CLEAN ENERGY CORRIDOR OF CENTRAL AMERICA (CECCA) STRATEGY

The vast renewable energy (RE) resource potential of Central America offers opportunities to meet its growing energy demand, maintain energy security, and achieve the envisaged renewable targets in the region. Central American power systems currently face an increasing number of connection demands from wind farms and solar photovoltaic (PV) power plants, necessitating urgent responses in order to maintain system reliability, affordability and investors' confidence.

The Clean Energy Corridor of Central America (CECCA) is a regional initiative calling for accelerated development and cross-border trade of renewable power in Central America. The implementation of the CECCA initiative and its set of activities within the regional context will support the integration of larger sums of renewables into the Regional Transmission Network. With Mexico, Colombia and Belize expected to join the regional electricity market, the CECCA strategy could be expanded accordingly in future phases.

The CECCA initiative has been developed in response to -requests expressed by IRENA member states, and to the Communique agreed to by Heads of Delegation from Latin America during IRENA's Fifth Assembly (16 January 2015), which stressed the importance of RE deployment to achieve the strategic goals of the Latin American economies, and in consultation with stakeholders in the region.

This corridor initiative represents a strategic approach, structured around five pillars, and customized to address the regional and local context. It will be jointly implemented with stakeholders in the region through two phases.

FIVE IMPLEMENTATION PILLARS

- **Enabling Frameworks** (Phases 1 & 2) to support systemic changes and developments required for a reliable and affordable power system transition (further sub-divided into technical and governance themes);
- **Country and Regional Planning** (Phase 2) to fully consider cost-effective RE options;
- **Zoning & Resource Assessment** (Phase 2) to identify high resource and appropriate areas for RE deployment;
- **Capacity Building** (Phases 1 & 2) to plan, operate, maintain and govern power systems with higher shares of RE generation;
- **Public Information** (Phases 1 & 2) on how CECCA provides reliable, sustainable and affordable energy.

SCOPE OF ACTIVITIES

IRENA has identified several activities to implement the five pillars of the CECCA strategy. Phase 1 represents priority activities to be implemented between 2015 and 2017. Further consultation at the end of Phase 1 will potentially identify additional activities to be implemented during Phase 2 and beyond.

The text below and the associated table in ANNEX 1 describe the activities within each pillar and the envisaged timeline for implementation. The chronological sequence and a brief description of the priority activities to be implemented over the short-term can be found in ANNEX 2.

Implementation Pillars	Activities Phase 1	Activities Phase 2
1. Enabling Frameworks	**Power system operation and grid behaviour of generators** – Technically assessing control centre practices and tools for variable renewable energy (VRE) integration at national and regional level – Conducting a diagnostic on the maximum penetration levels of VRE in the regional and national power systems under secure conditions – Technical support for the design of technical requirements/grid codes specifically aimed at VRE generators **Regulatory Empowerment Project** – Identification and assessment of governance and regulatory barriers to RE deployment – Economic impact assessments of RE deployment and cost allocation rules – Development of governance and regulatory frameworks for secure, reliable and affordable system operations and development with RE resources **Other activities within Enabling Frameworks** Scoping for effective application of the Project Facilitation Platform* and the development of country reports and market analyses in the CECCA region.	Scoping of further regional needs for enabling frameworks in order to identify additional activities over the long-term which will contribute to enable RE development and integration.
2. Country and Regional Planning	Scoping of regional needs to identify detailed activities under phase 2.	Supporting the adequate consideration of cost-effective RE options while achieving affordable and secure electricity systems in line with the regional energy policy strategic goals.
3. Zoning and Resource Assessment	Scoping of regional needs to identify detailed activities under phase 2, also building upon the available tools developed by IRENA, such as the Global Atlas and the Renewable Energy Zoning methodology.	Identification of high resource areas that are technically, environmentally and economically feasible for RE deployment
4. Capacity Building	Training in practices and in the use of tools for VRE integration at national and regional levels Training in the assessment, design and implementation of rules, standards, and regulations which ensure the reliable integration of VRE at national and regional level Scoping of regional needs to identify further detailed activities under phase 2.	Other identified capacity building activities for the planning, operation, maintenance and governance of power systems with higher shares of RE generation
5. Public Information	Activities will cut across all other pillars of the CECCA strategy and will be implemented in parallel with their activities.	Activities will cut across all other pillars of the CECCA strategy and will be implemented in parallel with their activities.

*The PFP is a virtual market place to enhance project development and financing.

PARTNERS

IRENA will seek to coordinate and collaborate with stakeholders active in the region to ensure synergies and to avoid duplication of efforts in its activities.

1. **Countries**
   Central American countries included in the Clean Energy Corridor (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama), as well as other countries of the region as appropriate, through their Ministries of Energy and Environment.

2. **Main Technical Partners**
   The Regional Commission for Electric Interconnection (CRIE – regional regulator); the Regional Market Operator (EOR); the Regional Transmission Asset Owner Company (EPR) and the Director Council of the Regional Electricity Market (CDMER).

3. **Other Organizations**
   Other key stakeholders involved in RE integration and deployment in the region include, but are not limited to, national regulators and operators, the Central American Integration System (SICA), SIEPAC Regional Institutions, Central American Electrification Council (CEAC), Central American Commission on Environment and Development (CCAD), the Inter-American Development Bank (IDB), the US Agency for International Development (USAID), the German Agency for International Cooperation (GIZ), Economic Commission for Latin America and the Caribbean (ECLAC), Latin American Energy Organization (OLADE), the World Bank, the Global Wind Energy Council (GWEC), and the Latin American Network of Climate Change Bureaux (RIOCC).

4. **Business Partners**
   Network and system operators, utilities, national and international investors, and independent power producers (IPPs).

5. **Civil Society – NGO's**
   Community Associations, Non-Governmental Organizations, and Academia.

NEXT STEPS DURING 2015

For the successful implementation of CECCA activities, the following next steps are recommended:

- Achieve an official endorsement of the CECCA strategy and action agenda during Council of Ministers that can translate into a joint Communique;
- Implement the first joint activities under the CECCA (capacity building); and
- Implement the joint envisaged activities of phase 1 from 2016 onwards.

ANNEX-1 - Implementation Schedule

PUBLIC INFORMATION

	Phase 1			Phase 2		
	2015	2016	2017	2018	2019	2020
POLITICAL FRAMEWORK						
Official endorsement of the CACEC strategy and action agenda						
ENABLING FRAMEWORKS						
Power system operation and grid behaviour of generators						
Technical assessment control centres						
Maximum Share VRE						
Technical requirements VRE						
Regulatory Empowerment Project						
Non-technical barriers						
Economic Impacts						
Operations & Development						
Other activities within enabling frameworks						
Scoping for Enabling Frameworks (including PFP)						
Enabling Frameworks (including PFP, market analysis)						
COUNTRY AND REGIONAL PLANNING						
Scoping Planning for phase 2 activities						
Achievement of affordable and secure system						
ZONING AND RESOURCE ASSESSMENT						
Scoping Resources						
Identification of suitable areas for RE deployment						
CAPACITY BUILDING						
Practices and tools for VRE integration						
Rules and regulations for VRE integration						
Scoping phase 2 activities for capacity building						
CB for system planning, operation and governance						

ANNEX-2

Chronological sequence of priority activities in Phase 1

The set of proposed activities to be implemented in the short term (2015 - 2017), including targeted capacity building exercises, will contribute to the development of enabling frameworks in the region. In cases where sufficient certainty exists with regard to the scope of the activities, their chronological sequence is briefly described below. Sufficient certainty already exists for activities described in

- ANNEX2A
- ANNEX 2B.

Additional envisaged activities to be implemented during Phase 1 of the CECCA initiative remain subject to further stakeholder discussion in order to clearly define the scope of the projects. This stakeholder discussion will be integrated during the implementation of the initial activities.

ANNEX-2A

These activities are technical in nature and involve "Practices and tools for VRE integration" within the pillar "Capacity Building" and "Power system operation and grid behavior of generators" under the "Enabling Frameworks" pillar.

1st. **Technical capacity building activities for grid operation**: The initial activities will provide knowledge and awareness on practices, strategies and tools used in the operation of a power system with medium to high shares of VRE. It will comprise both theoretical and hands-on components that will be implemented inside a control centre of a selected System Operator with the required experience in VRE integration. The target audience will include national and regional operators from the Central American countries connected to the regional electricity grid. The initial capacity building activities are expected to provide the necessary awareness regarding the barriers, best practices, real scenarios and needs to facilitate the reliable integration of upcoming interconnections of solar PV and wind projects to the regional grid. The capacity built during these activities will create a better understanding of the regional and national operators' role and participation in the subsequent activities, while also providing them with hands-on experience and a leading role in reinforcing and building their own technical systems.

2nd. **Technical assessment of control centres, operation practices and tools for a reliable integration of VRE into the system:** This assessment will be carried out primarily inside the regional operator's control room. It will also include, if deemed necessary, visits to national operators' facilities. It will seek to identify potentially necessary upgrades or adjustments of practices and tools in the control room, aimed at obtaining a comprehensive system model well-suited for the activities that would follow (analysis of the maximum penetration of VRE and assistance in the design of grid connection requirements), while also keeping a systemic approach to futures upgrades for controllability purposes, situational awareness improvement, etc. Building on previous capacity building activities, the operators are expected to participate in the technical assessment with the leadership and guidance of selected experts.

3rd. **Conducting a diagnostic on the maximum penetration levels of VRE under secure conditions in the regional system:** In response to conclusions drawn from the technical assessment described above, some upgrades to the regional system operator's control room may be necessary in order to perform simulations resulting in different scenarios of VRE penetration, including inputs such as different technical requirements for these types of generators. The maximum penetration of wind and solar PV will depend on many factors, among which include the grid behaviour of these generators - something directly tied to the technical requirements in force for these power plants - and the controllability of the VRE portfolio - something closely related to the operations and tools used in the control room. The methodology used to perform the diagnostic is expected to be fully understood by the control room and power system engineers, allowing them to lead subsequent updates and execution of such a diagnostic that takes into consideration future system changes.

4th. **Assistance on technical requirements design for VRE generators:** The technical content of these requirements would be based directly from the VRE penetration scenarios developed in the previous activity.

ANNEX-2B

These activities discuss the role and options of power systems governance and regulation for integrating of VRE They involve "Rules and regulations for VRE integration" within the pillar "Capacity Building" and those within "Regulatory Empowerment Project" under the pillar "Enabling Frameworks."

1st. **Capacity building activities for governing power system flexibility provision and use**: This capacity building element aims to identify the knowledge base and status quo of the stakeholders and jurisdictions involved in the context of the Governance for Flexibility Project "GoFlex" (described below). The capacity building activity will function as a wider-project initiation stage and will ensure a detailed overview and expert discussion on the scope and depth of GoFlex with key stakeholders in the regional and national context, while allocating roles and responsibilities for the further implementation of GoFlex. This capacity building workshop is planned to span two to three days with the aim of bringing together relevant governance decision makers, system operators, and decision makers from Central America, together with technical experts from regions with relevant experience in governing power system flexibility.

2nd. **Implementation of the Governance for Flexibility (GoFlex) project:** GoFlex will build sufficient knowledge and confidence amongst governance decision makers, with the aim to inform and support the development and implementation of sound enabling environments for the provision and use of flexibility resources. These environments are important as they provide the guiding rules and incentives for decisions made by the range of stakeholders involved, including VRE and conventional generators, other flexibility providers, and system operators. As such, GoFlex will contribute to ensuring a continuously reliable and cost-efficient integration of VRE resources into power systems of Central America, an important factor fostering the incremental deployment of renewable resources. GoFlex aims at national and regional governance decision makers and operators from the Central American countries connected to the regional electricity grid.