European Geothermal Energy Council (EGEC)

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EGEC response to Commission's Consultation on Environment and Energy Aid Guidelines (EEAG)

EGEC, the European Geothermal Energy Council, was founded in 1998 as an international non-profit association in Brussels, with the aim of promoting the use of geothermal energy. EGEC has 135 members from 28 European countries: private companies, national associations, consultants, research centres, geological surveys and other public authorities.

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KEY MESSAGES

- The European Geothermal Energy Council (EGEC) welcomes the revision process of the Environmental and Energy Aid Guidelines (hereinafter referred to as “draft EEAG”) as part of the process for the modernization of State aid control in the European Union (EU). Within this framework, **the Commission should clarify the interaction between the Environmental and Energy Aid Guidelines and the General Block Exemption Regulation, and clearly indicate the conditions under which a given scheme should or should not be notified.**

- **The very objective of the EEAG is to set the limits within which state aid may be considered compatible with the internal market** when it is granted to promote the execution of an important project of common European interest (e.g. environmental protection) or to facilitate the development of certain economic activities (e.g. the development of renewable energy sources). **These criteria cannot contradict Article 194 TFEU and Directive 2009/28/EC. The EEAG should leave Member States some flexibility on how to support a wide variety of renewable energy technologies and meet their 2020 binding RES targets.**

- Support mechanisms are effective due to their design; therefore the Commission should promote overall good design instead of specific mechanisms. **With the Guidance for the design of renewables support schemes (Guidance)[1] published in November 2013, the Commission adequately put forward non-binding recommendations.** The Guidance, like the Guidelines, is concerned with over-compensation but takes a broader view of how it can be avoided. The Guidance recognises the utility of schemes with in-built digression that adapt remuneration levels to improvements in technology cost. **If implemented, it would achieve the same objectives as the Guidelines while allowing the Member States to preserve the features of national support schemes that make them stable, predictable and investor-friendly.**

- **The EEAG assume there is a well-functioning EU internal energy market, which is not the case today** (different grid costs, capital costs, administrative costs, regulated electricity prices, fossil fuels and nuclear still receiving subsidies, etc). A fully transparent, fair and robust internal energy market reflecting the full costs of energy generation technology needs to be in place before new geothermal technologies can fully participate and compete in the market on a level playing field and their support can be more market integrated. **The**

[1] SWD(2013) 439 final

focus should be put on eliminating existing market failures still acting as barriers for new market entrants.

- **By imposing a mandatory and technology neutral bidding process, the draft EEAG would *de facto* restrict eligible state aid to large players only**, which is against one of the principles of the EU internal energy market. This approach **fails to recognise the specificities of each different renewable technology** and their inherent barriers. As far as Geothermal is concerned, it provides base-load power (the load factor of new technologies amounts to more than 90%), but a project takes on average 6-7 years to be developed. The significant initial investment is related to the drilling and to the need to cover the geological risk at the beginning of the exploration**.** Therefore, **a stable legal and financial framework is vital. Imposing abrupt changes and technology-neutral auctioning would cause projects under development to be abandoned and a significant number of existing companies to go bankrupt.**

- **The distinction between deployed and less deployed technologies is artificial and would prevent Member States from designing technology specific, cost-efficient support mechanisms.** The competitiveness of a technology in a specific national market and segment may vary significantly. Additionally, there are different technologies and market segments for each energy source. For instance High temperature hydrothermal, Low temperature hydrothermal, and Enhanced Geothermal Systems (EGS) should be considered as three different technologies with different levels of maturity. More details are provided in Annex I. **For these reasons, we believe a learning-curve approach**, **as the one taken by the European Investment Bank, would be more pertinent.**

- Feed-in tariffs (FiTs) have proven to be successful to allow new technologies to progress along their learning curve. **The draft EEAG phase out FiTs for any installation above 1MW**, regardless of technology development /costs. An exemption is given to wind energy, to which a threshold of 5 MW applies. However, i**n order to treat all generators and RES technologies equally in this regard, EGEC suggests a threshold of 10 MW to be applied to all technologies, including geothermal.**

- Indeed, there are still a number of technologies needing this public policy instrument to emerge. Otherwise the EU will miss the opportunity to decrease energy import and develop a wide range of RES technologies on which is global leader. The **Phase out of FiTs without a careful analysis of the maturity of the markets, technologies and segments would therefore be premature, at least for some technologies.**

- **In order to complete the EU internal energy market the focus should be put on eliminating existing market failures**, e.g. fossil fuels subsidies, still acting as barriers for new market entrants and new technologies.

COMMENTS TO SPECIFIC PROVISIONS

Duration (Paragraph 116)

According to the draft EEAG, the Commission will authorise aid schemes for a maximum period of ten years. If maintained, such measures should be re-notified after such a period. However, what "re-notification" actually means is not clear. In this regard, a simplified procedure for those schemes not subject to changes appears to be appropriate.

Additionally, and for the sake of clarity, it should be highlighted that the 10-year limit applies to the schemes and not to the period during which the support is granted, usually ranging between 10 and 25 years.

Cross-border support (Paragraph 118)

Cross border support mechanisms would only lead to cost-efficiencies if all parameters (grid costs and their ability to represent congestion, capital costs, administrative costs, electricity prices, etc) were identical across Europe, or at least among the those countries involved in a specific cross-border mechanism. However, this is not the case today. **It is important to clarify in this paragraph that the existence of a cooperation mechanism does not necessarily imply that Member States must allow for cross-border support** and that they will remain in full control of the means to reach their binding targets. The potential of RES across Europe should be exploited in the framework of the existing legislative framework (cooperation mechanisms of the RES Directive).

**Distinction of technology maturity
(Paragraph 119)**

This paragraph establishes a difference between deployed and less deployed electricity technologies. **"Deployed"** are considered those technologies whose share in terms of electricity production/consumption amounts at least to 1-3% at EU level. Technologies with a smaller share are considered "**less deployed"**. Different conditions apply to deployed or less deployed technologies for a state aid to be considered acceptable by the Commission.

This distinction is however artificial. Firstly, it is not clear at all what "technology" means in this context. There are different technologies and market segments for each energy source. For example High temperature hydrothermal, Low temperature hydrothermal and EGS (see Annex I) should be considered as three different technologies of geothermal power with different level of maturity like it is common for on-shore and off-shore wind.

Considering the market penetration of a given technology at European level would introduce barriers to new market entrants: it would indeed constrain investors in under-developed markets to only rely on a more limited set of supporting instruments, simply because this technology has experienced market development somewhere else. Since the competitiveness of a RES technology varies from one country to another and is by no means only linked to the evolution of the cost component, such a logic is going against the establishment of a level-playing field among investors across Europe.

Given the current uncertainties on the evolution of the European electricity mix, which still greatly depends on the respective national choices, a technology considered “deployed” at a given point in time can very well be considered “less deployed” later on. Such an uncertainty would be detrimental to investors’ confidence.

For the above reasons EGEC believes that this distinction is not appropriate. Instead, a learning-curve approach to renewable energies, **as the one taken by the European Investment Bank[2], would be more pertinent.** Accordingly, Member States should define the level of competitiveness of a given technology, by considering at local level the full costs of electricity generation.

The Guidance suggests to use the **levelised cost of electricity (LCoE) method taking into account** system costs, e.g. for grid connection / grid reinforcement/need of back-up and costs of market integration (balancing costs).

However, the LCoE approach usually does not capture the following components:

- Systems factors like transmission other network costs such as impact on system balancing, impact on state/system energy security
- Externalities like government funded research, residual insurance responsibilities that fall to government, external costs of pollution damage or external benefits (e.g. value of learning to future generations)
- Business impacts like effects of fuel price and future revenue volatility, future changes in legislation, risks.

In a level-playing field, therefore, there is the need to include, as much as possible the above components or, as an alternative, to offer a bonus to those technologies providing benefits to the overall electricity system.

An alternative way to measure the market maturity in the geothermal sector is to take into account the number of geothermal wells drilled, the number of installations in operation and/or the level of geological risk (very high below 6 deep wells, intermediate between 6 and 60 wells, medium/low with deep geothermal installations widely in operation across a given country).

Mandatory bidding process
(Paragraph 120a)

According to the draft EEAG, aid should be granted through mandatory bidding process. Such a bidding process would not be limited to large projects only. For this reason, this is a “one-size fits-all” approach imposed EU wide through the state aid guidelines.

[2] EIB and Energy: Delivering Growth, Security and Sustainability – EIB Screening and Assessment Criteria for Energy Projects, 25 July 2013.

It should be considered that tendering schemes add up administrative costs and increase the risks already inherent to the different technologies. Moreover they require high upfront financial resources with little guarantee of success.

The peculiar and very high geological risk for geothermal energy project is already a major barrier for the development of the technology[3] and there is no need to add additional risks and costs.

Mandatory tendering schemes would favour traditional technologies and investors only. Small scale investors who are unable to face high risks and transaction and administrative costs would automatically be excluded. Additionally, tendering schemes would represent a barrier to new market entrants, especially in countries where a renewable energy technology is currently underdeveloped.

EGEC believes that bidding process is not always the most cost-effective tool and that the choice of a granting scheme needs to be tailor-made and left up to Member States choice. Therefore we strongly encourage the Commission to delete paragraph 120 a).

Technology neutrality
(Paragraph 120b)

This sub-paragraph introduces the notion of technology-neutrality.

From a legal perspective, a technology-neutral selection process is contrary to the Article 194 TFEU which states that the measures to achieve the Union Policy on energy shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply. It would indeed prevent Member States from supporting technologies which are not necessarily the cheapest ones. In addition, such an approach may not take into consideration the benefits that a given technology may provide to the the overall electricity system: e.g. geothermal electricity provides flexibility and base-load power, is local and relatively close to the demand and thereby contributes to local development without the need for additional infrastructure extension.

From an economical perspective, this approach would lead to over-compensation. While only the currently cheapest technologies would get support, other technologies that could – if they were developed – become the most cost-effective options in the future would be excluded. Alternatively, the support level would have to be quite high to allow these less mature

[3] Beyond exploration, the bankability of a geothermal project is threatened by the geological risk. The geological risk includes the risk not to find an adequate resource (short-term risk) and the risk that the resource naturally declines over time (the long-term risk). With the notable exception of a few European market participants operating in well-developed geothermal regions, project developers have very little capability to manage the financial risk owing to the poor knowledge of the deep subsurface, lack of technological progress and high cost. In effect the probability of success/failure weighted net present values of project cash flows tend to be overly negative, thus effectively shutting out private capital from investing in geothermal energy.

technologies to come in, while generating windfall profits for the more mature ones. In order to avoid over-compensation, support should on the contrary be technology specific and tailor-made to segments and markets.

Finally, from a conceptual perspective, this proposal contradicts the very purpose of State Aid, which is to remove different barriers and to help less competitive technologies to develop: a technology neutral approach would simply undermine this objective by allowing only close-to-competitive technologies to be supported.

Operating aid for "less deployed technologies"
(Paragraph 121)

The draft EEAG define that aid for less deployed technologies (according to the definition set up in paragraph 119) could be granted through a feed-in-premium (FiP) or equivalent measures involving the direct marketing of the electricity produced. FiTs are only acceptable for small scale-installations below 1 MW, according to paragraph 123.

According to the International Energy Agency[4] policy makers need to adjust their priorities as RES deployment grows, taking a dynamic approach in the three phases of deployment. FiTs have proven to be very efficient and constructive in the past for emerging technologies (inception phase), Switching to feed-in premium is more appropriate during the consolidation phase, when the main challenge is the integration of large volumes of RES into the system Imposing a feed-in-premium to less advanced technologies would ignore the necessary first step of the inception phase. There are still a number of new technologies that need this public policy instrument in the form of FiTs to progress along their learning curves, otherwise the EU will miss the opportunity to develop a wide range of technologies that can increase not only its global leadership but also contribute to decrease energy import.

It is worth highlighting that the Commission has already provided guidance on how to better design support mechanisms, which should overcome the problems encountered in the past of poorly designed support schemes. Therefore EGEC strongly encourages the Commission to delete paragraph 121.

Operating aid for RES H&C
(Paragraph 122)

Para 122 concerns the aid granted to RES uses other than electricity, for example the renewable heating and cooling (RHC). This paragraph refers to paragraph 122 (b), and (c) which does not exist (clerical mistake). EGEC understands that this should be read "121 (b), and (c)" instead.

EGEC understands that this paragraph would apply to every aid provided to all RHC installations (including district heating) whatever the technology, the size and the type of support. This should be clearly stated and would be in line, e.g. with the Renewable Heat Incentive in the UK.

[4] International Energy Agency, Deploying Renewables: Best Future Policy Practice, 2011

Aid for projects of first commercial scale and small RES electricity installations (Paragraph 123)

EGEC welcomes the proposal to differentiate projects of first commercial scale and small scale installations. In this regard, the draft EEAG allows for aid in the form of feed-in tariff for renewable electricity small scale installations below 1MW. An exemption is given to wind energy, to which a threshold of 5 MW applies. However, and in order to treat all generators and RES technologies on an equal footing, **EGEC suggests the threshold of 10 MWe to be applied to all technologies, including geothermal energy.**

Applicability (Paragraph 230)

It is our interpretation that support schemes not in line with the EEAG will have to be adapted within 12 months (i.e. by July 2015) and put into force within additional 12 months, say by July 2016).

Additionally, it should be made clearer that whenever a beneficiary has received confirmation from a Member State that it will benefit from State aid under a scheme currently in place for a predetermined period, such aid can be granted under the entire period under the conditions laid down in the scheme at the time of the confirmation.

Regarding paragraph 230 on the adaptation of existing RES support schemes, the footnote 100 clarifies that existing RES schemes which are not changed can remain in place even after the entry into force of these new Guidelines.

However, it indicates that "a change means any adjustment to an existing scheme other than the publication of new support tariffs according to an already existing and approved methodology". This approach is too restrictive as it could lead to a situation where a Member State does not introduce a necessary change to a given scheme (other than the support level) in order to avoid being obliged to switch to another, less relevant support mechanism.

We consider that Member States should remain free to make necessary incremental changes to existing schemes other than the level of support. The Guidelines should only apply to new schemes once a Member State has decided to switch from a given type of support scheme (FIT) to another type (Feed-in-premium or certificates). The footnote 100 should be adjusted accordingly.

CONCLUSIONS

The very objective of the EEAG is to set the limits within which state aid may be considered compatible with the internal market when it is granted to promote the execution of an important project of common European interest (e.g. environmental protection) or to facilitate the development of certain economic activities (e.g. the development of renewable energy sources). **These criteria cannot contradict Article 194 TFEU and Directive 2009/28/EC. The EEAG should leave Member States some flexibility on how to support a wide variety of renewable energy technologies and meet their 2020 binding RES targets.**

In this framework it is of the utmost importance to highlight that the objective of a support scheme, such as a public Risk Mitigation Insurance Fund for Geothermal, is to compensate for market failures and unfair competition. Support schemes are also intended to favour the deployment of a given technology by creating a secure investment environment catalysing an initial round of investment and allow the technology to progress along its learning curve. Hence, support schemes should be temporary and can be phased out as this technology reaches full competitiveness in a (then) complete and open internal market where a level playing field is fully established.

Today, however, this seems premature. Market conditions in the EU electricity and heat sectors prevent geothermal to fully compete with conventional technologies developed under protected, monopolistic market structures. The internal market is still far from being perfect and transparent. Firstly, in many countries electricity and gas prices are regulated, thus they do not reflect the full costs of the electricity, gas, and/or heat generation. Secondly, fossil fuel and nuclear sectors still receive many subsidies. Thirdly, there is lack of market transparency, including lack of information provision to customers and a clear billing.

Support measures for geothermal technologies are therefore needed to favour the progress towards cost-competitiveness of a key source in the future European energy mix and to compensate for current market-failures.

ANNEX I: GEOTHERMAL TECHNOLOGIES AND COSTS[5]

Geothermal power technologies

Over the last 100 years, the production of geothermal energy has been concentrated in areas where rich hydrothermal resources are available. However, the development of advanced technologies has enabled the production of geothermal energy at low temperature in all European countries. Today, three technologies exist to produce electricity from geothermal energy and one is under development:

1*) Conventional high temperature, hydrothermal geothermal electricity production (dry steam and flash steam)*
As demonstrated in numerous sites since 1904, heat from the underground can be converted into electricity with dry steam power plants and flash steam plants (water dominated reservoirs and temperatures above 180°C).

2) Low temperature, hydrothermal geothermal electricity production (Binary: ORC and Kalina Cycle)
Binary, known also as organic Rankine cycle (ORC) or Kalina Cycle, plants operate usually with waters in the 100 to 180°C temperature range. Adequate working fluid selection may allow extending the former design temperature range from 180°C to 75°C.

3) Enhanced Geothermal Systems – EGS
An Enhanced Geothermal System is an underground reservoir that has been created or improved artificially. The concept of Enhanced Geothermal Systems is going greatly increase geothermal potential as it allows for the production of geothermal electricity nearly anywhere in Europe with medium and low temperature. This concept involves:

- Using the natural fracture systems in the basement rocks
- Enlarging its permeability through massive stimulation
- Installing a multi-well system
- Through pumping and lifting, forcing the water to migrate through the fracture system of enhanced permeability ("reservoir") and use the heat for power production.

A major effort to introduce EGS could create a substantial base-load electric power production, as geothermal energy is available independent from the time of day or year, of climate, weather, etc. A steady increase in geothermal power production could be expected in all EU countries.

4) Supercritical fluids
The long-term evolution for geothermal resource exploitation concerns the supercritical zones of geothermal fields with very high temperatures (up to 500°C) at relatively shallow (< 5 km) depths It is expected that supercritical fluid can provide 5-10 times more energy per volumetric

[5] Source: EGEC Policy Paper "Financing Geothermal Energy" available at: http://egec.info/egec-publishes-paper-on-financing-geothermal-energy-2/

flow compared to conventional geothermal power plants using condensing turbines. Thus it will have a tremendous effect on the production capacity of geothermal energy.

Geothermal heat technologies

With geothermal energy for heating and cooling, two main resource types are distinguished:

1) The first (very low temperature in the range of the annual mean air temperature on site, up to about 25 °C) is based on the stable groundwater and ground temperatures at shallow depth (the limit is typically set at 400 m). Typically, heat pumps are used to extract energy from the ground and raise the temperature to the level required by the heating systems.
2) The second (low and medium temperature, ranging from 25 °C to over 100 °C) extracts the heat from ground and groundwater at higher temperature, and typically at greater depth. If the geothermal heat is at a level of temperature compatible with the temperature required by the heating system, the energy from the ground or the ground water can be used directly (without any thermodynamic device). Direct applications are found in:

- district heating or combined heat and power installations
- agriculture (horticulture, aquaculture, drying)
- industrial processes
- balneology
- absorption heat pumps for cooling purposes.

Economics of geothermal technologies

Where high-temperature hydrothermal resources are available, in many cases geothermal electricity is competitive with newly built conventional power plants.
Binary systems can also achieve reasonable and competitive costs in several cases, but costs vary considerably depending on the size of the plant, the temperature level of the resource and the geographic location.
EGS cost cannot yet be assessed accurately because of the limited experience derived from pilot plants.

Geothermal heat may be competitive for district heating where a resource with sufficiently high temperatures is available and an adaptable district heating system is in place. Geothermal heat may also be competitive for industrial and agriculture applications (greenhouses).
As Geothermal Heat Pumps can be considered a mature and competitive technology, a level playing field with the fossil fuel heating systems will allow phasing out any subsidies for shallow geothermal in the heating sector.

LCo of Geothermal Electricity	**Costs 2012 Range(€/kWh)**	**Average (€/kWh)**	**Costs 2030 Average (€/kWh)**
Electricity Conventional – high T°	0,05 to 0,09	0,07	0,03
Low temperature and small high T° plants	0,10 to 0,20	0,15	0,07
Enhanced Geothermal Systems	0,20 to 0,30	0,25	0,07

LCo of Geothermal Heat	**Costs 2012 Range(€/kWh)**	**Average (€/kWh)**	**Costs 2030 Average (€/kWh)**
Geothermal HP	0,05 to 0,30	0,08	0,05
Geothermal DH	0,02 to 0,20	0,06	0,04
Geothermal direct uses[6]	0,04 to 0,10	0,05	0,04

Figure 1 Levelised costs of geothermal technologies *Source: Update of Strategic Research Priorities for Geothermal Technology (2012, European Technology Platform on Renewable Heating and Cooling)*

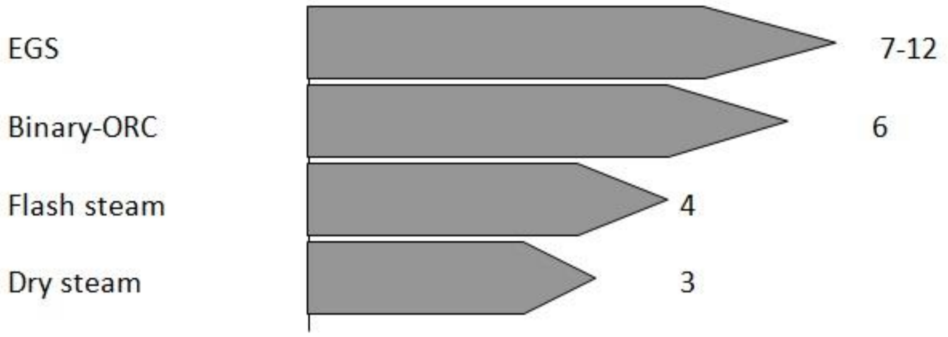
Technology costs

Investment costs	Geothermal electricity development costs vary considerably as they depend on a wide range of conditions, including resource temperature and pressure, reservoir depth, location, drilling market etc. See below the capital costs per geothermal technology.
Operation and Maintenance costs	O&M costs in geothermal electricity plants are limited, as geothermal plants require few or no fuel.
Commercial costs	Commercial costs associated with developments also need to be included in costing a geothermal project. These include financing charges (including establishment costs and interest), interest during construction, corporate overhead, legal costs, insurances. For geothermal, risk insurance is the main issue. It depends on the origin of the resources invested and the way they are secured, as well the amount of initial capital investment.

Figure 2 Technology costs

[6] Directs uses are geothermal applications in balneology, greenhouses, agro-industrial processes etc.

Capital costs, € million /MWe installed



Geothermal heat technologies are also capital intensive with low O&M costs.
Capital costs, € million /MWth installed

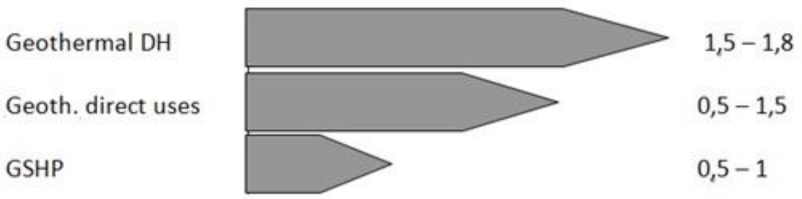


Figure 3 Capital costs of geothermal technologies