

4th BESTGRID and 2nd INSPIRE-Grid international dissemination workshop

“Grid Aesthetics – How to engage stakeholders in landscape planning, design and aesthetics of grid infrastructure”

**19 May, 10am - 20 May, 5pm, Milan
A workshop hosted by Terna**

Participation

~ 60 participants from TSOs, NGOs, politics, authorities, industry and academia

Tuesday, 19 May 2015

1. Introduction

In this workshop on “Grid Aesthetics” the two EU-funded projects INSPIRE-Grid and BESTGRID met, which meant a meeting between two projects dealing with public participation and grid planning from two different angles: one more research based, the other one based on testing new approaches in reality. Antonella Battaglini (Renewables Grid Initiative – coordinator of the BESTGRID project), Romano Ambrogi (RSE – coordinator of the INSPIRE-Grid project) and Adel Motawi (Terna – workshop host) welcomed the workshop participants and spoke about the importance of acceptance that goes hand in hand with the development of new pylon design concepts. Now that new designs are being tested, many people realise that they are often much less intrusive for the landscape, more pleasing to the eye and just as often even more environmentally friendly. Romano Ambrogi stressed that aesthetics is just one thing when it comes to new designs, but intelligence and smartness is something we also have to focus on. “Smartainability – smartness and sustainability – is the goal of our work at RSE”, he said. “We believe that innovation and substantially reducing the impact on nature and landscape is a great way to gain greater acceptability from the public”,

Adel Motawi added. For this reason, Terna has now started to introduce new pylon designs and naturalistic engineering in Italy. Antonella Battaglini, in addition, mentioned competitions searching for new pylon designs that are now going on in many European countries. The Swiss grid operator Swissgrid, for example, has embraced the idea of new pylon designs and has decided to use the GridExpo as a basis for discussing the design of new grid projects with the public.

2. BESTGRID contributions

Dirk Gotzmann | *Civilscape: Landscape and landscape planning – an introduction*

Within the huge field of landscape concepts, Dirk Gotzmann focused on presenting the European Landscape Convention and comparing and contrasting classic and modern landscape planning. The idea of Civilscape, a network of civil society organisation from 31 countries, is that landscape is a collective challenge that needs a collective answer, which means that as many people as possible should be involved in landscape planning – an activity concerned with reconciling competing land uses while protecting natural processes and significant cultural resources.

Classic landscape planning, in Germany like in many countries, was invented in the 1980s. As for grid planning, one of the major obstacles in German landscape planning is that the main competence is on state level instead of national level. In Germany, planners also distinguish between landscape structure plans, regional landscape programmes and local landscape plans. On all of these levels, landscape planning makes an important long-term contribution to the conservation of natural resources. It not only addresses the narrower areas of particularly valuable protected sites, but also devises strategies for full coverage, sustainable conservation and long-term development of nature and landscapes. Civilscape therefore believes that the public should have a much bigger say in landscape planning – in

classic planning approaches the public's main role is to approve already written plans. Publication is called especially in the light of the Council of Europe's European Landscape Convention, also known as the Florence Convention, which describes landscape as "an area as perceived by people whose character is the result of the action and interaction of natural and/or human factors" – highlighting that landscape has a strong subjective component.

After the first European countries started to implement the convention in 2004, the perception of what landscape means has slowly started to change. Landscape is looked at as a unit, not only as the territory of a certain municipality. Thanks to this development, we have more and more landscape unit maps, depicting landscapes as perceived by people. In 2005, for example, the Catalan government decided on a new landscape policy for the region. They introduced a landscape catalogue that foresees public participation during every step of the planning process, including identification and characterisation, evaluation of the landscape, definition of landscape quality objectives as well as establishment of criteria, measurements and follow-up indicators. Direct interviews with landscape agents, experts, business professionals, trade unions, cultural associations and ecologists are conducted and everyone has the opportunity to engage in the planning process via a web platform, which on average receives several thousand entries per project. This kind of planning takes into account aesthetic values, natural and ecological values, productive, historical, and social use values, spiritual and mythological values as well as symbolic and identity values. To further promote modern landscape planning, Civilscape is now organising some European education projects that focus on the implementation on the landscape convention.

The following discussion centred around the extend to which climate change and the change, that landscapes/ecological conditions will be subject to, factor into landscape planning. A second topic revolved around marine landscape planning. Dirk Gotzmann gave some examples of countries, whose landscape planning is clearly related to climate change. They look at the impact that climate change will have in the next 30 years. What does it mean and is it possible to adapt? This is true for the Netherlands or for Germany, for example.

On the issue of marine landscape planning Elia and National Grid shared their experiences. Both representatives agreed that the line between landscape planning and marine spatial planning seems to become increasingly thin, but aside from how exactly you define it, the involvement of locals is a must. Marine spatial planning is a collaborative effort that includes sea users as well as organisations concerned with historical artefacts on the seabed or environmental protection. Dirk Gotzmann added that in his view the difference between landscape planning and spatial planning is social construction. Landscape planning takes the emotions of people and their connection to a certain landscape into account.

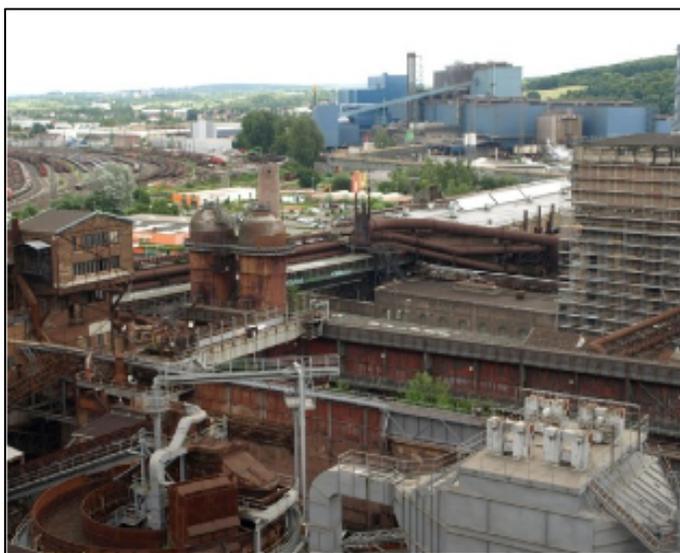
Towards the end of the discussion the question of acceptance was brought up. To what degree will people accept changes to their landscape due to new infrastructure? Dirk Gotzmann's experiences show that, when the needed dialogue is taking place, a lot of people understand the necessity of change. People mostly accept progress, but the change of the scale of infrastructure, that we encounter more and more, is a difficulty. Civilscape ran 17 European workshops on energy infrastructure and acceptance, but what scale people will accept is still an open question.

Prof. Dr. Olaf Kühne | University Weihenstephan-Triesdorf: Attitudes and perceptions – how do we feel about our surroundings?

Prof. Olaf Kühne started his presentation by talking about people's acceptance of the physical changes brought about by the energy transition. Many accept them, he says, but there is also a lot of resistance, like in Bavaria, for example. The reasons for such opposition can not only be found in the NIMBY argument, but are connected to strong feelings of home associated with the landscape.

The principle of landscape is social constructivism: Landscape cannot be understood as a given object, but rather as a socially defined construct of human consciousness. In the process of socialisation human beings learn to apprehend what may be designated as landscape. An object does not possess beauty, Kühne says, but we have learned to call certain things beautiful. We learn what landscape is in the process of socialisation, from parents, teachers, films. Important factors are the native landscape and the stereotypical landscape. Which type of landscape we consider beautiful therefore also depends on where we grew up. The native landscape does not need to be beautiful or sublime, it needs to be familiar. Therefore, change is often constructed as loss of home. But native landscape is also subject to intergenerational change – a new generation is born into a landscape that the parents might have fought. Younger generations, for example consider wind farms part of the landscape.

This social construction of landscape also influences the social construction of climate change, which takes place in a recursive process, especially between scientific research, politics, media and the population. The consequence of this interconnection is that people's stance on climate change and associated social options for action are not without contradiction. Particularly cognitive and emotional connections often create inconsistencies.



Example of an industrial, non-stereotypical landscape, which still might be considered beautiful and trigger feelings of home for natives

Kühne concludes that, especially because there is no way of objectively determining which feelings are connected to a certain landscape, participation of the local population is without

alternative when it comes to planning infrastructure for the implementation of the energy transition.

The discussion that followed, focussed on the acceptance of grids. On average, acceptance of grids takes one generation, Kühne said, after that their breakdown can even be mourned. He gave the example of a brick production site built in Bavaria in the 19th century. Initially, people protested the erection claiming that their rural landscape was being urbanised, but now the same organisations, who fought the erection back then, are claiming that dismantling the building would be getting rid of a historic object.

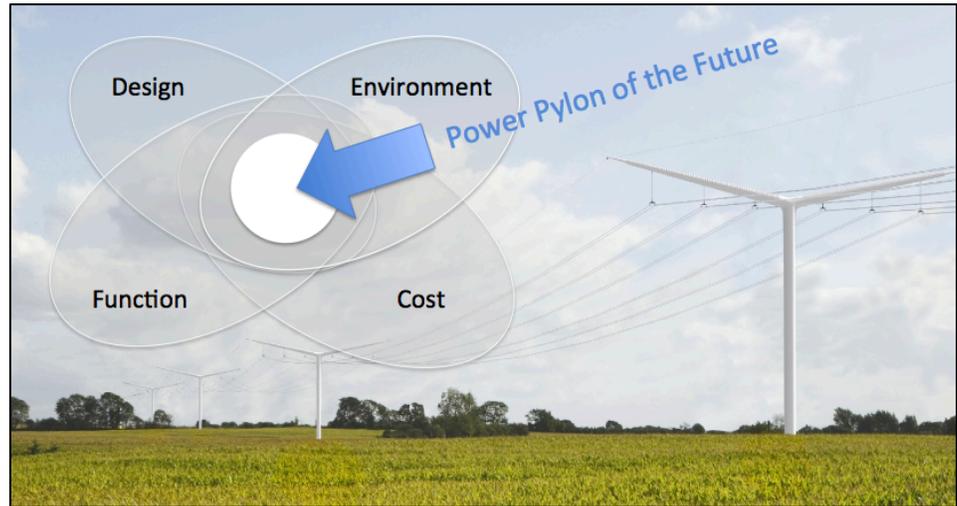
In general, it can be said that people are very accepting of wind turbines. There are Energiewende cycling routes by now, for example. We know that changes will be accepted, but we need to help people accept. There are, however, big differences between rural, suburban and urban areas. People from rural areas are more accepting than people from suburban areas, for example.

A counterintuitive idea towards acceptance was also discussed. Aside from traditional romantic perceptions of landscape, many people are also impressed by large objects in the landscape. Therefore, instead of trying to make pylons disappear, making them bigger and more sublime can also be a strategy.

How can design change the way we plan electricity grids? Debate by Henrik Skouboe from Bystrup Architects (amongst others designers of the T-Pylon) and Hugh Dutton (designer of the Equilibre and Germoglio)

What is design? That is the question Henrik Skouboe started his presentation with. People often think of designers as artists. But this is not all. They have to learn everything about function and technical aspects when it comes to designing pylons – and cost also always plays a role. Designers challenge every aspect inherent to the pylon. The goal is to reduce

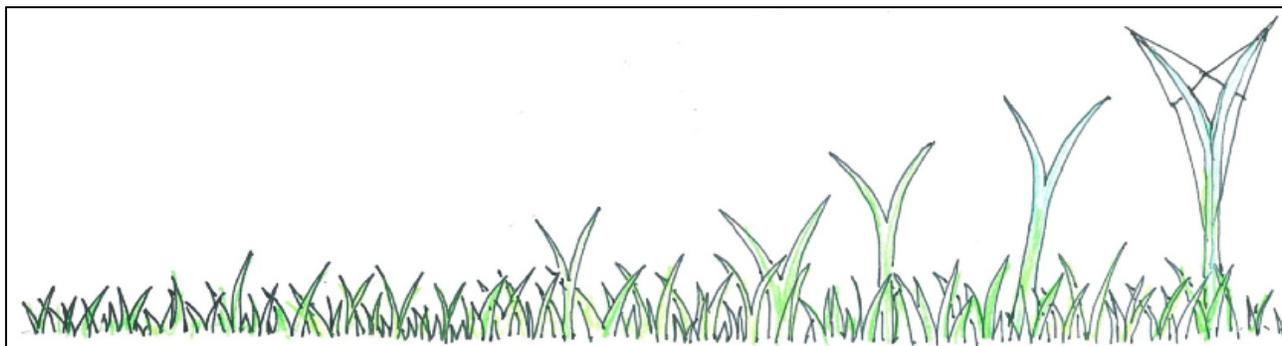
corona noise, reduce EMF, create a positive visual appearance and design a foundation that can be installed in the course of six hours – the entire pylon should ideally be installed within one day. Other challenges are efficient stringing or knowledge of the surroundings.



Bystrup's vision of the power pylon of the future

When a house is being designed, the surroundings are known from the start. But when designing a power line, the architect has to consider different kinds of surroundings: farmlands, sandy areas, residential areas etc. For every environment different options have to be considered including infrastructure alignment and underground cables. Bystrup solves these problems by creating a family of towers. They look similar but by choosing different pylons from the same family it is possible to adjust to various surroundings along the line.

Hugh Dutton started by saying that tension and non-linear engineering play a huge role in his designs. The goal is that they transport a poetic message and an idea of beauty coupled with an understanding of the environment. Giving a meaning to a place is one of the most important tasks in pylon design and even though a pylon is a manmade object it has to resonate with the landscape, Dutton said. In his design of the Germoglio pylon, he and his team were inspired by trees. By using nature as his principle design source, Dutton aspires to change the image of pylons and move away from classic industrial design. His hope is to create an object that people can be proud of, an object that they don't consider as an intrusion but that they actually like. What is important here is not to try to hide – a design has to be confident as well as fit in with the landscape.



Idea development sketch of the Germoglio

In the following debate the two designers talked about their design philosophies, acceptance issues, standardised pylon designs and bird protection.

Both Skouboe and Dutton rebutted having philosophies that can be described as eye-catching (Dutton) vs. integration (Skouboe). Skouboe explained that for him the pleasantness of the pylon design also plays a big role and Dutton clarified that he also seeks to minimise the pylons in the landscape. When they are visible, however, they should be agreeable.

What about participation and local identity vs. standardisation? Its critical that there is a participatory process in terms of design and placement, Dutton said. You can of course take this to absurd extremes where every place has its own pylon, which, of course, is going to far. But windmills, for example, have become objects without a specific identity – they look almost the same everywhere –, but maybe they should be different and respond to the landscape they are build in. Skouboe agreed, saying that he actually believes that underground cables are the best solution. But if a cable is not feasible, you have to make a compromise and you always have to consider the environment as well as different TSO specifications in terms of health and safety, which differ substantially across Europe. That's why it's different from landscape to landscape which pylon fits best. It might even be possible to create a standardised design kit for Europe, but worldwide might be asking too much – in America, for example, they would probably like their own icon.

And bird protection? Old designs had advantages when it comes to preventing electrocution and collisions. How do new designs take this problem into consideration? Collision is always a problem when you have a conductor hanging in the air, Skouboe explained. We are talking and we are trying to minimise impacts on birds. Right now we are looking at the possibility of markers.

And when will we be seeing newly designed pylons in the landscape on a larger scale? Currently, the German TSOs, for example, are testing different options. But in 10 or 20 years from now there will be a lot more design pylons in the landscape. The lattice tower is not as cherished as it used to be, it used to be the symbol of bringing electricity to people, Dutton said. It was a symbol for innovation. This is not the case anymore.



Dutton's Germoglio pylon

[Alexander Braun | Europoles: Overview: new landscape and design approaches in Europe](#)

Alexander Braun talked about the technical feasibility of new pylon designs, and also touched upon the fields of public acceptance and costs of new designs. The most important reason to implement new pylon designs is public acceptance, Braun said. But almost all new pylon solutions are more expensive than the tested old lattice towers and some designs might just not be technically feasible. So, when the deciding on the design of a pylon, all these factors –

gain in public acceptance, costs and technical feasibility – have to be considered and weighed against each other.

Technically, many design approaches are already feasible today. In the high-voltage range, for example, there are now different standard compact solutions (a selection of monopoles) available. At the moment, long-term testing, including ageing tests, breaking tests and electrical tests, is being conducted. The results are very good – so, many new solutions are working and have the potential to be implemented some day. What remains is the cost factor, but there are many companies working on bringing down the costs as well. State-of-the-art engineering and technology will soon allow for new structures with competitive prices.



Wintrack Design – TenneT 2 x 400kV

But individual solutions still cost substantially more than standard designs. So, the real argument for individual designs is public acceptance. People wish for modern pylons with low height, low impact, reduced EMF fields and a pleasant design. Grid architects can satisfy all these wishes. And sometimes, it even makes sense to just focus on one of them. If in one region, for example, people are especially concerned about EMF, an individual solution can be a line with the lowest possible EMF field. If that is people's primary concern, aspects such as beauty or pylon height might fade into the background. Other approaches can be to make a line small and narrow or make a design that blends in with the landscape so much that it almost disappears. This

illustrates the many single advantages that new design solutions offer, but in terms of cost it will be some time before they can compete with lattice towers. However, other trump cards of new designs are their longevity and reduced maintenance needs. On the negative side, the development of an individual pylon solution might just take decades. The Netherlands are

now implementing a newly designed system that has been established as the national standard – the Wintrack system. It took 10 years from the first idea to get it approved and be able to apply it.

The discussion with the audience mainly revolved around cost. Participants note that over the complete lifespan of a grid line modern solutions are actually cheaper than standard lattice towers. However, purchasing managers often do not look so far, they plan with a cash-back after twenty years, even though the new poles should last for 100 years. And in Germany, for example, there is the added complication, that TSOs need special regulation if they want to invest more than what is necessary. A higher investment is not intended by the system and a TSO usually gets penalised if it is not on the same cost level as its competitors.

Tom Wagner | TenneT: Landscape planning to improve biodiversity

Tom Wagner reported on TenneT's SuedLink cooperation with NABU Lower Saxony (German regional chapter of BirdLife) under the banner of the BESTGRID project. The cooperation focuses on how to ecologically optimise the expansion of the grid.

In the German Central Highlands (Weserbergland) the two partners aspired to find new standards in planning and implementation as well as test environmental requirements to maintain ecological functions. They found two spaces that are now used exemplary sites – representing areas that TenneT will most likely encounter often along the final SuedLink corridor. The partners organised two round tables to discuss tools that help avoid defragmentation effects, including early involvement of experts, biotope linkage via power line corridors and nature conservation techniques.

The final report of TenneT and NABU's cooperation will include new ways on how to incorporate the new practices into the formal planning procedure. First learnings show that

the regulatory framework needs to be changed to some degree and the partners are talking to the BNetzA and politicians about options that could be realised.

The following questions from the audience aimed at the fragmentation of stakeholder groups and the specific regulatory changes that TenneT had in mind. Wagner responded that his experience so far shows that the spectrum of stakeholders is very wide and wishes often do not overlap. But that is the nature of public acceptance and has to be dealt with.

On the specific regulatory changes he gave the example of underground cabling. In Germany, cabling is currently not allowed, if it's sole purpose is to protect the environment. TenneT would like to change this.

2. INSPIRE-Grid contributions

Stefano Maran | RSE: Introduction to INSPIRE-Grid

Stefano Maran introduced the INSPIRE-Grid, a research project financed by the 7th framework programme of the European Union and inspired by the European renewables and interconnection targets.

Almost half of Europe's interconnector projects are experiencing delays or cancellation and it is too simple to dismiss all this opposition as being due to a NIMBY attitude. Other factors include lack of trust in the decision makers and scientists, lack of trust in the fairness of decision-making and in the distribution of justice. This indicates a definite need to better explore the reasons for opposition to grid projects. The assumption of INSPIRE-Grid is that these reasons are very diverse.

By combining competences from social and technical sciences, working together with TSOs, researchers, NGOs and authorities and applying real cases, INSPIRE-Grid aims to

contribute to increased stakeholder support and public acceptance for future electricity grid infrastructure. By way of a multidisciplinary approach, INSPIRE-Grid will develop a methodology to manage consultation processes in different settings and design an expert-led European good practice guide. The project's main steps include the development of suitable mechanisms for an effective project communication and real participation of stakeholders as well as an implementation test involving current grid projects that aims to strengthen the methodology development and allow for proper testing of INSPIRE-Grid's outputs.

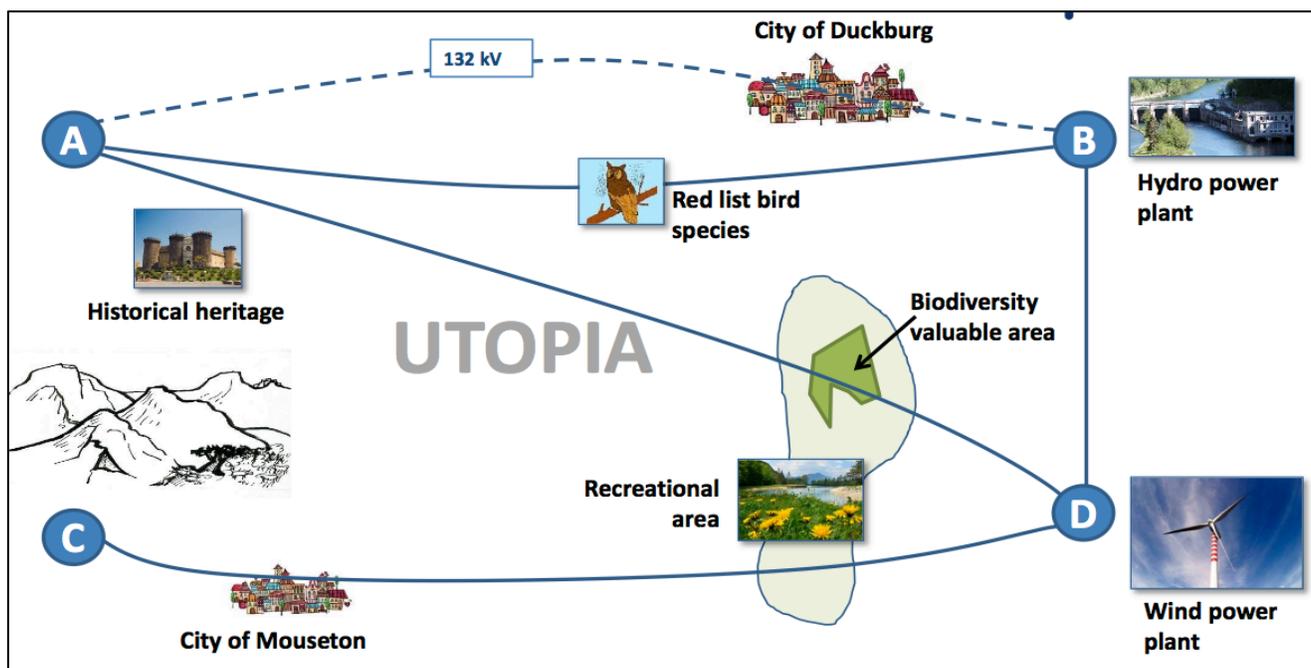
Alessandro Luè | Poliedra & Leonhard Späth | ETH Zurich: Introduction to multi-criteria analysis (MCA) and simulation game

Alessandro Luè and Leonhard Späth from the INSPIRE-Grid consortium partners Poliedra and ETH Zurich, respectively, introduced the multi-criteria analysis tool, which will be applied in the course of the INSPIRE-Grid project, and was the principle component of the simulation game that was conducted later in the workshop day. The general aim of multi-criteria analysis is to compare and evaluate positive and negative effects of decisions; in the context of INSPIRE-Grid this means the choice for the realisation of a grid infrastructure.

When it comes to grid planning, local and global effects often contradict each other – on a global level they are mostly positive, while there can be a number of negative effects on a local level. But what is the best trade-off? How can we rank the alternatives? One possibility is to rank the different solutions from different points of view, such as RES integration, security of supply, landscape protection, biodiversity protection etc. This is the idea behind multi-criteria analysis. It aims to identify scenarios, the involved stakeholders,

the possible alternatives and the objectives and lastly, to estimate the effects of the alternatives. In a next step, the alternatives are compared and ranked according to stakeholder preferences.

In a fictional scenario, that they would later engage in, the workshop participants were asked to take on the role of a specific stakeholder (TSO, environmentalist, tourism operator, landscape association, citizen etc.) and in their group agree on the weighing of criteria from the fields of technology, investment, socio-economy, environment and landscape. As part of the simulation game, each participant presented their views to the other participants emphasizing, from the point of view of the stakeholder he/she was impersonating, which criteria are most important and why. Afterwards, the group had time to discuss and come up with a ranking that represents a compromise between all present stakeholders. The object of the simulation game was to test the multi-criteria analysis tool and help Poliedra and ETH Zurich to refine it for implementation in the INSPIRE-Grid test cases.



Map of fictional region of Utopia displaying different routing choices, that was used in the simulation game

Multi-criteria analysis simulation game led by Poliedra and ETH Zurich

After the day's presentations, the workshop participants took part in a multi-criteria analysis simulation game. In four groups they discussed the ranking of criteria that play a role in determining the route of a power line. Every participant acted as a member of a relevant stakeholder group: citizen, environmentalist, tourism operator, local politician, TSO representative, energy company representative and landscape association representative. All groups had 2 hours to discuss and come up with a ranking of the criteria.

Wednesday, 20 May 2015

1. Presentation of MCA results

Simona Muratori from Poliedra presented the results of the simulation game in the morning of the second workshop day. She started her presentation by explaining the different implementation/evaluation possibilities of Multi-Criteria Analyses. One way is to numerically elicit the weights, which express the relative importance of the criteria in the specific case – resulting in a numerical value for all routing alternatives, which can then be ranked accordingly. In many cases, assigning weights numerically in a rigorous way is too difficult and time-consuming – and, of course, each stakeholder has different values – so even if they are able to assign exact weights, it's difficult to bring the different perspectives together. For this reason, Poliedra opted to only ask for ordinal information, which also meant ranking the criteria according to their importance, but without the use of numerical values. This does not result in an exact ranking when bringing all perspectives together, but a positive side effect is that it leaves more room for compromise search. Ranking the weights instead of eliciting them numerically actually results in a range of values for each alternative. In fact, for each set

of numerical weights congruent with the given ranking, it is possible to compute the corresponding value of the alternatives, and therefore find the range of values for each alternative. The safest way of ranking the alternatives according to these ranges is to look at the highest minimum value of each range. Another possibility is to rank them according to the average value.

Surprising outcomes of the workshop simulation game were the fact that three out of four tables were actually able to agree on a complete ranking of the criteria, and that one routing alternative (CDB) scored comparatively high at all tables, even being number one at two tables, whereas another (NULL) was unwanted everywhere.

SECTOR	INDICATORS
TECHNICAL ASPECTS	C1 - Risk of network disruption [-]
	C2 - RES additional production [GWh/year]
INVESTMENT COST	C3 - Project cost [M€]
SOCIO – ECONOMIC ASPECTS	C4 - Population near the power lines [inhabitants]
	C5 - Touristic income [%/year]
ENVIRONMENT	C6 - Valuable area for biodiversity [km ²]
	C7 - Vulnerable bird species [-]
	C8 - GHG emissions avoided [tonCO ₂ eq/year]
	C9 - Land not yet infrastructured [km]
LANDSCAPE	C10 - Cultural and landscape valuable areas [km ²]
	C11 - Cultural heritage and landscape elements [-]
	C12 - Visibility of the line [-]

Decision criteria in the simulation game

More general results and insights that the simulation game produced included the acknowledgement that Multi-Criteria Analysis creates more space for discussion, because there is no direct conflict about routing alternatives, instead it's the importance of different values that is up for discussion. Going one step back and discussing criteria also helps in identifying conflict issues and

better managing conflict. Other advantages of the tool are the possibility to make decision-making processes transparent and repeatable as well as establishing the conditions for a proactive participation of stakeholders.

2. Field trip: two pylon designs and one substation

After the presentation of the MCA results, the participants of the workshop left for a joint field trip to the hinterland of Milan to see two newly designed and built pylon sections (one of them being the Germoglio pylon designed and on day one of the workshop presented by Hugh Dutton) and visit substation masked with naturalistic engineering methods.

During the trip Terna introduced the participants to their pylon design concept and the analyses and environmental studies that led to the final concept for the masked substation.



Workshop impressions: Antina Sander (RGI) moderating a debate between Henrik Skouboe and Hugh Dutton (above left), simulation game (above right), Germoglio pylon near Milan (below left), and visit at substation masked with naturalistic engineering methods (below right).