LEDS ENERGY WORKING GROUP

REGIONAL PLATFORM LEDS LAC RESILIENT AND LOW EMISSION DEVELOPMENT STRATEGIES

Advancing Bioelectricity in Latin America and the Caribbean

Proceedings and Outcomes of the First Implementation Year of a Community of Practice of Leading Countries in the Region

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About the LEDS GP

The Low Emission Development Strategies Global Partnership (LEDS GP) was founded in 2011 to facilitate peer learning, technical cooperation and information exchange to support the formation and implementation of low emission development strategies. It has a focus on support to developing countries and regions.

LEDS GP engages leaders from over 300 institutions across government agencies, technical institutes, international agencies, and NGOs. It operates through regional platforms in Africa, Asia, and Latin America and the Caribbean and has six technical global working groups and a global secretariat. Developing country leaders in each region set priorities for learning, collaboration, and advisory support delivered collectively through the Partnership.

The LEDS Energy Working Group (EWG) is a demand-driven network comprised of more than 500 energy sector practitioners, representing national governments, multilateral institutions, private practitioners, and non-governmental organizations. It supports the regional LEDS GP platforms and operates in close collaboration with other sectoral platforms and the LEDS GP Secretariat. Membership is open to all interested parties. The EWG secretariat in 2016 was hosted by the Worldwatch Institute, in 2017 it is by SD Strategies.

The Latin America and the Caribbean Platform for Resilient and Low Emission Development Strategies (LEDS LAC) is a network of organizations and individuals working in the promotion, design, and implementation of low emission development strategies (LEDS) in the region. Launched in 2012 and currently with more than 950 members, LEDS LAC is guided by an independent Steering Committee and coordinated by a Secretariat operated by the Peruvian organization Libelula with support from the Tropical Agriculture Research and Higher Education Center (CATIE), based in Costa Rica.

Cover photo: Nueva Aldea Biomass Power Plant Phase 1, photo courtesy of United Nations Framework Convention on Climate Change.

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Production of this report would not have been possible without the deep engagement and participation of the broad and growing networks of partners in the LEDS Energy Working Group and Latin America and Caribbean Platform for Resilient and Low Emissions Development Strategies, and in particular the members of this Community of Practice. While we hope the report is helpful to many practitioners, this report first and foremost belongs to the country leads comprising this group.

Our sincere gratitude is extended to the following home institutions, ministries, and companies who participated in the initiative: Antigua and Barbadian Ministry of Tourism, Economic Development, Investment, and Energy; Argentinian Ministry of Agriculture and Planning; Asociación Sustentar; Costa Rican Center for Sustainable Markets Intelligence; Colombian Ministry of Environment and Sustainable Development; Colombian Ministry of Mining and Energy; Costa Rican Electricity Institute; Costa Rican Ministry of Agriculture and Livestock; Cuban Ministry of Science, Technology, and the Environment; Ecuadorean Ministry of Electricity; El Salvadorian National Energy Council; Jamaican Ministry of Science, Energy, and Technology; and the Petroleum Corporation of Jamaica; and the Uruguayan National Directorate

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Table of Contents

Why a LAC Bioelectricity Community of Practice?

The use of biomass resources to generate electricity can provide important social, economic, and environmental benefits. Bioenergy systems have a wide range of applications that provide a low emission and climate resilient alternative to fossil fuel based electricity generation. Latin America and the Caribbean (LAC) have significant potential for the development of bioelectricity. Developing these resources will be key to meeting the Sustainable Development Goals (SDGs), and Nationally Determined Contributions (NDCs) in the region. However, this potential remains largely unrealized.

In many LAC countries, public and private bioenergy investment opportunities are hindered by a lack of requisite legislative frameworks, supportive policies and regulations, and transparent and uncomplicated administrative processes. Governments seeking to employ efficient bioelectricity policies all too often lack access to quality data and tools that are essential for evaluating and comparing alternative bioelectricity development pathways.

Participants in the 4th Annual LEDS LAC Regional Workshop that took place in October 2015 in Punta Cana, Dominican Republic, expressed interest in the modern biomass energy potential for electricity generation. In response, the LEDS Energy Working Group (EWG) and the Latin America and the Caribbean Platform for Resilient and Low Emission Development Strategies (LEDS LAC) have collaborated closely to create a LAC Community of Practice on Bioelectricity (LAC CoPB). The LAC Bioelectricity Community of Practice was established in early 2016 and constituted through a work plan, along with multiple virtual meetings and joint information-sharing platforms. 2016 efforts culminated in a workshop at the end of the year where a clear strategy and work plan for its continuation in 2017 was agreed.

What is a Community of Practice?

Whereas, the term Community of Practice (CoP) is used to describe different networks of practitioners with widely varying missions and scopes of activities; the installation and successful facilitation of Energy CoPs in its specific form has become a signature activity of the EWG, implemented in cooperation with the regional platforms of the LEDS GP. Our Energy CoPs support the mission of the LEDS GP to assist countries to design and implement successful climate compatible development strategies by creating a members-driven practitioner network.

Formulating and deploying low emission development strategies for the energy sector is often a complex process, requiring integrated analysis of various technical, socioeconomic, financial, market, and political factors. As has been the case for bioelectricity in the LAC region, inadequate human and financial capacity can constrain the development and implementation of long term strategies for energy sector development. International Communities of Practice can address these shortcomings by facilitating deeper technical collaboration and peer to peer learning on the design and implementation of specific and effective policies and measures.

A Community of Practice is a network of engaged experts and practitioners from a shared sector or working area, who form a group to regularly engage in peer to peer learning to improve their personal and collective group knowledge[1]. The initiative offers an alternative to conventional knowledge sharing networks that tend to feature top-down development assistance and policy adoption, by providing an inclusive, member driven experience. To promote this active participation, LEDS Communities of Practice have prioritized working with decision-makers of countries which hold ambitious targets for short-term progress on the selected issue area.

Whilst no two communities are alike, they all require a structure permitting fluid membership that is not attached to any single individual, promoting forms of exchange both inside and outside of formal communication channels. A desired end result of this process is that communication which might not have otherwise occurred between relevant stakeholders is facilitated both at the national and international levels. Therefore, country delegations in LEDS Communities of Practice are selected to include diverse perspectives to maximize impact, including technical leads and policymakers. This diversity in background necessitates significant time engagement from group facilitators to act as "co-pilots," ensuring that the community evolves dynamically to meet the needs of their members and that all members arrive at a shared understanding of the major factors affecting the issue area.

Goals, Strategy and Structure of the Initiative

A first critical step in the founding of the LAC Bioelectricity Community of Practice was to refine what specific technical, finance- and policy-related questions were held regarding the development of bioelectricity systems in the LAC region.

Conceptual framework

Common questions from this knowledge gap analysis formed the foundations and conceptual framework for the virtual technical sessions and helped scope country-specific requests for technical assistance and expertise. The following questions, broadly separated into three categories, were identified as most pressing challenges to countries through a survey disseminated to LAC government leaders in charge of the design and implementation of bioelectricity policies and programs:

1. Resource potentials and technical considerations
    a. How to assess a country's bioelectricity potential
    b. What technical challenges exist and how can they be addressed?
2. Costs and benefits
    a. What will be the costs and benefits of alternative bioelectricity development pathways?

[1] "Reed, John. "Communities of Practice: A Tool for Creating Institutional Change in Support of the Mission of the Federal Energy Management Program." November, 2014, *U.S. Department of Energy Federal Energy Management Program*

3. Policy, administration, and financing
    a. What support policies and measures exist, and how can they be integrated in the existing legal framework of a country?
    b. How to create effective and cost-efficient administrative procedures
    c. What do national and international commercial banks and public funders look for?
    d. How to create an investment prospectus
    e. How to design fundable and attractive NAMAs and INDCs

These three working areas, along with research dossiers exploring their status in LEDS LAC countries created by the community organizers (See Annex C), formed the foundations for the 2016 work program of the LEDS LAC Bioelectricity Community of Practice. This work program consisted of three online sessions, which prepared the participants for a final in-person hands-on workshop. In between sessions, practitioners applied what they learned to their individual country contexts and then had the opportunity to discuss their results and collaborate on shared challenges with supporting experts across several online forums, including private Dropbox and LinkedIn groups.

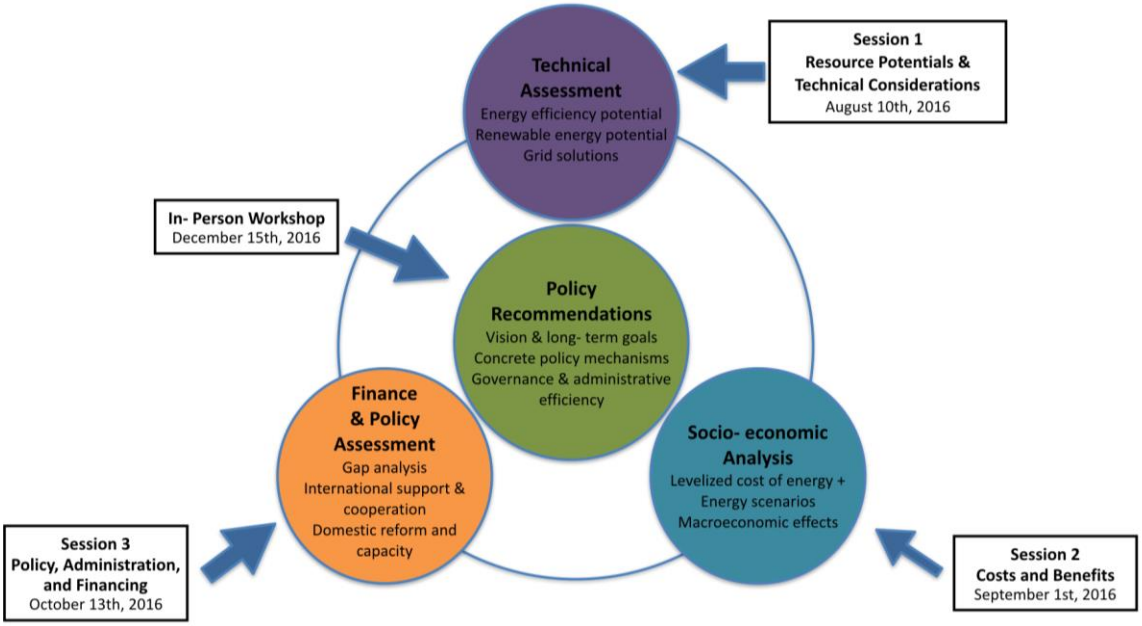


Figure 1: Overview of Community of Practice Proceedings

The structure for these online sessions and the in-person workshop was derived from the Worldwatch Institute Sustainable Energy Roadmap (SERIP) framework (see Figure 1). The SERIP framework is a comprehensive methodology for creating long-term energy policy goals and concrete mechanisms to successfully navigate changes to national and regional infrastructure capable of meeting 21st century

energy challenges. This framework has been highly positively received in the LAC region, where it was used in Worldwatch roadmaps for the Dominican Republic, Jamaica, Haiti, Central America, and the Caribbean Community (CARICOM)[2].

Online Sessions Culminating in an In-Person Workshop

In order to avoid a conventional top-down knowledge sharing structure, the online sessions were designed to first foster robust discussion and knowledge sharing between the Community of Practice members, supplemented with perspectives and advice from leading experts. To encourage this exchange, each session was designed to feature leading experts in the relevant topic along with group members presenting background research regarding the status of the topic in their country context.

A typical online session lasted 4.5 hours. We usually started with an overview of the session and a brief recap of previous sessions. In Module 1, country delegations presented prepared slides detailing their country's status on bioelectricity development relating to the focus of the session. Presentations were followed by a group discussion during which members discussed and compared their presented materials, identified knowledge gaps and discussed potential joint working areas.

Modules 2 and 3 of a session featured presentations from experts, who through this sequence of events could directly relate to the earlier comments by country representatives. Each presentation was followed by a period of Q&As with the presenter, and a discussion aimed at establishing areas for immediate and long term bilateral technical and policy assistance. The last half hour of each session wrapped up the discussions and explored next steps in the initiative, including the logistics for upcoming sessions.

An overview of the agendas for each individual online session and information on the experts who facilitated them is given in Annex A of this report.

Following the conclusion of the three-part online session series, the Community of Practice facilitators organized an in-person workshop, designed with the over-arching goal of bringing together the most-involved group members and experts featured from the online sessions to assess progress made, identify remaining knowledge gaps, and draft concrete policy measures and work plans for each represented country in 2017.

As with the online sessions, a priority for the in-person workshop was to promote dialogue and knowledge sharing between the group members rather than featuring the conventional top-down instruction from facilitators and speakers. Therefore, the facilitators worked with workshop leaders Camila Ramos and Kay Schaubach to design an open concept and member-driven workshop agenda (see Annex B).

Attendees of the In-Person Workshop in Costa Rica formed a core group of ten (10) highly involved Community of Practice members representing Argentina, Costa Rica, El Salvador, Jamaica and Uruguay.

[2] "Sustainable Energy Roadmaps," Worldwatch Institute Climate and Energy Program, http://www.worldwatch.org/sustainable-energy-roadmaps

These members were selected due to their roles in the design and implementation of bioelectricity policies and programs in their respective countries.

Individual Country Assessments

As the outcome of the workshop, the Community of Practice aimed for a clear distinction between individual countries' needs for technical assistance and a set of issues that the Community of Practice members wanted to achieve as a team.

Community Members' Goals for 2017

During Session 2 of the workshop, country delegations presented detailed reports on their countries' situation with regard to the advancement of bioelectricity, including assessments of the current status of bioelectricity policies and the broader framework for investments. These presentations were informed by background country profiles prepared by the group facilitators (See Annex C).

Figure 2 provides an overview of the goals that Community of Practice Member Countries set for themselves in 2017, building, inter alia, on the scoping analysis carried forward as part of this initiative.

Figure 2: Member State Bioelectricity Policy & Project Goals for 2017

Country	What changes to existing bioelectricity policy frameworks are envisioned in 2017? Where does ambition in existing policy targets need to be increased?
Argentina	• Bioelectricity policy and regulation framework now targets large-scale electricity projects. Framework needs to be changed to actively promote medium and small size cogeneration, thermal generation, self consumption biomass and biogas projects. Towards this end, the Distributed Generation Law is under discussion in Congress, expected to be passed and regulated by the beginning of 2017. This law needs to set feedstock-specific feed-in tariff rates. The government is also analyzing a potential regulation program to favor biomass/biogas thermal projects. • Bioelectricity policy needs to be nuanced to effectively regulate production of electricity from waste water treatment plant (WWTP) feedstocks, including sludge and liquid waste regulation, WWTP owner and operator relationship, and safety requirements. Law 27.191 could address this by specifying a minimum percentage of RE coming from WWTP

Costa Rica	• Targeting achieving public consensus on implementation of a Residual Biomass Energy NAMA. This process will include the need for a bioenergy roadmap detailing energy potential and economic viability of available biomass feedstocks. • Regulations for bioenergy plants need to be reviewed and updated to incentivize bioelectricity project development, including security and safety rules, biomass feedstock use guidelines, and plant construction legal framework.
El Salvador	• Targeting development of distributed, small and medium scale self-generation, and wholesale bioelectricity projects through dedicated Power Purchase Agreements (PPAs) tendering processes, like has been done for LNG, solar, and wind • Plans to design and define three pilot animal/agricultural waste bio-digester facilities to test sustainability of business model in the medium and long terms.
Jamaica	• Envisioning a review of established relevant energy policies and the in-draft biofuel policy, focusing on sensitivity of policy adjustment mechanisms to current conditions in the energy sector • Targeting production of a detailed baseline assessment for available biomass feedstocks, extending beyond sugarcane to include other crop residues, sewage, and municipal organic waste
Uruguay	• Establishing investment frameworks for sustainable processing of biomass into a spectrum of marketable products and energy (extending beyond bioelectricity), to improve investment proposition for bioelectricity projects

Remaining Knowledge Gaps and Technical Assistance Requests

Figure 3 summarizes the specific knowledge gaps that Community of Practice Member Countries have identified and that they consider important to be addressed in order to achieve their policy goals in 2017 and beyond. These knowledge gaps will be reviewed by the LEDS GP in order to identify those topics among them that can be best addressed through Technical Assistance provided by the Partnership. These knowledge gaps and TA requests thus represent the most important guideposts for the design of the workplan for the 2nd year of this Community of Practice, as members requested to continue the initiative in 2017.

Figure 3: Members' Knowledge Gaps and TA Requests

Country	Knowledge Gaps and Technical Assistance Requests
Argentina	• Seeking shared experience and case studies on successful policy development processes that have resulted in successful integration of co-generation and co-digestion facilities to electrical system. In particular seeking information on how relevant ministries can establish working networks to develop solutions for shared challenges (Ex. Ministry of Environment collaborating with Ministry of Energy to create better sludge and organic waste management processes through electricity generation facilities) • Currently only large-scale electricity generation biomass projects are covered under current regulation and policies. By signing a Power Purchase Agreement (PPA) they gain access to private sector financing easily. Therefore, Argentina delegation is seeking assistance in identifying and developing effective policy instruments to incentivize investment in small to medium scale bioelectricity projects.
Costa Rica	• Seeking research on available technologies, regulations, and resource assessments for electricity generation from wet and dry agricultural biomass residues • Seeking case studies on bioelectricity business model development to assist in de-risking sector for development banks
El Salvador	• Seeking assistance in assessing the energy potential and socio-economic viability of existing and planned pilot animal/agricultural waste biodigester facilities (See Figure 2) • Seeking technical assistance in determining which bioenergy generation technology options to pursue and on how to successfully finance municipal-waste bioelectricity projects
Jamaica	• Seeking technical assistance in implementing actions outlined in the Jamaica Sustainable Energy Roadmap, including expanded education campaigns to improve risk perception for bioenergy, establishment of sovereign guarantees for sustainable energy loans with support of development banks, and establishing strategies for accessing climate finance sources through Nationally Appropriate Mitigation Actions (NAMAs) and the Green Climate Fund (GCF) • Seeking case studies of successful dedicated bioelectricity project development using dedicated biomass RFP approach (given biomass is uncompetitive with a general renewable energy RFP approach)

Uruguay	• Seeking shared experience and case studies on successful bioelectricity project development, given appropriate and similar geographic and biophysical characteristics to Uruguay • Seeking technical assistance in addressing biomass feedstock variability and handling challenges

Suggested Bilateral Support Facilitated by the LEDS GP in 2017

The following country-specific technical assistance to individual Community of Practice Members could be provided by LEDS GP:

- **Argentina**: Establishing waste-water feedstock-specific implementation plan for bioelectricity project development (Possibly led by Kay Schaubach)
- **El Salvador**: Establishing municipal waste feedstock-specific implementation plan for bioelectricity project development (Possibly led by: Kay Schaubach)
- **Costa Rica**: Determining a priority list of bioelectricity sector indicators which can be used to align different interests of stakeholders to drive forward policy development (Possibly led by: Marco Colangeli)
- **Jamaica**: Review of draft biofuels and energy from waste policies to determine whether to pursue a coordinated bioenergy policy or distinguish between feedstocks and technologies (Possibly led by: Camila Ramos and Kay Schaubach)

Challenges to be Addressed in Group Work

In support of the identified strategy development goals and to address the remaining knowledge gaps, workshop facilitators collaborated with the attendees to design a work plan for LEDS LAC and the EWG to be execute in 2017 by the Community of Practice. This work plan is delineated between shared knowledge gaps, which can be addressed through collective activities, and supplementary country-specific assistance requests, which are best met through direct and country-specific support from Community of Practice technical leads.

From a review of the shared knowledge gaps and policy targets the group first prioritized creating a concrete one-stop shop for bioelectricity policy development, including a path dependent framework showing preliminary steps to determining policy choices.

Designing a Comprehensive Process for Bioelectricity Policy Development

The need to establish a path-dependent process for designing bioelectricity policy was perhaps the most significant shared insight for workshop attendees. Each country represented at the workshop had at least one bioenergy-related policy either in the drafting process, at negotiation stage, or already in force. Questions directed towards the experts and workshop facilitators often related to the ineffectiveness of these measures in driving growth of the bioelectricity sector. Almost uniformly, these implementation challenges stem from insufficient preliminary analysis of underlying technical, social, economic and environmental factors in the country. The members of the CoP asked for continued support in designing a decision-making process in which the different components that are essential to comprehensive, climate-compatible and development-oriented strategy-building, are brought together. Concrete tools like bioelectricity roadmaps as well as participatory approaches like stakeholder consultations as well as institutional reforms like the establishment of bioenergy commissions will be discussed.

Assessing Resource Potentials for Bioelectricity

As a resource, bioenergy potential is complicated to assess. Whilst, for example, solar and wind potential can be consistently assessed using modeling technologies, bioenergy is subject to site and feedstock-specific restraints, complicating its assessment significantly.

One of the earliest requests from the Community of Practice membership was to not limit the focus of the group to the most popular agricultural biomass residues and generation technologies, such as sugarcane bagasse. Instead the group broadened its focus to include all agricultural, forestry, municipal, and water based biomass feedstock and their associated generation technologies, such as auto-generation, co-firing, pyrolysis, gasification, and co-generation. This broad approach formed the context of the first online session, our deep-dive on available bioelectricity resource assessment technologies and methodologies.

Before engaging with any of the various resource assessment technologies or methodologies available it was established that the critical first step was to determine to whom, and at what level of depth the resource assessment would be delivered, since biomass resource assessments can be delivered broadly at a level of technical potentials – or more precisely at an economic level.

The theoretical approach can illustrate ultimate resource potential based on calculation or measurements of net primary productivity for a given biome. A technical approach nuances this analysis, limiting the

theoretical potential by accounting for terrain limitations, land use and environmental considerations, collection inefficiencies, and a number of other technical and social constraints. This level of analysis is most useful for policy makers setting generation targets for broad geographic regions and can be most cost effectively achieved using modeling technologies.

These models can be linear, dynamic, or geospatial-based, integrating various factors to assess resource availability, quantity, and quality. One such example is the Biopower Atlas, a model presented in the first online session that integrates Geographic Information Systems (GIS) and statistical data to illustrate spatial patterns and relationships of biomass feedstocks. Critically, the quality of model outputs rely on the availability of data compared to the needs of the assessment. Furthermore, modeling alone does not guarantee the viability of a given bioelectricity generation technology for the targeted feedstock and area. Site specific surveys and integrated analysis of socio-economic and environmental impacts, while time consuming and costly, are necessary to provide a complete understanding of the feasibility of a given technology.

Understanding Markets and Tradeoffs

Assessing and communicating the social, economic, and environmental impacts of energy market development is another, often overlooked, essential step in designing appropriate policies to stimulate their growth. This is particularly the case for bioelectricity projects, which on a generation cost basis alone often struggle to compete with fossil fuels and other renewable energy technologies such as solar and wind. This tendency is reflected in existing Levelized Cost of Energy (LCOE) generation technology comparative analyses for many countries represented in the LEDS LAC Bioelectricity Community of Practice.

The Community of Practice introduced several approaches for integrating secondary impacts of bioelectricity projects into the policy making process. The first and most broad is to subject the proposed policy or project to a methodology of sustainability indicators to assess its social, economic, and environmental footprint. During Session 2 the group was introduced to the Global Bioenergy Partnership and their framework of 24 Sustainability Indicators for Bioenergy (See Figure 4).

Values for each environmental (marked green), social (marked orange), and economic (marked blue) indicator are determined by unique methodological approaches and data requirements. This framework can be used effectively to assess impacts of existing bioelectricity projects and policies to determine what changes, if any, are necessary to better meet set targets. Furthermore, this framework can arm policymakers with tools to demonstrate the positive impact of bioelectricity that a simple generation cost comparison approach might otherwise overlook. Furthermore, methodologies like the GBEP Sustainability Indicators provide a mechanism for policy makers to understand the true economic contribution of bioelectricity by considering use of biomass by-products by subsidiary entities throughout the bioenergy value chain.

Figure 4: Sustainability Indicators for Bioenergy

INDICATORS		
1. Lifecycle GHG emissions	9. Allocation and tenure of land for new bioenergy production	17. Productivity
2. Soil quality	10. Price and supply of a national food basket	18. Net energy balance
3. Harvest levels of wood resources	11. Change in income	19. Gross value added
4. Emissions of non-GHG air pollutants, including air toxics	12. Jobs in the bioenergy sector	20. Change in consumption of fossil fuels and traditional use of biomass
5. Water use and efficiency	13. Change in unpaid time spent by women and children collecting biomass	21. Training and re-qualification of the workforce
6. Water quality	14. Bioenergy used to expand access to modern energy services	22. Energy diversity
7. Biological diversity in the landscape	15. Change in mortality and burden of disease attributable to indoor smoke	23. Infrastructure and logistics for distribution of bioenergy
8. Land use and land-use change related to bioenergy feedstock production	16. Incidence of occupational injury, illness and fatalities	24. Capacity and flexibility of use of bioenergy

Creating Attractive Bioelectricity Markets

A final and essential step prior to establishing concrete policy instruments is to ensure that the private sector will be drawn towards bioelectricity investment opportunities and have the capacity to embrace them. This knowledge area was a primary focus of both the third online session and the workshop.

Across all countries represented in the group, foreign exchange exposure and currency volatility, country risk perception and credit worthiness of off-takers, and low prices and tight returns for bioelectricity ventures consistently restrain private sector investment. These investment barriers must be met through a combination of public and private sector measures.

Strategically deployed and innovative public climate financing instruments can play a key role in de-risking private sector investment in bioelectricity by aligning public and private interests and enabling upscaling of existing projects. National and multinational development banks are ideally suited to provide this service through a range of financing tools. For bioelectricity projects facing insurmountable up-front investment costs, development banks can provide project debt financing at terms preferable to those

prevailing in the private market through longer loan tenors, grace periods, and below market interest rates. For troubled bioelectricity investments expecting market-rate returns, development banks can provide capital instruments for short term balance sheet financing in return for project level equity and creditor debt.

By establishing these financing instruments, governments communicate a strong support signal not only to bioelectricity project developers, but also to the private financial sector—which also has a number of instruments at its disposal to address specific bioelectricity investor needs. Private sector risk mitigation instruments such as bilateral contracts for foreign exchange swaps, Power Purchase Agreements (PPAs), and Emissions Reduction Purchase Agreements (ERPAs) can address technical risks relating to operation phases of bioelectricity projects. Similarly, private sector issued credit enhancement instruments, such as asset-backed securities, interest rate subsidies, credit tranching, and green bonds are tools through which banks can guarantee the liabilities to a project towards its lenders.

Regulators can help project developers deliver professional and bankable project proposals by creating a predictable and stable regulatory regime for renewable energy and foreign direct investment. Since bioelectricity projects often struggle to compete on a generation cost basis with fossil fuels and alternative renewable energies, dedicated regulatory instruments, such as Renewable Portfolio Standards (RPS) public tenders, Feed-in-Tariffs (FiTs), tax incentives, and auctions are often necessary to create a niche for bioenergy project developers. Once these avenues are established it becomes critical to ensure that generation prices offered to project developers are consistently communicated and periodically updated to reflect often-changing political and economic environments. In this way currency volatility and foreign exchange exposure impacts of project developers can be mitigated.

Overall, Community of Practice members were highly satisfied with the initiative and are excited to continue working on bioelectricity policy development in 2017. Annex D documents the systematized evaluation given by Community of Practice members on overall initiative performance. The preliminary framework for bioelectricity project development outlined above provides a comprehensive starting point for Community of Practice members to more effectively communicate bioelectricity sector risks and opportunities to their home institutions. On its own, however, this framework cannot catalyze the transformative change members hope to achieve. Continued group-oriented programming and country-specific technical assistance is required to build on progress in 2016.

Suggested Group Work Facilitated by the LEDS GP in 2017

Based on the input for the 2017 work plan from Community of Practice member countries, the following proposed knowledge exchange and peer learning group activities are suggested:

- **Online Session 1:** Improving understanding between policy makers, development banks, and the private sector on bioenergy sector risks and steps that can be taken on all sides to mitigate that risk. (Possibly led by Camila Ramos, Clean Energy Latin America)
    - *Brazil Case Study*: The Role of National Development Banks in De-risking Bioelectricity Sector Development, including project debt financing and capital instruments
    - *Argentina Case Study***:** The Role of Private Lending Institutions in De-risking Bioelectricity Sector Development, including bilateral contracts and credit enhancement instruments. (See Annex A Argentina Dossier FODER biomass trust fund)

- **Online Session 2:** Addressing biomass feedstock-specific investment risks in bioelectricity project development (Possibly led by Kay Schaubach, German Biomass Research Center)

- **Online Session 3:** Determining appropriate scale for bioelectricity project development: From self-generation to utility scale (Possibly led by Anelia Milbrandt, National Renewable Energy Laboratory)

- **Workshop:** The online sessions should culminate in a one-day workshop at which the results of all group work are reflected and insights from in-country deep dives will be presented in order to examine progress made and design the next necessary steps to advance bioelectricity as a means for further economic and social development in the member countries and the region at large.

Annex A: Online Session Themes and Experts

Session 1 | Resource Potentials & Technical Considerations
Goal: Assessing resource potentials of a variety of biomass feedstocks for electricity generation in participating countries and analyzing technical challenges and solutions
Featured Experts:

- Anelia Milbrandt **|** Senior Energy Resources Analyst at the National Renewable Energy Laboratory (NREL). Anelia presented the Biopower Atlas, a sophisticated and extensively used biomass resource assessment tool that covers areas such as biopower generation and capacity potential, existing policies and incentives to support biopower in a given region, existing infrastructure, and competition for resources.

- Alejandro Roblero **|** Chief Executive Officer at the Center for Sustainable Markets Intelligence (CIMS). Alejandro presented the case study of Costa Rica's experience with biomass resource assessment through the *Organic Agricultural Waste Generation (OAW)* Initiative

Session 2 | Costs & Benefits of Alternative Bioelectricity Pathways
Goal: Evaluating the economic and social costs and benefits of alternative pathways for biomass feedstock residue integration into electrical systems
Featured Experts:

- Marco Colangeli | Program Adviser for the Global Bioenergy Partnership (GBEP) at the Food and Agriculture Organization (FAO). Marco provided an overview of the Global Bioenergy Partnership, including its groundbreaking framework of sustainability indicators for bioenergy cost and benefit analysis and case studies of its application in Indonesia and Colombia

Session 3 | Policy, Administration, and Financing
Goal: Creating attractive investment environments for biomass-based electricity generation
Featured Experts:

- Camila Ramos | Founder and managing director of Clean Energy Latin America (CELA). Camila provided an overview of best business models for bioelectricity development, covering public tendering, accessing finance, debt structuring, and working with development banks

- Kay Schaubach | Leader of the "Markets and Utilizations" Working Group at the German Biomass Research Center (DBFZ). Kay presented on the creation of enabling legal frameworks for bioelectricity, including financial incentives and safety boundaries.

Annex B: Agenda of the In-Person Workshop

9:00 – 10:15 Session 1: Setting the stage

- Welcome from Minister Luis Felipe Arauz Cavallini, Costa Rica Ministry of Agriculture and Livestock
- Introduction of agenda and workshop goals
- Personal introductions of participants and their expectations
- Recap of online sessions
- Kay Schaubach introductory presentation: *From research and analysis to smart policy-making: The German and Caribbean experiences*
- Camila Ramos introductory presentation: *Markets, business models, policies: Regional experiences in bioelectricity investments risks and enablers*

10:30 – 13:00 Session 2: Country-by-country discussions: Where do we stand? What achievements are envisioned in 2017? Where is support needed? *-30 minutes per country delegation-*

- Moderated country conversations based on slides shared from facilitators and completed by attendees

14:30 – 16:00 Session 3: How to tackle current challenges? How to achieve 2017 goals?

- Development of country work plans in break-out groups. Grouping of key challenges in the areas of
    - Technology and information TA needs of individual countries (lead: Kay) technical/policy assistance
    - Financing and Policies for 2017 work plans (lead: Camila)

16:15 – 17:30 Session 4: Presentation of work plans to the whole group

- Presentation of break-out group results to plenary
- Discussion:
    - What is essential? What is achievable? How?
    - Best and worst practices: Learning from another

17:30 – 18:00 Session 5: Wrap-up and next steps

Annex C: Country Profiles

The following *country profiles were prepared by project staff and sent to country delegations for review prior to the in-person workshop as a way to identify existing knowledge and knowledge gaps and well as to set 2017 project goals.*

Argentina

Biomass/Bioelectricity Potential

- An Executive Report by CADER (2015) identifies 5.5 GW of biomass (2GW from residual, and 3.5GW from energy crops). (Page 8)
    - Question: Have there been any subsequent technological assessments of biomass/bioelectricity potential? What results?
- The 2013 NAMA by PROBIOMASA reports that the potential of biomass consumption can increase from 2.5% to 10% (=12 million ton/ year of energy consumption and avoided emissions of almost 9 million tons of CO2eq per year)
    - Other benefits include saving on fossil fuel imports, creation of jobs, energy security improvements in ~30 communities, reduction of soil and water pollution, and fire reduction. (Page 1)

Biomass/Bioelectricity Installed Capacity:

- The Executive Report by CADER (2015) reports that government investment increased production of biomass from 1% in 2005 to 13% in 2014, which corresponded with the installation of the UPM pulp mills such as Botnia and Montes del Plata (page 37)
    - Question: How did production of biomass in Argentina increase if the Botnia pulp mill is in Uruguay? Is there another mill in Argentina of the same name?

Biomass/Bioelectricity Policies

- 2015: Argentina (i)NDC. Sets target to increase use of biomass for electricity amongst a suite of agriculture-based climate mitigation measures. Measures contributing to "Unconditional Goal" to reduce GHG emissions by 15% in 2030 to projected BAU emissions for that year.
- 2013: Argentina NAMA "PROBIOMASA – Project for the Promotion of Energy from Biomass." Purpose to provide a tool for technical evaluation of biomass projects against each other and to improve access to financing streams. PROBIOMASA targets 2700 MW (50% electricity, 50% thermal) generated from biomass by 2030, along with associated fuel import savings, jobs creation, CO2 emissions reduction, and local environmental pollution reduction targets.
- Law 27.191. Renewable Energy Goals to 2025. Law improves and extends RE legal framework, setting mandatory (20% from RE) 2025 targets for all energy consumers and instructing MINEM to design appropriate mechanisms to achieve mandate. Law Allows large consumers to source RE

directly from IPPs, traders, utilities, or self-generation. Includes fiscal incentives to IPPs to reduce PPA prices, market and financial incentives for local supply chain, and sector specific trust fund (FODER) to provide payment guarantees and project financing

Financing and Institutional Support:

- Law 27.191. Establishes sector specific trust fund (FODER).
- FODER utilizes a blend of treasury funds, public offerings, pension funds, and multilateral climate funds to finance long term project loans, interest rate subsidies, and equity contributions
- FODER utilizes a specific charge to electricity consumers to provide guarantees for all tendered PPAs.

Costa Rica

Biomass/Bioelectricity Potential

- The Ministry of Environment and Energy (MINAE) and the Energy administration (DSE) did a study in 2002 which estimated the annual production potential of biomass (from bagasse, firewood, other agricultural residues) to be 457.7 PJ (~127TWh) (p. 4)
    - Question: Is there an updated study of the biomass potential in Costa Rica?
- CIMS-INCAE (2011) analyzed the biomass potential in Costa Rica and discovered that biomass could be created through sawdust, pineapple crop waste, and biodiesel produced from Jatropha. These sources could be used for energy-intensive industry. They also concluded that there was enough biomass, but that the technology was no readily available.

Biomass/Bioelectricity Installed Capacity:

Two Percent of electricity in the grid comes from biomass.

Biomass/Bioelectricity Policies:

- 2015: Costa Rican (i)NDC. Includes the prospect of developing NAMA proposals for livestock and biomass in order to reach carbon neutrality by 2021
- 2015: Proposed Costa Rican NAMA on Biomass Energy (with support from GIZ and Cooperación española). Focus to facilitate use of organic agricultural/forestry residues (including sugar cane, pineapple, rice, palm oil, bananas, wood, and livestock) with best available technologies to increase use of clean energy
- 2015: National Development Plan 2015-2018. Sets strategic pillars, priorities, and objectives to optimize electricity system to satisfy growing demand while avoiding energy rationing. Prescribes that The Costa Rican Oil Refinery Company (RECOPE) continues to participate in R&D of projects relating to biomass.
- 2015: VII National Energy Plan 2015-2030. Provides guidance on development of energy sector including establishing a specific electricity tariff for bioelectricity (covering all feedstocks) through ICE, advancing distributed generation from biomass

- April 2016: Feed-in tariffs for Waste-to-Energy (WtE) projects under consultation period beginning in April 2016.

Financing and Institutional Support:

- February 2016: National Forum on Energy from Biomass held. Forum included roundtable of government, private sector, and civil society representatives

Private Sector Projects

- Companies (Del Oro—orange juice company—and Tio Pelon) feeding energy into the grid with their surplus electricity from biomass, and therefore saving themselves money.
- Coopeguanacaste (electrical distribution company) is to invest $35 million in a biomass plant, expected to produce 2.5-3MWh (can light ~300 houses)
- Agropecuaria 7048 – $15 million investment for plant that is powered through gasification; as of December, was only awaiting permits
- Bridgestone in Costa Rica reduced emissions by 55% in a year and a half using biomass
- Several million dollars worth of investment in biomass (waste) put on hold for environmental concerns (all projects were put on hold)

El Salvador

Biomass/Bioelectricity Potential

- Plan Maestro para el Desarollo de la Energia Renovable (Master Plan for Development of RE) (2012) reports 109.5 MW of biomass potential (page 15)
    - Considering biomass from Sugar (109.5 MW), Coffee (0.06 MW), Rice (0.95MW) (pages 63-64)

Biomass/Bioelectricity Installed Capacity:

- El Consejo National de Energia reported that there were 103.5MW of biomass installed, approximately 7% of renewable capacity (page 3)

Biomass/Bioelectricity Policies:

- 2015: El Salvador (i)NDC. Does not set concrete unconditional target but aims to boost energy efficiency and the transition towards renewables. (i)NDC does not explicitly mention biomass or bioelectricity.
- 2014: Five Year Development Plan 2014-2019. Mandates mainstreaming of climate change considerations across all government energy, economic, and agricultural institutions.
- specific target of 15% increased RE production by 2019 from 2014 levels.
- Economic development strategy includes objective to reform energy sector regulatory framework to facilitate diversification of energy matrix through renewable energy

- Objective E.7.4.2 – Develop cross-sectoral climate change adaptation plans, including in the agriculture and energy sectors
- 2015: Master Plan for the Development of Renewable Energy. Provides scoping analysis of biomass technologies and recommendations to increase use, including updating biomass data, establishing regional cooperative frameworks of biomass resource factories, and technology transfer for small-scale biomass power plants

Financing and Institutional Support:

- Decree 462 (2007) was issued in order to increase investment in renewable energy projects, including biomass and biogas.
    - Projects are eligible for the following benefits:
        - Exempt from import duties for the first 10 years on any equipment, machines, materials, etc., including things needed for transmission etc.
        - All projects over 10MW will be completely exempt from income tax for 5 years, and for projects less than 10MW, exempt for 10 years.
        - Tax exemption from profits made from emission certificates
        - All on page 2

Private Sector Projects:

- Ingenio El Angel—finalized the last phase of the biomass plant next to sugar mill ($70 million)

  ~0.536MW per ton of bagasse (cogeneration)

Jamaica

Biomass/Bioelectricity Potential

- National Energy Policy, "high potential for biomass production" (page 34)
- Biomass Feedstock and Cogeneration in the Sugar Industry of Jamaica (2011) issued by MEM. The consultant team is from LANDELL MILLS LTD. It has biomass assessment. The agricultural sector and especially the sugar sector is the main producer of renewable energy. For cogeneration and electricity production, a figure of 220 to 300 GWh yearly production, with 94 MW installed capacities is estimated. (Page 1)
- Jamaica Sustainable Energy Roadmap (2013) suggested by improving power generation efficiency at Jamaica's existing sugar refineries and using waste from current agricultural production, biomass can provide nearly 10% of the country's current electricity demand. (Page 54)

Biomass/Bioelectricity Installed Capacity:

- No public information on installed biomass capacity or project information.

Biomass/Bioelectricity Policies:

- 2015: Jamaica (i)NDC? Reaffirms target for 20% renewable energy share by 2030 and goal for energy security by utilizing domestic energy resources. Does not explicitly biomass or any other specific renewable energy generation technologies
- 2009: Vision 2030: Energy Sector Plan. Produced under instruction of Government of Jamaica to prepare a comprehensive long-term national development plan. Broad targets to reduce dependence on imported petroleum and create a diversified, efficient, and sustainable energy sector. Targets development of a range of biomass feedstocks for electricity including biogas from sewage systems, waste-to-energy, solid waste disposal, and agricultural residues
- 2009: National Energy Policy 2009-2030. NEP promotes energy security, environmental sustainability of the energy sector, energy efficiency and conservation, energy sources diversification, and increased use of economically viable renewable energy sources. Government target to supply 20% of the country's energy from renewables by 2020. Bioenergy not considered of "high importance" in NEP
- 2003: National Solid Waste Management Act and Regulations. Establishes National Solid Waste Management Authority, responsible for collection, storage, transport, recycling, reuse, and disposal of solid waste. **Includes right to introduce cost recovery measures for waste management—such as energy resource recovery from waste**
- 2010: DRAFT National Energy-from-Waste Policy. Sets strategic policy framework to facilitate 1) creation of economic infrastructure and planning conditions for energy-from-waste sector, 2) utilize most appropriate technologies for sustainability, 3) create partnerships with the waste and agriculture sectors, and 4) create a well defined regulatory framework for energy generation from waste

Financing and Institutional Support:

- Jamaica Sustainable Energy Roadmap (2013) suggested actions to strengthen Sustainable Energy Finance in Jamaica including expanded education campaigns to improve risk perception for sustainable energy investments, establishment of sovereign guarantees for sustainable energy loans with support from development banks, and establishment of national strategies for accessing climate finance through Nationally Appropriate Mitigation Actions (NAMAs) and the Green Climate Fund (GCF)

Uruguay

Biomass/Bioelectricity Potential

- From the REGSA Analysis, biomass potential estimated at 200 MW from saw mills and 100MW associated with waste in the North (Page 12)
    - Question: Have there been any subsequent technological assessments of biomass/bioelectricity potential? What have been those results?

Biomass/Bioelectricity Installed Capacity:

- The SE4ALL assessment reported that 9% of Uruguay's energy in 2011 came from biomass (page 11) and that a total of 109MW of biomass projects had been developed (page 31).

- Question: Since 2011 has there been any more installed bioelectricity capacity?

Biomass/Bioelectricity Policies:

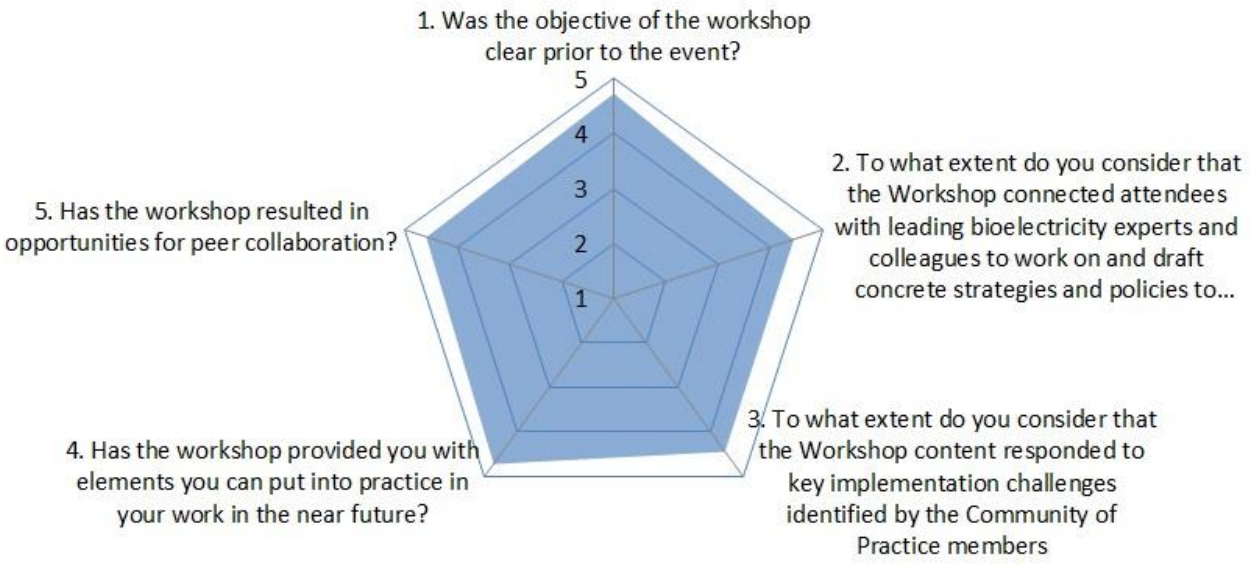
- 2015: Uruguay (i)NDC. Sets economy wide target for 40% energy generation from renewable energy sources by 2017 (primarily wind, but including emphasis on solar PV and biomass)
- 2005: National Energy Policy 2005-2030. Sets short (5 year), medium (10 – 15 years), and long (20+) year goals for energy system development. Includes target to incorporate 200 MW from biomass through private investment, to be operational by 2015.
- **Financing and Institutional Support:**
- March 2006: Decree 77/006. Prescribes that national electricity utility will offer specialized tenders through auction for generation facilities providing energy from various renewable energy technologies, including biomass
- August 2009: Decree 354/009. Prescribes that non-conventional/renewable energy resources providing electricity to the national grid are exempt from 1) 90% income tax exemption for projects beginning between July 2009-December 2017, 2) 60% income tax exemption for projects beginning between January 2018-December 2020, and 3) 40% income tax exemption for projects beginning between January 2021-December 2023.
- 2010: EXPIRED Decree 367/010. Feed-in Tariff for biomass electricity generation, ran from 2010 to 2011. Higher tariffs (US $107/MWh) offered for centrally dispatched electricity (utility controlled) and lower tariffs (US $92/MWh) were offered for self-dispatched electricity (uncontrolled). ***has this FiT been replaced?***

Private Sector Projects:

- Botnia- private company generates electricity for their own consumption (using biomass) and sells surplus to grid.

Annex D: Evaluation of the Initiative

Evaluation of LEDS LAC Bioelectricity Community of Practice Effectiveness, Given in Average Score (1-5)



Survey Questions	Average Score	Strongly agree (Weighted Score of 5)	Somewhat agree (Weighted Score of 4)	Neither agree nor disagree (Weighted Score of 3)	Somewhat disagree (Weighted Score of 2)	Strongly disagree (Weighted Score of 1)	No response
1. Was the objective of the workshop clear prior to the event?	4.73	8	3	0	0	0	0
2. To what extent do you consider that the Workshop connected attendees with leading bioelectricity experts and colleagues to work on and draft concrete strategies and policies to address bioelectricity challenges	4.45	7	2	2	0	0	0
3. To what extent do you consider that the Workshop content responded to key implementation challenges identified by the Community of Practice members	4.45	7	3	0	1	0	0
4. Has the workshop provided you with elements you can put into practice in your work in the near future?	4.73	8	3	0	0	0	0
5. Has the workshop resulted in opportunities for peer collaboration?	4.6	6	4	0	0	0	1