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Generation adequacy, capacity mechanisms and the internal market in electricity

WWF European Policy Office response to the European Commission's Consultation

Some stakeholders, particularly fossil fuel power generators, have voiced concerns that the integration of increasing levels of variable renewable energy into power grids could lead to temporary miss-matches between supply and demand. These same stakeholders often propose capacity mechanisms that pay fossil fuel generators to be 'on-standby' if the sun is not shining and the wind is not blowing to ensure that the lights stay on. This consultation response shows that this is an overly simplistic characterisation of the current situation, and a self-interested response. Instead of a focus on supporting generation, this consultation response recognises that a more sophisticated approach is needed to match variable supply with flexible demand. In this way we can remain on track to a fully renewable energy supply without risking the lock-in of fossil fuels and nuclear energy.

Key Recommendations

- Better information is needed at national, regional and European levels in order for policy makers and market operators to be able to assess whether there is a need for capacity markets in member states
- Capacity markets, if they are needed, should be set up in a way that prioritises long-term electricity demand reduction and greater system flexibility through targeted support for electricity demand side response measures, electricity storage, and greater regional grid interconnections
- The Commission's consultation appears biased towards new generation capacity over much more sustainable tools to ensure that variable supply can meet flexible demand
- The overall goal of capacity markets should be to support the integration of increasing quantities of renewable electricity into power grids in a way that is as cost-effective and sustainable as possible while guaranteeing security of supply
- Any support that capacity mechanisms provide to fossil fuel capacity as part of retaining flexible back-up to increasing variable renewable power supply should only be considered where absolutely necessary, only after all other flexibility options have been maximised, and only under strict efficiency and operating conditions that become increasingly stringent over time, in line with WWF's vision of 100% renewable energy by 2050

Executive Summary

WWF's research has shown that by 2050, the world economy could get all the energy it needs from renewable sources. Not only is this feat possible and key to tackling dangerous climate change, but it is also cost-effective. By 2050, WWF's vision would save the planet nearly €4 trillion per year through energy efficiency and reduced fuel costs¹. A forthcoming WWF report² shows that to stay on track with this global vision, the EU should, by 2030, achieve at least 38% primary energy savings (compared to the PRIMES 2007 baseline projection) and a 41% share of renewable energy in total consumption. Doing so would deliver a 50% cut in energy-related emissions compared to 1990 levels. As a wealthy and technologically advanced region, the EU could and should aim to achieve a share of 100% renewable energy before 2050, by exceeding these 2030 milestone goals. Influential national reports, such as *Positive Energy: how renewable electricity can transform the UK by 2030*³, and *Blueprint Germany: A strategy for a climate safe 2050*⁴ explain in detail how EU member states could reduce electricity demand and use renewable sources to meet 60% or more of electricity demand by 2030 (UK) and could reduce greenhouse gas emissions by some 95% by 2050 from 1990 levels (Germany).

As is made clear below, whether there is a need for capacity markets in EU member states will depend significantly on national circumstances. Nonetheless, the priorities for capacity markets should be common, and **any developments in this area should be made in conjunction with progress towards an ambitious package of post-2020 EU level climate and energy legislation. The overall goal of capacity markets should be to support the integration of increasing quantities of renewable electricity into power grids in a way that is as cost-effective and sustainable as possible while guaranteeing security of supply. In order to achieve this goal, capacity markets should be set up in a way that prioritises long-term electricity demand reduction and greater system flexibility through targeted support for electricity demand side response measures, electricity storage, and greater regional grid interconnections.** In particular, the role of interconnection to provide the flexibility to meet demand in the context of increasingly variable supply could receive more attention in European debates on electricity capacities.

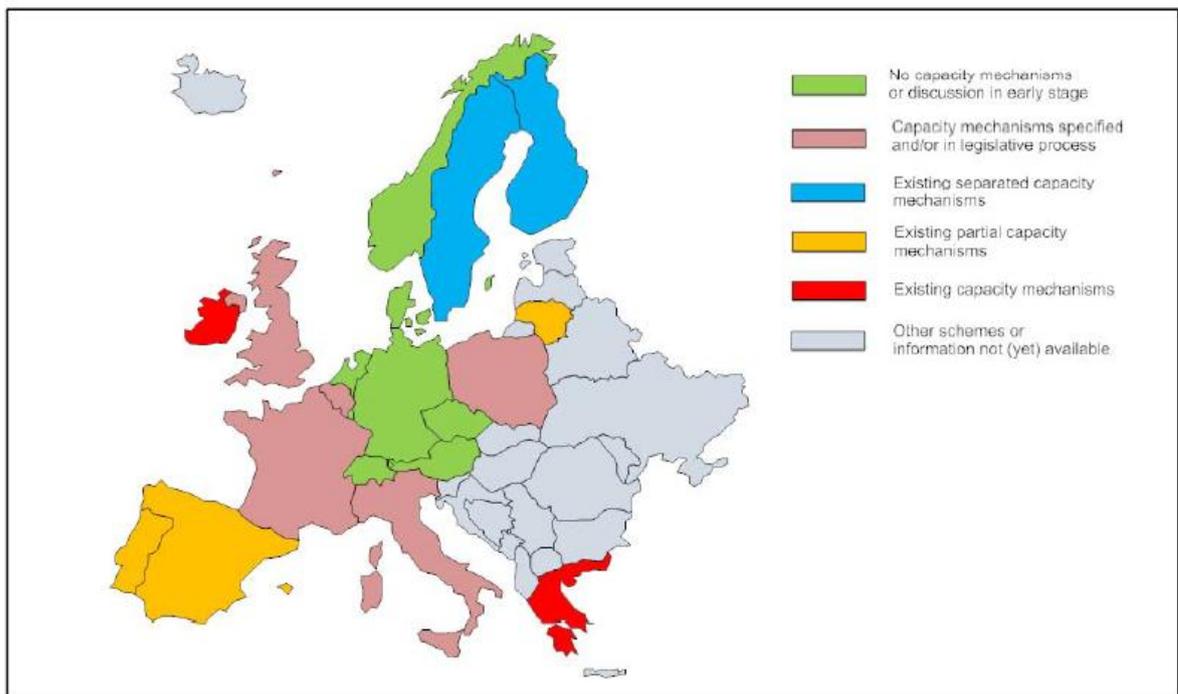
Any support that capacity mechanisms provide to fossil fuel plants in order to retain flexible back-up to increasing variable renewable power supply should only be considered where absolutely necessary, only after all other flexibility

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- 1 WWF International and ECOFYS, The Energy Report, www.panda.org/energyreport/
 - 2 WWF European Policy Office and ECOFYS – Renewable energy: a 2030 scenario for the EU, 2012, http://awsassets.panda.org/downloads/report_eu_2030_re_target.pdf
 - 3 WWF UK, Positive Energy: how renewable electricity can transform the UK by 2030, http://assets.wwf.org.uk/downloads/positive_energy_final_designed.pdf
 - 4 WWF Germany, Blueprint Germany: A strategy for a climate safe 2050, http://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF_Blueprint_Germany.pdf

options have been maximised, and only under strict operational efficiency conditions such as compliance with a stringent emissions performance standard and/or maximum annual running hours. Furthermore, such pre-conditions should be tightened over time and combined with a decreasing cap on the amount of fossil fuel generation that could receive capacity payments, in line with WWF's vision of 100% renewable energy by 2050. This would mean that system quality is prioritised, including the reduction of greenhouse gas emissions and other sustainability criteria. The Commission's consultation appears biased towards ensuring that supply meets demand by prioritising more fossil fuel generation, rather than focusing on minimising the amount of new generation infrastructure that needs to be built. The consultation thereby risks encouraging national capacity mechanisms that result in a dash for more fossil fuel plants, which could both undermine the EU's greenhouse gas emission reduction objectives and unnecessarily increase costs for European consumers and businesses; this must be avoided.

Introduction

It has been clear for some time that the integration of increasing amounts of variable renewable power supplies would have to be accommodated by changes to current market designs based on marginal prices. Given the importance that national governments place on the security of power supplies, it is understandable that a number of key member states have already acted, or are currently acting, to address domestic concerns about future supply and demand. Different national circumstances mean that different governments are proposing or considering different measures, which could undermine the development of an internal market in electricity. It is, therefore, of some disappointment that the Commission has not considered the question of changing patterns of electricity supply and demand, capacity mechanisms and the internal market in electricity sooner.



Source: Nies (2012), Öko-Institut.

The chart above shows the extent to which EU member states and neighbours have already engaged with the question of capacity mechanisms. In this context, it appears clear that any EU level work in this area in order to prevent distortions in electricity markets would have to take close account of differing national circumstances.

Furthermore, the current and prospective challenges associated with security of supply and the realignment of the electricity market, which is necessary in the long-term, raise a paradox of European energy policy – and not for the first time. Although Europe’s domestic market for electricity has developed more slowly than policy makers would have liked, a series of relatively well-functioning regional markets has emerged. Now, as in the past, the approach taken by European energy policy to achieve this greater regional integration has been to link markets and expanding trading areas with limited regulatory intervention. However, the responsibility for security of supply still rests

firmly with member state TSOs for the time being. There is no EU institution or an equivalent agency for any of the regional markets to which supra-national responsibility for security of supply has been – or is due to be – transferred. In other words, the reality of an increasingly integrated (regional) electricity market contrasts sharply with the fact that security of supply responsibilities remain clearly divided between member states⁵.

It is with reference to the circumstances described above, that the WWF EPO has responded to this consultation.

Consultation question responses⁶

Market dynamics and investment in energy infrastructure

The breadth of **question 1** on the impact of current market prices on investments in needed generation capacity fails to recognise that, despite ongoing efforts to complete the internal energy market in Europe, different member states still face differing economic realities concerning the short, medium, and long term outlook for energy prices, costs, returns on investment, and profits. That said, it is clear that highly dynamic developments in the underlying conditions of the energy industry and in power plant markets are already occurring or are likely to occur as EU member states work towards targets on renewable energy generation and energy savings:

- The fuel markets were characterised by a trend of rising prices and also by considerable volatility, which peaked in 2008.
- The CO₂ costs generated by the European Union Emissions Trading Scheme (EU ETS) introduced in 2005 were, as expected, quickly priced into the electricity markets and now constitute a new component of operating costs; there were relatively stable trends in the development of prices in the CO₂ market for brief periods, but the market is currently characterised by a massive slump in prices caused by a glut of emission allowances. This slump is not yet being adequately addressed by efforts to repair the EU ETS
- In the power plant markets, the prices of conventional plants have increased massively and are currently approximately 70% higher than they were ten years ago.
- In some member states in particular, the major promotion of variable renewable electricity such as PV solar and wind power has already or could result in significant slumps in peak (and average) prices.

5 WWF Germany, Oeko-Institute, LBD Consulting, and Raue LLP, Focused capacity markets: A new market design for the transition to a new energy system, 2012

6 The Consultation document can be read at this link - http://ec.europa.eu/energy/gas_electricity/consultations/20130207_generation_adequacy_en.htm, and the consultation questions are included in annex 1.

These fundamental trends have major consequences for the profit margins of new power plants, i.e. the generation of revenues to cover not only the operating costs, but also the investment costs and fixed overheads (HR, maintenance and overhauls, etc.) of new power plants. Refinancing new built power plants in a market design characterized by the above trends is proving difficult. Increasing amounts of renewable energies are not the cause for narrowing margins. However margins tend to be lower in energy markets with higher shares of renewable energy and market pricing based on marginal costs. Over the last 2 years, certain existing plants seem to be facing similar problems in covering their fix costs. However, the impact will be felt to differing degrees in different member states.

Furthermore, it is difficult, if not impossible to know, given the information currently available, what constitutes ‘needed generation capacity’ across Europe. While the cross-border assessment of security of supply by ENTSO-E as part of its annual System Adequacy Forecast (SAF) has been informative, it is produced primarily from the network operators’ perspective and does not therefore assess how likely it is that registered power plant projects will be implemented.

Therefore, WWF’s European Policy Office (WWF EPO) finds that it is unhelpful to seek to answer this question from a pan-European perspective. However, EU level institutions and agencies could play a helpful role in answering this question by gathering and presenting comparable and aggregable information on the functioning of each member state energy market with regard to future investments in generation adequacy. Any efforts in this area should, however, take into account the risk that simply highlighting the possibility of capacity markets can add to the need for such measures due to a hiatus in investment decisions as market actors wait to see further details of potential new market arrangements.

Equally, **question 2** on whether support for specific energy sources undermines investments needed to ensure generation adequacy fails to recognise differing energy economic realities in different EU member states. It is, however, clear that energy markets across the EU are changing, and will have to continue to change in order to meet existing and hopefully future EU targets on energy savings, renewable energy, and emissions reductions. The recent Imperial College report funded by WWF UK, *On Picking Winners*⁷, shows that there is a clear case for providing targeted financial support policies for new technologies such as renewables to help accelerate deployment and cost reduction of these technologies, whereas this level of support should not be provided to more mature forms of technologies like fossil fuel plants. However, given that the predominant marginal costs market design in EU member states is not aimed at facilitating the transformation to very low carbon energy systems, it is possible that some initially unforeseen impacts may occur as a result of the implementation, within marginal cost markets, of policies to deliver on these targets. The EU could consider what information is

7 Imperial College London and WWK UK, http://assets.wwf.org.uk/downloads/on_picking_winners_oct_2012.pdf

required, member state by member state, as well as EU-wide, in order to be able to answer this question with a high degree of confidence. ENTSO-E could be well placed to do this. As a corollary point, it is vital to remember that security of supply is only one aspect of the European energy trilemma, and that the other two elements of competitiveness and sustainability must not be forgotten.

System quality at EU and member state level

The need to consider all three aims of climate and energy policy is equally important when considering the role of cross-border day ahead, intraday and balancing markets (**question 3**). Any development in national, regional, and EU-wide markets must seek to ensure overall system quality, by starting from the assumption that any capacity, including demand side measures brought forward through these markets, must be highly flexible. In particular, the successful transformation of the EU energy system will require the prioritisation of energy savings, demand side responsiveness, energy storage capacities, and expansion of electricity interconnection capacity within and between member states, in order to accommodate increasing levels of variable renewable energy generation.

In order to make certain that internal market rules fully contribute to ensuring variable supply can match flexible demand (**question 4**), the first step is to ensure that EU policy makers are sufficiently informed so that any proposed changes to internal market rules are required and appropriate at the EU level, while also reflecting differing circumstances in different member states. In particular, it is important, given the current development of different responses to the need to ensure sufficient flexible capacity in a number of member states, that each of these domestic market changes are undertaken in a way which does not undermine the internal energy market.

Action at EU level could be complemented by member states (**Question 5**) seeking to work together to ensure that any national market changes to ensure variable supply can match flexible demand are not in conflict to the extent that they undermine the internal energy market by compromising the trading of electricity between markets.

Improved information and cooperation

Overall, there is a clear need for better information and greater cooperation at national, regional, and European level. The first step in this direction would be a review of how generation adequacy assessments are carried out in the internal market (**question 7**), with the aim of generating more in depth reviews with common methodologies and comparable results.

Better information could also be provided by adding additional detail to ENTSO-E's generation adequacy assessment work (**question 8**). While the information gathered (and also the transparency of how it is presented) has been improved by ENTSO-E recently, there is nonetheless an urgent need for

the underlying data to be further substantiated and for the transparency relating to assumptions and their reliability to be increased. Also, as mentioned above, ENTSO-E's System Adequacy Forecast is produced primarily from the network operators' perspective and is therefore weakened by the fact that it does not assess how likely it is that registered power plant projects will be implemented.

Given the importance of additional information, there could be scope for mandatory risk assessments or national/regional plans, similar to those required under the Gas Security of Supply Regulation (**question 10**), which clarify how variable supply will match flexible demand. However, the key element of additional reporting should be a strong focus on the need for comparable and aggregable data rather than the mandatory nature of the report. One potential process that could be replicated is the Grid Development Planning (Netzentwicklungsplan) in Germany that derives needed grid extension measures from scenarios on expected changes in the power plant portfolio in 10 and 20 years time. This exercise could be complemented by a "security of supply" analysis as proposed above.

Furthermore, it could be helpful to make informed judgments about the need for capacity mechanisms in different member states if standards on how variable supply can meet flexible demand were common across the EU (**question 11**). However, as the consultation question suggests, such an approach might be most effective if it were based on common preferences regarding the level of security of supply that different consumers desire.

Mechanisms to ensure variable supply meets flexible demand

Given the long-term nature of investment decisions in the energy sector, there is a risk that market changes are only introduced once the problem is fully identified, which can be too late to develop and implement a policy in time to give the correct investment signals to address the situation (**Question 12**).

Therefore, it can be more appropriate to anticipate a market functioning problem, investigate the risks as thoroughly as possible, and to respond on that basis, while there is still scope for achieving the necessary change on the ground in a timely fashion. As is made clear above, any changes to markets must only be done in order to ensure – subject to guaranteeing security of supply – the most cost-effective and sustainable integration of increasing quantities of renewable electricity into power grids, by prioritising long-term electricity demand reduction and greater energy flexibility through targeted support for demand side response measures, energy storage, and regional grid interconnections. Market functioning should be considered insufficient (**question 13**) if the market in question is unable to deliver competitively priced, sustainable energy in line with the (potentially varying) security of supply or flexible consumption requirements of different customers.

A strategic reserve, depending on its design and implementation, has the potential to support the transition from a fossil fuel based electricity system and the transition away from nuclear power generation (**question 14**).

However, strategic reserves may not be the most appropriate mechanisms available to member states seeking to ensure that increasingly variable supply meets flexible demand for a number of reasons. Strategic reserves probably generate the lowest capacity payment costs, because the segments of the power plant fleet that enjoy capacity payments will likely be limited. However, strategic reserves also cause price peaks in the energy only market – this being the purpose of the model – that apply to the entire market volume and which therefore have a considerable leverage effect. These price peaks can soon exceed the sum of the capacity payments. Furthermore strategic reserves are typically designed exclusively to guarantee security of supply and generally are not adequate to help refinance new plants. Also by definition, strategic reserves fail to utilise the potential of demand side measures. By contrast, a focused capacity mechanism can be tailored to help deliver system quality and achieve climate goals, as well as matching variable supply to flexible demand at the lowest overall cost to consumers.

The most in detailed assessment carried out by a WWF office regarding capacity mechanisms is the paper entitled *Focused capacity markets: A new market design for the transition to a new energy system*⁸ carried out by the Öko-Institut, LBD-Consulting, and RAUE LLP on behalf of WWF Germany. This paper presents the idea of a focused capacity mechanism in order to ensure generation adequacy during Germany's transition to a renewably powered energy system, including the phase-out of nuclear power generation capacity. This recent report evaluates both market wide capacity mechanisms and strategic reserves, and finds that both are more distortionary than the report's proposal for a focused capacity mechanism. A comprehensive, or market wide, capacity mechanism can result in comparatively high costs on the consumer side and can be very difficult to adjust or abolish once implemented.

Equally, a strategic reserve system can only be reversible without causing major repercussions in the market if, firstly, the 'no way back' principle is systematically implemented and, secondly, the capacity volume recorded by the strategic reserve model remains relatively low (**question 15**).

The analysis presented by WWF Germany argues that, in addition to safeguarding security of supply and contributing towards the overhaul of the power supply system, the restructuring of the electricity market through a focused capacity market would maintain the level of competition in the electricity market and limit costs for consumers (**question 16**).

WWF Germany is the WWF office that has given greatest consideration to the question of generation adequacy and capacity mechanisms because this is an active and high profile debate as part of the 'Energiewende'. However, as is noted above, other member states have already implemented or are developing / considering capacity markets. (**question 18**). If the Commission were to develop guidance, it would most likely have to accommodate those capacity market developments that are already underway.

8 Öko-Institut, LBD-Consulting, and RAUE LLP on behalf of WWF Germany
<http://www.oeko.de/oekodoc/1631/2012-004-en.pdf>

Standards for mechanisms to ensure variable supply meets flexible demand

Likewise, while it may be useful for the Commission to develop detailed criteria to assess the compatibility of capacity mechanisms with the internal energy market, it would be important to know to what end this would be done, given the current circumstances in the EU (**question 19**). In this context, it is important to remember that even though EU member states have the right to determine their own energy mix, energy policy is explicitly stated to be a shared competence in article 4 of the Treaty of the Functioning of the European Union. Article 194 of the same treaty states that member states' determination of their energy mix must be undertaken without prejudice to the application of other provisions of the treaties, such as rules on the internal market, competition, & environmental protection.

Furthermore, while it would be important to ensure that any new capacity mechanisms can function within the internal energy market, does the Commission have a clear suggestion for what would be an appropriate response if one of the existing capacity mechanisms were found to be incompatible with the functioning of the internal market? It seems necessary to address this point before considering the actual content of any proposed criteria for capacity markets (**question 20**).

For WWF, a minimum standard on capacity mechanisms would be that any market changes are designed to reward flexibility from existing suppliers and consumers, as well as promoting increased flexibility as energy systems develop, while guaranteeing security of supply. Support for backup fossil fuel capacity should only be considered where absolutely necessary, only after all other flexibility options have been maximised, and only under strict operational efficiency conditions such as compliance with a stringent emissions performance standard and/or maximum annual running hours. Furthermore, such pre-conditions should be tightened over time and combined with a decreasing cap on the amount of fossil fuel generation that could receive capacity payments, in line with WWF's vision of 100% renewable energy by 2050. This would mean that system quality is prioritised, including the reduction of greenhouse gas emissions and other sustainability criteria. Therefore, any market changes to address generation adequacy concerns must prioritise the use of demand side responsiveness, interconnection and storage well above the strictly limited and decreasing use of flexible fossil fuel powered back-up.

Annex 1

Consultation questions

1)	Do you consider that the current market prices prevent investments in needed generation capacity?
2)	Do you consider that support (e.g. direct financial support, priority dispatch or special network fees) for specific energy sources (renewables, coal, nuclear) undermines investments needed to ensure generation adequacy? If yes, how and to what extent?
3)	Do you consider that work on the establishment of cross-border day ahead, intraday and balancing markets will contribute to ensuring security of supply? Within what timeframe do you see this happening?
4)	What additional steps, if any, should be taken at European level to ensure that internal market rules fully contribute to ensuring generation adequacy and security of supply?
5)	What additional steps could Member States take to support the effectiveness of the internal market in delivering generation adequacy?
6)	How should public authorities reflect the preferences of consumers in relation to security of supply? How can they reflect preferences for lower standards on the part of some consumers?
7)	Do you consider that there is a need for review of how generation adequacy assessments are carried out in the internal market? In particular, is there a need for more in depth generation adequacy reviews at: a. National level b. Regional Level c. European Level
8)	Looking forward, is the generation adequacy outlook produced by ENTSO-E sufficiently detailed? In particular, a. Is there a need for a regional or European assessment of the availability of flexible capacity? b. Are there other areas where this generation adequacy assessment should be made more detailed?
9)	Do you consider the Electricity Security of Supply Directive to be adequate? If it should be revised, on which points?
10)	Would you support the introduction of mandatory risk assessments or generation adequacy plans at national and regional level similar to those required under the Gas Security of Supply Regulation?
11)	Should generation adequacy standards be harmonised across the EU? What should be that standard or how could it be developed taking into account potentially diverging preference regarding security of supply?
12)	Do you consider that capacity mechanisms should be introduced only if and when steps to improve market functioning are clearly insufficient?
13)	Under what circumstances would you consider market functioning to be insufficient: a. to ensure that new flexible resources are delivered?

	b. to ensure sufficient capacity is available to meet demand on the system at times of highest system stress?
14)	In relation to strategic reserves: a. Do you consider that the introduction of a strategic reserve can support the transition from a fossil fuel based electricity system or during a nuclear phase out? b. What risks, if any, to effective competition and the functioning of the internal market do you consider being associated with the introduction of strategic reserves?
15)	In relation to capacity markets and/or payments: a. Which models of capacity market and /or payments do you consider to be most and least distortionary and most compatible with the effective competition and the functioning of the internal market, and why? b. Which models of capacity market and /or payments do you consider to be most compatible with ensuring flexibility in a low carbon electricity system? c. Are there any models of capacity mechanism the introduction of which would be irreversible, or reversible only with great difficulty?
16)	Which models of capacity mechanisms do you consider to have the least impact on costs for final consumers?
17)	To what extent do you consider capacity mechanisms could build on balancing market regimes to encourage flexibility in all its forms?
18)	Should the Commission set out to provide the blueprint for an EU-wide capacity mechanism?
19)	Do you consider that the European Commission should develop detailed criteria to assess the compatibility of capacity mechanisms with the internal energy market?
20)	Do you consider the detailed criteria set out above to be appropriate? a. Should any criteria be added to this list? b. Which, if any, criteria should be given most weight?

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