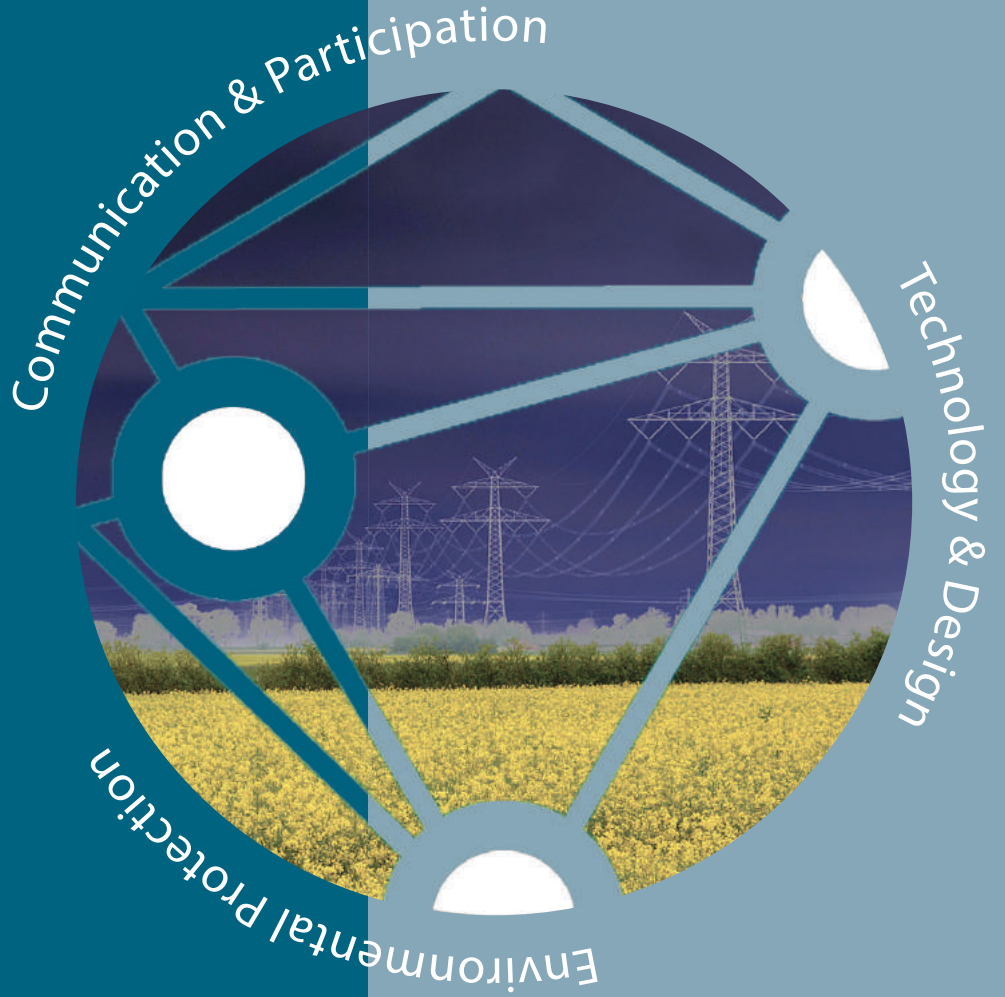
AWARD

GOOD PRACTICE OF THE YEAR



2017

Renewables Grid Initiative

Imprint

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The Renewables Grid Initiative is a unique collaboration of NGOs and TSOs from across Europe. We promote transparent, environmentally sensitive grid development to enable the further steady growth of renewable energy and the energy transition.

RGI gratefully acknowledges funding from Stiftung Mercator and the European Climate Foundation.

For more information, visit our website: www.renewables-grid.eu

Foreword by Dominique Ristori, Director General for Energy, European Commission

Dear readers,

2017 is another important year for Europe's energy and climate policy. Last year, the Commission has tabled the largest package of legislative proposals and initiatives to accelerate the energy transition in the "Clean Energy for All Europeans" package. We had three key objectives in mind: to put energy efficiency first, make the EU be world leader in renewable energies and to put consumers at the centre. In recent years, Europe has shown that it is possible to successfully decouple economic growth from greenhouse gas emissions. We want to go one step beyond and show that decarbonisation is also an economic opportunity, accelerating investments, jobs and growth. In this context, renewable energy has been providing increasing shares of our energy consumption and will provide about half of our electricity by 2030.

The timely deployment of energy infrastructure is indispensible for this process. This task, however is far from trivial. Energy infrastructure will only be successfully built with the support of key stakeholders – from politicians on European, national and regional levels to industries, civil society and citizens. We will need committed companies and organisations, like the Renewables Grid Initiative, that develop new and innovative approaches, ideas and technologies; courageous politicians and regulators who work together beyond national borders and engage in dialogues with citizens; and an active civil society that contributes to policies and planning procedures.

This is why I welcome and support initiatives like RGI's 'Good Practice of the Year' award that honours organisations willing to pave the way for others by developing new procedures, technologies and approaches. It gives much needed visibility to practices that are worth replicating. Moreover, the award's categories reflect important aspects for the implementation of the Energy Union: technological innovation is key to achieve our ambitious energy and climate goals; engaging in a constructive and effective dialogue with stakeholders and citizens leads to better projects and broader societal support; and, finally, we need to find innovative solutions that keep the impact on nature and environment as little as possible in order to safe the basis of our livelihoods.

I would like to extend my warmest congratulations to this year's winners of the award. The prize is a recognition of the risks they took and the benefits to others who can learn from their experience.

Introduction

AWARD GOOD PRACTICE OF THE YEAR

Renewables Grid Initiative

MAZARS

The ‘Good Practice of the Year’ award rewards those who dare to think outside the box when it comes to creating the grid for the energy transition. Each year, we invite everyone who develops new technological solutions for the grid of the future, tackles innovative grid designs, takes on the overwhelming question of how grid projects can be met with more societal support, or creates improved nature protection approaches, to share their practice via our award competition.

Many organisations accepted the invitation and contributed an array of valuable practices this year. We are very proud of the diverse selection that has been chosen by the jury and we get to present in this brochure. In the category ‘Technology & Design’ they range from sophisticated services for smarter network management, to specific load control schemes, and the employment of renewables to balance the grid. Our winning practice in this category comes from Swiss energy company Alpiq and looks at self-learning algorithms to effectively integrate distributed energy resources. To that end, Alpiq developed a real-time data-to-decision platform that our jury praised for its relevance in today’s energy landscape and its likelihood of becoming a commercially successful practice. “It is universally applicable. It is not a disruptive practice, but still utilising technology that we will be relying on much more in the future. It combines the future way of working with a very good insight to the existing system”, the jury states as its reason for choosing the Alpiq platform as the winning practice.

The ‘Environmental Protection’ category showed just as much diversity. We received practices that look at how to reduce the environmental impact of underground cables, how to make power lines safe for birds on a big scale as well as sensible land use in grid corridors. The champion practice in this category was submitted by Spanish transmission system operator (TSO) Red Eléctrica de España (REE). They have developed and implemented a methodological guide to restore a sea grass species that provides essential functions to the Mediterranean ecosystem. The practice is an example of a direct connection between critical infrastructure and ecosystem recovery and can be replicated elsewhere as well as target other species of sea plants. The jury was very fascinated by REE’s approach, saying: “It is an impressive and impactful undertaking that focuses on the recovery of natural CO2 consumers and therefore contributes to the fight against climate change in a very relevant way.”

The ‘Communication & Participation’ category proved that the wish to engage the broader public with the topic of grid development can lead to very creative practices: from a gaming app that lets players balance the grid, to funding local community projects and a Mobile Citizen’s Office, that was crowned the winner this year. German TSO 50Hertz developed a mobile information van that visits and engages people who might not be able or willing to partake in traditional information events. It is a simple and very flexible method to reach a wide range of people living in more remote areas and has the potential to be widely replicated. “50Hertz came up with a different and innovative way of putting a human face on a company. They established trust in every day situations and hugely expanded the opportunities for people to engage early and extensively”, the jury explains their choice.

The Renewables Grid Initiative warmly congratulates the winners and thanks our amazing jury, who donated an incredible amount of time and expertise to make sure the very best practices receive the recognition they deserve. And last, but certainly not least, we thank the international auditing and advisory company MAZARS for accompanying the evaluation process for the fourth year in a row.

An independent jury of experts

Based on the evaluation criteria and their personal expertise, our independent jury elected a winner in each of our three categories: Communication & Participation, Technology & Design and Environmental Protection. The jury members are experts in their respective fields that include grid development, energy policy and biodiversity:

Mike Hogan

Senior Advisor at the Regulatory Assistance Project

Mike Hogan works on electricity decarbonisation policy, particularly matters related to market design. He previously led the power programme at the European Climate Foundation and has 35 years' experience in the electricity industry.

Member of the European Economic and Social Committee (EESC)

Pierre Jean Coulon is the President of the Section "Transport, Energy, Infrastructure and Information Society" of the EESC. Previously, he was President of the international NGO "Right to Energy SOS Future", as well as an expert adviser to the United Nations.

Pierre Jean Coulon

Patrick Devine-Wright

Professor of Human Geography at the University of Exeter

Patrick Devine-Wright is an expert on public engagement with low-carbon energy technologies and associated infrastructure such as high voltage power lines. He has participated in, and led, several multi-disciplinary research consortia and advises an EU pilot project on public acceptance of electricity grids.

Marie Donnelly

Former Director for New and Renewable Sources of Energy, Energy Efficiency and Innovation at DG Energy, European Commission

Within the Directorate General for Energy, Marie Donnelly is responsible for the development of policies and actions on energy efficiency and renewable energy and the coordination of research activities in the field of energy. She retired in 2017.

Humberto Delgado Rosa

Director for Natural Capital, DG Environment, European Commission

Humberto Delgado Rosa is the Director for Natural Capital at DG Environment. Previously, he was Director for Mainstreaming Adaptation and Low Carbon Technology at DG Climate Action. He is experienced in environmental policy, particularly biodiversity and climate change issues.

Dr. Maguelonne Dejeant-Pons

Executive Secretary of the European Landscape Convention

She has published several books dealing with territorial development, the protection of coastal and marine zones, biological and landscape diversity and the human right to the environment.

Jo Leinen

MEP and member of the Party of European Socialists

Jo Leinen has been a Member of the European Parliament since 1999. Before becoming an MEP, Jo Leinen was Minister for the Environment in the State Government of Saarland (Germany) from 1985-1994.

Head of Unit B 1 at DG Energy, European Commission

Catharina Sikow-Magny joined the European Commission in 1997. She is the head of unit in charge of "Internal market I: networks and regional initiatives" in the Directorate General of Energy. Before that, she was responsible for the international transport relations team.

Catharina Sikow-Magny

Gregg D. Ander

Executive Consultant at the Energy Foundation

Gregg D. Ander is an executive consultant for the Energy Foundation, which he formerly worked for as Vice President of Power Strategies. In this role, he oversaw a portfolio of initiatives including energy efficiency, demand response, renewables, gas, coal, smart grid, and financing.

Founder of energy utility advisory company Truebase

Baard Eilertsen is the former CEO & President of Wireless Maingate AB. He created the world's largest and most successful Smart Home solution 100Koll for E.ON. In 2015, Baard started Truebase AB, a company advising large utility companies in Europe on strategy.

Baard Eilertsen

Technology & Design

“Real-time technology for the effective integration of distributed energy resources”

by Alpiq

Alpiq developed a real-time data-to-decision platform that offers products and services to its customers and partners for all aspects around energy and flexibility markets. The self-learning algorithms deployed in the cloud platform catalyse the effective integration of Distributed Energy Resources (DER) through the optimal dispatch of flexible generation and load.

Highlights

- Making use of synergies between different types of assets throughout the whole energy value chain and enable their easy and efficient dispatch to short-term markets
- Self-learning algorithms (fundamental DER model, self-learning forecasts, stochastic optimisation) enabling full automation of data-to- decisions processes
- Rapid modification of algorithms to fit changing regulatory and market incentives
- Scalable and modular framework based on micro-services, combining different competences of partners’ assets and solutions

Scope

The platform was initially implemented to connect assets and sources in Switzerland, Germany and the UK in 2016. Forthcoming scaling-up includes Italy and Spain, with complete roll-out across EU to follow.

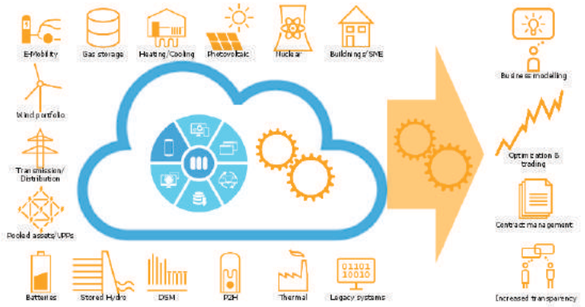
Description

The international energy markets are becoming increasingly more complex, more integrated and more distributed.

The key to effective DER utilisation is to accommodate for future uncertainties with a flexible framework that enables a rapid, autonomous adaptation and holistic integration. Alpiq’s Digital Technology & Innovations team addresses this challenge via the development of an integrated platform where all energy stakeholders’ assets are interlinked and optimally managed.

All types of systems can be connected to the platform, from smart homes, charging networks of electric cars, to large industrial consumers, centralised and decentralised power stations, solar systems, storage facilities and electricity grids. The platform processes all parameters from available data sources in real-time, calculates the optimal decision options and can directly dispatch them. The generalised framework serves a wide range of applications (e.g. peak-shaving, demand response and aggregation of capacities for Virtual Power Plants), thus enabling the involved partners to generate additional revenues.

Alpiq recently demonstrated a commercial showcase on a waste water treatment plant, where two flexible, sewage-gas powered generators were optimised in order to apply peak-shaving and effectively reduce grid-usage during periods of high tariffs.



Additional information

Alpiq is one of the leading energy companies in Switzerland and is aiming to become Europe’s leading smart energy services provider. The new business unit Digital Technology & Innovation will focus on the further development of self-learning algorithms in order to use digitalisation to connect and optimise all flexible and decentralised assets in the energy sector.

WiseGRID - Wide scale demonstration of integrated solutions and business models for the European smart grid”

by 21 partner project consortium

The WiseGRID project provides a set of solutions, technologies and business models which increase the smartness, stability and security of an open, consumer-centric European energy grid and provide cleaner and more affordable energy for European citizens, through an enhanced use of storage technologies and electro-mobility and a highly increased share of RES. It aims to deliver the tools and business models that will facilitate the creation of an open market and enable all energy stakeholders to play an active role towards a democratic energy transition.

Highlights

- Development of consumer-centric demand response mechanisms, business models and regulatory recommendations
- Development of advanced monitoring methods of the distribution grid, and utilisation of Virtual Power Plants (VPPs) and micro-grids as balancing assets
- Reduction of generation curtailment without deterioration of quality of supply
- Development of services for charging Electric Vehicles (EVs)

Scope

The project will provide applications for different actors, such as prosumers, DSOs, aggregators and EV fleet operators. WiseGRID technological solutions will be demonstrated and evaluated under real life conditions in four large scale demonstrators – in Belgium, Italy, Spain and Greece – involving more than 1,700 consumers utilising energy systems consisting of batteries, heat pumps, PV, wind and hydro, EVs and charging stations. Following the project’s conclusion, the practice will be replicated in other scenarios across Europe.

Description

The emergence of decentralised renewable energy sources and their utilisation by non-traditional energy stakeholders (residential, commercial) can enable a gradual transition to a consumer-centric energy market. The idea of the WiseGRID project is to empower and protect citizens on their way to becoming active energy stakeholders, while efficiently integrating large shares of decentralised renewable generation. The project will develop nine ICT tools that will cover operational aspects of DSOs, aggregators, prosumers, EVs, renewable energy, and storage.

Via the implementation of these technological solutions in a suitable energy market, WiseGRID aims to significantly contribute to positive long-term impacts, such as: I) increasing overall efficiency through a holistic approach of the electricity, heat and gas sectors at consumer level, II) contributing to a 50 per cent renewables share by 2030 and a 20 per cent reduction of CO2 emissions, III) reinforcing the position of the European renewables, storage and EV industry at a global level, IV) contributing to the creation of 1,800 direct and 90,000 indirect jobs.

Additional information

The project consortium is led by the Spanish company ETRA I+D and consists of 21 partners including electric cooperatives, distribution system operators, technological providers, energy providers, legal advisors and research institutes, from Belgium, Greece, France, Spain, Romania, Germany, Italy and the UK.

WiseGRID is still in its infancy, having only been kicked off in November 2016. It is presented in this brochure as an example of an outstanding idea. We hope to present its outcomes in one of our brochures a few years down the line.

More info: www.wisegrid.eu

“East Iceland Clean Energy Connections”

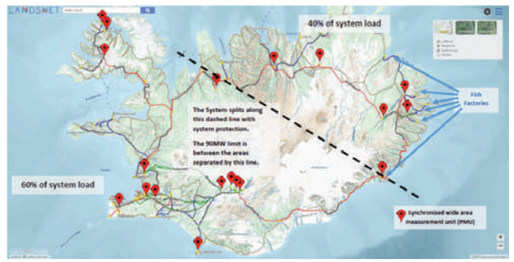
by Landsnet

Landsnet applied load control schemes to the existing grid infrastructure in order to connect fish factories in East Iceland to the main grid using synchronised real-time measurements. This connection enabled the factories to replace crude oil for their energy consumption needs with renewable-sourced electricity from the main grid.

Highlights

- Transmission network constraint for eastward power flow raised by 44 per cent when the control scheme is active
- Societal benefits (90,000 tonnes of CO2 avoided) and environmental savings (13.4m €/year for 2 weeks of active control scheme)
- More flexible use of generation resources
- Reduced customer outages after large disturbances
- Provision of fast response capabilities by relevant electricity stakeholders

Scope



The practice, initially applied to six factories distributed across 200km of the Eastern coast and a smelter in Southwest Iceland, is now part of a EU Horizon2020-funded project (MIGRATE) that aims to further pilot-test the approach and apply it throughout Iceland. Beyond Iceland, the methodology can be employed in cases where an increase of the local grid’s utilisation is needed in order to transmit more power through bottlenecks, without risking system security.

Description

Increased environmental awareness and higher energy costs have driven fish factories in East Iceland to explore alternatives to crude oil as their main source of energy. As the transmission network in the area was already constrained, significant investments in new lines through remote, environmentally sensitive areas would have been required. To combat the negative impacts of new transmission infrastructure, Landsnet opted for applying new methods to the existing grid. By using fast synchronised wide area measurements distributed around the grid and automated control of distribution resources from the transmission control centre, the factories could be tripped rapidly when needed to protect the wider grid. Through these measures, the usable capacity of the existing grid was increased and the fish industry was allowed to replace crude oil with Iceland’s main grid renewable electricity to power their factories.

Additional information

Landsnet, Iceland’s TSO, developed the practice in collaboration with various energy stakeholders. Fisheries implementing grid-controlled load shedding capability, the TSO incorporating a new control methodology and adapting operational constraints and practices, the DSO (Rarik) planning for new connections and load switching, a vendor (GE) providing design expertise, system studies and equipment supply & configuration, and a telecommunication provider (Orkufjarskipti) with high bandwidth optical fibre network.

“Hierarchical and distributed automation for medium voltage (MV) and low voltage (LV) grids”

by IDE4L

The EU-funded IDE4L project demonstrated an entire system of distribution network automation, IT systems and functions enabling active network management. The vertically and horizontally distributed decision making architecture aims to improve real-time monitoring and controllability of MV and LV grids and to integrate renewable energy sources and new loads more efficiently, without compromising the distribution grid’s reliability.

Highlights

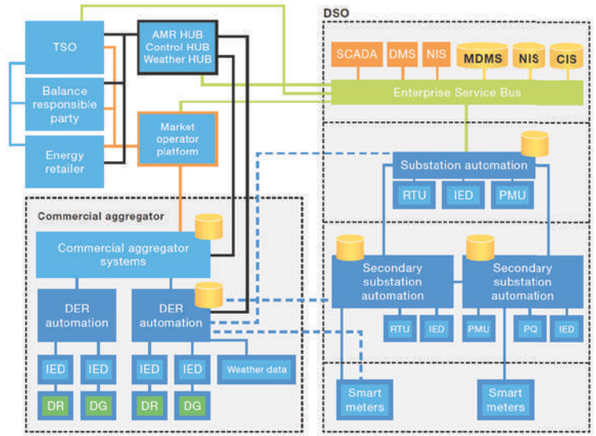
- 6 laboratory demonstrations and 3 field demonstrations validating the developed architecture, monitoring, control and protection systems in real physical grids with connections to PV panels, wind turbines, heat pumps and actual consumers
- Decentralised Fault Location Isolation and Supply Restoration (FLISR) solution based on IEC 61850 GOOSE including adaptation to grid topology or DER configuration changes is ready for market launch
- 3-4 times increase of grid capacity compared to existing passive grid reinforcement methods
- Interoperability through standard-based interfaces and scalability of automation system
- Reduced reaction time to varying conditions and workload for control centre operators

Scope

Although the practice was demonstrated in Denmark, Italy and Spain, the automated architecture, solution and functionalities are applicable to any distribution grid in Europe (or globally where relevant).

Description

The emergence of distributed renewable energy resources has increased the complexity of managing MV and LV grids. New challenges that have emerged include: I) exploitation of existing networks and resources more efficiently, II) maintaining high reliability and power quality standards, III) reducing demand uncertainties, and IV) resolving conflicts between electricity market needs and technical constraints. The IDE4L project was conceptualised to address these challenges and design advanced automation systems that utilise ancillary services of distributed energy resources and aggregators.



IDE4L relied on existing technology, solutions and emerging requirements in order to design the advanced automation system. Key functionalities include decentralised FLISR, real-time monitoring, state estimation and congestion management. The resulting concept managed fast charging conditions and utilised the existing distribution network more cost-efficiently through exchanging dynamic information and services among flexibility market actors (DSOs/commercial aggregators and TSOs).

Additional information

The Tampere University of Technology is the project coordinator of the EU FP7-funded project IDE4L (2013-16), which includes research institutes and university faculties, associations, technical solution providers and distribution system operators, and energy providers from 6 countries in Europe.

More info: www.ide4l.eu

"Using Renewable Resources to Balance the Grid"

by California Independent System Operator (CAISO), National Renewable Energy Laboratory (NREL) and First Solar

CAISO, NREL and First Solar demonstrated how large-scale solar resources can provide essential reliability services to the grid, which have traditionally been offered by conventional power plants. A series of technical tests conducted on a 300 MW PV plant showcased the role of advanced controls in leveraging the solar energy's value and contributing to grid stability.

Highlights

- Most extensive testing and demonstration of reliability services involving PV generation ever conducted in the world
- Reducing the need for conventional power plants to provide reliability services
- More accurate ramping of PV plant's power output compared to conventional power plants
- Cost savings through eliminating the need for voltage control devices after sunset
- Smart inverter technology combined with advanced plant controls allowing multiple PV resources to operate as a single resource

	Test	Performance
Ramping	• Ramp its real-power output at a specified ramp-rate • Provide regulation up/down service	☆
Voltage	• Provide reactive power support in various modes - Control a specified voltage schedule - Operate at a constant power factor - Produce a constant level of MVAR - Provide controllable reactive support (droop setting) - Capability to provide reactive support at night	☆
Frequency	• Provide frequency response for low frequency and high frequency events - Control the speed of frequency response - Provide fast frequency response to arrest frequency decline	☆

Scope

Besides replication in any large-scale PV power plant in the world, the practice is also applicable for clustered PV resources (assuming appropriate power aggregation and availability of communications and controls). Additionally, to further enhance system flexibility, storage can be easily incorporated into the concept.

Description

By 2030, utilities in California are required by state law to produce 50% of their electricity sales from renewable energy sources. To reach this goal, California grid operators need to find additional ways to maintain grid reliability and balance generation and load with increased levels of variable renewable generation. Demonstrating today that additional ways are feasible is instrumental in achieving the state's broader objective of a resilient, reliable, low-carbon grid.

For this purpose, CAISO in collaboration with NREL and First Solar, conducted various tests in order to demonstrate the PV plant's capability to provide upwards/downwards ramping of its power output, frequency response and voltage control.

Since some PV plants already can provide these necessary reliability services, the practice could be implemented as soon as the regulatory environment allows renewable resources to be equitably compensated with conventional plants.

Additional information

Practice's partners (2016): CAISO (California's grid operator), NREL (leading U.S. federal research centre on renewable energies), First Solar (vertically integrated large-scale PV utility)

CAISO plans a broad stakeholder outreach effort with industry to identify barriers with PV resources providing reliability services

Environmental Protection

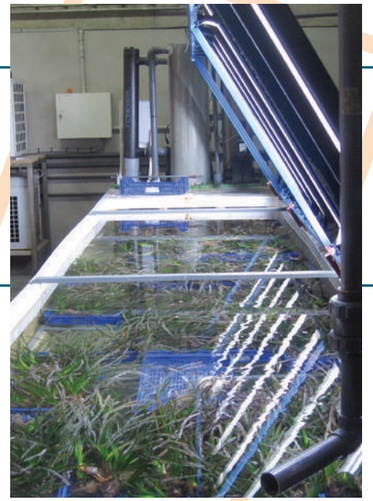
“Innovative technique for the recovery of Posidonia Oceanica seagrass meadows”

by Red Eléctrica De España

Posidonia Oceanica is a seagrass species that provides essential functions to the Mediterranean ecosystem, most notably it acts as a natural carbon sink. REE has developed and applied a methodological guide to restore large-scale degraded areas and ensure the non-invasive recovery of Posidonia Oceanica, according to R&D results.

Highlights

- After one year of planting, the survival rate was over 60 per cent; 51 per cent of the fragments planted in 2016 had generated new shoots after 6 months, 18 per cent of the fragments had generated new shoots after 1 year.
- REE will publish a methodological guide on developing an open sea grass meadow recovery method including technical, material and economic viability



Scope

The practice has been implemented at the Balearic Islands but can be enlarged to the entire Mediterranean Sea, providing the first step towards a new understanding of reforestation in the marine environment.

Description

Wind farms and submarine cables can contribute to the degradation of seagrass meadows, which suffer from a 1 per cent to 5 per cent annual estimated rate of loss globally. Posidonia Oceanica forms large underwater meadows that are an important part of the ecosystem due to their ability to sequester about half a million tonnes of CO2 in the Mediterranean Sea per year.

Restoration projects, such as the one REE is undertaking, have the potential to increase carbon sequestration capacities, and to protect sediment carbon stocks of seagrass meadows.

To address these challenges, REE conducted research on the use of Posidonia Oceanica seedlings and developed an open seagrass meadow recovery method. The method involves the collection and cultivation of Posidonia Oceanica fragments and seeds grown under laboratory-controlled conditions or obtained directly from natural seagrass meadows. Subsequently, the seedlings can be transplanted into degraded meadow areas, for example into trenches opened on the seafloor due to works associated to the laying of submarine electricity cables.

Additional information

REE, the Spanish transmission system operator, developed the practice in collaboration with the Spanish National Research Council (CSIC) from 2012 until 2016.

Large-scale implementation of the methodology throughout the Balearic Islands is currently being planned.

More info: www.ree.es/es/sostenibilidad/mapa-de-proyectos

"Conversion of the use of land in the easement corridors for the power transmission lines"

by Rede Electrica Nacional (REN)

REN developed an active approach to the vegetation management of buffer strips under overhead lines, maximising the services provided by the ecosystem and introducing new approaches to its conservation and restoration. The practice aims to add value to the land and the species themselves through the plantation of native trees and shrubs. As a result, the abandonment of these corridors can be avoided while protecting them from forest fires and enabling them to become income generators for landowners.

Highlights

- 745,000 native forest trees planted (400 trees per day) on circa 1,450 ha of land belonging to more than 7,700 owners
- Raising awareness for the protection of biodiversity and native forests through training actions for over 1000 children from 11 countries
- Creation of local employment through the exploitation of non-timber products

Scope

The practice has been used in mainland Portugal since 2010.

Description

Hydro and wind power generation in Portugal are integrated into areas covered by the National Network of Protected Areas and by Natura 2000. Reforestation with native trees minimises infrastructure impacts and increases their resilience to forest fires as the buffer strips are integrated into the defence system of forests against fires. As REN has usage rights but does not own these reforestation areas, it is key to involve landowners in the process, showing how the management of these areas can be an income generator even though the species planted are not fast-growing or large-sized.

This paradigm shift in vegetation management of the transmission line corridors was implemented through 4 key activities: I) mapping of the territory and identification of landowners and biodiversity specifications, II) developing an action plan for each biodiversity type, III) training actions with the landowners and partnerships with national bodies and NGOs, IV) raising awareness in local communities in partnership with relevant educational biodiversity initiatives.

Additional information

REN, the Portuguese TSO, is one of the largest-contributing companies to the recovery of the native forest. The practice was developed in cooperation with landowners, local authorities, the association of forestry producers, the Institute for Nature and Forest Conservation (ICFN), the Ministry of Education, and QUERCUS (environmental NGO).

In partnership with the LIFE Elia project, who won the 'Good Practice of the Year' award in 2015, REN developed a reference manual on the vegetation management of transmission line corridors for the Mediterranean region.

More info: www.ren.pt/en-GB/sustentabilidade/partes_interessadas/comunidade/

“Underground high voltage cables (UGCs) – Environmental research and on-site development of innovative solutions”

by Amprion GmbH

Amprion has been conducting a long-term ecological research programme in rural areas, consisting of 20 years of field experiments, and of validation of experimental findings through monitoring of an UGC project in Germany. Through this project, Amprion aims to increase the understanding of UGCs’ thermal and hydrological impact on the soil, and of any resulting ecological impacts on flora and fauna. The practice’s findings will offer insights on how to predict and reduce impacts of construction and operation during the project planning phase.

Highlights

- Field experiment findings show a low (or negligible) ecological impact on agricultural production and soil properties
- Amprion carried out an ecological assessment using real data from field experiments, rather than from a theoretical model
- The practice aims to reduce UGC impact on soil and farmland, accelerate permitting processes and foster acceptance of UGCs through enhanced learning and understanding, especially with farmers and local stakeholders

Scope

The practice can be applied to any project location and its findings can aid future similar projects through knowledge transfer of the developed methodology, monitoring and measuring approaches.

Description

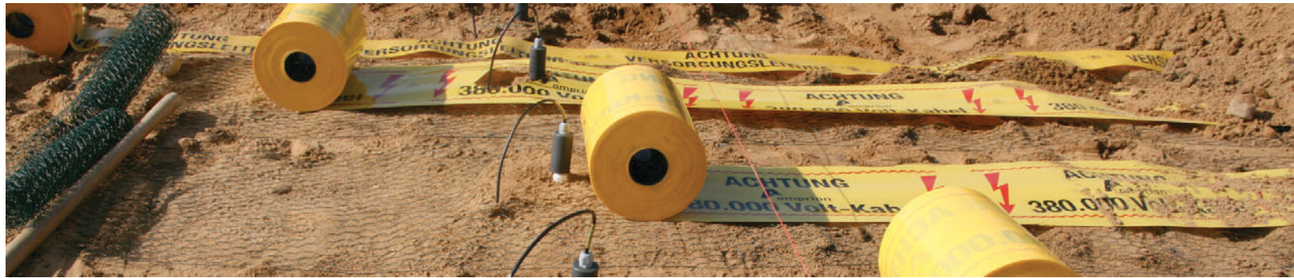
Underground cables with high voltage ratings have not been widely used in rural areas in Europe. Due to the lack of knowledge with regard to the ecological impact of UGCs, it is not possible to forecast potential negative impacts and address them accordingly during a project’s planning phase. Amprion’s comprehensive long-term research programme spanning over 20 years aims to address this knowledge deficit.

Starting in 2005 with a 5-year field experiment of artificial soil heating, the thermal effects for different operating scenarios and hydrological conditions were simulated and recorded. Following this, another 5-year experiment was carried out on a 110kV UGC system operating under extreme loads and different bedding materials. Growth and yield were monitored during cultivation experiments in order to establish the effects on agricultural crops. In 2015, the final stage of the practice started; a 10-year monitoring programme of the first 380kV AC (3.6GW), 3.4km UGC project in Germany (Raesfeld), where an instrument station provides continuous monitoring of the soil’s properties.

Additional information

Amprion, a German TSO operating the high voltage grid from Lower Saxony down to the Alps, carried out the practice in cooperation with the Albert-Ludwigs University of Freiburg (Chair of Soil Ecology) and ERM (environmental consultancy). Other stakeholders that were part of the Steering Committee included the University of Südwestfalen, the Westphalia-Lippe Agricultural Association, the Chamber of Agriculture NRW, and several experts and farmers.

Amprion’s project website (in German): www.netzausbau.amprion.net/projekte/wesel-meppen/projektbeschreibung



"Making safer power lines for birds - Protocolo Avifauna"

by EDP Distribuição

A large percentage of non-natural bird mortality is known to be caused by electrocution from and collision with power lines. To mitigate this impact, EDP insulated poles and installed signalling devices designed to improve the lines' visibility for birds. These lines were identified by the NGOs collaborating with EDP Distribuição.

Highlights

- Implementation of anti-electrocution measures on 6,300 pylons and 521km of overhead lines equipped with anti-collision devices
- Estimated reduction of mortality due to electrocution and collision by 35,000 birds (possibly preventing total decline of species with scarce population)

Scope

Since 2003, the practice is applied in continental Portugal including several protected areas (important bird and biodiversity areas, Natura 2000 Special Protection Areas). Beyond Portugal, the mitigation measures are suitable for implementation in any country with the same objective.

Description

Bird mortality caused by power lines may contribute to population decline for several species, including endangered species with unfavourable conservation status. To reduce mortality and prevent the decline of species, EDP Distribuição and the NGOs identified black spots of power line-caused mortality for endangered species, and assessed power line-induced mortality located inside protected areas.

Over 1,670km of power lines have been surveyed until today, leading to the development of risk assessment maps for some endangered species. The practice also developed new tools for mortality black spot identification and subsequent retrofitting with anti-collision devices and insulating poles as an anti-electrocution mitigation measure. The efficiency of the different implemented mitigation measures was assessed and quantified by monitoring mortality rates after the retrofit.

Beyond tackling the environmental impact of power lines, the practice showcases a model long-term cooperation between environmental authorities, an electricity distribution company and NGOs.

Additional information

EDP Distribuição, the Portuguese electricity distribution company and part of the EDP group, collaborated with three environmental NGOs (SPEA, QUERCUS, LPN) and the National Authority for Nature Conservation (ICNF) through a technical commission assessing the interactions between overhead lines and birds (CTLEA).

More info (in Portuguese): www.edpdistribuicao.pt/pt/ambiente/desempenhoambiental/pages/linhaseletricaseavifauna.aspx

“Low impact high voltage underground cable systems”

by Greenconnector

Worldenergy is developing an underground HVDC cross-border interconnector between Italy and Switzerland (Greenconnector), while utilising existing infrastructure for the cable’s installation.

Highlights

- Reusing 80km of existing infrastructure (old pipeline) and optimising cable design and installation methods
- Cable laying on the bottom of a closed, 300m deep lake, using conventional marine techniques, even in the absence of cable laying ships

Scope

The practice can serve as a reference case for long distance installations inside pipelines and for cable laying on the bottom of closed lakes.

Description

Renewable energy North and South of the Alps is weakly correlated, thus the region would benefit greatly from removing any congestion bottlenecks and allowing bi-directional exchange of renewable electricity. The increase of the overall import-export capacity between Switzerland and Italy via the Greenconnector project will positively impact market integration, competition and system flexibility. As such large-scale grid infrastructure projects can often cause significant environmental impacts, project developers aim to develop

approaches that try to minimise such impacts and eventually lead to higher public acceptance. This is especially true of the Alpine region, where new corridors are difficult to find and are environmentally sensitive because of the narrow valleys and attractive landscapes.

Greenconnector’s environmentally friendly approach consists of the use of an out of service oil pipeline for the cable’s installation, and cable laying on the bottom of a lake. These methods are expected to result in numerous technical, economic, environmental and visual impact benefits: from better cable protection and higher reliability, to significant reductions of installation cost and time, and from minimising ground and natural habitat disruption, to no cable visibility along the entire route and a reduced route length.

Additional information

Worldenergy is developing the Greenconnector project in cooperation with suppliers and civil works contractors, and local authorities. The HVDC cross-border interconnector project (1000MW, 400kV DC) is located between Lombardy (Italy) and Graubünden (Switzerland). The route length is 150km of underground DC cable, of which 47km are laid on the bottom of lake Como in Italy and 80km inside the existing pipeline.

The project started in 2003, with the next 15 years being dedicated to data collection, design, planning and permitting also via conducting a number of technical and environmental studies and surveys. It has been permitted in Italy, with unanimous approval by all local and central administrations involved along the 120km route on the Italian side. Construction will begin in 2019, with an expected commissioning date in 2022.

More info: www.greenconnector.it/inglese.html

“Radar monitoring on the Strait of Messina”

by Terna Rete Italia S.p.A.

Italian TSO Terna monitors migratory birdlife between the region of Calabria and the island of Sicily in order to assess the impact of a new overhead line (OHL). Two radars were used to collect scientific and measured evidence of the number of birds passing the corridor line, their migratory routes and their flying height.

Highlights

- No measurable impact on bird traffic caused by the overhead line
- Proved the importance of the Strait of Messina as a birds migratory corridor as evidenced the by large amounts of registered passages

Scope

Although the practice was applied across the Sorgente-Rizziconi OHL, it can be replicated in other similar settings. However, as the practice is expensive and requires the involvement of highly specialised and numerous researchers, it is suitable only for OHLs crossing important habitats.

Description

The impact of OHLs on birds is a field often subject to bias and preconceptions. One of the main difficulties is to assess their impact adequately and evaluate the accuracy of the assessment. For this purpose, Terna developed a radar monitoring study on the Strait of Messina, a bottleneck for sub-Saharian migratory birds. Two watch points on each side of the Strait, one in Sicily and one in Calabria, are operated at the same time by ornithologists. Over the last three years, more than 115,000 passages of migratory birds have been recorded, tracking over 70,000 birds during spring and over 45,000 birds during fall. No collisions or any negative effects on the migratory route have been observed, proving the absence of the new OHL’s impact.

The most relevant added value of the practice is in the scientific and measurable evidence of the migratory routes in relation to OHLs. The long-term data (2014-18) obtained through the radar monitoring programme will allow for a better understanding of migratory routes and the overall impact of OHLs on birds.

Additional information

Terna, the Italian TSO, developed this practice in collaboration with two ornithologist scientific NGOs (Ornis Italica and MEDRAPTORS) and the eco-ethology laboratory at the University of Pavia.

Communication & Participation

“Close and personal dialogue: development of a Mobile Citizen's Office for public participation”

by 50Hertz

German TSO 50Hertz developed a Mobile Citizen’s Office (DialogMobil), intended for public participation and communication purposes. Through the DialogMobil, 50Hertz informs and engages with residents in a direct conversation on the energy transition and planned grid development activities.

Highlights

- Accessing local knowledge and gathering relevant information early via direct contact between locals and the planning teams
- Approaching those who otherwise would not or cannot take part in the dialogue by visiting their hometowns
- Operational gains – saving financial and personnel resources, extremely short set-up times, flexible with regard to time and location

Scope

Already in 2014, 50Hertz has reached the local population in the direct vicinity of potential corridor routes in mainly rural areas of 50Hertz’s grid area, using a mobile citizen’s office. Since 2016, the DialogMobil has become a continuous part of the public participation approach. The practice can be used for various grid development projects that can benefit from direct dialogue with the public, as well as for other activities (e.g. fairs, internal meetings).

Description

Grid development requires dialogue and a direct exchange with the targeted groups. Participation and information event formats are often diverse, yet for a number of reasons a share of the affected population is not reached via these traditional events.

In addition, as new transmission line projects span over a wide area of a country and across federal states, districts, cities and municipalities, it is challenging to equally inform and involve all stakeholders within the planning area.

For this reason, 50Hertz developed the DialogMobil, a custom-designed van allowing for a comprehensive and flexible information and participation approach with comparably low organisational effort and personnel requirements. With the help of planning documents, visual aids and exhibition pieces, maps and line models available in the DialogMobil, 50Hertz provides easily accessible information both in city hotspots and at the project sites, which can often be found in rural areas with thinly populated small towns. The DialogMobil visits citizens in their daily environment and achieves greater participation of a most relevant target group whose members don’t live close to more central information events.

Additional information

The DialogMobil was 50Hertz’ pilot project in the EU-funded BESTGRID project (http://www.bestgrid.eu). Five pilot projects tested and evaluated new ways to cooperate and spread information in the field. Partners of the 50Hertz pilot project included 3 German NGOs, Germanwatch, NABU (BirdLife Germany), Deutsche Umwelthilfe (German Environmental Aid).

More info: www.50hertz.com/grid-extension

“Close to the citizen, close to home, on an equal footing”

by Schleswig-Holstein Ministry of Energy, Agriculture, the Environment and Rural Areas (Germany), TenneT TSO GmbH

The government of the German state of Schleswig-Holstein, the TSO TenneT and the local districts of Dithmarschen and Nordfriesland developed an informal dialogue procedure for a new transmission line along Northern Germany’s West coast, which was implemented in close cooperation in 2013. Corridor options and technology alternatives were discussed with local citizens, municipalities and associations before the permission phase of the project and as a sort of substitute for the formal spatial planning procedure.

Highlights

- Strong cooperation with a common commitment to a plan and a common dialogue process among state government, districts and grid operator
- State and district politicians assumed political responsibility for grid expansion at public dialogue events
- Outcomes of the dialogue process (over 2000 participants, circa 400 consultation contributions) had a positive impact and were considered in the project’s planning

Scope

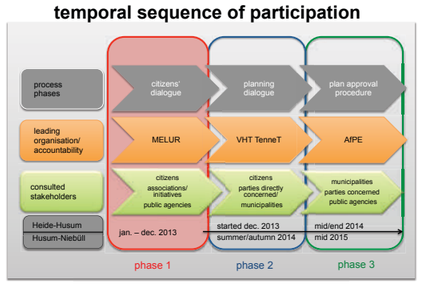
The practice was applied to a new 380kV transmission line in the state of Schleswig-Holstein in Northern Germany, over 3 years (2012-14) of developing, implementing and evaluating the dialogue process. The developed procedure and insights gained can be leveraged for any grid expansion project throughout Germany and Europe.

Description

Schleswig-Holstein is the state with the best wind power conditions in Germany due to its coastal regions. With increasing shares of renewable energy generation, grid expansion projects are becoming essential in order to transport a large part of generated power to consumption centres in South and West Germany. Successful cooperation between the state, local governments and the project developer can greatly contribute to the acceleration of grid expansion projects.

For this purpose, the project partners agreed on a realisation agreement that would serve as the foundation for designing and implementing a dialogue process. The agreement’s core ideas are: I) to implement an early, informal dialogue process in the region with several regional conferences, specialist and citizen dialogues, and II) to establish a clear, transparent and ambitious schedule for planning, approval and construction.

The dialogue was divided into a citizens’ dialogue, which was moderated by the environmental NGO German Environmental Aid (DUH), a planning dialogue, and a plan approval procedure. The outcomes of the dialogue processes impacted the project on a wide range of issues. On the technical side, 80 per cent of the total new 380 kV line was designed to be strung on the same pylons as an existing 110kV line. In a regional bird migration area, the old 110kV line is going to be stripped down and replaced by a ground cable to prevent having two lines crossing bird migration routes. On the community side, the largest possible distances to residential buildings were planned and rules were developed in relation to agriculture and nature preservation issues in the affected areas.



Additional information

The realisation agreement and corresponding dialogue procedure have been applied to another grid expansion project across the East coast of Schleswig-Holstein (2014-16).

More info (in German): www.tennet.eu/de/unser-netz/onshore-projekte-deutschland/westkuestenleitung/ and www.schleswig-holstein.de/westkuestenleitung

"BALANCE"

by Statnett

Statnett developed a gaming app for mobile devices dealing with the topic of grid expansion in order to increase knowledge of and interest in energy, electricity, the power system, the green electric future and related topics among the general public and stakeholders.

Highlights

- Increases knowledge about the power system by utilising a simplified grid structure, presented in a landscape resembling SimCity, the whole set up based on a power simulator and Ohm's law, to make challenges realistic
- Opens people's minds to issues and challenges that many have never thought of before
- Top-ten game in 35 countries, more than 3 million downloads worldwide

Scope

BALANCE was launched in 2015, and became a rapid success. An English version was introduced in 2016. It is designed for long-term use and there will be frequent updates, such as a possibility for players to design their own levels.

Description

For most people the power grid system is an area of low interest. At the same time, Statnett is aware that the level of knowledge among their stakeholders influences in what way they regard Statnett's services. BALANCE is a part of an overarching effort to make the power system relevant and attractive, whilst creating positive expectations for an electric future.

BALANCE was designed to be playful, fun and simple whilst still conveying a relevant message about the power system to the users. Gamers are presented with the challenge to secure power supply to communities and cities by avoiding blackouts, ensuring that the power grids are functional, and that the right amount of power is produced at all times – to keep the balance.

Before Christmas 2015, BALANCE was the second most popular game in Norway. Today, with an English version available, the game has more than 3 million downloads worldwide, and figures are growing by 10-15,000 every day. Statnett has gathered a first round of feedback and found that the game seems to serve the purpose they created it for. In fact, trust in Statnett is 19 percentage points higher among players of BALANCE compared to the general public, and perceived knowledge about Statnett and the power system is 23 percentage points higher.

Additional information

The game is a new concept that Statnett developed from scratch together with the agency Hyper Games, and with Tech Centres from around Norway providing continuous feedback during the development phase.

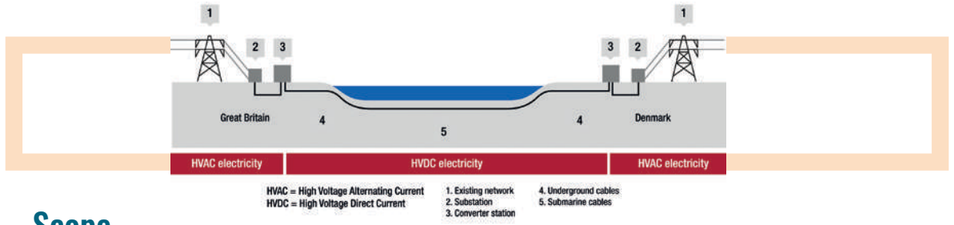
“PCI permitting one stop shop – times four!”

by National Grid Viking Link Limited & Energinet.dk

National Grid Viking Link Limited and Energinet.dk are developing a cross-border interconnector (Viking Link) between UK and Denmark. It is one of the most multi-jurisdictional infrastructure projects in Europe to fully apply the “one stop shop”, a permitting and participation approach introduced in the European Commission's TEN-E regulation.

Highlights

- Achieved good coordination, clear programmes and discussion across the four involved Member States (UK, Germany, Netherlands, Denmark)
- Ensured that all relevant stakeholders are offered a meaningful opportunity to be involved in the project’s development
- Similarities and differences in national approaches have been exchanged between NCAs
- Manual of procedures and practices of the permit granting process for Projects of Common Interest (PCIs) have evolved in light of this pioneer practice and Member States are now better prepared to deal with similar projects



Scope

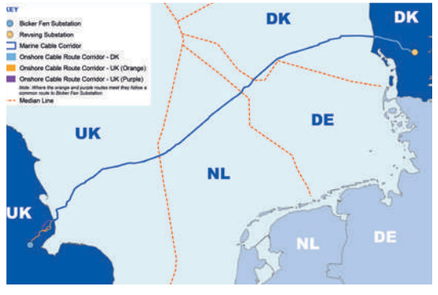
While the permitting “one stop shop” of the Viking Link spans across four countries in Northern Europe over 5 years (2014-2018), the regulation applies to any grid infrastructure PCI in Europe.

Description

The European Commission’s TEN-E Regulation aims to streamline the permitting process for PCIs. Each country has to identify a National Competent Authority (NCA) that is responsible for ensuring that the regulation’s requirements are fulfilled.

Viking Link coordinated a permitting schedule involving 4 NCAs and 4 UK / 2 Danish local authorities with a strong focus on understanding the TEN-E regulation’s requirements and how each of the 4 NCAs interprets its implications within their permitting processes. Through multiple NCA meetings a shared understanding of approaches to environmental assessments and permitting programmes in each jurisdiction was achieved.

Viking Link provides a unique opportunity to offer insights and best practices for the benefit of other developers and for consideration in the TEN-E regulation 2017 evaluation by the EC. Such lessons learned include: I) High value and efficiency can be gained from engaging specialist local consultants with niche expertise of national processes and personnel. II) NCAs can have different perceptions of the requirements and how to align them with national processes – this can lead to ambiguity and “parallel running” between TEN-E and national processes and may create confusion for stakeholders.



Additional information

Viking Link is a 1400MW, 760km HVDC underground and submarine cable with an operational date of 2022.

Initial experiences have already been shared with NGOs, TSOs and developers through DG Energy’s Northern Seas Offshore Grids Regional Group. Further contributions to the Marine Spatial Planning Support Group of the North Seas High Level Group are planned.

More info: www.viking-link.com

Co-financed by the European Union
Connecting Europe Facility

"Regulation on Cost Benefit Analysis (CBA) methodology for the Italian transmission network development plan"

by Italian Regulatory Authority for Energy and Water (AEEGSI)

AEEGSI conducted a series of public consultations and workshops leading to an improved CBA for new grid infrastructure projects. It became national regulation and was already applied to Italy's Network Development Plan (NDP) in 2017.

Highlights

- CBA methodology with 7 monetised benefit categories (as opposed to ENTSO-E's last CBA of 2 monetised benefits)
- Application of improved CBA methodology on the 2017 national NDP
- Alignment with EU level work of ENTSO-E, ACER, EC and other stakeholders of ENTSO-E's Ten Year Network Development Plan (TYNDP)

Scope

While currently the new CBA is applied in Italy, the intention is to discuss its key elements with other TSOs and National Regulatory Authorities (NRAs) in order to foster CBA improvements across Europe.

Description

NDPs contribute significantly to the efficient and effective development of new grid infrastructure. They have become a useful tool to ensure a transparent process and give an overview of expected future scenarios, grid investment needs and their impact on society (routing, costs and benefits). Within NDPs, transmission grid investments are commonly selected based on a techno-economic analysis, including assessing their costs and benefits, and comparing them to alternative solutions. These CBA methodologies are increasingly crucial to better identify high-value projects – with regard to both TSO-internal decisions and the NRA's evaluation.

AEEGSI facilitated the participation of Italian stakeholders and governed a process that led to the further improvement of current CBA approaches. Through the addition of more monetised benefit categories, further clarity on new grid infrastructure needs can be achieved. Positive impacts and benefits for citizens are easily visible and comparable. They can be better communicated and improve stakeholders' understanding of the value of proposed infrastructure projects.

Additional information

AEEGSI coordinated a stakeholder process, which included Terna, RSE (Italian energy research centre), and energy sector stakeholders (utilities, distribution system operators, and their respective associations). The process also took practices of and discussions with ENTSO-E, ACER, other NRAs and the EC into due account.

More info: www.autorita.energia.it/allegati/docs/16/627-16eng.pdf

"EirGrid Community Fund"

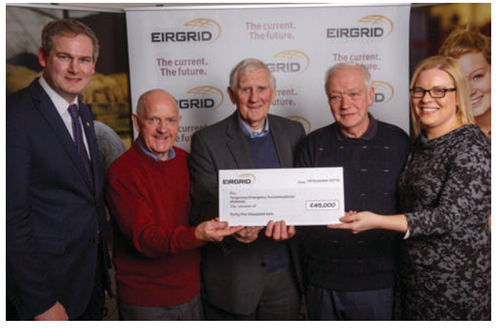
by EirGrid

EirGrid developed a Community Fund in order to provide compensation to local communities who are located closest to new transmission infrastructure. The fund recognises the importance of local communities and voluntary organisations aiming to address issues that those particular communities are facing and provides them with compensation in the form of grants.

Highlights

- In 2016, 37 community groups received funding from the first Community Fund – The Mullingar-Kinnegad fund (music, athletic and sporting organisations, childcare services and support for senior citizens)
- Working collaboratively with independent organisations to decide who benefits from the Community Fund
- This initiative plays an important part in contributing to increased public acceptance of grid projects

Scope



The practice is applied to a specific geographical area surrounding any newly built transmission line. The fund is calculated based on the length and voltage of the new transmission line. In the case of the Mullingar-Kinnegad 110 kV line, the €360,000 fund was available to organisations within 2km on either side of the line which is 34km in length.

Description

When the electricity grid is expanded, communities located close to newly built infrastructure may be affected. Recognising the importance of supporting these local communities can be vital for a project's successful implementation. This is why, in January 2014, EirGrid developed the Community Fund initiative. This was introduced after a consultation process where EirGrid listened to public feedback.

Through the Community Fund, EirGrid delivers and will continue to deliver long-lasting benefits to affected communities by granting financial support to organisations that address relevant local issues (employment, education, improvement of local facilities, energy efficiency initiatives). The benefits of such an approach have already been seen. Not only has feedback from these communities resulted in improving the developed approach, but the development of this practice has also encouraged a change of mindset within EirGrid, acknowledging that building trust with affected communities and establishing open and transparent communication are key to increasing public acceptance of grid infrastructure projects.

Additional information

EirGrid, the Irish TSO, developed the practice over two years in cooperation with the Community Foundation of Ireland (CFI) and in close communication with the Irish Department of Communications, Climate Action and Environment, the Irish Energy Regulator, representative and membership bodies. The Community Fund is now part of EirGrid's company policy and it will be made available for any new transmission infrastructure project.

More info: www.eirgridgroup.com/about/in-the-community/communityfund