Submission for consideration in development of Bioenergy Roadmap of Australia

World Bioenergy Association

Bioenergy

Bioenergy is the largest form of renewable energy covering 14% of the overall energy consumption globally. Energy from biomass can be as any of the three forms of energy – power, heat/cool or transport fuels. Unlike other intermittent renewable energy sources, energy from biomass is on-demand, or 'dispatchable'. The capacity factor of bioenergy plants can be 95%, and energy efficiency is usually at least 80% and often over 95% when all heat energy produced is utilised. More permanent jobs are created per unit of energy consumed from biomass that from any of the other renewable energy forms with more than 3 million people being employed in the sector globally[1]. Bioenergy is the only form of renewable energy that can fully substitute fossil fuelled power plants, without the need for battery storage or sources of 'back-up'.

Production of bioenergy can be at levels including national, city and village level and can significantly add to regional economic stability. Production of bioenergy is carbon neutral as the emissions produced during combustion is equal to the emissions captured by the biomass feedstock, while the emissions from the supply chain of biomass to bioenergy (e.g. transport) can be mitigated by replacing fossil fuels with biofuels. The production can be carbon positive as well with technologies such as BECCS.

Typically, bioenergy is produced from wastes and residues from forestry, agriculture and municipal solid waste while in limited cases, feedstock is grown for the sole purpose of producing energy (e.g. short rotation crops). Bioenergy production is technologically mature and 1000's of commercial scale facilities are producing bioenergy around the world. Many of the world's leading industrialized countries have bioenergy as their primary focus for reduction of national GHG emissions, creating jobs and ensuring energy security.

In the EU overall, bioenergy provides up over 60% of all renewable energy consumed including energy used for heating, cooling, transport fuels and electricity. EU countries where this is the case include Germany, Denmark and Austria. In each of these, it is the source of not just heat, but significant biofuels and power. Moreover, there are a number of countries where more energy consumed comes from biomass than any other single source, and Sweden, Finland and Latvia are examples among EU countries (e.g. Sweden biomass is the source of over 40% of all energy consumed).

[1] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jun/IRENA_RE_Jobs_2019-report.pdf

Australia is one of the sleeping giants in bioenergy due to the vast untapped potential of biomass available in the country. The country has great potential for development of a bioenergy sector as part of development of a bioeconomy. In 2017, the share of biomass and waste in primary energy was 4%. The share of biopower was only 1.3% in the national electricity mix[2] while there was no significant contribution from bioenergy in both heating and transport fuels. As mentioned previously, countries similar to Australia have already realized the potential for bioenergy in meeting the energy needs and reducing emissions along with its multitude of socio – economic benefits of jobs and local economic development.

Markets and Technologies

Drivers and impediments

There is a huge potential for the deployment of bioenergy in Australia. Our research has shown millions of tons of agriculture and forest residues underutilized in the country. These are either left on the fields/forest, burnt or converted to processed biomass (e.g. woodchips) for export markets. At the same time, the country is heavily dependent on coal, natural gas and imported oil produces for energy needs which impact the health and economy of the nation. The success of the bioenergy sector will help the country to reduce emissions as well as improving the economic situation by reducing imports, creating good paying jobs and utilizing local resources.

Unlike other intermittent renewable energy sources which require large scale deployment of storage power (e.g. batteries), bioenergy along with hydropower offer much needed, on demand (dispatchable) renewable energy to meet the needs of end consumers. Moreover, the cost of generating electricity from biomass has been falling significantly and with the right incentives, can compete with fossil fuel as well as renewable energy technologies[3]. In some cases, utilizing biomass is 2 – 3 times cheaper than fossil sources including natural gas[4].

The challenges faced by bioenergy have a common theme among all sectors and geographies. Lack of proper dissemination of information and perpetuation of mistruths due to lobbying by fossil fuel and other competing interests is one of the biggest impediments for the successful deployment of bioenergy in Australia and around the world. For sure, there are examples of poor management of bioenergy processes. However, these examples are either too few or occur due to other factors including bad land management practices and poor implementation of sustainability practices. Misleading arguments such as bioenergy destroying native forests leading to soil degradation and water loss are get promoted on various channels overshadowing the overwhelming evidence based on scientific research and practical realities

[2] https://www.iea.org/data-and-statistics/data-tables?country=AUSTRALI&energy=Electricity&year=2017

[3] https://irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019

[4] http://www.biokuras.lt/content_images/failai%20naujienoms/2017.11.21%20Informacinis%20leidinys_LITBIOMA.pdf

that show the various social, environmental and economic benefits of deploying sustainable bioenergy. The only possible way ahead to remove such impediments is to disseminate fact-based information to all relevant stakeholders.

Supply chain gaps

For the successful development of bioenergy, a synergy among all relevant stakeholders is extremely important. The lack of any long-term strategies by both federal and state governments has impeded the development of a proper supply chain in both forestry and agriculture sectors which ideally includes harvest, transport and storage of residues. Unlike the European Union which had stable policies for developing renewables including bioenergy (e.g. Renewable Energy Directive), the lack of such policies has impeded investments in both infrastructure as well as essential equipment required for developing efficient supply chains. Moreover, the lack of training and education for highly skilled labour to work in design, development, construction, operation and maintenance of bioenergy facilities is a major challenge.

Competitive advantage

An excellent advantage of a bioenergy-based system is the flexibility of feedstock available for utilization to produce energy. Moreover, the key benefit compared to other renewable energy technologies is that bioenergy is the only renewable energy source to meet all the demand of end use energy including heating, cooling, transport fuels, electricity etc. The scalability of the technology means that all sectors have successful case studies where bioenergy has contributed to reducing emissions and replacing fossil fuels in various end use sectors including residential, commercial, agriculture, fishing, mining etc.

Biomass Combined heat and power (CHP)

Biomass-to-heat is one clear area that could and should be developed, as it has a clear advantage economically over the use of other fossil fuels including natural gas and heating oil. As mentioned previously, biomass to heat is often the cheaper and financially stable option compared to natural gas in many parts of the world. A good example is Lithuania where biomass (e.g. wood pellets) used for heating is still 2 - 3 times cheaper than natural gas. Cities that switched to district heating with biomass had their energy bill reduced by 20 – 45%. In many examples, the payback time for a switch to biomass for industry heat is only couple of years. The international examples extend beyond forestry products and residues. Countries such as Denmark is a highly successful model for the efficient use of agriculture residue (e.g. straw) to energy due to high technological advancement, long term policies and financial instruments to incentivize the bioenergy use. The model is being studied and replicated in other parts of the world including interest in China, India etc.

Heating is not only limited to residential or commercial establishments due to the requiring of space heating and/or hot water. Industries such as automobile, pharmaceutical etc. also require a steady supply of heat throughout the year which can be fulfilled by biomass heat. In

instances where heat is not required, biomass heat can be converted to cooling using technologies such as adsorption chillers as is being investigated in European countries.

Anaerobic Digestion (Biogas)

Biogas can be produced from a wide range of putrescible wastes that are otherwise gathered and left in landfills leading to various ecological challenges of water pollution due to leakages and air pollution due to methane emissions. To solve this challenge, many countries around the world have adopted anaerobic digestion to produce biogas. Currently, close to 60 million m^3 of biogas is produced annually which is used for both electricity and heat production. Moreover, countries in Europe have successfully upgraded the biogas to biomethane which is either fed into the gas grid or can directly replace fossil gas in the transport sector. For e.g., biogas buses have a share of 15% in the overall public transport fuel use in the city of Stockholm (population of 1 million)[5]. Also, Copenhagen incorporated biogas in its city grid and this is expected to reach 100% by 2022. Cities such as Canberra, Sydney and Melbourne would benefit from focussing attention on utilizing upgraded biogas (along with other renewables) to run the public transport facilities as a first step.

Transport Fuels (Bioethanol, biodiesel)

Globally, more than 150 billion litres of biofuels are produced which account for 3 – 4% of the global oil consumption in the transport sector. Major policies to incentivize biofuel production include carbon pricing, blending mandates, emission reduction targets etc. Liquid biofuel production in Australia is limited due to lack of federal or state level mandates for biofuel production. Instances where biofuel feedstock such as crops, animal fats and used cooking oil (UCO) doesn't help the development of the sector. There are numerous pathways, technologies, end products and feedstock for the production of biofuels in Australia and success stories of Brazil, Sweden, Finland and the recent policy developments in India, China, Indonesia, Thailand etc. can be replicated for a successful liquid biofuel sector in Australia.

International trends

Electricity sector in Australia is dominated by the use of coal (62%) and natural gas (20%). Although natural gas may continue due to the availability of reserves in the country and export of majority of the production, coal production and consumption is expected to decline globally. Significant drop in generation of electricity from renewable energy sources including solar, wind, biopower will further drive the decline in the use of coal for electricity. Countries around the world are showing how renewables are dispelling myths and having an increasing penetration in the electricity grid, for e.g., renewables overtook coal for the first time in more than 130 years in terms of energy generation in USA[6] while Britain went coal

[5] https://www.biofuel-express.com/en/stockholm-is-the-worlds-first-capital-with-100-fossil-free-bus-services/

[6] https://www.theguardian.com/environment/2020/jun/03/renewables-surpass-coal-us-energy-generation-130-years

free for more than 2 months since the dawn of the industrial revolution[7] and EU facing a decline in coal production which was replaced by renewables and natural gas[8]. Countries such as Japan and South Korea have clearly identified the advantages of replacing coal with pellets, wood chips, and residues such as palm kernel shells and have signalled intent with major policy decisions (Feed in tariffs and renewable energy certificates) that are driving increased biomass use and declining coal use[9]. by This shows the resilience and the possibility of significant renewable penetration in major economies worldwide.

The heat market is not so well developed in Australia. In 2017, 9.5 Mtoe of fuel was used to produce heat in the country which is 200 times less than the total fuel used for electricity in the country. Three quarters of the fuel use for electricity and heat production is from coal. As pointed out previously, there is demand for fuels for space heating and hot water for residential, commercial sectors while industrial demand for process heat is also a driver for increasing renewable energy use. Processed solid biomass (e.g. pellets and wood chips) offer an excellent opportunity for low cost, sustainable and on demand heat production.

In transportation, crude oil and oil products have a share of 92% in the transport mix while in Australia, the share is 97% in final consumption. 88% of all the consumption of oil products in Australia comes from imports which significantly impacts the country's economy and threatens energy security of the country. Liquid biofuels offer a sustainable and renewable option for decarbonizing the transport sector in Australia. Experiences from around the world (e.g. Brazil, Sweden, Finland, USA) show that liquid biofuels are playing an increasingly significant role in replacing oil and developing country's economies. Sweden has a share of

The trend is clear, fossil fuels are no longer a sustainable option for energy generation and bioenergy along with other renewable energy sources will play a major role. In the near term (2030), coal will face a global phase out due to social, economic and environmental considerations. In the long term (2050), even though the global dependence on fossil oil will continue for a while, the significant focus on carbon neutrality as highlighted by IPCC[10] (Intergovernmental Panel on Climate Change) and in major economies (e.g. EU aiming for carbon neutrality by 2050[11]) means that fossil fuels will have a diminishing role to play with renewables including bioenergy as the best options going forward.

Focus: Domestic and trade

Biomass-to-heat is one of the markets that Australia's bioenergy sector needs to focus on. It can replace the use of natural gas or coal for heating/cooling at residential facilities and minor

[7] https://www.bbc.com/news/science-environment-52973089

[8] https://www.euractiv.com/section/electricity/news/power-shift-eu-coal-output-falls-24-in-2019/

[9] http://biomassmagazine.com/articles/15284/report-analyzes-biomass-supply-demand-in-asia-to-2030

[10] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf

[11] https://ec.europa.eu/clima/policies/strategies/2050_en

industries with wood pellets that are fired in boilers. It is suggested for Australia to focus on its domestic capabilities for heat and power in the initial stages.

After the success in the local market, trade of biofuels, feedstock and equipment are a real possibility. For liquid biofuels, Australia may think of partnering with international bioenergy stakeholders for export businesses. A surge in the demand for liquid biofuels from EU and USA for road, aviation and maritime transportation have opened immense prospects for fuel supply. Moreover, availability of biofuel feedstock such as waste animal fats and UCO are supplied to international markets that add to the economic development. Utilizing these raw materials from the farms in rural areas also stimulates employment benefits via such projects and is another income stream for various farmers and landowners.

International agreements as drivers

Australia played an important role in the development of the Paris Agreement and was one of the earliest countries to ratify[12]. Australia's Paris Agreement target is 26-28% reduction below 2005 levels by 2030[13] and it is quite evident that the country is not on track to meet the goals. However, as per the Paris Agreement and the issues highlighted by IPCC special report on 1.5 degree Celsius[14], countries around the world are facing increasing pressure to submit ambitious climate targets. Evidence from research communities, commitments from business sector and increasing public awareness (e.g. Fridays for future) around the world show that the path ahead is filled with renewable energy technologies and energy efficiency measures and a fossil fuel phase out is imminent.

Australia is also committed to UN Sustainable Development Goals (SDG) by 2030 and has already made progress towards achieving the goals. To make significant progress towards achieving goals including reducing poverty (SDG 1), affordable and clean energy (SDG 7), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9) and climate action (SDG 13), it is important to include bioenergy and related sectors in focus.

Australia has millions of tonnes of economically biomass available, and this can be utilized using mature technologies to produce energy for the emerging domestic market, and energy and energy carriers of different types for the international markets. The international market has massive and growing demand for biofuels, pellets, pyrolysis oil, and woodchip. There is the start of a demand for liquefied and compressed biomethane. It is almost certain that demand for sustainable and energy efficient biofuels etc. will increase as carbon tax and national and EU emission reduction and renewable energy targets rise through 2030 towards 2050.

[12] https://publications.industry.gov.au/publications/climate-change/climate-change/government.html

[13] https://climateactiontracker.org/countries/australia/

[14] https://www.ipcc.ch/sr15/

The Australian domestic industry will be able to produce more energy dense, higher value products from biomass cost-competitively, with the international market providing the demand and a certain base return for the various products in export demand. This will enable construction of plants sized to have good economies of scale, and it allows reducing product export as domestic demand increases. Presently the bulk of wood pellets are exported, going mainly to Japan. The markets for black pellets and pyrolysis oil are presently entirely overseas. The primary market (and currently the best prices) for ethanol and renewable diesel are in Europe and USA.

Resources

Feedstock

Currently available feedstock such as milling residues, black liquor from paper industries, nut shells, wood chips/residues from forests and plantations can be used to produce heat and power via thermochemical technologies like gasification, combustion and pyrolysis. In the agriculture sector, sugarcane and sweet sorghum residues can be used for bioethanol production and canola, UCO residues which are currently exported, can be used for biodiesel production. Animal dung, food wastes, sewage treatment sludge and other organic matter are available to produce biogas. Moreover, purpose grown energy crops with significant potential in Australia include lignocellulosic bamboo, oil mallee (Eucalyptus – Western Australia) and grasses like miscanthus which could be used for heat/power generation. In the agriculture crops mentioned above can be used for ethanol production. The amount of cereal straw available in Australia is also huge and if this is converted either to cellulosic ethanol to replace gasoline in the transport sector or can be processed to produce pellets for either co firing or direct combustion in electricity/heat plants as well.

Environmental impacts

The environmental impact of bioenergy production pathways is heavily dependent on the type of feedstock, technology used, location and end products along with the proper implementation of sustainability criteria. It has certain obvious advantages in ensuring a reduction in air pollution in urban areas caused due to the burning of fossil fuels. Moreover, various studies have shown that the life cycle emissions of bioenergy production have significant GHG savings compared to the fossil fuels being replaced.

Another key factor is biodiversity along with land use change due to increased use of biomass for energy purposes. The impact depends on the initial land use, bioenergy production pathways and management practices. Strict adherence to sustainability criteria as evident in majority of the bioenergy production pathways around the world ensures that bioenergy production could improve local yields and maintain the ecosystem functions crucial for biodiversity. The effect of bioenergy production on soil carbon can also be mitigated by appropriate management of the residues during harvest and post production – for e.g. it is always recommended to leave certain amount of residues on the field to maintain soil fertility

and by products produced during some of the conversion processes (e.g. biochar) can increase soil quality.

Climate change impacts

Climate change will have an impact on energy systems worldwide. Currently, significant amount of crops and forest residues along with urban waste is unexploited globally. At the same time, bioenergy depends on a diverse range of feedstock that can be grown sustainably around the world. Regions with high precipitation can produce high water requiring crops such as sugarcane while crops such as eucalyptus or jatropha can survive in semi-arid regions. Moreover, municipal solid waste is an ever present feedstock supply in urban areas. The current COVID19 pandemic has already shown the resilience of majority of supply chains.

Current policy

In Australia, The Clean Energy Council's Bioenergy Roadmap[15] believes that by 2020, total electricity generation from biomass could reach 10 624 GWh per year that is six times more than the 2016 – 2017 levels. Under the liquid biofuels sector, due to region-wise mandates within the country to meet decarbonization goals in the transport sector, petrol-ethanol blends are available at fuel stations. Currently, there are three commercial ethanol producers in Australia with five more facilities that are commissioned to start operating later this year[16]. Several biodiesel producers have also begun their operations in Victoria, New South Wales, Queensland and Western Australia. Examples of support policies available for Australian bioenergy production at federal and state level include:

Policy and regulatory instruments

Australia should initiate a plan on '*Climate Neutral Australia by 2050'* which should include for a gradual (step by step) phase out of fossil fuels in all end use sectors of electricity, heating, cooling and transport sectors. An international example is the Fossil Free Sweden initiative which encourages business sector to draw up roadmaps on how they will be fossil fuel free so as to meet the decision by Swedish parliament to make Sweden climate neutral by 2045. Moreover, EU aims to be climate neutral by 2050 – an economy with net zero greenhouse gas emissions. The announcement of such a vision would signal intent to investors to invest and deploy renewable energy technologies including bioenergy.

Secondly, there has rarely been such an opportunity for the global community including Australia to take action against fossil carbon emissions and global warming as there is now due to the low oil prices. Australia should initiate plans to gradually reduce *fossil fuel subsidies* which currently cost billions of dollars to the national economy[17]. Moreover, a

[15] https://research.qut.edu.au/biorefining/publications/biofuels-to-bioproducts-a-growth-industry-for-australia/

[16] http://www.energyfarmers.com.au/wp-content/uploads/01-Australian-Bioenergy-Roadmap.pdf

[17] https://stats.oecd.org/Index.aspx?DataSetCode=FFS_AUS

nationwide planning and implementation of a *price on carbon* (minimum of 30 – 40 AUD/ton CO_2) would provide incentives for developing and deploying bioenergy and renewable energy among all sectors. The current ACCU credits based on the ERF are way too low and do not cover all sectors[18].

International success stories

In the electricity sector, the **EU RED** (Renewable Energy Directive) was one of the key enablers for the development of bioenergy technology in Europe. Stable and long-term policies (e.g. blending mandates) provide much needed clarity to investors for investing in bioenergy production. Under the new RED 2, each country is developing national action plans on how the countries can achieve the renewable energy targets. Moreover, the overall EU vision of climate neutrality by 2050 is a significant milestone and can be a major driver for bioenergy development in the region. Currently, countries in Asia (e.g. Japan and South Korea) are implementing ambitious policies for increasing bioenergy use. Utilization of biomass (e.g. wood pellets, chips and agriculture residues) has increased while the use of coal is decreasing due to co firing with bioenergy or total replacement of coal with biomass. Policies such as Feed in Tariffs and Renewable Energy Certificates are promoting bioenergy either by providing financial incentives for using renewables and imposing penalties for continuing use of fossil fuels. Countries with well-established industries such as sugarcane in India and Brazil, wood industry in Sweden and Finland have benefited with increased use of biomass in the energy mix due to policies such as carbon pricing and federal mandates for increasing renewable energy share in the national electricity grid.

A key policy instrument for rapid expansion of bioenergy use within Australia would be a high price on carbon. Carbon taxes are efficient way to reduce efficient way to reduce the use of fossil fuels, improve energy efficiency, and make renewables more competitive.

Social license

Some of the factors that drive social acceptance and broad public support include: Reduction of fossil fuel import, stable fuel prices, GHG emission reduction, rural development and job creation, economic progress and waste to energy (W2E) conversion. The outcome of a successful utilization of biomass to bioenergy will be creation of 1000's of permanent jobs, decentralization of energy, greater national resource security and a major reduction in national GHG emissions. Other benefits include mitigation to agricultural production of the risks of climate change, diversification of farm incomes, and stimulus of regional economies, along with retention of population in rural and regional areas. Proper dissemination of the multiple benefits of bioenergy will drive social acceptance of the sector. Apart from that, stakeholder engagement along the entire supply chain followed by fair redressal of queries related to bioenergy production will go a long way in ensuring greater support for bioenergy.

[18] https://carbonpricingdashboard.worldbank.org/map_data

In majority of the situations around the world, only residues or low value feedstock is used for bioenergy production. These include harvesting residues from forests, wood processing residues from sawmill/timber industries, municipal solid waste from cities, agriculture crop residues and energy crops. The availability of different wastes and residues in Australia is immense and these forms of bioenergy offer the multiple benefits of providing much needed renewable energy, replacing fossil fuels, solve ecological problems of waste disposal, provide jobs and promote local economic development. Thus, a significant portion of feedstock base to produce bioenergy will be supported by the general public.

In this regard, the role of governments, academia and national/regional associations is extremely critical in ensuring the development and dissemination of fact based information about various forms of bioenergy and the multitude of benefits from the sector.

Key Stakeholders

Bioenergy involves strong collaboration among stakeholders along the entire supply chain. On the technology side, depending on the feedstock, production pathway and end use, key stakeholders include technology developers (e.g. boilers, gasifiers, fermentation tanks etc.), biofuel producers (e.g. pellets, liquid biofuels, biogas), feedstock producers (e.g. farmers, foresters, city/town municipalities producing municipal waste), bioenergy producers (e.g. utilities) and end consumers. For the success of any project and the bioenergy sector in general, a complete harmony among all these contributors is essential for significant development and deployment of bioenergy in Australia.

To achieve success, inputs from a variety of other stakeholders including the research community, civil society, general public and local governments is critical to ensure that bioenergy achieves significant shares in the energy mix of Australia. In such situations, industry associations at national level (e.g. Bioenergy Australia) or state level (e.g. Queensland Renewable Fuels Association) play a crucial role in engaging stakeholders and discussing opportunities and challenges for bioenergy development. International agencies such as WBA, IRENA and IEA are ever present in the discussions and can actively contribute to bioenergy queries.

Through stakeholder participation, information and knowledge sharing regarding various bioenergy platforms and the related services can be improved. The functioning of global bioenergy working groups and task forces can be explained by these professionals due to the high level of expertise they showcase in this field. Their participation can either be direct (involving biomass parts of the supply chain: densification, pelleting, drying, etc, along with process technology to convert this biomass to fuels and chemicals) or indirect (in the form of partnerships with equipment manufacturers, coordinating with operation engineers, transport of raw material, market analysis, etc). Another key insight that they bring into the bioenergy community is their financial investment skills that facilitates them to decide what projects to invest on and whether it would benefit them individually (on a business perspective) and also at the societal level.

Conclusion

In summary, most of the countries that are leaders in genuinely transitioning from fossil-fuelled energy toward 100% renewable sourced energy have bioenergy development as a major part of this transition. Most of these countries have already announced a formal target of achieving zero net GHG emissions by 2050 and bioenergy will play a prominent role in the future energy mix. Three elements will commonly be in place in the policies and strategies to allow the reaching of this target include:

- Long term plans for phase out of all fossil fuels across all sectors
- Implementing energy efficiency measures
- Promoting the development of renewable energy and bioenergy

It is high time that Australia puts in place the necessary, long term and stable policy and regulatory instruments to incentivize the production of sustainable bioenergy. The development of a roadmap is an excellent step and as an organization promoting bioenergy on a global level for more than a decade, the WBA commends the federal government for initiating the development of this Bioenergy Roadmap, and is pleased to send in this submission and happy to offer any advice in its development and implementation.

World Bioenergy Association

WBA is a global not for profit, non-governmental organization with a mission to promote the sustainable development of bioenergy on a global level and to support the business environment for bioenergy. WBA was established in 2008 and has a Secretariat in Stockholm, Sweden along with a branch office in Changchun, China. Our member network comprises of more than 250 members from more than 60 countries representing equipment manufacturers, biofuel and biogas producers, research institutes, individuals, national and regional bioenergy associations etc. from the complete value chain of biomass to bioenergy. We publish numerous factsheets, reports, position papers, articles, press releases on important topics related to bioenergy technology, policy, markets etc. WBA also organizes events including mission trips and conferences/workshops regularly to provide a platform for interaction among international bioenergy stakeholders. WBA is the only global organization promoting bioenergy at international forums due to our observer status with IRENA (International Renewable Energy Agency), UNFCCC (United Nations Framework Convention on Climate Change) and our collaboration with IEA (International Energy Agency), REN21 (Renewable Energy Policy Network for the 21st Century), GCF (Green Climate Fund), Go100% RE etc.

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