

Template for reporting the JIRI Working Groups statement of work

Objectives of this template:

- To inform about the key outcomes and main activities carried out by the JIRI Working Groups.
- To present an overview of the JIRI WGs achievements for discussion with the European Commission representatives and other relevant stakeholders.

JIRI Working Group on ENERGY

Overview

- **MAIN THEMATIC LINES OF WORK**

The EU directive on the promotion of electricity produced from renewable energy sourcesThe EU directive on the promotion of electricity produced from renewable energy sources

The EU-CELAC SOM has been established as a regular bi-regional dialogue on Science, Technology & Innovation to implement the JIRI through biannual Action Plans focus on thematic areas. The SOM assesses the strategic issues and provides recommendations for a JIRI Annual Work Plan that is implemented by the different existing projects (ALCUE NET, ERANet-LAC, EULAC Health, etc.).

The **European Union** has a strong commitment in promoting renewable energy sources. Wind, solar, hydroelectric, oceanic, geothermal, biomass and biofuels are alternatives to fossil fuels that contribute to reduce greenhouse gas emissions, diversifying the energy supply and decrease dependence on the markets - volatile and unreliable - of fossil fuels (in particular, oil and gas). European legislation on the promotion of renewable energies has evolved significantly in recent years. The future framework for action for the period after 2020 is in the process of being discussed. Article 194 of the Treaty on the Functioning of the European Union (TFEU): the Union's energy policy seeks to encourage the development of new and renewable energies. Adapting the electricity network to the ambitious deployment of renewable energy is one of the main objectives of the Energy Union strategy, also supported by the Energy Roadmap for 2050 and the Energy Infrastructure Package. The promotion and development of new generation renewable

technologies is also one of the key elements of the European Strategic Energy Technology Plan (EETE Plan) Renewable Energy

Resources in **CELAC** countries are endowed with abundant renewable energy sources. Solar, wind, biomass, small hydro and other energy resources from the ocean, are available in the region in larger or smaller quantities, depending on the geographical location and morphology of the individual countries. The force of winds can be used to produce mechanical power and electricity by means of commercially available and cost-competitive technologies. Southeast Mexico and most Central American and Caribbean countries are under the influence of Trade Winds, while Southern Mexico and Central America are also exposed to strong and almost constant thermally driven winds. Windy places can also be found in the southern hemisphere. Solar energy is more evenly distributed, as good portions of Latin America lie within the so-called Sun Belt Region of highest solar radiation. Thus, except for site specific adverse microclimates, solar energy is a predictable and reliable resource. As a natural consequence of the solar radiation available, photosynthetic activity in most of the region is rather high, and hence the high production of biomass. On top of that, many countries have an economy based on agriculture, so that agricultural waste, forest residues and other residues from animal rising, which constitute another form of biomass, is also abundant. These resources are difficult to evaluate, so that information in aggregate and analyzed form is scarce. Most countries in the region use already a good portion of their hydraulic potential to generate electricity. However, most operations lie in the multi-megawatt range, seeking economies of scale characteristic of hydroelectric technologies. This practice has left a large portion of the small hydroelectric potential yet to be exploited. Given the high rainfall indices and the rough topography of many countries, small hydropower offers a good alternative to supply electricity, especially in remote sites. Wave and tidal power, along with other forms of energy available in the ocean, represent an enormous energy potential for many countries, especially when one considers the large coastline to inland ratio of most countries under consideration. Unfortunately, technologies to tap such energy resources are still far from commercialization.

The EU-LAC Energy Scientific Working Groups worked in the selection and prioritization defining the specific following topics in the areas previously identified as high added value and mutual interest in the two regions in the Scientific Research Agenda. As a main result from the activities focused in renewable energies organized mainly in the frame of the ALCUE NET project, specific research and innovation areas have been identified as priorities of common interest on which the cooperation should focus include:

Solar thermal:

The European Union and its Member States have committed themselves to achieving a 20% share of renewable energy in Europe's final energy consumption by 2020. To reach this target, the renewable heating sector will have to make a significant contribution since the demand for heating and cooling represents 49% of the total energy demand in Europe. As only three renewable sources (biomass, geothermal and solar) generate heat, it is crucial to clarify how these different sectors can contribute to the renewable energy target. Obviously, solar thermal systems will be needed to provide a substantial share of the low temperature heat: deep geothermal sources are limited to a few locations in Europe and shallow geothermal is considered as an energy efficiency technology to develop.

The Latin America and Caribbean (LAC) region has substantial untapped solar thermal potential for both residential and commercial applications, but experience shows that enhanced trust in the technology is vital for its development. Less than three per cent of the solar thermal potential in the LAC region is used today, but the deployment of better quality assurance mechanisms can result in major market growth. This unique forum brings together key players from the region to share best practices and implement quality assurance mechanisms for solar water heaters in the region. The LAC region has only implemented small amounts of solar technology for the electrification of isolated areas where the deployment of networks and other generation technologies have high development costs. But in recent years, we have witnessed major generation projects in the region, thanks to the political, economic and environmental boost to the expansion of the water heating market. Improved quality assurance capabilities are vital to promote the use of solar thermal energy in the LAC region. Adequate standards, testing, labelling and certification increase the trust that investors and consumers place in this technology, and can lead to significant market expansion when matched with appropriate government policies (Experts and leaders from across Latin America and the Caribbean, San Jose, Costa Rica, 29 June, 2015)

The common topics defined by the Energy working group to work together are:

- Quality Assurance Procedures oriented to the use of certified equipment and its certification, certifications integration, installers harmonization, equipment and installers.
- Thermal energy storage mainly in distributed generation. Indicators for healthy aging in EU and LAC countries

Solar photovoltaic:

Solar energy is the most abundant energy resource on Earth. After hydro and wind power, solar photovoltaic (PV) energy is the third most important renewable energy source, in terms of global installed capacity. A whole range of solar technologies exists to capture the energy from the sun and convert it to deliver heat, cooling, electricity, lighting and fuels for many applications. Around 85% of all new PV systems, though, are based on crystalline silicon technology, which is now mature. Novel technologies are being explored based on nanomaterials and could give rise to breakthroughs in terms of efficiency.

As the cost of PV technology continues to decrease and electricity prices remain high, PV is on its way to becoming commercially competitive in the energy sector. In countries with plenty of sunshine, payback on the initial investment can take as little as two years.

Europe has traditionally been a leader in R&D on PV across the whole value chain. As an example, (figure below) shows the distribution of authors of scientific papers on crystalline silicon for 2011-2014. The three well-known regional centre of excellence are evident: Baden Württemberg and Saxony in Germany and, the Benelux. In contrast for thin film the distribution is much broader, with substantial activity in France, Italy, Spain, Sweden and the UK, in addition to that in the Benelux and Germany. For other technologies an even broader range of activity is seen.

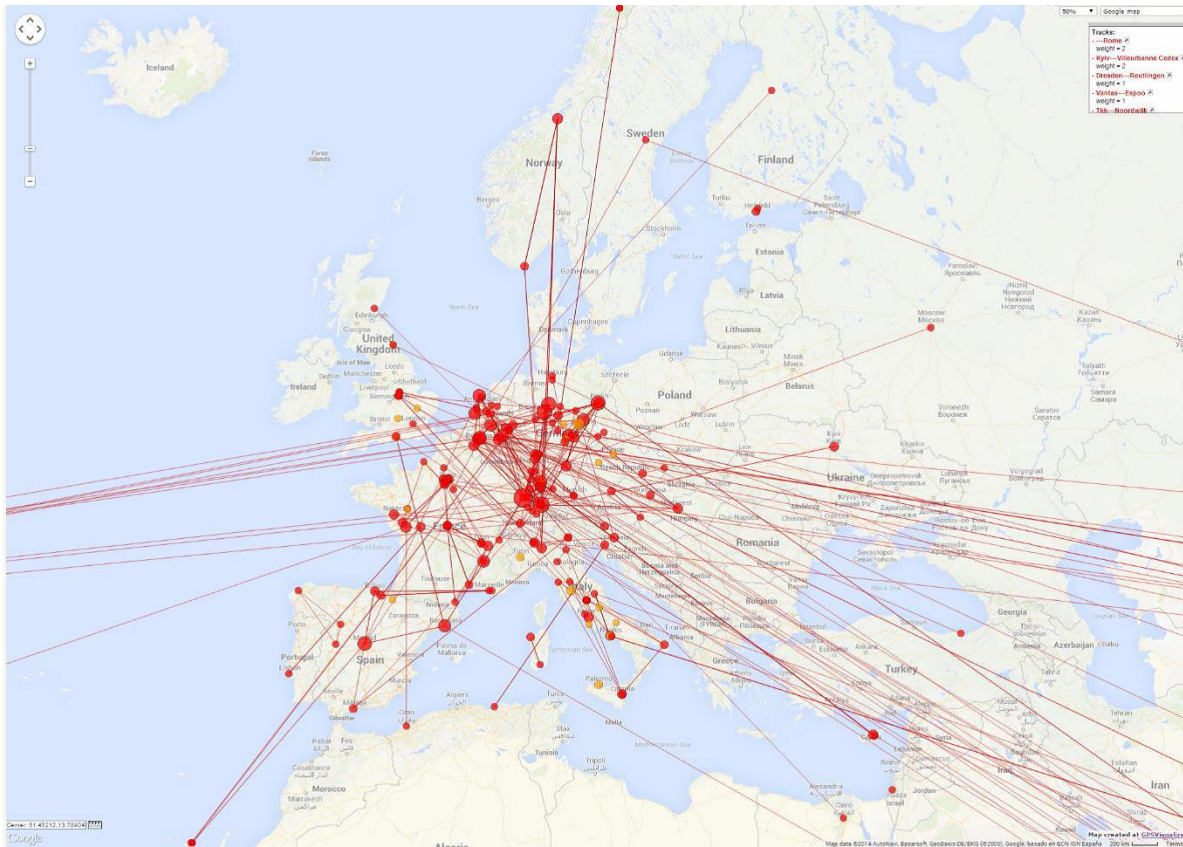


Figure: Geographical distribution of authors of PV research publications on crystalline silicon in the period 2011-2014 from the Scopus database. Author locations are shown as red points, with the size of the point reflecting the number of papers. The red lines indicate links between co-authors. Source: <http://s3platform.jrc.ec.europa.eu/photovoltaic-solar-energy>

Latin America and the Caribbean are geographical areas with the highest solar radiation in the world, registering more than 2200kWh / m² / year. Photovoltaic energy has been recognized as one of the most important alternatives for the generation of energy in these decentralized areas of the CELAC countries. The main components for a photovoltaic system are the photovoltaic generator (solar panels), the storage system, the charge regulator and the current adaptation system. The dimensioning of each of these components became the first analysis to be carried out when installing a photovoltaic system, as this depends on the specific conditions of the site and its requirements. However, the deeper analysis must be done to the logistic process that must be taken into account for the construction of a photovoltaic solar energy project in remote areas of the energy network. For this, there are different restrictions, such as topography, weather conditions, delivery times of service providers and data delivery times.

In the CELAC area they have gone from practically not having photovoltaic installations at the beginning of this decade (2011) to forecasts that augur more than 40 GW installed at the end (2020). That is the panorama that appears before the observers of this ample geographic space, that includes all the territory towards

the south of the Bravo River -one of the border limits between the United States and Mexico- and the southern Chile. Mexico, Brazil and Chile are now leading the move, but Argentina and Colombia are expected to join shortly. Several analyzes justify the basis for this great boom in photovoltaics in the region: the fall in the prices of solar energy in Latin American auctions; the early start-up of several plants under construction in Chile, Mexico and Brazil; that about half of the Latin American photovoltaic will be installed this year in Mexico; and that Latin America will reach 10% of the global demand for solar energy by 2020.

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Quality Assurance Procedures
- Stands alone systems
- Advanced grid integration & large integration of PV in building areas

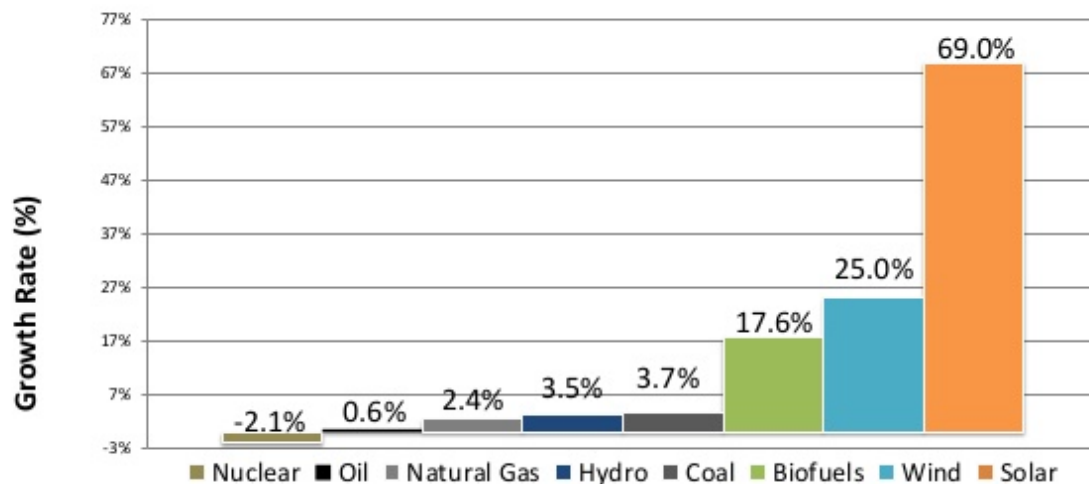
Wind energy:

In December 2014, the installed capacity of wind power in the **European Union** totaled 128,751 megawatts (MW). The EU wind industry has had a compound annual growth rate (CAGR) of 10% between the years 2000 and 2013. In 2014, a total of 11,791 MW of wind power was installed, representing 32% of all new power capacity. In a normal wind year the wind power capacity installed by early 2014 would produce 257 TWh of electricity, enough to supply 8% of the EU's electricity consumption. In the future, wind power is likely to continue to grow in the European Union. According to a European Environment Agency report, wind energy can play a major role in achieving the European renewable energy targets. The European Wind Energy Association estimates that 230 gigawatts (GW) of wind capacity will be installed in Europe by 2020, consisting of 190 GW onshore and 40 GW offshore. This would produce 14-17% of the EU's electricity, avoiding 333 million tones of CO₂ per year and saving Europe €28 billion a year in fuel costs.



Offshore wind turbines near Copenhagen

Wind energy has enormous potential in **Latin America and Caribe**. With its relatively low population density, vast distances and energy needs in remote places, Latin America offers an ideal setting to harness wind energy. Energy needs in windy, but isolated or remote places, such as the Caribbean islands, the mountains and plateaus of the Andes and the Mesoamerican ranges, as well as the region's vast savannahs (*llanos, cerrado, Chaco* and *pampas*), can be met more efficiently by wind turbines than any other alternative. Wind energy is more easily adapted to scale than solar energy: compared to solar panels or solar concentrators, wind turbines generate more electricity relative to the area that they take up, and this difference is growing as wind turbines increase in size and efficiency. Thus, wind energy can be a more appropriate technology in isolated areas with significant energy needs. If planned with care, wind turbine facilities have little adverse effect on ecosystems, and in the region's vast uninhabited spaces, they can have few or no aesthetic and sound impacts either. Several areas in the region are increasingly using wind power. The Caribbean, in fact, has a long history of use of wind energy; many sugarcane mills in the islands were powered by windmills before the advent of highly efficient steam engines burning bagasse. Mexico is, after Brazil (discussed at length elsewhere in this issue of *ReVista*), the second largest market for wind energy in Latin America, particularly in the southern part of the country, where wind conditions are most favorable. Costa Rica, with a strong commitment to renewable energy, has installed the largest number of wind power turbines in Central America, followed closely by Honduras. In the Southern Cone, Chile and Argentina are aggressively investing in wind power. Nevertheless, wind energy is still a relatively underexploited resource across the region, particularly in relation to its vast potential.



Global energy growth by source in the CELAC area from 2007 to 2012. Source: WorldWatch Institute, 2014

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Wind Resource Assessment and short term forecasting
- Wind Turbines: technology for regional manufacturing
- Removing barriers and promoting deployment and acceptance of wind energy: market obstacles, environmental issues, capacities

Bioenergy:

There are two reasons to be optimistic the bioenergy in the EU. First, bioenergy offers one of the most capital-efficient transitions from coal to renewables. In 2011, the European Union produced about 850 terawatt-hours of electricity from coal and lignite; that accounted for about a quarter of energy production. Reducing the share of coal-fired power generation is an essential part of any decarbonization strategy. Biomass cofiring and coal-to-biomass conversions enable generators to use existing coal assets and infrastructure to produce renewable energy. This cannot be said of other renewable-energy sources. Second, bioenergy offers a scalable opportunity for European utilities to take part in the second wave of renewable-energy-source growth. To date, European utilities have captured a limited share of these investments, mostly onshore wind and roof-top solar. Biomass has the significant advantages of being able to serve as a source of baseload power, which wind and solar cannot, and requires no major investments in the grid. With carbon capture and storage still far from happening, bioenergy offers a way for big utilities to comply with renewable targets while using their existing assets.

This topic passed to the GW on Bioenergy created by the SOM.

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Biomass availability and supply;;
- Conversion processes
- Markets and regulatory framework;
- Sustainability

Energy efficiency:

Energy efficiency field in CELAC countries offers great potential for reducing the negative effects of the ever-increasing rates of energy consumption associated with economic growth and the move towards more energy-intensive societal models. The United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) identified some energy efficiency policy recommendations during the Latin American regional workshop on energy efficiency policy recommendations (Lima, October 2014) in different areas as Buildings, Lighting, Appliances & Equipment, transport or industry.

The EU countries are also implementing energy efficiency measures in all sectors, and these have contributed considerably to a decrease in EU energy consumption. The EU's drive towards a more energy efficient future has also produced substantial benefits for Europeans. For instance: new buildings consume half the energy they did in the 1980s, energy intensity in EU industry decreased by 16% between 2005 and 2014, more efficient appliances are expected to save consumers €100 billion annually – about €465 per household – on their energy bills by 2020, EU countries have committed themselves to rolling out almost 200 million smart meters for electricity and 45 million for gas by 2020, leading to better information and savings for consumers and the share of refrigerators in the highest energy efficiency labelling classes (A and above) increased from less than 5% in 1995 to more than 90% in 2010.

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Increasing energy efficiency in buildings
- Heating and cooling
- Increasing energy efficiency in industry and SMEs
- Increasing energy efficiency of energy-related products
- Innovative financing for energy efficiency

- Citizen Engagement, capacity building, governance and communication for energy efficiency main energy.

Geothermal:

Geothermal energy is a type of energy that comes from the Earth's internal heat. It is found in the underground, in places known as geothermal reservoirs, which may be used for productive and domestic purposes. Currently, the world's geothermal resources provide electric energy and energy for direct use equivalent to 167 TWh/year.

It is important to understand that the development of geothermal projects involves a high exploratory risk, which may normally imply between 5 and 7 years of activities and investments prior to operations, including periods of up to 5 years for exploration, sample drilling, and field development prior to the construction of the generation plant.

Installed geothermal capacity in Latin America: Toward the end of 2013, it reached 1,438.3 MW, of which Mexico, with 823.4 MW in operation, concentrated almost 60 percent. It must be noted that to date, in South America there are no geothermal plants for electricity generation despite a potential use of between 550 to 680 GW. According to the latest projections of the International Energy Agency (IEA), Latin America will be generating close to 14.0 TWh in geothermal energy toward 2018, a significant growth of 43 percent, or 4.2 TWh in five years compared to the 9.8 TWh registered in 2013. Mexico, encouraged by the recent energy reforms, plans to contribute with the largest portion of the growth. In South and Central America, multiple geothermal projects are being evaluated. According to the most recent Regional Indicative Plan for the Expansion of Generation in Central America (Plan Indicativo Regional de Expansión de Generación para Centroamérica), of the Consejo de Electrificación de América Central (Central American Electrification Council), it is estimated that the installed capacity for geothermal generation in the region will expand by 701 MW until 2019, at an investment cost of USD 2.662 billion.

Europe is currently the world leader in this technology (2012). The rock fracturing system has been improved for high pressure water injection. The hot water returns to the surface through a system of flows. A heat exchanger transfers the energy to a second circuit that drives a turbine to generate electricity. There are places where geothermal fluids can be found at different depths due to the warming of groundwater when coming into contact with very hot impermeable rocks. In this way, with temperatures above 300 ° C, geothermal aquifers generate large

amounts of steam at high temperatures. The British geological service has carried out a study in Glasgow to explore the presence of geothermal aquifers and map the vast network of abandoned mines under the city.

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Capacity Building: increasing geothermal human capacities in Latin America and Caribbean countries.
- Fostering networks (EU-CELAC) for knowledge exchange.

Ocean energy

Mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.

Despite the high predictability of tidal energy's resource and timing, long construction times, high capital intensity and low load factors will most likely rule out significant cost reductions in tidal technologies in the near term.

Recent favorable developments in wave energy due to the increased focus on climate change include, technological developments in Scotland, Australia, Denmark and the USA, and a high potential for energy supply - wave energy could provide 10% of the current world electricity supply (if appropriately harnessed) - and the potential synergies with the offshore oil and gas industry could be significant. However, there are still a number of unresolved technological issues. The possibility of wave energy unit costs falling to 2-3 pence/kWh within 3 to 5 years mentioned in the commentary is derived from experience of onshore wind energy costs, not from experience in wave energy. Nevertheless, the full utilization of wave energy potential appears to be some way off.

The many benefits of ocean thermal energy conversion (OTEC) include: small seasonal and daily variations in availability, benign environmental performance and by-products in a family of deep ocean water applications, for example food (aquaculture and agriculture) and potable water, and improving economics as a result of higher oil prices. However, a number of key component technologies and further R&D are still needed, in order to be able to build a representative pilot plant to demonstrate OTEC's advantages to prospective investors.

It is acknowledged that there has been little research into utilizing marine current energy for power generation and today no commercial turbines are in operation (thus making the assessment of production costs difficult). There is, however, a large global marine current resource potential which possesses a number of advantages over other renewables, such as its higher energy density, highly

predictable power outputs, independence from extreme atmospheric fluctuations and a zero or minimal visual impact.

Ocean energy has the potential to play a significant role in the future energy system, whilst contributing to the reduction of carbon emissions and stimulating economic growth in coastal and remote areas. Ocean energy has attracted increasing interest, particularly in the EU, which is currently at the forefront of ocean energy development.

Tidal and Wave energy represents the two most advanced types of ocean energy technologies. In the **EU**, the aim is to reach 100 GW of combined wave and tidal capacity installed by 2050. In order to achieve these targets the sector needs to overcome a series of challenges and barriers with regards to technology readiness, financing and market establishment, administrative and environmental issues and the availability of grid connections especially in remote areas. Currently these barriers are hindering the sector's progress; its ability to attract inwards investments and to engage with the supply chain to unlock cost-reduction mechanisms. A number of policy initiatives and mechanisms have been put in place to ensure that ocean energy technologies could become cost-competitive in the short term, in order to exploit the benefits that these technologies could provide to the EU.

CELAC region has huge potential because most of their country has in terms of marine energy, have vast coastline. The Latin American Conference on Marine Energy in 2011 was said that "It is time to discuss marine energy, a non-conventional energy source which there is less known about in terms of its characteristics, impacts and benefits for our region". As an example, Chile, a renewable resource not prepared to be thrown into the shade by solar is ocean energy. With its long coastline of over 4,000 Km, powerful waves and tidal currents, Chile has 164 MW of potential capacity available through marine energy resources, according to the Chilean government's assessment. Chile has the greatest potential in the world for the development of wave energy and will have a competitive marine energy market in coming years. As a consequence, the Chilean government created the national Marine Energy Centre, which was the first to be established in Latin America.

The most interesting common topics to work between both regions were defined by the Energy working group and these are:

- Open ocean energy research infrastructures to research and innovation agents from both areas

- R&D focus on subsystems and components with an increasing number of innovative concepts, to reduce costs into full-scale prototype, tested both individually and as part of the whole device.
- Power take-off systems validation near full-scale in real sea conditions.
- Increase reliability of devices through testing and deployment, permitting the certification of sub-systems and components.
- Data collection/resources evaluation.
- Computational model development for energy production prediction and its validation within existing oceanic platforms and centers.

Smart grids:

Smart grids are energy networks that can automatically monitor energy flows and adjust to changes in energy supply and demand accordingly. When coupled with smart metering systems, smart grids reach consumers and suppliers by providing information on real-time consumption. With smart meters, consumers can adapt – in time and volume - their energy usage to different energy prices throughout the day, saving money on their energy bills by consuming more energy in lower price periods.

Smart grids can also help to better integrate renewable energy. While the sun does not shine all the time and the wind does not always blow, combining information on energy demand with weather forecasts can allow grid operators to better plan the integration of renewable energy into the grid and balance their networks. Smart grids also open up the possibility for consumers who produce their own energy to respond to prices and sell excess to the grid.

A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability”.

The EU aims to replace at least 80% of electricity meters with smart meters by 2020 wherever it is cost-effective to do so. This smart metering and smart grids rollout can reduce emissions in the EU by up to 9% and annual household energy consumption by similar amounts. To measure cost effectiveness, EU countries conducted cost-benefit analyses based on guidelines provided by the European

Commission. A similar assessment was carried out on smart meters for gas. The Smart Grids Task Force was set up by the European Commission in 2009 to advise on issues related to smart grid deployment and development. It consists of five Expert Groups which focus on specific areas. Their work helps shape EU smart grid policies.

On 30 November 2016, the Commission published a proposal stating that all consumers should be entitled to request a smart meter from their supplier. Smart meters should allow consumers to reap the benefits of the progressive digitalisation of the energy market via several different functions. Consumers should also be able to access dynamic electricity price contracts.

In the CELAC regions, a very wide range of energy mix situations and market environments have been detected and a single common motivation for the evolution towards smart grids could not be found in the course of the study, apart from a main unifying idea: the urgent necessity to reduce system losses and increase the electricity system efficiency. Each LAC country shall therefore find its own ideal balance of technologies and develop its own smart grids roadmap. CELAC countries are characterized by system losses and electricity thefts that in some regions reach level beyond international benchmark. Smart grids can give an outstanding contribution in the increase of the system efficiency and in helping enhancing access to energy and electricity. CELAC governments and stakeholders should foster the development of regional smart grids.

The most interesting common topics to cooperate between both regions were defined by the Energy working group and these are:

- Observability and control (including ICT for control)
- Modelling power systems and ICT together
- Observability at distribution level (including ICT for control)
- Smart grids for distributed generation using renewable energies
- Consumer maturity (including software to optimize user behaviour)
- Power technology to increase network flexibility
- Software simulation technologies generating the tools for a better planning and management of the system (enabling the participation of variable renewable energy sources, integrating storage and distributed generation, and adequate support for the new wholesale markets, specifically regarding value assessment of resources, dispatch decisions and pricing of each generator on a short time basis)

- **LIST OF COUNTRIES AND INSTITUTIONS INVOLVED ON THE JIRI WG**

ALCUENET AND ERANET-LAC COUNTRY PARTNERS: Argentina, Austria, Barbados, Belgium, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Finland, France, Germany, Guatemala, Italy, Latvia, Mexico, Norway, Panama, Peru, Poland, Portugal, Romania, Spain, Turkey and Uruguay.

- **SYNERGIES GENERATED WITH RELEVANT INITIATIVES AND KEY STAKEHOLDERS**

- The activities carried out within ALCUENET, joint to the synergies with ERANETLAC, and focused in the EU-CELAC Collaboration increased:
 - The information provided during the life of ALCUENET to stakeholders facilitated the access to cooperation.
 - The collaboration between the regions in short and medium term.
 - The development of researcher networks. The different ALCUENET events have being very useful to:
 - The information provided by the ALCUENET action facilitated the access to cooperation between both regions.
 - To extend and maintain stakeholders professional networks.
 - The dialogue between researchers and S&T stakeholders in general and policy makers was important to feed the policy dialogue.
 - They actions work as matchmaking events. Leading minds from both regions in the thematic field of the workshop were connected.
 - The dialogue created new research actions
 - Stakeholders gained relevant complementary knowledge, expertise and skills.
 - The different workshops created international visibility of scientific works from the different countries.
 - The communication channels of contact between states, funding agencies and R&D institutions.
 - The development of cooperation agreements
 - The mobilization of funds

- The synergies with other programmes like ALCUENET and CYTED were important because the number of application to de different calls increased.
- It was also detected synergies with the CYTED programme. CYTED General Assembly launched in 2017 the Second Call (2017) for Action by CYTED in "Projects on strategic issues" that projects financed with CYTED funds and with external contributions from the member countries. One of the strategic themes in which the call is centered is "the use of Biomass Waste in the Production of Transport Fuels"

- **BARRIERS IDENTIFIED ON THE BI-REGIONAL COOPERATION**

But if we want to maintain or increase the current cooperation level between both regions, it is important to take into account also the barriers to overcome like:

- **Financial restrictions:** it is necessary for any single country from both geographical areas to keep working in maintaining its funding commitments. For this task, the EC has a special role because with the EC plan and launch of programmes is encouraging the EU-CELAC countries in going ahead with this strategic cooperation and in improving its levels of commitments.
 - The cooperation between research institutions and private sectors should be promoted in order to reach **innovation**. During the life of ERANETLAC and ALCUENET the action has been focused mainly in basic and applied research and some technological development. Thus in the next actions the innovation should be more present to achieve social challenges and to be more in the line of H2020.
- **OUTCOMES SO FAR: MOST VISIBLE ACTIVITIES; MAIN DELIVERABLES; IMPACT AND ADDED VALUE**

The activities carried out in support to the scientific policy bi-regional dialogue between the European Union and Latin America and the Caribbean for the renewable energies area in the frame of Working Group on Renewable Energies for Societal Challenges have sought the following objectives:

- Generating a thematic bi-regional dialogue both at a technical and a political level in support to the implementation of the JIRI's Road Map in the renewable energies area, particularly in bio-energy, wind energy, solar –photovoltaic and thermal energy, and energy efficiency.
- Identify and bring together stakeholders representing industry, researchers and policy makers from EU and LAC, the European Commission and the EU and LAC technology platforms.
- Developing relevant background documentation for the identification of current principal policy, institutional and technical limitations and opportunities; possibilities for policy coordination (policy components, sharing of experiences and best practices).
- Identify cooperation activities to be developed in renewable energies among EU and Latin American and Caribbean countries and identify appropriate instruments, mechanisms and funding schemes for coordinating and financing joint research, technology development and innovation activities.
- Discuss European and Latin American public policies concerning the renewable energies
- Produce inputs for the Renewable Energies SOM working group.

I. BACKGROUND

The European Union seeks to reinforce its cooperation in Science and Technology (S&T) with different regions of the world so as to increase its capacity to solve global issues and major challenges. To this end, the European Commission has provided the 7th Framework Programme for Science and Technology (FP7) with INCO-NETs which are instruments to deepen the bi-regional dialogue on research policy and to strengthen the bi-regional coordination of science and technology cooperation between the EU and other regions.

The EULARINET project (European Union – Latin American Research and Innovation Networks) (<http://www.eularinet.eu/>) is the INCO-Net focused on Latin America and as such, this project aims at further deepen the bi-regional dialogue on S&T between the European Union and Latin America.

EULARINET stems from the agreed common vision for S&T cooperation between Latin America and the European Union that evolved during the Summits process.

During the VI EU-LAC Summit of Heads of State and Government which took place in Madrid on May 18th, 2010 the EU-LAC (European Union – Latin America and Caribbean) Joint Initiative for Research and Innovation (JIRI) was endorsed and its Roadmap was approved in the EU-LAC Senior Officials Meeting (SOM) of March 2011 in Brussels.

During said SOM Meeting the renewable energies area was one of four specific areas selected for defining and developing bi-regional pilot activities on which the enhanced bi-regional cooperation will be developed within the framework of the JIRI.

Following the conclusions of the Brussels SOM and in agreement with the activities mentioned in its Roadmap, EULARINET has contributed to support the S&T bi-regional dialogue throughout the organization of two bi-regional workshops and complementary activities in renewable energies as described as follow:

Phase 1: Meetings for discussing the Background documents on EU-LAC joint priorities

- a) Madrid, 11th -12th May 2011 and GENERA 2011
- b) May 16th – 25th 2011: Series of videoconferences on solar, photovoltaic, wind energies as well as bioenergy (Background documents downloadable from EULARINET web page)

Phase 2: Workshops on implementation of activities

- a) Rio de Janeiro, 31st August – 1st September 2011 (Wind Energy summing up)
- b) Mexico, 21st -22nd September 2011 (Bioenergy and Solar Energy summing up section + Renewable Energies SOM Working Group meeting after working sessions)

The works of both the workshop on renewable energies held in Mexico City on September 21-22, 2011 and in Rio de Janeiro, Brazil on August 31st and September 1st, 2011 are therefore part of a pilot initiative to develop and implement the EU-LAC (European Union – Latin America and Caribbean) Joint Initiative for Research

and Innovation (JIRI), adopted on the Senior Officials' meeting (SOM) on Science and Technology organised in Buenos Aires, Argentina, on February 25-26, 2010.

This document compiles the preliminary pilot activities on solar thermal energy, solar photovoltaic energy, bioenergy and wind energy.

The proposals for pilot activities have been summarized trying to following a common structure:

- Priority setting based on the analysis of the R&D recommendations for EU-LAC cooperation
- Common specific subareas of cooperation
- Proposed cooperation activities
- Pilot projects and partners
- Goals and timeline
- Budget estimate
- Proposed funding schemes and instruments
- Final recommendations

In certain areas some fields have not been thoroughly worked out since the EU-LAC SOM Working Group on Renewable Energies will further work on policy coordination options, joint RTI project implementation instruments and funding options.

II. DURING THE ALCUE-NET PROGRAMME

In the field of Renewable Energy four main areas were identified (*Bioenergy, Solar Thermal Energy, Photovoltaic Energy and Wind Energy*), including *Energy Efficiency* as a horizontal issue in every area. The themes have been selected considering the potential for EU-LAC cooperation, the added value and the alignment with the EU and LAC priorities (i.e. *EU SET-Plan*).

After many years of cooperation between both areas there are many overcome barriers like:

- The definition and continuous updating of common interest areas for cooperation between EU-CELAC countries.

- The coordinating common activities between countries with different legal systems and legal procedures.
- The mobility of human resources between EU-CELAC also has experiment an important improvement.
- The ability of researchers in finding suitable partners inside EU-CELAC countries to take over new R&D projects and share complementary knowledge.
- And the development of communication channels to inform to research and innovation institutions about the possibilities of cooperation.

Attending to the most visible outcomes we would like to make to the experts meetings organized by the group:

ALCUE NET –European-Latin American Workshop on Renewable Energies, October, 2013, Mexico.

The objectives of the workshop were: to validate the topics for cooperation, to define the bi-regional priority areas for pilot activities including wind, solar and bioenergy, as well as energy efficiency, to implement specific activities expecting to eventually evolve into a full bi-regional cooperation platform and to support the implementation of activities ranging from foresight to agenda setting and actual joint instrument implementation in the energy theme.

During the meeting additional expert meetings focused in identifying and designing further joint initiatives for cooperation and promoting innovation. Mapping and analysis of country potential is in process: collection, processing and centralization of key information focused on the renewable energies in LAC and European Union (1st phase), analysis of country potential -critical mass of researchers and research organizations from both the private and public sectors; current cooperation with EU counterparts. Exhaustive list of on-going relevant -national, regional and EU-LAC-STI programs, projects platforms (ETPs) with relevance on the thematic area-FP included (2nd phase).

To follow up existing “Observatories”- “Observatorio de Energía Renovable para América Latina y el Caribe” under OLADE (Organización Latinoamericana de Energía) et al was other of the actions taken over.

Two strategic approaches towards Energy Efficiency were proposed within the implementation plan of the activities in the frame of ALCUE NET project in the energy area:

- I. the “Integrated Road Map” by the EC that will put forward key research and innovation actions to be undertaken in the next 6 years and will be the basis for EU, national and multi-Member State activities, and can serve as well, as a basis for private investments in energy research and innovation. In this approach energy efficiency is horizontal to solar thermal photovoltaic, wind and bioenergy;
- II. based on the EU energy efficiency policy, full potential of energy efficiency, focus on end use consumption is prioritized and according to the “Secure, clean and efficient energy Challenge”. Areas related to buildings: heating & cooling, industry aspects and - products development

During the Energy WG meeting the topics to include in the First ERANet-LAC Joint Call were validated taking into account the consideration of the Funding Agencies participating in ERANet-LAC.

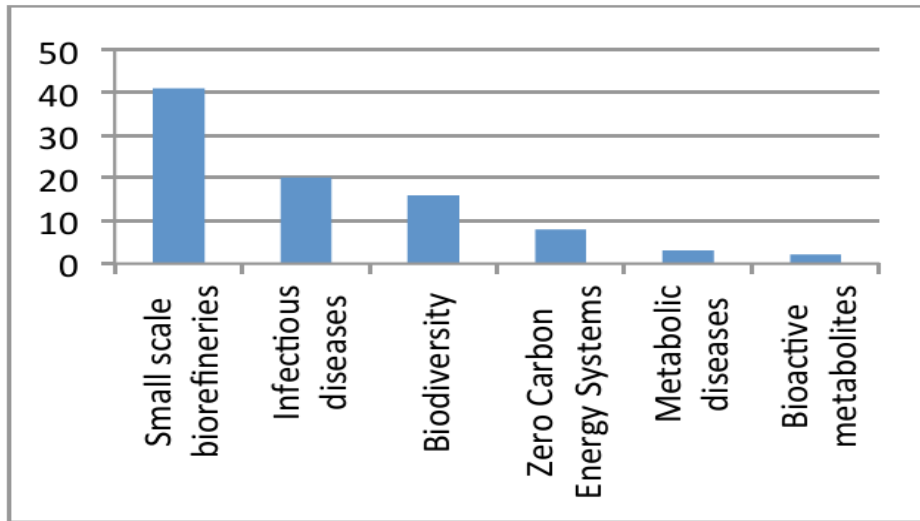
In order to fund research activities, a ranked list of themes was elaborated and presented to the EU-CELAC SOM, which selected along with technical experts the topics included in the first call of the ERANet-LAC:

- *Small-scale self-sustainable biorefineries for multi-feedstock processing of agro-industrial and urban wastes for advanced biofuels, biobased chemicals and biomaterials.*
- *Towards Zero Carbon Energy Systems for heating and cooling in industrial processes by means of solar technologies including the envelopes of the buildings.*

The selection process was based on an open and flexible approach, integrating some of the themes to involve more stakeholders and achieve a greater impact of the projects.

In November 2014 was launch the **1st ERANet-LAC joint call** and in the field of energy 49 proposals were submitted and 2 project funded.

No. of proposals per thematic area



The first transnational call under the ERANet-LAC project was successfully completed on 27th November 2014. The 20 participating funding organizations from Europe, Latin America and the Caribbean countries received a total of 90 proposals. The proposals submitted in the first joint call address the following thematic fields: Biodiversity (18%), Bioeconomy/Energy (57%), and Health (25%).

Some of the expert comments made reference to;

- the funds available in the 1st ERANet-LAC call telling that there are not sufficient funds to perform research projects, since achieving significant improvements in the state-of-the-art of some of the current technologies has a high cost. Moreover, it is necessary to perform further studies and test to detect the more efficient technologies to be used.
- To gather Governmental Plans related to Renewable Energy and identify business/ investment opportunities to encourage companies.
- To establish a standardised measurement procedures and reliable data. Many of the projects/ studies related to metrology require larger implementation-time and budget.
- One of the Energy WG recommendations would be to establish an EU-CELAC Energy thematic project, to support the activities in the area in a more efficient way.

ENERGY TOPICS:

Topic 1: “Towards Zero Carbon Energy Systems for heating and cooling in industrial processes by means of solar technologies including the envelopes of the buildings”: Specific Challenge: Three complementary approaches towards reliable and competitive energy systems reduce carbon consumption considering the whole life cycle and economic and social impacts: The first is related to medium solar thermal temperature for heat production coupled to industrial processes; the second implies heat pumps or cold/ice production for refrigeration; the third concerns industrial buildings and offices design to integrate solar technologies for climate control (HVAC) or even self-energy production..

Topic 2: “Small-scale self-sustainable biorefineries for multi-feedstock processing of agro-industrial and urban wastes for advanced biofuels, biobased chemicals and biomaterials”. Specific Challenge: A sustainable use of biomass sources requires re-thinking the current biomass processing chain in a more efficient manner including not only energy production but also other added-value products. The development of self-sustainable biorefinery plants with minimum production of residues and minimum consumption of fossil energy is an important challenge from an economical and environmental point of view. The development of small-scale units for the treatment of mixed or flexible biomasses/wastes from different sources (agro-industrial, urban wastes or food-processing wastes) will contribute to the debottlenecking of biorefineries development. The EU-LAC Energy Working Group started to work in bioenergy items but lately it pass to be competence of the The EU-LAC Bioeconomy Working Group.

In the energy topic participated **Argentina, Chile, Dominican Republic, France, Mexico, Norway, Panama, Peru, Portugal, Romania, Spain, Turkey, Uruguay.**

ALCUE NET – Latin America, Caribbean and European Union Policy Dialogue Meeting on Renewable Energies, March 2014, Mexico City, Mexico

In order to advance in the JIRI implementation, the Renewable Energies SOM Working Group met in Mexico City on March 12th, 2014 to review their progress, the results from the workshops and meetings and agreed on aspects oriented to the implementation of pilot activities and the way to go forward towards the SOM 2014.

The meeting was focused on the Bi-regional dialogue on EU-LAC R&I cooperation related to energy research agendas. This policy dialogue involved key actors from governmental institutions as well as representatives from international organizations, universities and experts from EU-LAC countries who provided inputs regarding energy policies, programmes and instruments in order to

- a) foster coordination of national programme priorities, joint initiatives development and good practices activities,
- b) advance in designing mechanisms and measures to stimulate synergy among the proposed activities.
- c) review inputs for the Senior Official Meeting in 2014.

During the plenary sessions, relevant EU-LAC initiatives related to renewable energies were presented with the aim to improve quality and effectiveness of scientific and technological cooperation through increased exchange information.

Based on the information previously distributed and presented in the plenary sessions, the participants explored the possibilities to working jointly with other institutions in matters related to applied research and technological innovation in renewable energies looking for synergies.

During the plenary sessions, relevant EU-LAC initiatives related to EU-CELAC international cooperation and to renewable energies were presented with the aim to improve quality and effectiveness of scientific and technological cooperation through increased exchange information.

The EU Strategy for international cooperation in research and innovation – H2020 and the EU-LAC regional cooperation for research and innovation was presented focusing on energy research and innovation as one of the key priorities in Horizon 2020. The structure of the key societal challenge "Secure, clean and efficient energy" was explained as it is structured around seven specific objectives and research areas (Reducing energy consumption and carbon footprint; Low-cost, low-carbon electricity supply; Alternative fuels and mobile energy sources; A single, smart European electricity grid; New knowledge and technologies; Robust decision making and public engagement; Market uptake of energy and ICT innovation) which are of common interest for both regions.

To understand the spirit of the EU-CELAC collaboration and the JIRI process is of great help particularly as it is presently in the basis of the bi-regional collaboration. General ideas, objectives and structure of the Joint Initiative for Research and Innovation (the JIRI), the SOM working groups and the pilot initiatives as well as

the EU-CELAC Action-Plan 2013-2015 and Road map were presented as the current scenario of the EU-CELAC collaboration on research and Innovation in the political framework.

There are several initiatives supporting the implementation of the JIRI. The INCO-Nets provided by the European Commission through the 7th Framework Programme for Science and Technology (FP7) have served as instruments to deepen the bi-regional dialogue on research policy and to strengthen the bi-regional coordination of science and technology cooperation between the EU and other regions.

The Bi-regional S&T Cooperation activities on Renewable Energies were introduced by presenting a summary of the objectives, activities and results of the INCO-NET projects ALCUENET, ENLACE & EUCARINET. Dr. Jorge Mendoza Vega, from ECOSUR Mexico and Dr. Carlos Meza Benavides, from UNESCO-International -Centre for Theoretical Physics (ICTP) presented ENLACE and EUCARINET as they have been involved in both projects producing deliverables on renewable energies cooperation. A video of ENLACE was reproduced.

The ERANet LAC project was described in detail stressing the fact that this type of international cooperation project sponsored by the European Commission through its Framework Programme is aimed at developing and strengthening the coordination of national and regional research programmes by providing a framework for the actors that implement public research programmes for them to coordinate their activities, e.g. by developing joint activities or by mutually supporting joint calls for trans-national proposals.

The Renewable Energies SOM Working Group worked in a series of recommendations for pilot activities. The lines for action for pilot activities for potential EU-LAC collaboration in renewable energies presented include:

- Coordinated activities funded through specific projects, joint/coordinated calls and 'twinning'.
- Actions to promote and support networking and exchanges between research organisations in on-going or planned projects, and for the establishment of thematic networks and strengthening capacity building and regulatory framework.
- The development of long term strategic proposals in order to better linking research and technological cooperation structures and nets as a first step towards what, in the medium or long term, could become LAC Technological Platforms on renewable energies.

ALCUE NET – Energy Workshop, November 2014, Seville, Spain

- The main objective of the ALCUE NET Energy workshop was to promote high-quality Research, Development and Innovation projects in the field of Renewable Energy and Energy Efficiency and to facilitate further collaboration between the research and the industrial sectors.
- Therefore, the meeting involved scientific experts from the two regions addressed by ALCUE NET project, the European Union and Latin America & the Caribbean, as well as representatives of the consortium, including funding agencies involved in the first call of the ERANet-LAC.
- In order to facilitate the dialogue with the industrial sector, the workshop was organised in the framework of the international conference on Concentrated Solar Power *CSP Today 2014* in Seville, which involved representatives of the most relevant companies working on solar energy and other renewable energy technologies.
- After the ALCUE NET Energy workshop, the participants had the opportunity to attend the CSP Today 2014 session focus on Research and Innovation issues and to visit the networking and exhibition area.

During the Energy WG meeting the topics to include in the 2nd ERANet-LAC Joint Call were validated taking into account the consideration of the Funding Agencies participating in ERANet-LAC. The design of the 2nd ERANet-LAC Joint Call is strongly oriented along the identified topics. Wind Energy - Advancement of small/medium-scale wind turbines in EULAC countries with the participation of Argentina (MINCYT), Brazil (FAPERJ and FAPESP), Dominican Republic (MESCYT), Finland (AKA), Latvia (VIAA), Mexico (CONACYT), Panama (SENACYT), Spain (MINECO), Romania (UEFISCDI), Turkey (TUBITAK), Uruguay (ANII), and solar thermal energy - Energy storage technologies with the participation of participation of Argentina (MINCYT), Brazil (FAPERJ and FAPESP), Chile (CONICYT), Finland (AKA), Latvia (VIAA), Mexico (CONACYT), Panama (SENACYT), Peru (CONCYTEC), Poland (NCBR), Romania (UEFISCDI), Spain (MINECO), Trinidad and Tobago (NIHERST), Turkey (TUBITAK), Uruguay (ANII)

Energy Workshop in Seville organized a technical visit to the Solucar complex is the largest solar thermal and photovoltaic facility in Europe that currently has 183 MW in operation, including the following solar power plants:

- *PS10 (10 MW): is the first commercial plant in the world to use tower technology. It has been operating successfully since mid-2007, supplying clean energy to the power grid. This technology was developed by Abengoa Solar in collaboration with important research centres, such as Ciemat and the DLR, in addition to a variety of universities.*
- *PS20 (20 MW): is the world's second commercial power tower that has been operating since mid-2009. It has technological enhancements with respect to PS10, such as a more efficient receiver, a range of improvements to the control and operational systems, as well as an improved thermal energy storage system.*
- *Solnova 1, 3 and 4 (50 MW/ plant): these three plants use parabolic trough technology developed by Abengoa Solar and feature significant design enhancements. The ASTRØ parabolic trough has superior precision and an exclusive construction and alignment process.*

In addition, the complex comprises a research and development site, with a variety of new technology demonstration plants.



ALCUE NET- Latin America, Caribbean - European Union workshop that will take place in Salta, Argentina on December 9th – 11th, 2014 which will be focused in Geothermal Energy.

Objectives of the meeting were to determinate the potential of geothermal energy

"Endogenous fluids" are caused by the internal heat of the planet Earth, and are responsible for providing the so-called "Geothermal Energy" associated especially with volcanic activity. This non-conventional energy resource, is common to almost all countries in Latin America and the Caribbean and many EC countries, thus constituting a huge energy potential still undeveloped. The Andes, the backbone of

the Americas, especially of the so called "Andean" countries - with more than 1500 volcanoes, is one of the most important "target" of the world in terms of exploration and discovery possibility of geothermal energy. This energy resource especially in synergy and combination with other alternative energies (especially wind and solar) sources, is a major possibility (if not the only!), especially in remote areas (i.e. Highland Plateaus - Altiplano and Puna area) where there are no other sources of energy, which could allow the development of the mining industry in particular and improving the quality of life for residents.

In order to enlarge the scope of Within the SOM political agenda in Science and Technology geothermal energy is the only non-conventional energy still not now included with the aim of further explore and increase the opportunities for bi-regional cooperation in the area of energy. In subsequent activities and meetings of the ALCUENET Project in the area of non-conventional Energy as well as in several output reports (IE "State of the Art in Science Technology and innovation related to the renewable energy in LAC countries"), Geothermics often appeared as an "unfinished business" that is of interest to be developed at the bi-regional level, as well as capacity building and training of human resources in the area as a common priority to both regions.

In view of the above mentioned reason, the following guidelines have been proposed for this workshop:

- Include Geothermic in the biregional political agenda in science and technology.
- Develop mutually beneficial exchange of know-how between both regions.
- Discuss the possibility of developing a proposal for "capacity building" to train subject-oriented specialists at the biregional level.

Submit and discuss the development of research development and innovation projects, in the area and explore the possibilities for bi-regional cooperation in Horizon 2020.

In Salta (Argentina), from 9 to 11 December 2014, different experts in geothermal research met to share the different experiences in Latin America – Caribbean, and European Union countries concerning geothermal development. Different topics were analyzed in this meeting. One of the central topics was “capacity building”, as a way to improve the geothermal industry in the region.

During the two days' workshop, European geothermal experiences in Island, Italy, Germany, Finland and Portugal were presented. From Latin America, experiences from Argentina, Mexico, Brasil, Uruguay, Colombia, Ecuador, Costa Rica, Chile and the English speaking Caribbean countries were also presented, showing the different geothermal development in these countries. There is only one geothermal power plant in South America (Copahue, Argentina), inactive since 1998. In Mexico and some Central American countries, geothermal energy contributes to the energy mix. Costa Rica in particular has some interesting experiences. In all these countries geothermal energy has developed with strong state support. The extent of exploration varies in different South American countries, there are major differences, both the level of potential of the resource geothermal, in its various types of low, medium and high enthalpy, and the degree of development and use of each of them, Chile being probably the most developed country in the region in geothermal exploration programs. A first geothermal power plant from the ENEL Green Power Italian company could be installed in Northern Chile by 2018.

In many regions of Latin America, where the main centers of consumption are far from the volcanic regions, there is still a large potential for using low enthalpy geothermal energy at near surface depth (2 to 60 m), i.e. ground source heat pumps for heating and cooling or simply buried tubes. In the case of Argentina, in the center and northern part of the country, where more than 90% of the population lives, the ground temperatures are about to $19\pm 20^{\circ}\text{C}$, which is already close to the comfort temperature in Winter as well as in Summer. This situation is probably similar to that in many other countries at similar latitudes. Given that the amount of primary energy used for heating and cooling is close to 20% in these regions, the economic impact of this technology is very important. Furthermore, the investments are relatively small, and can be implemented in small scale prototypes. Its impact is comparable to the distributed energy generation. In Buenos Aires, Argentina, UNSAM, INTI and ENARGAS have formed a collaborative team that has been working in this area for the last 2 years.

It was discussed in a Round table about the priority themes for recommending that they be included in the agenda of future calls. The main conclusion was that you recommended the inclusion of the energy Geo Thermal (in all its forms) as non-conventional energy to be included in policies for science, technology and innovation of the two regions, as well as their inclusion in future calls for the various calls for projects and funding. The study of energy geo thermal at this stage cannot be limited to specific, and must take the area entirely. With emphasis on its use to society, and the impact positive that you will have the use of a little-used natural resource.

Therefore, this group of experts proposed and identifies to the "Geo Thermal and society" as a topic to be taken into account for future opportunities for collaboration and financing within the framework of bi-regional research programs.

The Latin-American region show that one of the main barriers to develop intensively the geothermal industry in the region is in relation with the lack of human resources: geologist, hydrogeologist, engineers, etc. In some countries there is not experience in deep drilling and in some others; no main post-graduate and/or certificate courses are available. Only in El Salvador is currently giving a Geothermal Certificate by a join between Universidad de El Salvador and the LaGeo company. This certificate is supported by BID funds, and a GZB-CEGA study has been recently done analyzing the sustainability of this course in the future.

The present document/proposal will be aimed at

- implementing possible EU-CELAC short time joint actions/short term courses in geothermal energy;
- explore the possibilities for a Masters in geothermal energy (EU-LAC) taking into consideration the need of experts in this area in both regions

It is necessary to develop an international network for geothermal development in the region, which should include both, high enthalpy and low enthalpy alternatives. The Andean Geothermal Center of Excellence (CEGA, www.cega.ing.uchile.cl) in Chile and the Mexican Center for Innovation in Geothermal Energy (CeMIE-Geo, <http://www.cemiegeo.org/>) in Mexico are the only centers currently established in the region with training programs and geothermal research development. Other universities in the region also perform geothermal research but have no specific geothermal training courses.

The main actions concerning training that could be developed in the region would be:

In the short-term:

Based on the experience of Chile (2006, Diego Morata) and Mexico (2007, Rosa María Prol Ledesma) in the organizing itinerant UNESCO-SEG-SGA Latin American Metallogeny Course (http://cms.unige.ch/sciences/terre/research/Groups/mineral_resources/latinometal/latinometal.html), it could be possible to propose a similar itinerant model for a Latin American course on Geothermal Energy, that could be organized every year in a different country. This itinerant course has a theoretical part (4-5 days of lectures) and a practical part with 4-5 days field work. The organization of these

itinerant courses requires the presence of an AL-C-UE scientific board, with a general coordinator of the course that would alternate periodically, and the different national coordinators.

To develop this kind of course, issues such as grants, travel and local administration must be addressed. Nevertheless, in spite of the complexity of this type of itinerant courses, in particular at the beginning, the long term experience of the UNESCO-SEG-SGA courses on Metallogeny (next year will be the 15th edition) suggest that a similar initiative could be possible and realistic. Some support from the IGA-Academy and IRENA could also be feasible.

It is necessary to explore different mechanisms to support this idea, but the UNESCO experience reveals that large quantities of money are not necessary to carry out these courses.

In the long-term:

The possibility of having an International Geothermal Master Degree UE-LA was discussed. This concept seems to be more difficult to develop in a short time because:

- various universities involved in the MSc degree could imply big administration;
- a MSc degree must be granted by a University
- grants for students would be necessary
- additional money for to develop MSc thesis will be necessary
- normally each University will want to have its own MSc degrees
- it could also be necessary to define a “Claustro” (teaching board) and establish a MSc program

Conclusions

A real need and demand for geothermal human capacities in Latin America and Caribbean countries is evident from the presentation of researchers from different countries. The programs should include both high enthalpy and low enthalpy studies.

Training programs must be developed by the two established research centers in the region: CEGA in Chile and CeMIE-Geo in Mexico.

Itinerant (once every year in a different Latin America-Caribbean country) short courses (two weeks, including lectures and field work) seems to be the more realistic way of training in the short-term. Some experiences such as the International Volcanological Central Andes field course, (INENCO-GEONORTE – Salta, Argentina; www.unsa.edu.ar/~geonorte/cursos/curvol2014.htm) are very successful.

An International Master Degree would require the additional collaborative work of the different universities involved.

A Latin American Geothermal board seems to be necessary to organize future activities in the framework of the ALCUE-NET program.

WORKING GROUP

A working group with people from different countries was been established at this meeting. The first goal for this working group would be the elaboration of documents/proposals on Capacity Building in both Latin America - Caribbean and UE countries, focused on geothermal energy as proposed in the discussion session in Salta. The aim of this document is to contribute to enhance the bi-regional cooperation and benefit both EU and LAC scientific communities.

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Energy Working Group presentation and discussion during the ERANet-LAC Consortium Meeting and Final Funding Decision Meeting Panama, 6th – 8th September 2016

During the Panamá meeting the WG leaders presented the Potential pilot call on research and innovation in renewable energies.

The idea of this potential call was to follow the mandate of the SOM in the field of Opening Research Infrastructures from both regions showing a possible way to share infrastructures between S&T stakeholders from both regions.

During the meeting were discussed:

- The objectives and importance of an action enrolling energy RI
- The way of implementing the action and its feasibility
- The initial interest from the countries in participating.

ALCUE NET – Energy Workshop, December 2016, Gran Canaria, Spain

Objectives of the meeting

The meeting we are inviting you to participate in Spain will focus on addressing the perspectives for research and innovation infrastructure availability and the implementation of joint pilot call in the field of Renewable Energy in Research Infrastructures (RIs) in the EU-CELAC region for R&I cooperation related to energy research and innovation agendas.

Discussions will involve key players from funding organizations from more than 20 EU CELAC countries, as well as representatives and S&T experts in the field of renewable energies, as well experts in large infrastructures management.

The participants will be encouraged to explore different possibilities for managing and supporting a bi-regional pilot joint call on renewable energies performed in a large research infrastructures.

The success of this initiative will open the door for defining new calls in various thematic areas based in CRA spirit of sharing S&T infrastructures and also facilitate the mobility of researchers thanks to the commitment of countries from both regions.

Topic 6 ENERGY: Solar thermal energy - Energy storage technologies

Specific challenge: Solar energy is electromagnetic energy incident on the earth's surface intermittently. This energy can be stored as thermal, chemical or electrical energy. The existing technologies such as supercapacitors, thermal storage tanks sensible heat or solar fuels production requires further development for mass use. Improved solar energy technologies at lower costs and higher performance are needed in order to contribute to variable renewable energy sources.

Scope: Improve and develop new heat storage technologies towards energy applications in a variety of places addressing environmental issues.

Expected impact for both regions: Both regions would count with new technologies for storing solar energy aimed at generating potential for a wider use of them; lowering its costs and increasing the use of solar energy in all sectors, contributing to transform the global energy system.

- **NEXT STEPS TO REACH IN 2016-2017 (ACTIVITIES AND OUTCOMES)**

Possible contribution to the Common Research Area
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- **PILLAR OF MOBILITY**

To promote the Marie Skłodowska-Curie actions (MSCA) could be one of the most efficient ways to enhance mobility of researchers. The MSCA provide grants for all stages of researchers' careers - be they doctoral candidates or highly experienced researchers - and encourage transnational, intersectoral and interdisciplinary mobility. The MSCA enable research-focused organisations (universities, research centres, and companies) to host talented foreign researchers and to create strategic partnerships with leading institutions worldwide.

- **PILLAR OF INFRASTRUCTURES**

Research Infrastructures are a key instrument in attracting and bringing together researchers, funding agencies, politicians and industry to act together and tackle the cross-disciplinary scientific and technical issues of critical importance for our continued prosperity and quality of life.

Research Infrastructures are facilities, resources or services of a unique nature that have been identified by European research communities to conduct top-level activities in all fields.

This definition of Research Infrastructures, including the associated human resources, covers major equipment or sets of instruments, in addition to knowledge-containing resources such as collections, archives and data banks. Research Infrastructures may be “single-sited”, “distributed”, or “virtual” (the service being provided electronically). They often require structured information systems related to data management, enabling information and communication. These include technology-based infrastructures such as Grid, computing, software and middleware.

- To elaborate of the EU-CELAC Research Infrastructures Road Map in the field of ENERGY is important to identifying research infrastructures of both regions interest.

In all cases considered for the road map, these infrastructures must apply an “Open Access” policy for basic research, i.e. be open to all interested researchers, based on open competition and selection of the proposals evaluated on the sole scientific excellence by international peer review.

- To promote transnational access to research infrastructures is helping countries to make use of the synergies of a globalized R&D world and enforce the mobility of knowledge and researchers.
- To determinate the indicators for the evaluation of the RI contained in the roadmap. It is important to define set of ex-post, ex-ante and cooperation indicators to know the relevance of the RI and how much is contributing to the share of knowledges between EU-CELAC areas. The ex-ante indicators should give information about background of the RI, how open is to the world, how many projects implemented, success of projects, networks in the science community using the RI, etc.

Examples of indicators:

Ex-ante indicators	
• Maturity of the international organization	
• Number of nodes of Distributed RI, partners facilities	Number of nodes and flux of analysis users
• Geografical distribution of the service points or nodes	Level of accessibility of the users from both regions.
Ex-post indicator	
• Number of user accesses	Absolute value of access
• Number of users-partnership	Number of collaborating research teams or consortia investing long term instrumentation and manpower resources in the RI
• Number of joint proposal/total users	Absolute value of cooperative projects

Co-publications analysis: international	Increase of the international collaboration in co-publications
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It is important to determinate the most suitable agreement for the collaboration. Any collaboration implies an agreement that is in function of many variables like, stakeholders groups in a country, type of projects, the specific aspects of the user communities, type of RI, etc.

There are some examples about different **SCHEMES of cooperation between a RI with no members of a RI:**

- An ongoing concrete action is the launch the Eranet-LAC 3rd call with the pilot action in Ocean Energy Research Infrastructures. It will be necessary to valuate of the scientific, technical and socio-economic impact of this action, to know if this is a good way to implement the sharing of infrastructures, if the objective of the action is achieved and possible ways to improve that kind of action.
 - EMBL: the European Molecular Biology Laboratory (EMBL) and the Ministry of Science, Technology and Productive Innovation of Argentina, concluded a Memorandum of Understanding with the intention to encourage and facilitate cooperative activities between Argentina and EMBL in fields of common interests. This MoU creates legally binding obligations among parties like annual contribution and special contribution.
 - ECRIN: The European Clinical Research Infrastructure Network signed a Memorandum of Understanding to enter into mutual beneficial alliance in the operation of national infrastructures to support international clinical trial. This MoU is a declaration of intention that does not create any legally binding obligations among parties.
- EC WP 2018-2020:
 - a. A second action is based on the H2020 WP RI 2018-2020 is planning the inclusion of a coordination and support action (CSA) in the context of the EU CELAC collaboration to reinforce this RI collaboration with the following objectives: - Support the identification of priorities for regional and bi-regional Cooperation. - Foster the

exchange of best practices on issues of common strategic relevance such as national/regional road-mapping processes, research infrastructure management and research infrastructure staff development. - Support the identification of research infrastructures of common interest. The timing deadline expected is March 2019.

➤ **PILLAR OF STRENGTHENED THEMATIC COOPERATION**

Next 3rd ERANet-LAC Joint Call: Topic on Ocean Energy for the EU-CELAC scientific communities R&I projects based on large Research Infrastructures.

Under the pillar of Research Infrastructures, the EU and CELAC countries acknowledged the political and socio-economic importance to promote access to Large Research Infrastructures of global interest, to improve sharing of data and scientific excellence. In this context, the Parties agreed on the importance of sharing good practices in mapping existing research infrastructures as well as in roadmapping, process and methodology. Large Research Infrastructures provide unique opportunities for world-class research, training and capacity building as well as to stimulate knowledge and technology transfer. The pilot would consider at least one infrastructure from EU and one from CELAC. As co-leaders of the EU-CELAC Working Group on Renewable Energies, Mexico and Spain, through CONACYT and MINECO, has already identified potential infrastructures for housing R&D joint projects – CCOB (IH CANTABRIA) and PLOCAN located in Spain, and Wave Flume Facility of the Instituto de Mecánica de Fluidos e Ingeniería Ambiental. Universidad de la Republica located in Uruguay.

JIRI WG sustainability

➤ **RECOMMENDATIONS FOR THE FUTURE SUSTAINABILITY OF THE JIRI WG AND BI-REGIONAL COOPERATION ON R&I AFTER THE LIFETIME OF SUPPORTING PROJECTS, SUCH AS ALCUE NET AND ERA-NET LAC AND THE EU-LAC HEALTH.**

- Innovation and the solution of social challenges is one of the first objectives of the science and technology. In order to have more social impact it would be recommendable to promote the participation of enterprises and to foster entrepreneurship. To enhance this it could be interesting to create capacities between researchers in the field of entrepreneurship or to plan activities that led to the private sector to know what is going on in research

and what is the best way to become research projects into innovation projects.

➤ **REVISION OF THE JIRI WG STRATEGY (IN TERMS OF POLICIES, PRIORITIES, INSTRUMENTS, SYNERGIES, OBJECTIVES, EU-CELAC PERSPECTIVES, ETC.)**

- The WG on Energy considers that the Strategy planned is something alive and flexible that requires a continuous improvement, updating and adaptation to the social, environmental and economic situation of the participant countries.
- The priorities of the collaboration in energy are continuously changing in function of the development of research capacities in the different countries, the dialogues inside the working group including the EU-CELAC SOMs.
- Now we are in front of a new challenge that is to determinate the best way of cooperating after the ERANETLAC and ALCUENET. There are different alternatives like:
 - a. Maintaining the energy collaboration nets created by launching annual calls inside the EU-CELAC interest group and the CYTED programme.
 - b. Prepare proposals for the new EC calls for the collaboration between EU-CELAC countries in the field of energy or in crosscutting fields.
 - c. Use the EC Service Facility to support the process of launching a call.

➤ **EXPECTATION TOWARDS HORIZON 2020 (REGARDING IDENTIFIED CALLS; CONSORTIA BUILDING; NEW TOPICS + INSTRUMENTS NEEDED TO GIVE CELAC MORE VISIBILITY AS TARGET REGION; JOINT POSSIBLE COMMITMENTS; ETC.).**

- EC WP 2018-2020: H2020 WP RI 2018-2020 is planning the inclusion of a coordination and support action (CSA) in the context of the EU CELAC collaboration to reinforce this RI collaboration with the following objectives: - Support the identification of priorities for regional and bi-regional Cooperation. - Foster the exchange of best practices on issues of common strategic relevance such as national/regional road-mapping processes, research infrastructure management and research infrastructure staff

development. - Support the identification of research infrastructures of common interest. The timing deadline expected is March 2019.

➤ **NEW ACTIONS TO EXPLORE (IE. EU-CELAC INTEREST GROUP, PROPOSED BY ERA-NET LAC, ETC.)**

1- EU-CELAC Interest Group.

The EU-CELAC IG shall be a group of funding agencies from CELAC, EU Member States and Associated Countries wishing to cooperate in bi-regional science, technology and innovation (STI) collaboration. The EU-Commission is invited to participate with a specific view of promoting the overall coherence with the Governance of the EU-CELAC relations. The EU-CELAC IG shall build on the collaboration experience and mutual trust established in past and ongoing FP7 projects e.g. in the framework of ERANet-LAC. It shall organize joint actions, e.g. joint calls, and thus support the implementation of the Common EU-CELAC Research Area and create further added value to its three pillars: Mobility of Researchers; International outreach of Research Infrastructures; Increased thematic cooperation to address global challenges.

The EU-CELAC IG shall define priority topics and instruments of common interest, taking the SOM activities and suggestions by participating funding agencies into consideration. To do so, it shall meet yearly, alternately in EU or CELAC. The participating funding agencies will decide in which joint activities and themes they want to get involved (variable geometry).

2- CYTED Program

CYTED's main objective is to contribute to the harmonious development of the Ibero-American region through cooperation mechanisms that seek scientific and technological results transferable to productive systems and social policies. The beneficiaries of the CYTED financing instruments can be universities, R&D centers and innovative companies from member countries.

It is also a vocation of the CYTED Program as a bridge for interregional cooperation in Science and Technology between the European Union and Latin America.

Specific objectives of the CYTED Program are:

- Foster the integration of the Ibero-American Scientific and Technological Community, promoting an agenda of shared priorities for the region.
- To strengthen the technological development capacity of Ibero-America through the promotion of joint scientific research, transfer of knowledge and techniques, and the exchange of scientists and technologists among R + D + I groups in member countries.
- Promote the participation of business sectors of the member countries interested in innovation processes, in accordance with the research and technological developments of the Ibero-American Scientific and Technological Community.
- Promote the participation of researchers from the Region in other multilateral research programs through agreements.

In RESEARCH presents 2 types of actions:

- Projects on Strategic Issues are research and technological development projects between groups of CYTED countries that are funded both with CYTED funds and with external contributions from member countries through their national agencies (ONCYT). The projects must be relevant from the points of view of Research and innovation, they will be trans-national in nature and will last for a maximum of three years. The call is in competitive concurrence and subsequent peer evaluation.
- Thematic Networks are associations of research and development (R & D) groups of public or private entities and companies of the member countries of the CYTED Program, whose scientific or technological activities are related within a common area of interest and framed in one of Program Areas. They have as main objective the exchange of knowledge between groups of R & D and the enhancement of the cooperation like method of work.

Thematic Networks aim to promote among the groups:

- Stable and continuous scientific interactions
- Exchanges of scientific and technical knowledge of mutual interest
- Synergistic enhancement and coordination of its R & D lines• Exchanges and mobility of research staff• Training of human resources
- Technical and methodological training
- Elaboration of proposals of possible Research Projects or IBEROEKA Innovation Projects. Dissemination and technology transfer actions between different groups or entities, provided that

they are technically, economically and commercially viable. Proponents must be public or private R & D centers and / or public or private companies with proven activity in R & D & I actions. Maximum duration of four years for areas 1-7 and two years for area 8

In INNOVACION launches 2 types of actions:

- The CYTED Forums are meetings between entrepreneurs and Latin American researchers to discuss specialized topics around a specific technological sector to promote innovation, transfer and technological cooperation projects.

Its objectives are:

- Promote the incorporation of knowledge to the private and public sector of the Ibero-American countries
 - To stimulate the generation of projects of innovation, transfer and technological cooperation, as well as the capture of national and international financing
 - To enable and sponsor the sustainability of projects, collaborations and interactions previously established, particularly those funded by CYTED
 - Applicants may be entities or institutions of a public or private nature, and their proposals must meet all the requirements contained in the CALLS OF THE CALL.
- IBEROEKA is a certification made by CYTED for strategic innovation projects for member countries that include partner companies from at least two Ibero-American countries and that have the financing of national agencies. The IBEROEKA certification implies, in addition to a proven seal of quality, the possibility of priority access to the financing mechanisms for innovation in each participating country.

The call is kept permanently open. The proposer must be a company of one of the signatory countries of CYTED

- 3- Explore the funding option of the Service Facility (SF):** The H2020 2016-17 work program included new instruments to support international scientific and technological cooperation such as the "Support for the Strategic Development of International Cooperation in Research and Innovation Procurement of Service Facility" (SF). The SF is designed to support the policy of international cooperation in R & D & I between the European Union and third countries, in all its dimensions:

- a. To establish priorities.
- b. To implement a strategy.
- c. To follow-up of the activities.

As such, it is related to the road maps prepared by the European Commission for its international cooperation strategy in science and technology.

The activities offered include the support of the National Contact Points (NCPs) in Europe and outside Europe, the implementation of information campaigns, the organization of events (conferences, workshops, courses, intermediation activities), the establishment of online security solutions (web portals ...), engineering studies, etc.

In part, these missions replace the previous BILAT and INCONET of FP7, and their successors in the call 2014-15 and 2016-17 of 2020 (INT-1 and INT-2).

- 4- Explore the funding option of the Inter-American Development Bank.** The Inter-American Development Bank (IDB) is the largest source of development financing for Latin America and the Caribbean. Established in 1959, the IDB supports Latin American and Caribbean economic development, social development and regional integration by lending to governments and government agencies, including State corporations. One of the strategies of the IDB is the Climate Change Strategy (CCS). It is to serve as a guiding instrument for scaling up IDB support for actions to mitigate and adapt to climate change within Latin America and the Caribbean Leveraging the IDB's institutional strengths and its unique advantages, the CCS will promote the development and use of a range of public and private sector financial and nonfinancial instruments for strengthening the institutional, technical, and financial capacity to address climate change challenges.
- 5- Promote the launch of joint calls** for collaborative research activities funded through specific projects/ joint coordinated calls and/or "twinning" in the different energy fields defined.
- 6- Networking and exchanges.** Actions to promote and support networking and exchanges between research organizations in on-going or planned projects a:
 - a. Stablishing and maintaining thematic networks. The networks composed of experts in bioenergy, solar and wind energy, etc., created as a result of the activities of the working group has been

regularly involved in the activities coordinated by the INCONets and other projects like ACCESS to MEXCYT, etc. To foster linkages with regional thematic nets (Rembio, Mesomaerican nets, CYTED, etc.) and reinforce them through an on-line tool through ALCUENet.

- b. Promoting mobility programmes: Mobility programmes available for the exchange of EU-LAC scientists in EU and LAC universities and research organizations as well as IRSES and other existing instruments in Marie Curie and other national programmes is being promoted seeking synergy with bilat-project activities as well as through other projects where the Members of the WG participate, as well as the co-leaders of the other WGs. It is important to continue this promotion in the future no maintain and increase the number of movilities.
- c. Organizing workshops on renewable energy to update information related to regulatory aspects, common views, best practices in technology transfer, innovation, new interest collaborative areas, etc.