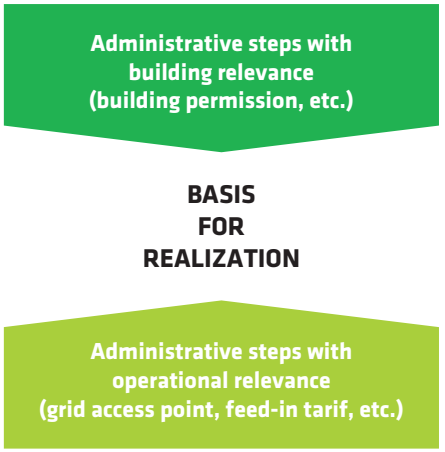
5.3 Best ways of managing administrative procedures

5.3.1 Existing experience in Burgenland (Austria)

Investigations on RES potentials on marginal areas for the region of Burgenland showed that on the one hand potentials for ground photovoltaic panels exist on brownfields, clear areas and dams of flood retention basins, and on the other hand there are existing biomass potentials on flood retention areas. Based on the information gathered within M2RES from policy makers, public administrations and energy suppliers it was found out that - concerning the technologies - the focus in the north of Burgenland should mainly concentrate on wind turbines and the focus in the south should concentrate on photovoltaic power plants – because of the potentials given.

As there could not be analyzed any wind energy potentials on marginal areas in the north of Burgenland, further investigations were concentrated on the realization of ground photovoltaic power plants. Experiences in this field of implementing photovoltaic power plants showed that there are existing consistent administrative procedures in Burgenland. Therefore it is necessary to follow the approval procedures recommended by the regional authorities and the Environmental Advocacy of the Provincial Government.

For the realization of electricity producing plants on marginal areas there are two main steps that have to be considered, as shown in the figure below:



Those steps with building relevance include all aspects for the construction of electricity producing plants (also mainly photovoltaic power plants and small wind turbines), regarding to building law, construction technique, and land use planning, as well as ecological aspects. The steps with operational relevance include all necessary approvals concerning the electricity act, allocation of a grid access point, approval of the plant as a green-electricity plant, preservation of feed-in tariffs etc.

Following the legal situation, authorities and necessary documents for the realization of power plants are depicted in the following paragraphs.

1. Legislation – Building Law of Burgenland 1997 (Bgld. BauG: StF: LGBl.Nr. 7/2010) and the Building Ordinance 2008

The Building Law of Burgenland differs between 1-marginally building project (§16), 2-notifiable building project (§17) and 3-building project requiring building permission (§18).

For the realization of photovoltaic power plants on marginal areas – and so on open space - §17 and §18 of the Building law of Burgenland have to be taken into account.

The difference if the proceeding according to §16, §17 or §18 has to be executed lies on the one hand on the kind of area that should be used for energy purposes and on the other hand on the kind and dimension of the plant that should be installed.

2. Legislation – Land use planning act of Burgenland (StF: LGBl. Nr. 18/1969, LGBl. Nr. 48/1969 (DFB))

If the power plant should be installed on building area:
The installation on open space is basically in all dedication classes possible. But it must be secured that there are no exceptions in the development plans and that there are no adverse effects to the overall appearance of the locality or the landscape due to the installation of the plant.

If the power plant should be installed on green area:
For free standing open space photovoltaic power plants the area has to be special dedicated. The special dedication class is called "GAEn" – "grassland for the production of renewable energy". Also the involvement into the overall appearance of the locality and the landscape has to be considered.

3. Nature- and Landscape conservation act (LGBl.Nr. 27/1991)

Installation in landscape conservation areas:
The installation of an open space-photovoltaic power plant subject to approval anywhere.

Installation outside landscape conservation areas:
The area has to be dedicated as "green area", "building area" or as "area for recovery and tourism" then it is possible to become the approval for a special dedication as "GAEn – grassland for the production of renewable energy".

4. Necessary documents and notifications

Necessary permitting documents:

- Description of the project / compilation of a technical report
- Plan of site
- List of neighbours
- Excerpt of land use plan
- Description of possible dangers or disturbances
- Net feeding point, depiction of the plant
- Connection scheme
- Assembly plan
- Static proof, etc.

Necessary notifications:

- meter point
- agreement for grid access
- building permission (municipality, district authority, land government)
- legal utility allowance according to the Electricity Law
- acknowledgement as a "green electricity plant" through the land government

Possible necessary notification – in particular cases:

- operational plant notification
- legal allowance according to nature conservation interests
- legal allowance according to waste management interests
- environmental risk assessment

5. Permission authorities and processes for the realization

Depending on the approval process that has to be applied, it has always been considered that the approval processes can often take a few months which is in a strong contrast to the fast exhausted subsidies.

For administrative steps with building relevance the authority is the municipality. According to § 30 of the Building Law the building authority of first instance is the mayor itself and building authority of second instance the municipal council.

Approval according to the Building Law of the Burgenland

Which approval process for the installation of an e.g. photovoltaic power plant in detail is necessary depends on the one hand on the side of the plant and on the other hand on the willingness of the abutting owners to agree with the project. So if the photovoltaic power plant has an affected surface area of less than 12 m² it is enough to just bring in a building permit application (according to §16). If the size is more than 12 m² a building order release (according to §17) of the municipality is needed. Therefore it is necessary that all neighbours that are within a radius of 15 m agree with the project and sign the planning document. If the neighbours don't agree with the projects or if other interests (of environmental, landscape conservation concerns, or others) are affected a building negotiation (according to §18) is necessary.

For the operation of a photovoltaic power plant it is necessary to have grid

access point which is also the metering point. For the allocation of this metering point an application has to be submitted to the grid operator and energy supplier.

Approval according to the Burgenland Electricity Law 2006

Photovoltaic power plants that have a performance of more than 20 kWp need a legal utility allowance according to the Electricity Law. Power plants between 20 – 250 kWp (or with a maximum area affected of 500 m² photovoltaic panels) underlie a simplified approval process - that means that the submission of the project gets displayed on the official notice board of the municipality. If the planned photovoltaic power plant has a performance of more than 250 kWp underlie an approval process – which means a setting of a hearing is necessary.

In single cases it can also be necessary to clarify uncertainties between the competences and responsibilities between the authorities of the district and the land government. If all listed documents and permissions are received and a feed-in tariff according to the Green Electricity Act or another investment subsidy necessary for a cost-effective operation of the plant is secured – the realization and implementation of the RES plant can be executed.

Possibilities and barriers

According to increasing awareness due to "hidden potentials" on marginal areas and due to the fact that more and more energy producing power plants are getting installed on valuable land (for agriculture, food production, etc.) there are getting new laws on national and provincial level drafted to restrict and prevent this development.

Based on latest available information, the laws will consequently most of all contain that valuable land (green-, agricultural areas, etc.) should no longer be used for producing energy but mainly marginal areas (like landfills, brownfields, etc.) that can regain value by installing energy power plants. So this is a great result for further investigations within M2RES.

But even if there are laws to regulate clearly the installation of power plants on marginal terrains, it further has to be found a special solution for the region of Burgenland, because of the following factors:

1. Efforts in using former landfills and brownfields for photovoltaic power plants lead within M2RES investigations to no result (this should be covered in the law that gets actually drafted).

2. Efforts in using clear areas for photovoltaic power plants (e.g. along roads or near other power plants and industries) are not allowed because beside the environmental lawyer clear areas are not accepted as marginal areas.

3. Efforts in using flood retention areas for energy crops & short rotation coppice is seen as problematical by the environmental lawyer because any plantations in flood retention basins will minimize the volume and consequently flood protection can no longer be guaranteed.

4. Other areas for possible energy production like military sites etc. don't exist in the region.

Consequently the advocacy of the environment suggested doing investigations in the direction of using "unused resources" on marginal areas. As on flood retention areas (along rivers), in flood retention basins, on clear areas (along roads), there are existing unused potentials in form of grass and tree cutting and as there is actually a scarcity of biomass resources and new potentials are needed, the mobilization of these resources could be a solution. So it is not seen as necessary to build new energy producing power plants on the marginal areas in Burgenland, but to find ways to activate already available and unused resources on them as input material for existing biomass and biogas power plants.

5.3.2 New regulatory framework for RES projects in Greece

Greek licensing procedures for projects using renewable energy sources (RES) have been simplified a lot during the last years. Indeed, Law 3894/2010 ("Acceleration and Transparency of Implementation of Strategic Investments" – Fast Track) was passed by the Greek legislature specifically to remove roadblocks in the permitting procedure, and to fast-track large-scale strategic investments, including investments in renewable energy sources. The public agency «Invest in Greece» now operates as a system for investment planning procedures and oversees, coordinating all the necessary legal authorisations for project development.

Under the fast-track procedures system in place, the project developers grant the agency the irrevocable authority to take all necessary steps in licensing procedure, and to apply and collect the necessary permits and licenses for projects. Greece's new fast-track procedure ensures that all relevant permits and licenses for the investment are issued within two months after submitting an application to the appropriate agency.

In case the regular permitting procedure has been chosen, the first necessary permit is the Electricity Generation License (EGL). The Greek Regulatory Authority for Energy (RAE) grants the EGL after an evaluation process that assesses the investor's technical and financial capability, and the project's viability. The Environmental Terms Approval (ETA) also needs to be obtained. Granting of the ETA depends on the level of the project's environmental impact.

Once the ETA is in place, an installation

license is required, which is granted by decision of the General Secretary of the Region where the RES Project is planned to be installed, or by a decision of the Minister of Environment, Energy and Climate Change (EECC), for the stations which produce electrical energy from RES or from CHP for whose environmental licensing are responsible the Minister of EECC and the on-occasion co-responsible Ministers. The project's operator and the Public Power Corporation S.A. (PPC) must agree on the terms and conditions for access to the grid, and must enter into a connection agreement. If the project will benefit from guaranteed FIT, the operator will have to enter into a Power Purchase Agreement. Once project construction is complete and the plant has undergone commissioning tests, an operation license is granted by the organisation that issued the Installation License.

In the past, the full authorisation procedure needed on average more than three and a half years to complete, even for small solar power plants and wind farms. It has reached seven years for larger projects. With the new streamlined approval process however, there is a coordination of all activities among the different administrative bodies. All these procedures are very clearly defined in the corresponding new RES Law 3851/2010 ("Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change") of the MEECC, which has set mandatory deadlines, establishing a firm timeframe, within which authorisation should be completed. The whole licensing procedure must not exceed more than one year.

A schematic diagram of this "new" procedure is given in the following graph.

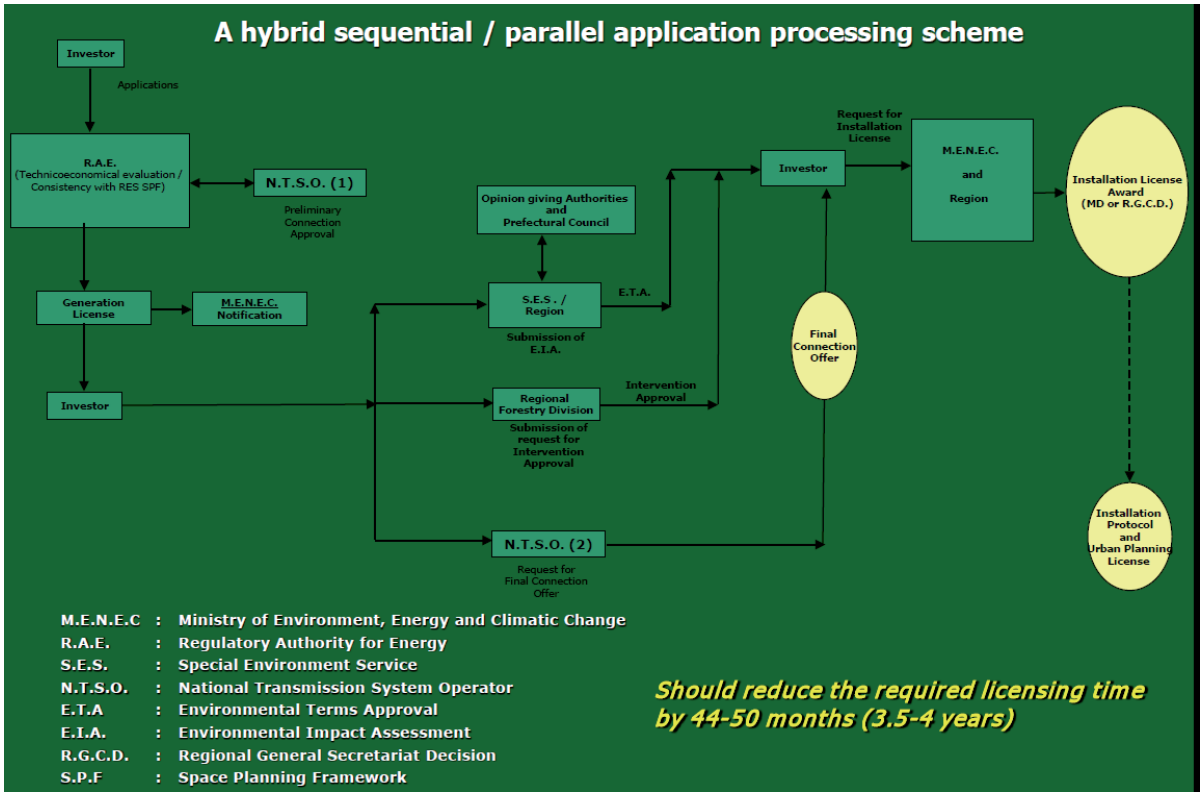


Figure 22: Schematic diagram of the Licensing Procedure for RES Projects according to the Law 3851/2010 (critical steps only)

Smaller scale projects, including the PV power stations with capacities up to 1 MWp, are, to a certain extent, exempt from the licensing procedure. In order to provide assistance at the beginning of the investment, tax law provides a suspension period for VAT payments until the investment begins to generate profits. This way cash flow for investment purposes becomes easier.

Although the legal, financial and regulatory framework actually works, and many global and local companies invested in solar energy and other renewable sources, there are still many issues to be resolved. One factor that has led to such a large number of proposals being submitted is that licenses for solar systems can be sold to another purchaser once granted by the RAE. The idea is that a property owner, who does not have the financial means to invest in e.g. a solar park, can obtain a license, sell it and also lease the accompanying land to the purchaser, leading numerous property owners to pay experts to submit the appropriate paperwork on their behalf.

This has created problems where licenses have been granted to individuals who do not have the investment capital to build the RES installation, resulting in the exclusion of investors who have the capital, or forcing them to purchase a license. In a specific prefecture there may be a limitation on absorption capacity, so unused issued licenses may be blocking out real investors. However, those who want to invest in the Greek RES market and do not want to deal with Greek bureaucracy are able to walk into the market, for a price. Measures have been taken to require many of the previously proposed projects be implemented by 2013, after which they will become void, allowing room for new applications. This space between the licensee and the investor is increasing the investment cost.

An exemplary Project in which the above mentioned "fast track" procedure was/is applied is the Project HELIOS, a very ambitious project related to energy production by renewable sources announced at the end of 2011. In particular, it involves the installation of photovoltaic systems for energy production on land that is a property of the Greek State. The primary objective of the project is for the Greek State to export the produced "green" energy to countries of the Northern Europe (mainly Germany), and use this income in order to decrease its public debt. According to the MEECC, all projects related to HELIOS will be "Turn key" fully licenced project SPV's (Special Purpose Vehicle) in specific owned site locations, free of any administrative and bureaucratic barriers.

For the foreseen total installed power capacity of 3,000 - 10,000 MW from PV systems, the total surface of land required is approximately 200 km2 (Surface of land per site: 0.5 km2, Minimum Site Capacity: 25 MW). For the initial phases of the project, suitable public land parcels, with no pending legal impediments, which are readily

available for the licensing process have already been identified. Also, the MEECC is already in the process of "mapping" additional suitable public land areas in cooperation with the National Wealth Management Fund.

In this respect, the results of the analysis carried out for the marginal terrains existing all over Greece (of course, with more detailed analysis made for the Attiki region), which in their vast majority belong to the State, and the projections presented in the frame of the national M2RES report for Greece are considered as being very helpful for the proper implementation of Project HELIOS.

5.4 Conclusions and final considerations

As it was made evident from the above paragraphs, as well as from the list of Laws and Decrees of Annex I that apply to each one of the M2RES countries, generally speaking, the main laws categories which govern the whole process of producing energy from RES are the following:

- Energy law
- Environmental law
- Agricultural law
- Spatial planning regulations.

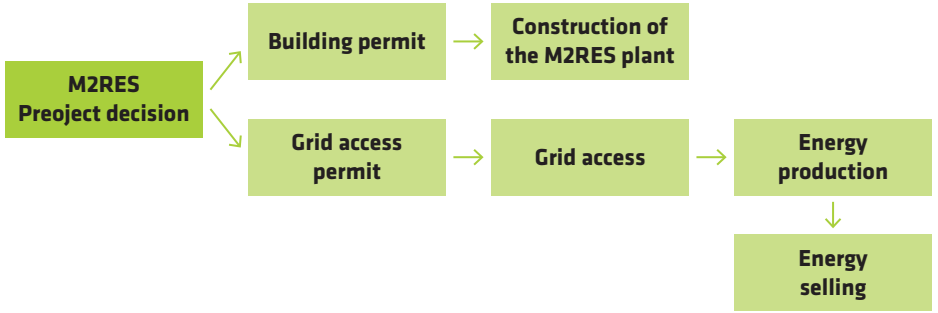
Basically, the process of development of an M2RES project is similar in the European countries, and it is based of the following main permits and licenses:

- Environmental and water use permits
- Building permit
- Grid connection and grid use permit
- License for energy production.

Other types of studies and documentations that can be supplementary requested:

- Geotechnical
- Topographic
- Biodiversity
- Cultural heritage
- Telecommunication
- Road permit
- Civil aviation.

The general process of development of an M2RES project is summarised in the next simplified figure/diagram:



The main steps on the road of development of a M2RES project are the following:

1. Identification of the M2RES plant location;
2. Geotechnical study;
3. pre-feasibility study;
4. obtaining the real estate rights;
5. cadastral registrations;
6. feasibility study;
7. licenses /study on electrical grid connection and use;
8. plant design and construction plans;
9. obtaining project permits and authorisations (urban planning, building permit, EIS, other permits (biodiversity, heritage, cultural, civil aviation, etc);
10. setting up authorization;
11. connection to the national system operator (grid connection solution, technical connection permit);
12. acquisition and assembly the equipment – building work;
13. agreements for energy produced and service agreement;
14. commissioning;
15. operation license issued by the national regulatory body;
16. contract with energy distribution company and energy supplier;
17. Diligences for obtaining incentives for green energy production.

However, when thinking at investing in a M2RES type project, a series of administrative barriers could be a major problem for renewable energy development and they need to be overcome. One of the main barriers in developing an M2RES type project could be the necessary time from the project idea to the commissioning of the plant. And this time span is depending on the legal steps required and the authorities and officials involved in the permitting and licensing procedure.

For example, the European project "Wind Barriers" performed an overview of the main results of the survey on administrative and grid procedures. The average results of this overview related to the countries implied in the M2RES project is presented below:

	Administrative procedure				Grid access procedure			
Country	**Total lead time** (months)	**Administrative lead time** (months)	**Authorities: direct contact** (N°)	**Authorities: indirect contact** (N°)	**Grid access lead time** (months)	**TSOs** (N°)	**DSOs** (N°)	**Other parties grid** (N°)
AT	31.65	18.93	10.38	13.90	17.56	0.84	1.00	3.42
BG	31.65	18.93	10.38	13.90	17.56	0.84	1.00	3.42
GR*	54.60	50.09	18.63	22.38	20.20	0.84	1.00	11.80
HU	31.65	18.93	10.38	13.90	17.56	0.84	1.00	3.42
IT	32.24	18.06	12.73	2.84	18.96	0.45	0.51	32.25
RO	31.6	18.93	10.38	13.90	17.56	0.84	1.00	3.42
EU27	**54.80**	**42.32**	**9.03**	**9.13**	**25.83**	**0.85**	**0.77**	**23.89**

** In the case of Greece, the times shown in the table correspond to the "old" administrative procedure; the situation has changed a lot (44 – 50 months less) after the Law 3851/2010 (see Chapter 5.3.2 and Annex I).*

BARRIERS RELATED TO THE ADMINISTRATIVE PROCEDURES AND CORRESPONDING INDICATORS: GRID ACCESS PROCEDURE

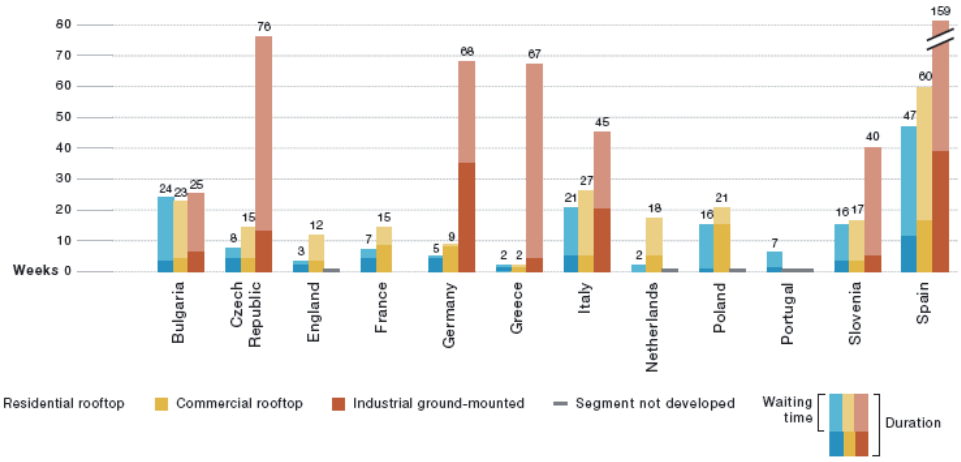
Country	Total lead time	Nº of authorities to be contacted directly	Nº of authorities with direct contact	Administrative lead time	Administrative costs (of overall project costs)	Transparency of the administrative procedure	Authority attitude
AT	+	+	-	+	-	+	-
BG	+	-	+	+	+	-	-
GR	0	-	-	-	-	-	-
HU	-	-	-	+	+	0	-
IT	+	-	+	+	+	0	0
RO	+	0	+	+	+	0	-

Relative country performance: *"**+**" performs 10% or even better than the EU average* *"**-**" performs 10% or even below the EU average* *"**0**" performs at EU average, within a 10% range.*

As far as PV plants are concerned, another IEE project – "PV Legal", analyzed the cumulative average durations of administrative permitting processes (weeks) and results are presented in the figure below.

Another important aspect that should be taken into account when thinking of the development of a M2RES project is related to environmental assessment and land use. Some projects could be hindered because of lawsuits on environmental or land property reasons.

As a conclusion, besides plans and strategies for fostering RES development and strong business plans, in order for a M2RES project to be a success, a good collaboration between investors and local and regional authorities is needed, so that all legal aspects will be covered and complied.



Annex
National legislation and requested authorizations in the M2RES countries

Annex: 1 **Austria**

Title/n°/date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Federal action plans, federal strategies		
Energy Strategy Austria, March 2010	Strategy of the Federal Ministry for Economy, Family and Youth, resp. Federal Ministry of Agriculture, Forestry, Environment and Water-Economy to reach the Kyoto-Target	The Austria Energy Strategy is based on a three-pillar strategy: **1.** A consequent increase of the energy efficiency in all essential sectors is the key for the energy and climate politics **2.** Development of renewable energies to strengthen the self sufficiency, to create new and high qualified jobs and to strengthen the competitiveness **3.** Long term securing of the energy supply
National action plan for renewable energy (NREAP-AT) (according to the Directive 2009/28/EG)	Till 30.06.2010 the European Union requested from every member country to present a National Action Plan for renewable energy (NAP)	The Associations for renewable energies in Austria have taken the initiative to elaborate a National Action Plan. These associations are the Austrian Biomass Association, IG Windpower Austria, Small Hydropower Austria, Photovoltaic Austria, Austria Solar, ARGE Compost & Biogas Austria and proPellets Austria. The framework conditions of the action plan area based on the energy strategy Austria 2010.
Climate Strategy 2008/2012, strategy of Austria to reach the Kyoto-Target and Adaptation of the Austrian Climate Strategy for achieving the Kyoto target 2008-2012 in 2007	The Climate Strategy 2007 relies on a mix of measures and is mainly based on the pillars of industry, residential buildings, expansion of public short-distance traffic and purchase of CO_2 emission certificates from abroad until 2012.	The Climate Strategy 2002 was comprehensively evaluated in 2005 by the Federal Environment Agency and Energy Agency. The evaluation showed that Austria has not come closer to the Kyoto target (data of 2003). As previous measurements have not been achieved and the necessary reductions will not be sufficient to achieve the goal, further measurements are required. Important measures are also the promotion of renewable energies, energy conservation and improving energy efficiency as well as promotion of environmental technology.
Federal law		
Forestry Act 1975, BGBl. Nr. 440/1975	Federal law of 13th July 1975 to regulate the forestry sector	Aim of this federal law is the preservation of the wood and the forest soil, the securing of a wood treatment so that the production capacity of the soil and its effects remain sustainably secured as defined by § 6 passage 2 and that a sustainable forest management is guaranteed.
Environmental Support Law – UFG; BGBl. Nr. 185/1993	Federal law to support measures in the areas of water economics, environment, clean up of former waste deposits, environmental protection abroad and the Austrian JI/CDM programs for the climate protection	Aim of this federal law is the environmental protection through different measures. The UFG supports this aim by granting of financing or investment grants or by claims to emission reduction units being purchased in accordance with §35 and the following.

Climate and Energy Fund Act (KLI.EN-FondsG) BGBl. I. Nr. 40/2007	Federal law for the establishment of the Climate and Energy Fund	The fund provides grants, issued orders and financed activities under the following program lines: increasing the share of renewable energy sources, improving energy intensity, increasing security of supply and reducing imports of fossil energy, enhance the development and dissemination of the Austrian environmental and energy technology, intensification of the climate-and energy-related research, as well as safeguarding and development of technology leadership.
Green Electricity Law / BGBl.I Nr. 75/2011	Federal law on electricity generation from renewable energy sources and on combined heat and power generation	The Green Electricity Law supports electricity production out of renewable energy sources by fixed feed-in tariffs for a defined and guaranteed period. It provides a funding regime for green electricity from water power; wind power, photovoltaic, solid, liquid or gaseous biomass, landfill respectively sewage gas and geothermal energy
Federal ordinances and directives		
Regulation of the Federal Minster for agriculture and forestry for fast-growing forest species of 6th February 1978, BGBl. Nr. 105/1978	Ordinance for fast-growing crops	In this ordinance the concrete definition of fast growing trees is determined, as well as upper limits for the maturity of the crops.
Regulation of the Federal Minister for agriculture and forestry, environment and water-economy for the execution of the Directive 2009/28/EG concerning the raw materials for biofuels, BGBl. II Nr. 250/2010	Ordinance for the realization of the guideline 2009/28/EC for the support of the use of energy from renewable sources and for the change and following abolition of the guidelines 2001/77/EG and 2003/30/EG, ABl. No. L 140 of 5.6.2009 p. 16	This ordinance applies to agricultural base materials which are used or taken into circulation of sustainable bio-fuels and sustainable liquid bio-combustibles according to the guideline 2009/28/EG. Agricultural base materials according to this ordinance contain particularly vegetable products from the agricultural initial production, including the harvest and other residues. This ordinance also applies to vegetable oils which are intended for processing into bio-fuels and liquid bio-combustibles, unless such that are under the Fuel Ordinance BGBl. II Nr. 418/1999.
Fuel Ordinance 1999, BGBl. II Nr. 418/1999	Regulation of the Minister for Environment, Youth and Family to assess the quality of fuels	In this ordinance are defined technical specifications based on health- and environmental aspects for fuels to run motor vehicles and trailers or facilities with ignition engine or with self-ignition engine as well as substitution regulations for bio-fuels.
Green electricity ordinance ÖSET-VO 2012, BGBl. II Nr. 307/2012	Regulation of the Federal Minister for Economy, Family and Youth to fix prices under contracts for purchasing electricity from green power plants, the Green Electricity Settlement Center is obliged for the conclusion of the contracts	This regulation sets the prices (feed-in tariffs) for the purchase of electric energy from new power plants, which got the necessary permits for construction issues in the first instance after 31 December 2004, and which are operating on the basis of renewable energy sources wind, sun (except photovoltaic with a peak performance of up to 5 kW), geothermal, wave and tidal energy, biomass, waste with high proportion of biogenic, landfill gas, sewage gas and biogas
Raw material additional fee for biogas plants for the calendar year 2012 (according to green electricity law §11a passage 6 to 9)	Regulation of the Federal Minister for Economy, Family and Youth that supports the biomass utilization via increased feed-in tariff from biogas plants	For the period from 1st January until 30th June 2012 an additional raw material fee of 3 cents/kWh is given extra above the green electricity feed-in tariff is given to biogas plants. This plants based on biogas from renewable resources for electrical energy and refers to plants having a passed contract for the purchase of green power till 19th October 2009
Environmental Support Law (UFI 2009)	National environmental support programme Austria, Directive of the Climate and Energy Fund to protect the environment, as it offers an incentive to realize measures by investment grants	The UFI offers an incentive to realize measures for avoidance and reduction of loads due to air pollution, climatic relevant gases, operational noise or hazardous waste. The support is made by non-refundable investment cost subsidies of up to 30%. Basis for the subsidy is the environmental support law (UFG) as well as the UFI support guidelines 2009.

Regional Regulation		
Federal state laws - Burgenland		
Burgenland Housing Assistance Act 2005, Bgld. WFG 2005, LGBl. Nr. 1/2005	Law of 10th November 2004 to support the construction and restoration of residential property and other related measures	This law supports the erection of houses, group residential buildings, terraced houses, apartments, in general the creation of living space, the installation of alternative energy plants etc. in Burgenland according to the means in the respective state budget available in the context of this law.
Burgenland Eco Support Law 2005, Bgld. ÖFG 2005	Law of 3rd May 2007 to promote renewable energy sources, new technologies for green electricity production as well as increase of energy efficiency	Law of 3rd May 2007 to promote renewable energy sources, new technologies for green electricity production as well as increase of energy efficiency
Law for Air Pollution Prevention, heating systems and air conditioners in Burgenland 2008, Bgld LHKG 2008, LGBl. Nr. 44/2000	Law over the installation and the operation of heating systems, the purification of the air during the operation of heating systems as well as over the checking of air conditioners	Aim of this law is the precaution against harmful changes of the natural composition of the free air by air pollutants (smoke, dust, gasses, etc.) and the efficient energy use in the operation of heating systems, that are exclusively or partly used for heating of rooms or hot water. A further aim is the efficient operation of air conditioners with a nominal power of more than 12 kW.
Burgenland Electricity Law 2006 – Bgld. WFVO 2005, LGBl. Nr. 59/2006	Law of 28th September 2006 to regulate the electricity sector in Burgenland	This law regulates the production, transmission, distribution of and supply with electrical energy in the Burgenland
Burgenland green funding law (LGBl.Nr. 40/2007)	The law supports bio-energy production by the elaboration of a fund	Law of 3rd May 2007 for promoting renewable energy sources, and new technologies for producing green electricity as well as increasing energy efficiency
Regulation of the governor of Burgenland from 24th April 2002 about the assignment of minimum prices for the purchase of electricity from green power plants and CHP plants through the distribution network operator		
Burgenland Housing Assistance Ordinance 2005 – Bgld. WFVO 2005	Regulation of the Burgenland State Government about the support of receiving the housing subsidies from the Burgenland from 1st February 2005	The land supports in the requirements of § 1 para. the 1st Burgenland Housing Assistance Act 2005 – Bgld. HAA 2005, the construction and renovation of residential properties, the creation of housing, the purchase of non-subsidized homes and apartments, the establishment of alternative energy systems, measures to improve the thermal performance of building envelope of a supported object (Ökoförderung) and grants equity compensation loans and housing assistance.
Directive 2012 to promote renewable energy sources	Directive to promote new technologies for production of green electricity as well as to increase energy efficiency in accordance with the Burgenland Green Founding Law as well as the Burgenland Housing Assistance Act 2005	The subject of funding in the frame of these directives is the allocation of non-repayable grants for the construction of network-controlled solar based power generation systems with a maximum capacity of eligible 4 kWpeak

Authorizations	Main documents/studies necessary	Observations
▸ National Council ▸ Municipality (building authority) ▸ Network operator ▸ Land government of Burgenland, Dep. 5 - Plant right, environmental protection and traffic (Permission authority) ▸ OeMAG – Green Electricity Settlement Center	▸ Planning documents ▸ building permission (according to the applicable regulations of the building law and ordinance) ▸ notification to the allocation of a meter point/feeding point ▸ notification to the recognition of the plant as a "green electricity plant"	According to the Green electricity ordinance ÖSET-VO 2012, BGBl. II Nr. 307/2012 ▸ feed-in tariffs are graduated depending on maximum capacity of the plant and on used raw materials ▸ feed-in tariffs are obtaining from the plant commissioning for a period of 13 years (photovoltaic, wind, geothermal, landfill, sewage gas) or for a period of 15 years (solid biomass and wastes with a high biogenic component, liquid biomass, biogas) ▸ Planning costs photovoltaic: 3-5% of the investment costs ▸ Planning costs Biogas Plant: approx. 10% of the investment costs ▸ Planning costs Biomass CHP Plant: approx. 10% of the investment costs
OeMAG - Green Electricity Settlement Center - application for getting a raw material additional fee for biogas plants	▸ application form (downloadable on OeMAG website) ▸ raw material balance sheet for the first six months of 2012 according to § 11a passage 8 in connection with passage 3 ÖSG (the corresponding form is also downloadable on the homepage or is sent on enquiry by mail)	Exceptions: ▸ plants which are put into operation, after coming into force of this determination ▸ mixed heating plants, hybrid plants as well as ▸ for which no contraction- and compensation obligation for the green electricity settlement center exists or this duty is restricted on the market rate, less the charges for compensation energy

Annex: 2 **Bulgaria**

Title/n°/date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Council of Ministers Decision n°133 of March 9, 2011, Prom. SG. 43 of 7 June 2011	**Energy Strategy of the Republic of Bulgaria 2020**. The Strategy is a key document of the National Energy Policy, approved by the Cabinet and passed by the National Assembly of Bulgaria.	This national energy strategy to 2020 reflects the political vision of the Government of the European Development of Bulgaria, in line with the current EU framework for energy policy and global trends in energy technology. The starting point of European energy policy in several priority areas: 1) Dealing with negative climate change, 2) Reduce the energy intensity of the economy and increase energy efficiency, including energy independent buildings, 3) limiting the dependence of the European Union (EU) on imported energy resources, and 4) Promoting economic growth and employment, thus ensuring secure and affordable energy to consumers.
L. suppl. SG. 23 of 8 March 2013	**Energy law** - This law regulates the social relations associated with the activities of production, import and export, transmission, distribution of electricity, heat and natural gas, transportation of oil and oil products through pipelines, trade in electricity, heat and natural gas and powers of public authorities in formulating energy policy, regulation and control.	Some of the main objectives of Law are to create conditions for: **1.** quality and secure supply of public electricity and heat and natural gas; **2.** energy development and energy security of the country through efficient energy use and energy resources; **3.** creation and development of a competitive and financially stable energy market; **4.** energy supply at minimum cost; **5.** promotion of cogeneration of electricity and heat; **6.** The development of infrastructures transmission and distribution of electricity, gas and transport of oil or petroleum products territory and through. The production, import, export, transmission, distribution and trading of electricity and thermal energy, gas, oil and Petrochemicals are made in ensuring the protection of life and health of citizens, property environment, security of supply, consumer interests and national interests.
L. Prom., SG. 35 of 3.05.2011, in force since 3.05.2011, am. and supplemented. No.. 29 of 10.04.2012, in force since on 04/10/2012	The **Law on Renewable Energy**, regulates the social relations of production and consumption: **1.** electricity, heat and cooling from renewable sources; **2.** gas from renewable sources; **3.** biofuels and renewable energy in transport.	The main objectives of this law are: **1.** promote the production and consumption of energy from renewable sources; **2.** promote the production and use of biofuels and renewable energy in transport; **3.** creating conditions for the inclusion of gas from renewable sources in transport networks and distribution of natural gas; **4.** creating conditions for the inclusion of heating and cooling from renewable sources in heating networks; **5.** providing information on support schemes, benefits and practicalities of development anduse of renewable sources of all stakeholders involved in the production and consumption of electricity, heat and cooling renewable sources of production and gas consumption from renewable sources, and production and consumption of biofuels and renewable energy in transport; **6.** creating conditions for sustainable and competitive energy policy and economic Growth through innovation, introduction of new products and technologies; **7.** creating conditions for sustainable development at regional and local level; **8.** creating conditions for increasing the competitiveness of SMEs through the production and consumption of electricity, heat and cooling from renewable sources; **9.** security of energy supply, procurement, and technical safety; **10.** Environmental protection and climate change mitigation; **11.** Raising living standards through economic efficient of renewable energy.

National Action Plan for Renewable Energy - The document was adopted by Protocol n° 1.38 Council of Ministers on 09.01.2013	National Action Plan for Renewable Energy (NREAP) was developed based on the requirements of Directive 2009/28/ EC following the model adopted by Commission Decision of 30 June 2009 plan is based on an integrated approach to public and social life the development of economic sectors in protecting and preserving the environment and life and health.	The aim is to ensure a sustainable transition to a low carbon economy, based on modern technology and increased use of renewable energy sources.
National long-term program to promote the use of biomass for the period 2008-2020- The document was adopted by Resolution N° 388 of the Council of Ministers of 20.06.2008	Council of Ministers of the national indicative targets for the consumption of biofuels and other renewable fuels. The program was adopted by resolution under item 2 of Protocol n° 43 of the Council of Ministers meeting held on 15 November 2007 In determining the targets in the program are taken into account Directive 2003/30/EC on the promotion of biofuels or other renewable fuels in the transport sector and the recent decisions of the European Council on 8-9 March 2007 on the definition of new, higher minimum targets for consumption of biofuels in the transport sector for each Member State.	Development, adoption and implementation of the program is an important step promotion of biofuels in the transport sector and the wider use of biomass for sustainable development of agriculture and forestry. Greater use of biofuels in the transport sector is part of measures to achieving the goals of the Kyoto Protocol. Increased use of biofuels.Transport is one of the tools by which Bulgaria will reduce the use of imported fuels and energy, and hence to ensure security of energy supply medium and long term. Replacing oil fuels with biofuels is one of the possibilities for utilization of renewable energy potential in the country, particularly biomass. This will, as to a more rational use of farmland and to utilization of abandoned areas in the country. However, the overall process the cultivation of energy commodities to distribution and consumption of biofuels contribute to greater employment of the population, especially in economically weak developed regions of the country.
National long-term program to promote the use of biofuels in the transport Sector 2008-2020 the document was adopted by Protocol N° 43.2 of the Council of Ministers of 15.11.2007		Greater use of biofuels in transport is part of the package, needed to achieve the objectives of the Kyoto Protocol. Increased use of biofuels in transport is one of the tools by which the community can reduce use of imported fuels and energy, and thus to secure the energy supply in the medium and long term. Promoting the use of biofuels in transport will enable larger-scale production of biofuels, which is a prerequisite for wider application of biomass. Also, the use of biofuels and following best practices in agriculture and forestry to create new opportunities for sustainable rural development in the pan agricultural policy. Biofuels in pure form or in blends can be burned in existing vehicles, using an established system -6 - distribution of fuels for motor vehicles. The blending of biofuels with oil allows for reducing the potential cost in system spread within the Community. Bulgaria is a country heavily dependent on imports of energy resources and has good potential and enough space for the growing of energy crops feedstocks for biofuel production. The process of cultivation, production of biofuels and their distribution is difficult, but at the same time opportunity for the development of this relatively new business in the country.

Authorizations	Main documents/studies necessary	Observations
Production License in RES	**Regulation on licensing in energy for the plants above 5 MWp** Approved by Decree n° 124 of 10.06.2004 Prom. SG. 53 of 22 June 2004., amended. SG. 78 of 30 September 2005., amended. SG. No. 11 of 5 February 2008.	The ordinance stipulates the procedures for: **1.** issuance, modification, amendment, suspension and revocation of licenses energy operations specified by the Energy Act (EA); **2.** the competitions of art. 46 EA; **3.** authorizing the transactions identified in the EA, and giving consent for conversion by division, separation, consolidation or merger through change of the legal form of licensees; **4.** Amended - SG. 11 of 2008) approving the terms and conditions of contracts art. 98a, 98b, 149, 150, 183a and 183b EA; **5.** Supply of electricity or thermal energy, natural gas; **6.** Complaints, examination and voluntary settlement of disputes in art. 22 EA (2) These regulations define the circumstances subject to entry in the public registers of licenses and decisions authorizing for transactions identified in the EA, and consent to the merger, consolidation, division or separation of licensees, order of entry, and to obtain information recorded circumstances.
Sustainable Energy Development Agency (SEDA)	The SEGA is subdivided in to three main directorates: **1.** "Energy Efficiency": **2.** "Renewable Energy Sources": **3.** General Directorate "Information, Analysis and Territorial Units"	Some of the main activities of the SEGA are hereby subdivided according to the each Directorate activities: The Directorate "Energy Efficiency" Organizes the elaboration of projects and concludes voluntary agreements and performs monitoring and their implementation; ► Cooperates with the bodies of the state government and the local authorities, associations of employers, professional organizations, consumer associations and non-profit legal entities for the implementation of the energy efficiency activities and measures; ► Cooperates with the bodies of the state government and the local autonomous bodies, as well as with the energy services market participants which fulfill their obligations in accordance with the Energy Efficiency Law; The "Renewable Energy Sources" Directorate: ► Cooperates in the elaboration and implementation of municipal programs on the promotion of use of renewable energy sources and biofuels; The General Directorate - Organizes the planned statistical transfers of determinate amounts of energy from renewable sources from the Republic of Bulgaria to another EU Member State and vice versa. ► Takes part in the elaboration of the legislation; ► Gathers, processes and maintains the information in accordance with the requirements of Energy Efficiency Law and the Law on energy from renewable sources; ► Submits to the Ministry of Finance reasonable proposals for the financing of energy performance contracts, making control over the presented documents; ► Takes part in control on the spot checks in accordance with cases included in Law on energy from renewable sources and the Law on energy efficiency.

Annex: 3 **Greece**

Title/n°/date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
L. 2773/1999	Law on the liberalisation of the energy market and on the regulation of issues related to energy policy.	This Law was issued within the framework of the harmonisation of the Hellenic Law to the provisions of Directive 96/92/EC for the liberalization of the electricity market and leaded, among others, to the establishment of the Regulatory Authority for Energy (RAE). This law authorises the tax for renewable energy to finance the feed-in tariff. Provision for grid connection and grid development with regard to RES systems. It has undergone several amendments (basically by Law 3175/2003) and has been supplemented by ministerial decisions.
L. 3468/2006	Production of electricity from Renewable Energy Sources and through high-efficiency co-generation of electricity and heat, and miscellaneous provisions. This Law, also known as "Greek Renewable Energy Source Act", focuses on the simplification of the permitting system for the RES investments in Greece.	The purpose of this law is on one hand, the transposition of Directive 2001/77/EC of the European Parliament and Council of September 27, 2001, on the promotion of electricity produced from renewable energy sources in the internal electricity market (OJ L 283/27.10.2001) and, on the other hand, the promotion, by granting priority to the generation of electrical power from Renewable Energy Sources (RES) and high-efficiency co-generation of electricity and heat plants in the internal electricity market, on the basis of rules and principles. Also the definition of electricity feed-in-tariffs system, applicable for the sales of RES-produced electricity to the grid. The tariffs are adjusted annually for inflation or increases in retail electricity prices
L. 3851/2010	Acceleration of the development of Renewable Energy Sources to deal with climate change. It further includes other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change.	It amends significant provisions of the currently applicable legislation, aiming at simplifying the licensing procedure, at rationalizing the feed-in-tariff scheme, at tackling existing barriers at local level, as well as at establishing specific regulations for the use of RES in buildings, in accordance with the "Energy Performance of Buildings Regulation" - KENAK (OG 407/B/2010). The main provisions introduced by this law are: ► The national targets for the RES until the end of 2020, based on Directive 2009/28/EC (EEL, 140/2009), are set as follows: a) Contribution of the energy produced from RES to the gross final energy consumption by a share of 20%. b) Contribution of the electrical energy produced by RES to the gross electrical energy consumption to a share of at least 40%. c) Contribution of the energy produced by RES to the final energy consumption for heating and cooling to a share of at least 20% d) Contribution of the electrical energy produced by RES to the gross electrical energy consumption in transportation to a share of at least 10%. ► Licensing Procedures are simplified. The license to produce electrical energy from RES and CHP (Combined Heat & Power) is issued by the Regulatory Authority for Energy (R.A.E.) and not by the Ministry (former) of Development as hitherto, thus significantly reducing the duration of the licensing process. ► Procedures of Preliminary Environmental Assessment (P.E.A.) and Approval of Environmental Conditions (A.E.C.) are merging into a single process. Deadline for submission of judgment/consultations by other authorities involved are established. ► The Special Framework for Spatial Planning and Sustainable Development for Renewable Energy Sources is strengthened, in order to clarify critical settings and provide the opportunity for immediate and effective implementation.

L. 4001/2011	This Law is related to the operation of the Electricity and Natural Gas Energy Markets, the exploration, production and transmission networks of hydrocarbons, and other provisions.	It establishes rules for the internal markets in electricity and natural gas, according to the instructions of the European Parliament and Council of July 13, 2009. Also, this Law elaborates and improves the procedure for PV systems licensing. More specifically, Law 4001, among other items, stipulates the unbundling of the system operators and enhances the role of the independent regulator regarding security of supply, licensing, monitoring of the market and consumer protection. Overall, the new law improves the legislative framework for the monitoring, control and regulation of the electricity and gas sectors.
Ministerial Decision (M.D.) ΥΑΠΕ/Φ 1/14810/04.10.2011	Permit Regulation for Renewable Energy Sources	This consists of the Regulation of the Production Licenses and it applies for the granting, variation, transfer and withdrawal of electricity generation licenses using RES, for High Performance CHP power plants, as well as Hybrid Plants RES as provided in Article 5 paragraph 3 and Article 6 par. 6 of L.3468/2006, as amended.
CMD 49828/2008	Special Framework for the Spatial Planning and Sustainable Development for the RES in Greece. It establishes an integrated approach to climate and energy policy in Greece by promoting environmental sustainability, combating climate change and fostering investments, on equal footing, through the promotion of a coherent framework of physical planning from the installation of RES projects.	This Special Framework for RES: ► Identifies criteria and guidelines for the location of RES projects, per RES category and type of geographic area, with emphasis on wind systems and hydropower units; ► Seeks to provide a clear framework to the competent authorities and the companies concerned, so be oriented suitably in terms of spatial installation areas and thus limit the ambiguities on land uses conflicts; ► Determines the key prerequisites for the harmonisation and coherence between all other spatial and urban plans subject to the Special Framework for RES, at the same time contributing to the achievement of the targets set under national and EU policies with a further increase of RES participation to power supply. ► Includes an Action Plan containing range of practical measures, activities and actions required for the full and effective implementation of the Special Framework as well as their respective sources of finance.

Regional/Local regulation

There are no special regional/local regulations, as in Greece the LRAs – especially the current "official" regional administrative divisions of Greece, the so called Peripheries - do share the common national regulations. Each Periphery does not have different laws or regulations at the level of how to issue permissions or licenses for cases such as RES installations.

Authorizations	Main documents/studies necessary	Observations
Production License	As described analytically in the M.D. ΥΑΠΕ/Φ1/ 14810/04.10.2011, the application for an EPL should consist of 8 parts: Part 1 – Applicant's references Part 2 – Description of the project Part 3 – An energy study for the calculation and the documentation of the produced energy in the site of installation of the project and documentation of RES potential in the proposed site. Part 4 – Preliminary Technical Study Part 5 – Project's business plan Part 6 – Overall business plan of the of the applicant or its shareholders Part 7 – Figures for the documentation of the economic viability of the investor Part 8 – Statements and other accompanying documents. In case the RES hybrid Unit is installed in a non- connected to the grid island the following extra parts are needed: Part 1 – Analytical technical description of the Hybrid Unit Part 2 – Technical & economical study Part 3 – Declaration for the compensation Part 4 – Offers for pricing/tariff Part 5 – Extra services	The production license is issued by decision of the RAE, which has to make a decision within 2 months after the date of application. Every 6 months a progress report of a specific template should be delivered to RAE. The production license is granted for a period of up to twenty five (25) years and may be renewed for another period of up to twenty five (25) years. Exemptions from the requirement of issuing an Energy Production Licence (EPL) are given in the following cases: **a)** Geothermal stations with installed capacity smaller than, or equal to 0.5 MW, **b)** Biomass, biogas and biofuel stations with installed electrical capacity smaller than or equal to 1 MW, **c)** Solar (Photovoltaic) stations or solar thermal power stations with installed electrical capacity smaller than or equal to 1 MWp, **d)** Wind energy facilities with installed electrical capacity smaller than or equal to 100 kW, **e)** CHP stations with installed electrical capacity smaller than or equal to 1 MWe, **f)** Stations from RES or CHP with installed electrical capacity up to 5 MWe, which are established by educational or research entities of the government or the private sector, for as long as these stations operate exclusively for educational or research purposes, as well as stations established by the Centre for Renewable Sources and Saving Energy (CRES), for as long as these stations operate to carry out certifications and measurements, **g)** Autonomous stations from RES or CHP which are not connected to the System or the Network, with installed capacity smaller than or equal to 5 MWe, with no possibility of altering their autonomous operation. The persons responsible for the operation of these stations in this case, are obliged, prior to installing these stations, to inform the relevant Manager regarding the location, capacity and technology of these stations, and **h)** Other stations with installed electricity capacity smaller than or equal to 50 kW, provided these stations use RES of those specified in Paragraph 2 of article 2, in a form different from that covered in the previous cases.

► Approval of Environmental Conditions (A.E.C.).
► Offerfor Connection to the System or the Grid
► Permissionfor intervention in a forest or a forest area

After receiving the production license from R.A.E., the party interested to be granted an installation license requests simultaneously for the issuing of a Connection Offer from the authorised Manager of the System or the Grid and a Decision of Approval of Environmental Conditions (A.E.C.), according to article 4 of law No 1650/1986, as it applies. In addition, the investor needs to get a permission for intervention in a forest or a forest area, according to paragraph 2 of article 58 of law No. 998/1979 (289 A '), should that be required, or generally the licenses needed for the acquisition of the right to use the installation site of the project.

For the decision of Approval of Environmental Terms to be issued, an Environmental Impact Study (EIS) and a complete folder of supporting documents must be submitted to the authorised environmental licensing authority. The EIS includes the following:

a) Detailed description of the project and accompanying works, such as civil works, connection to the grid etc.
b) Description of the existing environmental conditions, including documentation for the assessment of the main environmental impacts on humans, fauna, flora, soil, water, air, climate, landscape, materials, cultural heritage as well as, the interaction of these parameters.
c) Assessment and evaluation of the direct and indirect affiliations and synergies concerning impact to humans and the physical environment.
d) Summary of measures envisaged that would prevent or restrict or make up considerable environmental impact.
e) Summary of the main alternative to the intended project solutions and identification of the main selection criteria of the final project, bearing in mind the environmental impact.

The application folder is considered complete if no additional documents have been requested in writing from the party concerned within twenty (20) days from its submission.

The System Operator issues its decision within four (4) months the Connection Offer was requested, which becomes definite and binding when the A.E.C. (Approval of Environmental Conditions) decision is issued for a RES station or, if no A.E.C. decision is required, with the certificate from the relevant environmental authority of the region that the RES station is exempt from this obligation. The Connection Offer remains valid for four (4) years from its finalisation and it is binding toward the Manager and the beneficiary.

As regards the A.E.C., the authorised authority examines the impact of the project on the environment and the proposed measures to mitigate such impact, undertakes compliance with the consultation and publication procedures provided by law, and decides whether or not to issue a decision of Approval of Environmental Terms within four (4) months from such time as the folder is considered complete.

The decision of Approval of Environmental Conditions is valid for ten (10) years and may be renewed, one or more times for the same period, upon application that must be submitted no later than six (6) months prior to expiry of the decision of Approval of Environmental Conditions.

Installation License/permit	After the Connection Offer becomes binding, the investor takes action: **a)** for acquiring the installation license (filling in and submitting to the competent Authority a standardized application form, accompanied by all supporting documents, as defined in the various Decisions concerning the procedures for issuing of installation and operating permits of power generation plants using RES); **b)** for executing the Connection Contract and the Power Purchase Agreement, according to articles 9, 10 and 12 and the Codes for the Management of the System and the Network **c)** for granting licenses, protocols or other approvals which are possibly required according to the provisions of current legislation for the installation of the station, and which are issued without the requirement to previously obtain the installation license **d)** for the modification of the A.E.C. regarding the connection works, if required. **e)** After issuance of the Installation License and before start of works a Building License is issued by the City Planning authorities.	The installation license is granted within a time frame of fifteen (15) working days from the completion of the process of examining the documentation submitted by the investor, by decision of the General Secretary of the Region where the RES Project is planned to be installed, or by a decision of the Minister of EECC, for the stations which produce electrical energy from RES or from CHP for whose environmental licensing are responsible the Minister of Environment, Energy and Climate Change and the on- occasion co-responsible Ministers (according to Law 1650/1986). The installation license is valid for two (2) years and may be extended, at the most, for an equal length of time, by application of its holder, provided that: **a)** on the expiration of the two-year period the project has been executed, the expenditure for which covers 50% of the investment, or **b)** no case as above "a" exists, but the required contracts for the procurement of the equipment needed for the completion of the project have been signed, or **c)** there is a suspension by court decision of any license required for the execution of the project.
Operating License/permit	The Operating permit/licence is issued by decision of the authority that is responsible for the issuance of the Installation License, following an application of the party interested (according to the relevant form and accompanied by any requested supporting documents) and inspection by a team from services authorised with the fulfilment of the technical installation specifications for the trial operation of the station, as well as with securing the required functional and technical characteristics of the equipment used by the Centre for Renewable Energy Sources and Saving.	The operating license is granted within an exclusive deadline of twenty (20) days from completion of the above inspections, in line with the terms of the decision of the Minister of Environment, Energy and Climate Change. It is issued for a period of at least twenty (20) years and may be renewed for up to twenty (20) years.

Annex: 4 **Hungary**

Title / n° / date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Act LXXXVI of 2007 on electricity AND Government Decree No 273/2007 (X. 19.) on the implementation of certain provisions of Act LXXXVI of 2007 on electricity	All power plants (installation and operation)	Provisions regarding power plant licensing and grid connections
Act XVIII of 2005 on district heating	District heat producing geothermal energy plants, biomass heat plants	Licensing issues
Decree No 117/2007 (XII. 29.) of the Minister for Economy and Transport on the financial and technical requirements of connection the public to electricity network	Grid connections	T echnological terms and costs of grid connections. If a power plant uses renewable energy sources for at least 90% of its energy production the grid connection costs cannot be more than 50% of the total investment costs.
Decree No 37/2007 (XII. 13.) of the Minister for Local Governments and Regional Development on construction authority procedures;	Solar collectors and solar cells	Construction activities for the installation of solar collectors and solar cells are not conditional on authorisation or notification.
Government Decree No 347/2006 (XII. 23.) on the designation of bodies responsible for official and administrative tasks related to the environment, nature and water	Environmental permits	Competences and jurisdiction. The competent authority for environmental permits is the National Inspectorate for Environment, Nature and Water.
Decree No 129/2005 (XII. 29.) of the Minister for Economy and Transport on the charges of certain technical safety administration procedures and administrative services of the Hungarian Trade Licensing Office	Construction permits	Regulates the costs of construction permits
Decree No 33/2005 (XII. 27.) of the Minister for En- vironment and Water on the administrative service charges of environmental, nature and water authority procedures	Authorization costs	Regulates the procedural fee in environmental authorisation procedure
Act XXI of 1996 on regional development and spatial planning AND Act XXVI of 2003 on the National Spatial Plan	Spatial planning issues and rights	Regulating land-use issues and land-use permits
Government Decree No 76/2009 (IV. 8.) on spatial planning authority procedures	Spatial planning	Regulating land-use issues and land-use permits
Act LIII of 1995 on the general rules of environmental protection AND Government Decree No 314/2005 (XII. 25.) on environmental impact assessments and uniform environmental authorization procedures.	Environmental authorization procedures	Activities subject to uniform environmental use authorization, environmental impact assessments and the related procedures.
Act LVII of 1995 on water management AND Government Decree No 72/1996 (V. 22.) on the exercising of water management authority.	Water rights authorization procedures	Water rights authorization procedures in connection with district heat producing geothermal energy plants and certain types of heat pumps.

Decree No 33/2009 (VI. 30.) of the Minister for Transport, Communications and Energy on the conditions of invitations to tender for the establishment of wind power plant capacities, the minimum content requirements of the tenders and the rules of the tender procedures	Wind power plant capacity tenders	Regulates the tendering procedure for wind power plant capacities.
Decree No 91/2007 (XI. 20.) of the Minister for Economy and Transport on the amounts of the administrative service charges of the Hungarian Energy Office and the rules of the payment of administrative service charges and supervisory charges.	Authorization costs and service charges	Costs and service charges related to authorization procedures carried out by the Hungarian Energy Office.
Act XLVIII of 1993 on mining and its amendment (January 2010) AND Government Decree No 203/1998 (XII. 19.) on the implementation of Act XLVIII of 1993 on mining	Mining concessions – geothermal power plants	Research, extraction and use of geothermal energy from more than 2500 m below ground is allowed solely with a mining concession contract
Point 13 of Annex 1 to Decree No 37/2007 (XII. 13.) of the Minister for Local Governments and Regional Development,	Wind turbines	Construction of wind turbines is conditional on a simplified construction permit or on notification, depending on their height.

Regional / Local regulation

The regional regulations are completely missing due to the centralized governance system of Hungary. On the local level renewable investments are influenced solely through spatial planning as the jurisdiction of local authorities only involves decisions on zoning within the spatial plans.

Authorizations	Main documents/studies necessary	Observations (plants subject to authorization)
Environmental protection permission/ Uniform environmental use permit		▸Biogas (small) power plant ▸Solid biomass (small) power plant ▸Wind (small) power plant ▸Geothermal (small) electricity power plant ▸District heat producing geothermal plant ▸Geothermal (small) electricity power plant ▸Costs: Depending on the type of procedure required: 860 – 8600 EUR
Construction permit	Environmental protection permission / uniform environmental use permit Small scale power plant permit	▸Biogas (small) power plant ▸Solid biomass (small) power plant ▸Wind (small) power plant (from 0.5 MW) ▸Photovoltaic cell system (depending on design and available capacity) ▸District heat producing geothermal energy plant (from 0.5 MW) ▸Geothermal (small) electricity power plant ▸Costs: - 165 EUR + additional costs depending on the design / size of construction (35 – 350 EUR) - For installations generating district heat: 330 EUR (5-20 MW) / 660 EUR (20–150 MW) + additional costs depending on the design / size of construction (35-350 EUR - For geothermal power plants: 165 EUR + additional costs depending on the design / size of construction (35-350 EUR) + additional 125 EUR
Grid connection agreement	Connection plan Environmental protection permission / uniform environmental use permit Construction permit	▸Biogas (small) power plant ▸Solid biomass (small) power plant ▸Wind (small) power plant ▸PV cell system over an output of 0.5 MW ▸Geothermal (small) electricity power plant ▸Costs: Maximum 50 % of the total investment costs
Grid use agreement	Grid connection agreement Small-scale power plant permit	▸Biogas (small) power plant ▸Solid biomass (small) power plant ▸Wind (small) power plant ▸Photovoltaic cell system ▸Geothermal (small) electricity power plant
Occupancy licensing procedure		▸Biogas (small) power plant ▸Solid biomass (small) power plant ▸Wind (small) power plant ▸PV cell system over an output of 0.5 MW ▸District heat producing geothermal plant ▸Geothermal (small) electricity power plant ▸Costs: Between 35 – 350 EUR depending on the design / size of construction (in each case equals the additional amount to be paid for the construction permit)
License for the establishment of installations generating district heat	Commercial agreement with district heat provider Environmental protection permission / Uniform environmental use permit	▸Biomass heat plant ▸District heat producing geothermal energy plant (over 5 MW thermal efficiency) ▸Costs: Under 5 MW: 690 EUR; 5-50 MW: 1720 EUR; 50-200 MW: 6900 EUR

License for the operation of installations generating district heat	License for the establishment of installations generating district heat	▶ Biomass heat plant ▶ District heat producing geothermal energy plant
Water license		District heat producing geothermal plant Costs: 125 EUR + 1720 EUR
Water operation license		District heat producing geothermal plant Costs: -
Small-scale power plant permits (establishment and production authorization together)		For small-scale renewable energy investments that are still subject to a permit and have a capacity of over 0.5 MW. The authorization process is independent of the type of the power plant. ▶ Biogas (small) power plant ▶ Solid biomass (small) power plant ▶ Wind (small) power plant ▶ PV cell system over an output of 0.5 MW ▶ Geothermal (small) electricity power plant ▶ Costs: 0.5 – 5 MW: 1720 EUR 5 – 20 MW: 3450 EUR 20 – 50 MW: 8620 EUR

Notes:

▶ All prices are estimates using th e exchange rate: 1 EUR = 290 HUF

▶ Connections between the licensing procedures are clearly shown in the flowcharts of the study "Licensing procedure for renewable energy producing devices in Hungary".[1]

▶ The installation of boilers and heat pumps does not require a construction authority permit, as it does not involve any construction activities. Authorization of the establishment and connection to the network of household-scale small electric power plants is carried out by the distribution companies, and the relevant requirements and necessary steps are included in the Office-approved regulations of the electricity distributors.[2]

▶ The installation of wind turbines is subject to wind power capacity tenders organized by the Hungarian Energy Office. Currently there is no available capacity in Hungary until the next tender call.

▶ The installation of geothermal power plants that extract water from more than 2500 m below ground is subject to a mining concession tender announced by the relevant Ministry.[3]

[1] English summary: http://energiaklub.hu/dl/ME_eng_abstract_ENG.pdf

[2] Republic of Hungary National Renewable Energy Action Plan 2010-2020

[3] Energiaklub (2010): Licensing procedure for renewable energy producing devices in Hungary (http://energiaklub.hu/sites/default/files/energia_klub_megujulo__energia_engedelyeztetes_1.pdf)

Annex: 5 **Italy**

Title / n° / date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
D.M. 10/09/2010	National Guidelines for the authorization of electric energy production plants based on RES	National Guidelines aim at harmonizing the RES authorization process in the various regions.
D.Lgs n. 28/2011	Transposes the Directive 2009/28/CE, partially modifies D.M.10/09/2010 and introduces relevant simplifications to foster RES development	Together with D.M.10/09/2010, defines the authorization procedures for RES plants: ► Single Authorization (AU): issued by the regional administration (or by the provinces upon delegation) in agreement with the Conference of Services (common meetings of all the relevant authorities/institutions) within 90 days for power plants greater than: 20 kW PV, 60 kW wind power, 250 kW biogas. ► Simplified Habilitation Procedure (PAS) to be submitted to the Municipal Administration, subject to silent approval after 30 days for lower power plants.
	Establishes the rules to access incentives for RES production other than photovoltaic	► Introduces the mechanism of registers where the plants (< 5 MW) have to sign up and establishes a maximum installed power acknowledged for each year ► Introduces the mechanism of lowest unique bid auction (> 5 MW) ► Establishes a maximum for the incentives of 5,8 Billion Euro until 2020
D.M. 05/07/2012	Establishes the incentives for photovoltaic (V Conto energia)	► Plants greater than 200 kW are subject to a mechanism of registers with a maximum level of incentives per year. ► Incentives are granted on the basis of a comprehensive tariff the net amount of energy entered in the grid and a premium tariff for the energy used on site. ► Special tariffs are granted to energy produced by Thermodynamic Concentrated Solar power plants for a period of 25 years.
D.Lgs 152/2006	Art. 26 defines the cases where the Environmental Impact Assessment is needed	Issued by the Regional Administration (or by the Provincial Administrations upon delegation) through the Conference of Services for RES plants with nominal power greater than 1 MW
D.Lgs 79/99	Establishing the Green Certificates system for electricity production from RES, with subsequent modifications	Green Certificates are a granting mechanism for RES other than photovoltaic. They are granted by the Authority for the Electric System (GSE) which certifies that a given amount of energy has been produced by RES plants. Electricity producers are obliged to purchase a definite amount of Certificates established by a decree of the Ministry for Economic Development (MSE)
D.Lgs 22/2010	Establishes the procedures for granting of research permits and for the use of geothermic resources with subsequent modifications	Electricity production plants greater than 2 MWt or wells > 400 m

Regional/local regulation		
Regional regulation of Emilia-Romagna		
Energy Regional Plan - 2nd Implementation Plan 2011-2013 / Regional legislation board / 26-7-2011	General Regional plan for the energy sector	Four main lines of activity. The actions of interest for M2RES are 2.1 "Re-qualification productive areas in energy and environmental terms" and 4.2 "Requalification of urban areas and the territory in energy terms", including "planning instruments / tools for best locating and selecting urban and sub-urban areas suitable for RES installation"
Simplification of the procedures for biogas plants fed by biomasses from husbandry activities / Regional legislation board / 26-7-2010	Biogas plants on agricultural sites and farms	Defines and simplify the necessary authorizations to build biogas plants up to 1MWe and 3MWt on farms
First stage of Regional regulations for defining a geo map and restrictions for ground PV plants / Regional legislative assembly / 6-12- 2010	Regulations for locating PV plants at regional level	Inclusion / exclusion criteria and maximum size for ground PV plants on terrains suitable for other purposes (mainly agriculture)
Second stage defining a geo map and restrictions for ground PV plants / Regional legislative board / 17-1- 2010	Regional map for locating PV plants, including sets of special restrictions	GIS map specifying in visual detail the prescriptions adopted in Dec 2010
Regional map and restrictions for non PV RES plants (eolic, biogas, biomass, hydro) / Regional legislative assembly / 26-7-2011	Regulations and restrictions for locating non PV plants at regional level	Inclusion / exclusion criteria and maximum size for eolic, biogas, biomass and hydro plants
T echnical aspects involved in mitigation of environmental impact of biogas plants / Regional legislation board / 24- 10-2011	Measures for reducing the environmental impact of biogas plants	Considers air quality, noise, impact on traffic (when a plant needs feed by road), safety, storage, monitoring.
General authorization process for biogas cogeneration plants within 3-10 MWt size range / Regional legislation board / 24- 10-2011	Abatement of pollution	Fixes limits for various kinds of pollutants
Authorization procedures for electric generation plants of regional interest / Regional legislation board / 12-3-2012	Unified procedures and regulations for electric plants (traditional and RES) with P>50 MWt	
Prescriptions to be followed for air emissions of biomass plants / Regional legislation board / 12-4-2012	Procedure for estimating pollution effects	Review of the authorizations needed for different kinds of biomass plants (agriculture, wastes, livestock) their kind processing and prescriptions for calculating PM10 and NOx.

Regional regulation of Veneto		
New rules in waste management/ Regional legislation board / 21-01-2000, n. 3 (BUR n. 8/2000)	Energy from waste	Rules concerning use of waste in energy production and related financial incentives for SMEs. One of the objectives of the law is to encourage the maximum use of waste (after recovery), in order to generate energy. It follows a description of duties of the Region and Local Administrative bodies.
Rules for regional energy planning, energy saving and development of RES / Regional legislation board / 27-12-2000, n. 25 (BUR n. 114/2000)	Rules for regional energy planning, push of energy saving and development of RES	Overall framework on energy principles and first configuration of the Regional Energy Plan (PER) at regional level.
Assignment of administrative functions and tasks to local administrative bodies (implementation of Legislative Decree 31-03-1998, n. 112) / Regional legislation board / 13-04-2001, n. 11 (BUR n. 35/2001)	Common and specific tasks of local administrative bodies (Region, Province, Municipality) on energy issues	
Recommendation for the Regional board/ Regional Committee Resolution 16-10-2003, n. 46	For a regional strategic initiative on energy consistent with the environment, the quality of life, for an eco-development	This act has not been published.
Recommendation for the Regional Council/Act of the Regional Board 28-01-2005, n.7	Adoption of the Regional Energy Plan	This act has not been published.
Initiatives to support the production and use of woody biomass for energy purposes/Regional law 30-06-2006, n. 8 (BUR n. 60/2006)	Initiatives to support the production and use of woody biomass for energy purposes	Promotion of the wood-energy chain through the support of production, collection, transformation and use of biomass for energy purposes and related financial contributions.
Provisions for authorizations and incentives related to the construction of solar thermal and PV systems on Veneto Region area/Regional law 22- 01-2010, n. 10 (BUR n. 8/2010)	Legal framework of authorization processes and financial incentives for solar thermal and PV systems	Description of specific authorization processes divided per different categories of RES plants (solar thermal systems and PV system and sub-sectors) and creation of a specific financial fund for supporting their construction and installation.
Rules on energy production from biomass power plants, biogas and other renewable energysources/Regionallaw11-02-2011,n. 5 (BUR n. 14/2011)	Provisions for setting energy plants (aimed to electricity production) fuelled by biomass, biogas and other renewable energy sources.	Clarification on which categories of energy plants are covered by specific Regional laws and regulations on the energy sector.

Changes to the regional law July 8, 2009, n. 14 "Regional intervention in support of the construction industry and to encourage the use of sustainable building" and amendments to Regional Law July 12, 2007, n. 16 in the field of architectural barriers and subsequent amendments to the regional law April 23, 2004, n. 11 "Regulations for the government of the territory and landscape" and subsequent amendments and provisions on authorizations of solar and photovoltaic plants/ Regional law 08-07-2011, n. 13 (BUR n. 50/2011)	Article 10 - Provisions on the authorization of solar and photovoltaic installations.	Rules concerning the competence of Municipalities to provide the authorization for the installation of solar and photovoltaic panels, integrated and non-integrated, with peak power up to 1 megawatt (MW), included the works of connection to the grid. Additional rules are referred to the Region for its duties concerning Single Authorization (AU). The Regional Board is in charge of adopting and transmit to concerned Local Administrative Bodies the official templates.
General framework containing measures of re-financing of Regional Laws in different areas of intervention / Regional law 31-01-1984, n. 8 (BUR n. 5/1984)	Article 8 - Measures for the performance of the duties appointed to the Region by the Regional Law n. 308/1982 for the reduction of energy consumption and the development of renewable energy sources	The Regional Board is authorized to exercise the functions conferred by Regional Law no. 308/1982, within CIPE guidelines, ministerial decrees of implementation and taking into account main indications as follows: respect the coherence of actions with regard to general guidelines and planning documents adopted by the Region; promote measures to ensure the greatest amount of energy savings or renewable source used in relation to the size of the investment, including costs of operation and maintenance; promote the dissemination of innovative experimental technologies; specific provisions for focus the building, industrial, agriculture and forestry sectors. In addition, there are rules on how the Regional Board can promote agreements for surveys, studies and other promotional material to be disseminated to the general public.

Authorizations	**Main documents/studies necessary**	**Aprox. costs (if available)**	**Observations**
Single Authorization (AU)	▸ Detailed report by a qualified planner ▸ Detailed design, plans and layout ▸ Declarations on compatibility of plant with urban planning and building regulations in force ▸ Declarations on duties concerning safety as well as health and hygiene norms ▸ Environmental Impact Assessment (for power plants greater than 1 MW)	N. A.	issued by the Regional Administration (or by the provinces upon delegation) in agreement with the Conference of Services within 90 days for power plants greater than: 20 kW PV, 60 kW wind power, 250 kW biogas
Simplified Habilitation Procedure (PAS)	▸ Detailed report by a qualified planner ▸ Detailed design, plans and layout ▸ Declarations on compatibility of plant with urban planning and building regulations in force ▸ Declarations on duties concerning safety as well as health and hygiene norms	N. A.	Issued by Municipal Administration, subject to silent approval after 30 days for lower power plants
Communication to the Municipal Administration	▸ Communication of start of work ▸ Detailed report by a qualified planner	N. A.	For smaller plants (< 20 kW PV, < 50 kW biogas, wind power on the roof of existing buildings)

Annex: 6 **Romania**

Romania has transposed all relevant EU Directives in the renewable energy field. The mechanism for promoting the production of RES-Electricity, consisting of the quota obligation system coupled with GCs, the trading market for GCs and the targets set for the production of RES-Electricity. There is no legal basis for the RES projects only (in particular). The legislation was issued for all the construction projects. The energy projects are required to pass all the general requirements for construction projects but also, those of the national agency for energy (Romanian Energy Regulatory Authority – ANRE).

Title / n° / date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Law no. 123/2012	Energy Law	EL 123/2012 is set to prepare the Romanian electricity market for totalliberalization and specifies concrete terms to gradually reach this liberalization.
Law no. 134/2012	Promotion system for the production of energy from renewable energy sources	Through Law no. 134/2012 there was the validation of the GD 88/2011 for the approval of the Government's Emergency Decision no. 88/2011 on the amendment and supplementation of Law no. 220/2008 establishing the promotion system for the production of energy from renewable energy sources.
Government Decision No. 1069/2007	regarding the approval of the "National Energy Strategy 2007-2020"	The National Energy Strategy establishes the following principal objectives: (i) the promotion of electricity production from renewable sources of energy; (ii) the implementation of new technologies and clean technologies (i.e., low carbon technologies); and (iii) the establishment of a system to promote the trading of white certificates.
Law 220/2008	to establish a promotion system for production of energy from renewable energy sources	New rules are introduced applying to economic operators which develop power plants using renewable sources. The E-RES promotion system shall be applied for the electricity supplied to the network, produced from: a) hydro energy used in plants with installed capacity up to 10 MW; b) wind energy; c) solar energy; d) geothermal energy; e) biomass; f) bio-liquids; g) biogas; h) landfill gas; i) sewage treatment plant gas. E-RES producers will benefit from a number of green certificates (GC) for energy produced and delivered, as following (per MWh): ►Hydropower < 10 MW: 3 GCs for new installations; 2 GCs for upgraded installations; 0.5 GC for not upgraded installations; ►EOL: 2 GCs up to 2017 and 1 GC from 2018; ►Geothermal: 2 GCs ►Biomass, bio-liquids and biogas: 2 GCs (+ 1GC for high efficiency CHP; + 1GC for energy crops) ►Landfil gas and sludge fermentation gas from wastewater treatment plants: 1 GC (+1GC/MW for high efficiency CHP) ►Solar: 6 GCs

Order No. 6/2012	Monitoring of the renewable energy producers that benefit from the support scheme.	ANRE monitors the renewable energy producers that benefit from the support scheme and prepares annual reports. Should this monitoring process emphasize that the applicable support scheme triggers an overcompensation of the renewable energy producers, ANRE should propose measures to decrease the number of GCs granted according to the scheme, which should be further approved by the Romanian Government. However, in the case of a downward adjustment of the scheme, the amended scheme shall not apply retroactively. The applicability of an adjustment to the scheme (following the first monitoring process) is postponed until 1 January 2014 for the solar sector and until 1 January 2015 for all other renewable technologies. "Overcompensation" is defined as an internal rate of return at least 10% higher than the reference internal rate of return for a specific technology ►11.6% for PV systems and ►10.9% for wind turbines)
Order No. 42/2011	Regarding the approval of the Regulation for the accreditation of producers of RES-Electricity for the application of the GCs promotion scheme.	The Regulation approved by Order 42/2011 provides the accreditation conditions for the producers of energy from renewable sources, the rights and obligations of producers whose powers plants have been accredited, as well as the structure of the Registry of accredited power plants. The accreditation may be requested in a single phase, or in two different phases, preliminary and final, preliminary accreditation applying to the period of premises test.
Order No. 43/2011	Regarding the approval of the Regulation for issuance of GCs.	The Regulation approved by Order 43/2011 establishes the calculation method for the quantities of renewable energy which benefit from the support scheme provided by Law 220/2008, the issuance procedure of green certificates as well as the involved parties and their correspondent obligations. Order 43/2011 also provides that the procedure for the issuance of green certificates shall be reviewed by the National Company for Electric Transportation "Transelectrica" S.A. and approved by ANRE within 15 days as of entering into force of Order 43/2011.
Order No. 44/2011	Regarding the approval of the Regulation for the organization and functioning of the GC market.	This Regulation provides how the green certificates market operates, the parties involved and their responsibilities in the operation of such market, the required information in order to monitor the operation of green certificates market.
Order No. 45/2011	regarding the approval of the Methodology for the establishment of the annual acquisition quota of GCs.	The Methodology approved by Order 45/2011 establishes the calculation method for the annual mandatory acquisition quota of green certificates, the number of green certificates in case of electric energy suppliers' failure to comply with the mandatory acquisition quota, as well as the annual quota of electric energy from renewable sources within the final energy consumption. The Methodology also establishes the calculation method, the procedure of collection and transfer of the amounts of money collected in case of failure to comply with the annual mandatory acquisition quota of green certificate.
Government Decision No. 1429/2004	Regarding the approval of the Regulation certifying the origin of electricity produced from renewable energy sources and providing the legislative framework for issuance and registration of guarantees of origin.	Green electricity produces are obliged to request for GOs. GOs are issued by ANRE – Energy Regulatory Authority. GOs are issued every 6 months. E-RES producers submit requests for GO no later than 30 days following the end of June and January. A GO is valid for 1 year from the issuing date

Government Decision No. 540/2004	Regarding the approval of the Regulation for obtaining the licenses and authorizations in the electricity field.	Licenses' conditions: all the licensees are required to submit to ANRE: ► The annual (statutory) Financial Statements; ► An annual Financial Report regarding each of the regulated activities carried out in the preceding year. ► The Financial Report must be submitted to ANRE (for each licensed business) in a format laid down by the Authority; ► An annual Performance Report, containing the operational or performance information.
Government Decision No. 90/2008	Regarding the approval of the Regulation for the connection of users to electricity grids of public interest.	Main principle: Open Access to the grid for generators under Regulated Conditions The documentation attached to the connection request will include: **a)** Location approval; **b)** Solution study for the connection to the electricity grid; **c)** Technical and power data characterizing the user's generation or consumption place; **d)** Urbanism certificate; **e)** Scale plan showing the location in the area of the generation/consumption place endorsed by the issuer of the urbanism certificate and attached to it, for new constructions; **f)** Copy of the registration certificate in the Commercial Register; **g)** Ownership title or any other deed certifying the utilisation right over the land, enclosure or building constituting the generation or consumption place for which the connection is requested; **h)** Building authorization within its validity term;

Regional/local regulation

Regional development Plan 2007-2012 (realization of a new Plan for 2014-2020 is in progress)	Among key challenges at Regional level, rational use of natural resources, promoting renewable energy (including energy), and raising energy efficiency are mentioned.

The permitting process in Romania is a multiple step procedure, including different permits and licenses to be obtained during the development. The most relevant and important permits needed for the construction and operation of a RES project in Romania are summarized in the following table.

The main important streams in the permitting process are:
► Building permit;
► Environmental approval (as part of the Building Permit, see below);
► Grid connection permits
► Licenses related to electricity and Green Certificate market

Authorizations	Main documents/studies necessary	Observations
Urbanism certificate (UC)	▸ proof of ownership/superficies/ usufruct of the land ▸ topographical and cadastral plans ▸ site layout ▸ technical report ▸ pplication form ▸ proof of tax payment	Cadastral plans, site layout and technical report are done by an expert, and their cost is a subject of negotiations Process of issuance of a urbanism certificate is governed by the Law no. 50/1991 regarding the authorization for execution of construction works Costs: 12 RON+0,01 RON/sqm for every sqm over 1000 sqm ; For rural areas = 50%
Building permit (BP)	▸ Removal of the land from the Agricultural Registry; ▸ Zone Planning (PUZ) ▸ Approvals to connect to the public utilities; ▸ water supply; ▸ Sewerage; ▸ electric energy supply; ▸ Environmental approval ▸ Public Health approval; ▸ Civil defence and fire protection approval; ▸ Romanian Water (Apele Romane) Approval; ▸ Approval from The National Administration of Land Reclamation (ANIF). ▸ Ministry of Defense approval ▸ Ministry of Interior approval ▸ Telecomuncation company approval ▸ Geotechnical Approval; ▸ Archaeological Approval; ▸ Approval from the Romanian Civil Aviation Office; ▸ Proof of registration of the project toThe Romanian Architects Order (Ordinul Arhitectilor din Romania ▸ Technical documentation for BP-DTAC, DTOE	The Building Permit (BP) is to be issued by the local authorities at the municipality or county where the project is planned. These are also issuing the Urbanism Certificate (UC), one of the first documents to be obtained during the permitting process. The minimum duration of the permitting process is six months; usually it takes longer than that. Execution of construction works can only be based on technical design and execution details; The authority issuing building permits will establish a validity period of 12 months from date of issue, during which the applicant is required to start work. In this situation, the permit is extended for the duration of execution of the works stipulated by the permit, in accordance with technical design;

Location approval	▸ application for issuing request regarding permit for site location or the data sheet and related documents; ▸ applicant identification data; ▸ data for site location; ▸ objective name; ▸ energetically information about objective – if it will be or not an electrical network user, approximate power to grid connection, voltage use; ▸ contract signed for site releasing or/and for conditions in coexistence of electrical network; ▸ works execution for site releasing or/and for conditions in coexistence of electrical network; ▸ Urbanism certificate (one copy); ▸ Coexistence study to determine the degree of compatibility with the electrical grid; ▸ Territorial framing plan, at scale, in 2 copies, stamped by certificate issuer and annexed to urbanism certificate; ▸ Situation plan, respective plan regarding underground constructions, at scale in 2 copies, with the objective investment place, stamped by certificate issuer and annexed to urbanism certificate. From these must to result clearly the coordinates for future installation or construction, in horizontally and vertically plan from the existing fixed landmarks in the field, to be determined the position towards electrical networks from near area;	Issued in compliance with Methodology for site location documents issued, approved by ANRE Order no. 48/2008; Costs: Aprox 100 RON/km municipal network
Grid connection permit (ATR)	▸ permit for site location (one copy), for objective or installation which will be realized; ▸ solution study for connection to electric network; ▸ technical and energetically data characterized to the production place; ▸ Urbanism Certification in validity term (one copy); ▸ Plan situation at scale, with the location in area of production place, legal noticed by urbanism certification issuer; ▸ certificate copy registered to the trade register; ▸ property document or any other document which attest the right of field using for which is requesting the connection (one copy); ▸ objective authorization construction, in validity term, in copy;	issued according to the Regulation regarding users connection to the electricity networks of local interest, approved by HG, no. 90/2008 Validity 6 months (for projects connected to distribution grid) or 12 months (for projects connected to the transport grid). It may be prolonged following reasonable explanations. Within this term should be concluded the Grid Connection Contract Costs: 50-160 RON
Grid Connection Contract- GCC	▸ ATR and subsequent documents ▸ Study to evaluate the grid connection costs	The validity is related to the payments in due terms of the grid connection fee. The grid connection costs represent in fact the costs to build the needed connection infrastructure (cables, lines, transformers, power cell etc). Depends of the project and is divide in several steps

Documents issued by the Romanian Energy Regulatory Authority

Setting up license (only for energetically objectives with an installed power greater than 1 MW) & Energy Generation License (only for energetically objectives with an installed power greater than 250 kW)

a) Photocopies of the documents proving the applicant's rights of ownership or concessor or user of the land(s) implied in the development or refurbishment of the power unit;
b) Photocopies of the notifications handed over to the private or legal entities whose assets, lands or activities are to be affected by the legal rights stipulated under Art.16 and Art.18 of the Law No. 318 / 2003, during the development and commissioning of the installations and components of the power unit.
c) The list of facilities needed, according to Art.16 and Art.18 of the Law No 318 / 2003, during the activities of development / refurbishment and commissioning of the power unit;
d) Feasibility study, draw up by an accredited designer, according to the legislation in force; when the set-up authorisation is requested for the development/refurbishment of a power unit, using financial resources entirely provided from abroad, the feasibility study could be draw up by a foreign company, and subsequently translated into Romanian.
e) Documents confirming the availability of the financial resources for the development or the refurbishment of the power unit.
f) Technical agreement for connection to a public electric or thermal network within the National Grid, issued by Transmission System Operator or a Distribution Operator, as appropriate, and by the Thermal power transmission Operator, for the co-gen thermal power units that are to be connected to the network;
g) T echnical agreement of the Transmission System Operator on the design solution for integrating within the National Grid, in case of transmission lines or substation for which the technical agreement for connecting to the National Grid as stipulated by entry f is not necessary;
h) Environment agreement;
i) Location project for the power unit, clearly showing the protection and safety zones, as established according to the legislation in force;
j) The limits, determined according to the technical legislation in force, for the protection and safety zones;
k) Notification regarding the compliance with the conditions stipulated by the technical agreement for connecting of the power unit to the public electric network, and to the thermal power transmission network, where appropriate;

according to Regulation for giving licenses and permits for the electricity sector, approved by Government 540/2004, amended and approved by HG 553/2007);
The fees level is established on an yearly basis, according to the art 8 (2) of the Law 13/2007, (with amendments)

	l) Schedule of the stages of the activities that are to be developed as a result of the set-up authorisation; **m)** List of the appropriate measures for avoiding electricity unavailability or other incidents that could affect the activity of the network users during the activity of developing or refurbishing the power unit, when the applicant is the Transmission System Operator or a Distribution Operator; **n)** The explanatory report that includes all the data estimated by the applicant as necessary regarding the options and actions mentioned by any of the above documents ; **o)** The list of own personnel implied in the activities that are to be authorised, describing the staff structure for each speciality and the specific training.
Accreditation for producers of electricity from renewable energy sources	According to Regulation for the accreditation of producers of electricity from renewable energy sources ("E-RES") for the application of the promotion scheme by means of green certificates ("GC"), approved by ANRE Order No. 42/2011 The amount of the fee to be paid to ANRE pursuant to the Regulation, for 2012, are as follows: - RON 2,000: for legal entities – operators, which have requested the accreditation for the promotion system through GCs and which do not hold the licence for commercial exploitation of the E-RES capacity; - RON 500 / MW installed: for operators developing projects of E- RES production plants with an installed capacity higher than 125 MW subject to the detailed evaluation of the support measure and notification to the EC.

Annex: 7 **Slovenia**

Title/no./date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Energy Act, Official Gazette 27/07 (EZ-OCT2), 70/08 (EZ-C), 22/10 (EA-D), 37/11 (Constitutional Court decision), 10/12 (EZ- E).	This Act provides: ▸ the basic principles of energy policy; ▸ rules for the functioning of the electricity and natural gas markets; ▸ transport of carbon dioxide through the pipe transmission systems; ▸ mechanisms for dealing with consumer complaints; ▸ ways and forms of public utilities companies in energy sector; ▸ the principles of security and energy efficiency; ▸ promotion of renewable energy sources; ▸ requirements for ecodesign of energy related products; ▸ an indication of energy consumption and other sources of these products with energy labels and product datasheets; ▸ the conditions for the operation of energy plants; ▸ conditions for carrying out energy activities; ▸ issuing energy licenses and permits; ▸ bodies performing administrative functions under this Act.	Products which are given on the market or given in a use or rent, or put on display, directly or indirectly, by any means of distance selling, including the Internet, and are intended for the final user, must be equipped with an energy label and Data card product. On the label and on data card product must be given information relating to the use of electricity or other forms of energy Ad for products above in which are published information related with energy or price must include information about energy efficiency class of the product. Technical promotional material concerning product in which are described specific technical parameters such as technical manuals and brochures in print or online, must final users provide necessary information about the energy consumption or include information about the energy efficiency class of the product. Source: http://www.uradni-list.si/1/ content?id=109152
Resolution on the National Energy Program, Official Gazette 57/04 (ReNEP).	National Energy Plan (hereinafter referred to as NEP) is a coordinating document of future operations of institutions dealing with energy supply. It sets goals and establishes mechanisms for the transition from the provision of energy sources and electricity supply to a reliable, competitive and environmentally friendly supply of energy services. It also sets objectives and mechanisms for change in understanding the role and importance of energy for achieving higher prosperity. The document presents a vision of Slovenian energy use in a broad sense. It was evolved with the participation of the widest circle of Slovenian experts in this field. Source: http://www.uradni-list.si/1/ objava.jsp?urlid=200457&stevilka=2669	
Construction Act, Official Gazette 102/04 (CA-1-OCT1), 14/05 - correction, 92/05 (ZJC-B), 111/05 (Constitutional Court decision), 93/05, 120/06 (Court decision), 126/07 (CA-1B) 108/2009;	This Act provides content and shape of form request for a building permit for demanding facility and form for a building permit for demanding facility.	The operative part of the building permit for demanding facility description of the object contains information about the size, height, surface, material, purpose, and method of construction deviations. Explanations operative part of the building permit for demanding facility description of Facility must contain the findings. Source: http://www.uradni-list.si/1/ content?id=86099

The Public-Private Partnership Act, Official Gazette 127/06 (PPP);	Source: http://www.uradni-list.si/1/ content?id=76809 This act provides purpose and principles of private investment in public projects and / or public funding of private projects that are in the public interest ways of promoting public-private partnerships and institutions responsible for the promotion and development conditions, the process of drafting and design and implementation method of public-private partnerships, concessions, specific works and services and status of public-private partnerships, supervision of public-private partnerships, transformation of public enterprises, the law is used to resolve disputes arising from public-private partnerships and the jurisdiction of courts and arbitral tribunals to rule on disputes arising from these relationships.	The purpose of this Act is to facilitate and promote private investment in the construction, maintenance and facilities management of public-private partnerships and other projects that are in the public interest to provide economical and effective implementation of the economic and other public services, or other activities that are provided in manner and under the conditions applicable to the public service, or other activities, the implementation of which is in the public interest to allow the rational use, management or exploitation of natural resources, built a public good or other things in public ownership, and other private investment or public and private funds in the construction of facilities that are partially or wholly in the public interest, or in the business, the implementation of which is in the public interest.
Environmental Protection Act, Official Gazette 39/06 (EPA-1-OCT1), 66/06 (Constitutional Court decision), 33/07 (ZPNač rt) 57/08 (ZFO- 1A), 70/08 (EPA-1B), 108/2009;	This act provides governing the protection of the environment against environmental pollution as a prerequisite for sustainable development. In this context, provides the basic principles of environmental protection, environmental protection measures, environmental monitoring and information on the environment, economic and financial instruments for environmental protection, public utilities and environmental protection and other environmental protection related issues.	The aims of environmental protection are: ► prevent and reduce pollution, ► maintenance and improvement of environmental quality, ► sustainable use of natural resources, ► reducing energy consumption and increasing the use of renewable energy sources, etc. Source: http://www.uradni-list.si/1/ content?id=72890
The Public Agencies Act, Official Gazette 52/02 (ZJA), 51/04 (EU-A);	This Act regulates the public agency as a legal form of public entities.	A public agency can be established by the State or a local authority or association of local communities. Establishment of a public agency is entered in the court register. Source: http://www2.gov.si/objave/objave.....
Regulation on support for electricity produced from renewable energy sources (Official Gazette 37/09, 53/09, 68/09, 76/09,17/10,94/10,43/11,105/11,43/12);	This regulation provides: ► Types of energy technology manufacturing facilities for the production of electricity from renewable energy sources ► classification of RES generating plants, which may receive support under this Regulation, the size classes,	Source: http://www.uradni-list.si/1/ content?id=92220 On the basis of this regulation may be granted support for electricity produced from RES in RES generating plants, where the nominal electrical power generating plant does not exceed 125 MW. If the electricity is produced in combined or hybrid plants, Electricity can be produced from renewable energy sources, grant support under this Regulation, if part of the nominal electrical capacity attributable to the production of electricity from renewable energy sources does not exceed the rated power capacity of 125 MW.

Regulation on support for electricity produced by cogeneration of heat and electricity with high efficiency (Official Gazette o, no. 37/09, 53/09, 68/09, 76/09, 17/10, 81/10);	This regulation provides ► Types of energy technologies in production units with combined production of heat and electricity with high efficiency under this Regulation may receive support ► Detailed definition of support, ► The conditions for obtaining support ► Way of obtaining support, ► Method of receiving support and other issues associated with support for electricity produced in high efficiency cogeneration, ect.	Source: http://www.uradni-list.si/1/ objava.jsp?urlid=200937&objava=1779 Given the nominal electrical power generating plants CHP production facility under this Regulation divided into the following size classes: ► First Micro: nominal electrical capacity of less than 50 kW, ► Second male: nominal electrical power of less than 1 MW ► Third medium - lower: the nominal electrical power of 1 MW to 5 MW ► 4th medium - higher: nominal electrical power of 5 MW to 25 MW, ► 5th large - are lower nominal electrical power of 25 MW to 50 MW, ► 6th large - higher: nominal power of 50 MW to 200 MW,
Regulation on the issue of the production unit declarations and certificates of origin for electricity (Official Gazette, 8/09);	This Regulation shall specify the conditions and procedure for obtaining declaration for plants producing electricity from renewable energy sources and high-efficiency cogeneration	Source: http://www.uradni-list.si/1/ objava.jsp?urlid=20098&objava=207 Declaration of the production unit can acquire manufacturers of production equipment, producing or will produce electricity from renewable energy sources and for the production of cogeneration of heat and electricity to achieve the prescribed primary energy savings and meet the criteria in the regulation, which prescribes the method for determining the efficiency of cogeneration, the method of calculating the amount of electricity from (sopoizvodnje) and method of calculating primary energy savings in high-efficiency cogeneration. Declaration to be issued for plants that are used as input energy of one of the renewable sources of energy and are classified into the following groups: ► Hydropower, ► Power plants as a starting energy use of geothermal energy ► Power plants as energy input using various forms of biomass, ► Power plants that use wind energy ► Power plants that use solar energy, etc.
Decree on the determination and calculation of the support for the provision of production of electricity from high efficiency cogeneration and renewable energy sources (Official Gazette, 2/09, 49/10);	This regulation provides This Regulation lays down the method of calculation and accounting of contribution to support the production of electricity from high-efficiency cogeneration and renewable energy sources.	Source: http://www.uradni-list.si/1/ objava.jsp?urlid=20092&objava=58 This Regulation lays down the method of calculation and accounting of contribution to support the production of electricity from high-efficiency cogeneration and renewable energy sources. Any final customers of electricity, for each Pick up and delivery point to pay a contribution to support the production of electricity from renewable energy sources and high-efficiency cogeneration. The amount of the monthly contribution in the previous paragraph depends on the classification of the final customer, according to the power voltage level, category consumption and end use of electricity customer groups under this Regulation.

Regulation of Energy Infrastructure (Official Gazette, 62/03, 88/03, 75/10, 53/11);	This regulation provides facilities, equipment and networks which are drawn together for the infrastructure production and transmission of electricity, natural gas and electricity distribution.	Infrastructure for production of electricity consists of thermal power and nuclear power, hydro power plants with a nominal capacity of over 10 MW plants for cogeneration of electricity and heat with a rated power of 10 MW (e) and their components. Infrastructure for the production of natural gas pipelines are from gas wells to the central gas stations, gas pipelines from the CPP to users and pipelines from wells to muster stations and their components. Contractor activities energy is required to keep records of facilities that perform energy activity. The government does not give its permit to the inclusion in the infrastructure, if: ► This is not object, device or ► network representing infrastructure, or - It is not an essential element of such a facility, device or network... Source: http://www.eposavje.com/files.php?forc e&file=2011/07/VG_izklj_TEBrest_8999 43141.pdf
Decree on the implementation of public service for organization of the electricity market (Official Gazette, 8/09);	This regulation provides organization and implementation of public service for the organization of the electricity market, providing that ► duties, rights and obligations of public utility service ► Rights and obligations of the regulated electricity market, ► Method of financing public services.	Source: http://www.uradni-list.si/1/ objava.jsp?urlid=20098&stevilka=208 Public service provides: ► Management of total scheme of organized electricity market, ► The balancing of the electricity market, ► The implementation of the Centre's activities to support ► Implementation of imbalance settlement Organized electricity market in Slovenia is managed the market as a provider of public services. The participants of the regulated market are: ► Manufacturers, ► Clients ► Traders, market agents and market ► intermediaries -Suppliers ► Public utility service

Regional/local regulation: N/A

STEP	Authorizations	Main documents/ studies necessary	Observations
Planning information	Municipality	► Planning information	The planning information is not mandatory for a potential investor but it is recommended. Provides important information. Planning information lays down the criteria and conditions for planning the investment as defined by applicable spatial planning acts, the information on safeguards, restrictions and prohibitions.
Concept	Investor/Servic e provider	► Preliminary design and feasibility study	A concept, preliminary design and feasibility study, which can be made up of differently detailed documents and prepared depending on a unit's size, can justify the construction of a production unit from a technical, economic and environmental aspect. The investor may hire qualified consultants or design companies and although this can lead to additional costs it is particularly recommended for non-standard and more demanding projects.

Energy permit	Energy Agency	►Energy permit	According to the production units with a nominal capacity up to 1 MW do not require an energy permit. For production units with a higher nominal capacity an energy permit must be obtained before the acquisition of other permits. The investor must obtain the energy permit before the building permit. The energy permit includes the location and area, building type, fuel type, method and the conditions for performing energy sector activities and the obligations of the energy permit holder.
Specific permits	Slovenian Environmental Agency	►Water permit ►Concession ►agreement ►Environmental impact assessment	The Water Act provides for a concession for the energy use of waterways in the production of electricity in the case of hydropower plants that will be connected to the public electricity distribution network. An environmental impact assessment is mandatory for production units that use stationary internal combustion engines and gas turbines for the production of electricity, use biogas with a heat input larger than 1 MW , production units using hydropower with nominal capacity exceeding 1 MW and wind-powered production units with nominal capacity exceeding 5 MW or 100 kW in protected areas.
Obtaining project and connection approval	Electricity Distribution company	►Investor application	On the basis of the application submitted by the investor or a person authorised by the investor, the competent electricity distribution company issues the project conditions on behalf of the Distribution System Operator (hereinafter: SODO - System operator of distribution network), for buildings that are near the protection zone of existing electricity networks.
Building permit (PGD)		►Building permit	The field of building construction is governed by the Construction Act, which includes the construction of new buildings, reconstructions, building removal and change of intended use. According to the Regulation on classification of construction with regard to their complexity, individual buildings are divided into complex, less complex, non-complex and simple
Proof of land disposal (right to build)	Investor/Servic e provider	►Proof of land disposal	The investor has to submit a proof of land disposal or a proof of the right to build (e.g. ownership, easement).
Conclusion of an agreement for connection to the network	Electricity Distribution company	►Connection approval	Parallel to the selection of the most suitable provider, the procedure for the conclusion of the agreement for connection to the network should be started. After the final connection approval has been issued and on the basis of the role of the investor or the person authorised by the investor, the competent electricity distribution company concludes a Connection Agreement with the investor before the connection is constructed.
Project for implemented work (PID) and operating instructions	Investor/Servic e provider	►Agreement on the purchase/ sale of electricity	The investor has to undertake certain activities for the sale of electricity even before connection to the electricity network. Normally, the investor has to decide between one of the possible methods of sale – either a guaranteed purchase by Borzen's Centre for RES/CHP Support or the sale of electricity on the market.
Verification of the fulfillment of conditions for connection	Electricity Distribution company	►Agreement on the purchase and sale of electricity	The investor submits a complete connection application, attaches all the requested annexes and the concluded agreement on the purchase and sale of electricity with the selected supplier of electricity, or the decision on accession to the Balance Group of the Centre for RES/CHP Support to the electricity distribution company. If the construction of a simple unit for the production of electricity is deemed major maintenance work and does not require a building permit.

Conclusion of the Network Access Agreement	Electricity Distribution company	►Agreement on access to the electricity distribution network	The investor agrees a time with the competent electricity distribution company for the inspection of the metering point and the fulfilment of the conditions from the connection approval. During the inspection the electricity distribution company must check and harmonise the binding and the settings of the metering devices and the direction of the spin box in three- phase connections. When all the conditions have been met and the inspection has confirmed that all the conditions from the connection approval have been met, the electricity distribution company and the connection approval holder conclude an agreement on access to the electricity distribution network.
T echnical examination/inspection	Energy and Mining Inspectorate	►Inspector report, including all the required documentation.	A technical examination/inspection is performed by the competent inspector following an application by the investor; the service providers and the representative of the competent electricity distribution company are also present. The inspector inspects the installation of the production unit. After the inspection has been completed, a report is drawn up including all the required documentation.
Operating permit (if a building permit was issued for the production unit)	Administrative unit	►Operating permit	An operating permit is issued by an administrative body on the basis of the technical examination of the production unit, provided that it was established that the production unit was constructed in accordance with the applicable regulations and the issued building permit.
Operation in the support			An electricity distribution company issues an oral warning to the investor or their authorised person that the unit will be carrying current after connection and connects the production unit to the electricity distribution network.

Annex: 8 **IPA Countries**

Annex: 8.1 **Montenegro**

Title/no./date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Official Gazette of Montenegro no. 28/10	Law on Energy	The development and use of renewable energy sources is determined by the program of development and utilization of renewable energy sources by the Government for a period of 10 years in accordance with the Strategy of Energy Development, which includes in particular the national target of utilization renewable energy sources and terms, and dynamics for target achievement with incentives. Privileged generators may be eligible for an incentive for generated electricity, which is determined by the T ariff system for electricity generation from renewable energy sources and cogeneration, enforced by Government, in accordance with this law.
Official Gazette of Montenegro, no. 67/09	Regulation on wind power plants	This Regulation regulates the procedure of wind potential measurement and research, the method and procedure of land leasing at the measurement or wind farms location, wind farm construction process and its connection to the electricity system, as well as electricity sale.
Official Gazette of Montenegro, no. 37/11	Regulation on issuance, transfer and withdrawal of guarantees of origin for energy generated from renewable energy sources and highly efficient cogeneration	Guarantee of origin is issued to the electricity generator in a facility that uses renewable sources or cogeneration plant for highly efficient defined by the classification of plants that generate electricity from renewable sources and highly efficient cogeneration. Guarantee of origin is issued to generator that produces heat for district heating and / or cooling plant installed capacity over 1 MW, which uses at least 90% of primary energy from renewable energy sources or in highly efficient cogeneration plant.
Official Gazette of Montenegro, no. 52/11	Regulation on tariff system for determining incentives for electricity from renewable energy sources and highly efficient cogeneration	Incentives expressed in c € / kWh for electricity generated by plants using renewable sources of energy are calculated by applying the tariff system of subsidizing electricity price, generated by plants using renewable sources of energy and highly efficient cogeneration plants, which is an integral part of this regulation are: ▶ Wind farms 9.60 Power plants using solid biomass: ▷ from forestry and agriculture 13.71 ▷ from wood-processing industries 12.31 ▶ Solar power plants: ▷ on buildings or construction structures 15.00 ▶ Solid waste power plants 9.00 ▶ Landfill gas power plants 8.00 ▶ Biogas power plants 15.00.

Authorizations	Main documents/studies necessary
Regional/local regulation	
Authorization of the project (the energy permit and / or the Concession Agreement / Contract on facility construction and leasing land)	Assessment of the renewable source potential for location
Urban-technical requirements (building permit)	Urban-technical conditions, depending on the facility type include: **1.** geodetic and cadastral base; **2.** facility use; **3.** type and major technological unit of facility with basic characteristics and its spatial positioning; **4.** number of floors for facility, or a maximum facility height dimension; **5.** maximum allowable capacity of the facility (number of dwellings or the surface of usable space); **6.** site plan with plot boundaries and their relations with the neighboring plots, and places where work is performed in order to adapt space according to planning document; **7.** construction and regulatory line; **8.** levelling of facility elevation; **9.** type of facade material; **10.** type of material for roofing and its inclination; **11.** orientation of facility, relative to cardinal directions; **12.** meteorological data (wind rose, insolation, amount of atmospheric precipitation, temperature extremes, etc.); **13.** information on soil capacity and ground water level; **14.** seismic design parameters, as well as other conditions to reduce impacts and protect against earthquakes; **15.** conditions and measures for environmental protection; **16.** conditions for landscape design of the site; **17.** requirements for vehicles parking or garaging; **18.** location and method of connection object to the urban transport and public road; **19.** place, manner and conditions of facility connection to the electric, water, sewer, and other atmospheric infrastructure network; **20.** cable distribution of RTV program; **21.** requirements for protection from natural and technical-technological disasters; **22.** conditions for urban land arrangement, facility belonging site; **23.** requirements for design of facilities, registered within the cultural heritage register of Montenegro; **24.** requirements for energy efficiency; **25.** requirements for facilities that can have permanent, occasional or temporary impact on changes in water regime or water conditions; **26.** requirements for facilities that may affect air traffic safety; **27.** needs for geological, hydrological, land surveying and other tests; **28.** possibility of the construction in phases.

Annex: 8.2 **Serbia**

Title/no./date of legal regulation	Field of application	Main provisions/short abstract
National legislation		
Energy Law ("Official Gazette RS", numbers 57/11, 80/11-correction, 93/12 and 124/12)	In a part connected with renewable energy sources, the Law comprises establishing a promotion system for production of energy from renewable energy sources	In the area of RES, the Law creates conditions for stimulating the use of renewable energy sources and combined heat and electrical power generation. Also, it promotes environmental protection. The Law also defines the role of Energy Agency of the Republic of Serbia.
Decree on incentive measures for electricity generation using renewable energy sources and for combined heat and power (CHP) generation (Feed-in-tariffs), "Official Gazette RS", number 99/09	Provisions of this regulation is applied to all projects which intend to produce energy from Renewable Energy Sources and through high-efficiency co- generation of electricity and heat	▸This Decree regulates in detail incentive measures for electricity generation using renewable energy sources (hydro, biomass, biogas, landfill and sewage gas, wind, solar, geothermal and combined heat and power – CHP plants), identifies power plants producing electricity from such sources, and defines basic aspects of agreement. the incentive-based off-take ▸The feed-in tariff rate is guaranteed at agreed level for 12 years and determined separately for each renewable energy source. ▸The purchase price for the electricity set by feed-in tariffs is determined as an amount of eurocents per kilowatt hour (c€/kWh). New tariffs will be established from March 2013 ▸Feed-in tariffs differ depending on the type of the renewable energy source and the installed capacity of the power plant. ▸It is formed in a way to allow each investor to recoup investment and operational costs within 12 year period. ▸Only power plants with a capacity of less than 10 MW (save for landfill, sewage, solar and geothermal power plants) can be eligible for application of feed-in-tariffs.
Decree on the requirements for obtaining the status of the privileged electric power producer and the criteria for assessing the fulfillment of these requirements, "Official Gazette RS", number 72/09	Provisions of this regulation are applied for obtaining the status of privileged electric power producer (producer of renewable energy resources) and the criteria for assessing the fulfillment of these requirements.	This Decree regulates that the privileged producer status may be obtained by producers that: ▸Use renewable energy sources or a separated fraction of the communal waste in the electric power generation process; ▸Produce electric power in power plants regarded to be small power plants pursuant to the law regulating the energy area; ▸Simultaneously produce electrical and thermal energy, provided that they have met the criteria related to energy efficiency.
The Rulebook on Criteria for Issuing Energy Permits, Contents of the Application, and Procedure for Issuing Energy Permits, "Official Gazette RS", number 23/06 and 113/08	This rulebook promises criteria for construction of power generating facilities which is necessary to meet in order to obtain the energy permit	According to that rulebook, the following shall be submitted with the Application for the energy permit: **1.** The Information on the Location or the location permit issued within a period of maximum one year (if issued), **2.** The Preliminary Feasibility Study, **3.** Relevant statement of a bank that is willing to support the applicant or the investor in financing the construction of the energy facility, **4.** The opinion of the electricity transmission or distribution system operator on the requirements for and possibilities of connection of the new facility to the system.
Regional/local regulation		
There are no special regional and/or local regulations which are dealing with RES in the Republic of Serbia. As local authorities do not have different laws or regulations at the level of how to issue permissions or licenses for cases such as RES installations, they share the common national regulations		

Necessary Steps for Obtaining the Right to Engage in Power/Heat Generation to Construct and Constructing the Power Plant

Authorizations	Main documents/studies necessary	Observations
Information on the Location	Information on the Location Including: **1.** Data on Planning Document; **2.** Zone; **3.** Land Use; **4.** Regulatory and construction lines; **5.** Construction Codes; **6.** Requirements for access to infrastructure facilities; **7.** Request for preparation of a detailed Town Planning Document or Town Planning Design; **8.** Data on the Cadastre lot, whether it meets the requirements for a building plot, guidelines on the procedure for forming of a building plot; **9.** Engineering and geological requirements; **10.** List of the requirements included under special and technical design requirements.	Issuance of this information together with construction-related permits for power plant (Location Permit, Building Permit, Operating Permit) is within the jurisdiction of the Local Self-Government Unit Exceptions: ▸when the power plant is built in a national park or within the boundaries of a protected natural resource of outstanding significance ▸when the power equals or exceeds 10 MW ▸when facility is constructed in accordance with Art. 133. of the Law on Planning and Construction, it falls under the jurisdiction of the Ministry responsible for Spatial Planning, or the competent authority of the autonomous province if it is situated at the territory of the autonomous province ▸For facilities constructed in accordance with the above article 133 preparation of the Feasibility Study including the General Design and the Feasibility Study including the Preliminary Design/Main Design is mandatory and subject to review by the Review Committee.
Energy Permit	An energy permit is a permit for construction of an energy facility. As described in the Rulebook on Criteria for Issuing Energy Permits, Contents of the Application, and Procedure for Issuing Energy Permits, the following shall be submitted with the Application for the energy permit: **1.** The Information on the Location or the location permit issued within a period of maximum one year (if issued), **2.** The Preliminary Feasibility Study (recommendation: General Design, including Pre-feasibility Study), **3.** Relevant statement of a bank that is willing to support the applicant or the investor in financing the construction of the energy facility, **4.** The opinion of the electricity transmission or distribution system operator on the requirements for and possibilities of connection of the new facility to the system.	Energy permit is required only for energy facilities with a capacity of 1MW or more. For electricity, it is issued by the Ministry responsible for energy/for heat by local self-government Decision on Issuance of Energy Permit is valid for 2 years
Water Approval	Request for obtaining the Water Approval enclosed: **1.** Approvals by the Ministry of Health and the Ministry responsible for Environment for Main Design; **2.** Decision on issuance of Water Requirements; **3.** Main Design; **4.** Report by the Technical Review Committee; **5.** Other documents that may be required by the Decision on Issuance of Water Requirements.	It is issued by Ministry of Agriculture, Forestry and Water Management (Water Management Directorate).

Location Permit	Location permit involves: **1.** Preliminary Feasibility Study including the General Design **2.** Resolving of Property-Rights Issues/Allotment and Re-allotment Plans **3.** Design Requirements Request for obtaining the Location Permit enclosed: **1.** Copy of the Lot Plan (the date stamp: max. 6 months old), **2.** Excerpt from the cadastre of installations laid in the ground; **3.** Evidence of ownership rights, or of lease on the construction land; **4.** Data on the facility (in practice – General Design); **5.** Collected special and technical requirements.	Generally, it is issued by the local self- government/Town-planning Authority. For power plants using biomass/biogas up to 10MW-Local self-government. Power plants using biomass/biogas 10MW and more-Ministry or Province Secretariat responsible for energy issues. The Location Permit shall cease to be valid unless the Investor files a request for Issuance of the Building Permit within 2 years.
Environmental Impact Assessment Study	The Environmental Impact Assessment Study: **1.** is not required for Power plant with power < 1 MW **2.** may be requested for Power plant with 1< power < 50 MW **3.** is mandatory for Power plant with power > 50 MW,	It is issued by the Ministry responsible for environmental issues
Building (Construction) Permit	Request for issuance of the Building Permit enclosed: **1.** Location Permit; **2.** Three copies of the Main Design, including the Report on completed technical review of the design; **3.** Evidence on the ownership right, or the right to lease the construction land; **4.** Evidence on settled relations regarding payment of the fee for the land development; **5.** Evidence on payment of the administrative fee; **6.** Energy Permit (for the power plants exceeding 1MW)	It is issued by the local self-government- relevant Town-Planning Authority
Water Permit	Request for obtaining the Water Permit Enclosed: **1.** Decision on Water Approval; **2.** MoM of the Committee in charge of technical inspection of the constructed facility; **3.** Agreements signed with the public water-management company; **4.** Documents listed in the Decision on issuance of Water Approval. **5.** The Investor may subsequently be informed if additional documents need to be furnished.	Public water-management company (Srbijavode/Vode Vojvodine) or the Ministry of Agriculture, Forestry and W ater Management (Water Management Directorate)

Operating Permit	► Request for technical inspection of the facility. ► It is necessary to submit the As Built Design during the process of obtaining the Operating Permit ► The Water Permit is obtained upon completed technical inspection of the facility. ► Operating Permit shall not be issued without the Water Permit obtained beforehand	It is issued by local self-government-relevant Town-Planning Authority
License (permit to engage in an energy-related activity)	Request for the License, send to the Energy Agency (deadline for answer: 30 days)	► License is required only for power plants of one or more 1MW. ► It is issued by the Energy Agency of the Republic of Serbia. ► The decision on the License (valid for 10 years)
Approval for Connection to the Electric Grid/Approval for Connection to a Heat Distribution Network	► Request for issuance of the Approval for connecting the facility to the electric power grid enclosed (deadline for answer: 30 days).: 1. Data on the owner of the facility, or the holder of the right to use the facility (for a physical person: name and place of residence, personal ID number; for a legal entity or entrepreneur: business name or title, head office, PIB (VAT) number, individual identification number, number of the account and authorized person); 2. Data on the facility for which the approval for connection is requested (address, type, location of the facility and its use); 3. Estimated time for connecting the faciilty; 4. Data on overall installed power of the facility, number and power of generating units, generators voltage and block transformer; 5. Estimated average annual and monthly production; 6. Protection and measuring equipment; 7. Energy Permit and License for engaging in the activities of electric power generation for facilities exceeding the capacity of 1 MW. For constructed facilities, it is necessary to also submit the Construction Permit, as well as evidence on ownership of the facility or on the assigned right for use of the facility. ► The technical report for issuing the Decision on approval. ► Decision is valid for 2 years for electric grid.	Approval for connection to the electric grid is issued by the relevant energy entity whose system will be used for connecting the facility (EPS-Electric Power Company of Serbia, EMS-Electric Grid of Serbia) Approval for connection to the Heat Distribution Network is issued by a public utility service (competence: a local self- government unit) The technical report describes whether the equipment and installations of the facility that are to be connected meet the requirements prescribed under the law, technical, and other regulations governing the conditions and method of exploitation of such facilities

The Status of a Privileged Producer	Application for the status of a privileged producer (deadline for answer: 30 days) Request for acquiring the status of the privileged producer enclosed: **1.** A copy of the license for engaging in electricity generation, if the power plant has the capacity exceeding or equal to 1 MW; **2.** A copy of the agreement signed with the licence holder, if the power plant has the capacity equal to or exceeding 1 MW, and the producer is not the holder of the licence; **3.** As-built Design of the constructed power plant facility; **4.** A copy of the agreement signed for connecting to the distribution network or the transmission system; **5.** Operating Permit; **6.** Data on the person in charge of power plant management.	It is issued by the Ministry responsible for energy activities.
Power Purchase Agreement	The application to sign the Power Purchase Agreement	Agreement is signed with Electric Power Company of Serbia. It is valid for 12 years