

Development of Insurance Products for Biomass Power Industry in India

FEASIBILITY STUDY

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EXECUTIVE SUMMARY

1. **Biomass Power** Industry in India is in a **high growth** trajectory, but many projects are unable to obtain equity and debt finance in view of the **high-risk** perceptions about the industry.
2. Despite the abundant availability of Biomass, the market is **under-developed** and faces **uncertainties** of supply and pricing.
3. State-owned power **utilities**, which are monopoly buyers of power generated by the Biomass Power Plants, are often **irregular** in paying dues.
4. Biomass Power Plants who follow suitable risk management protocols have sound business models to mitigate **fuel supply** and **credit default risks**. Nonetheless, the Power Plants may face the prospect of shutting down power generation in the event that fuel is not available in adequate quantities or at reasonable prices. Availability of suitable insurance products can improve the financial capacity of the Biomass Power Plants.
5. The insurance industry currently offers a suite of **insurance products** to cover various business risks, but has no solutions to tackle fuel and credit risks. Business Interruption insurance policies can provide compensation for loss of profits arising from shutdown in Biomass Power Plants caused by shortage of fuel.
6. However, discussions with Indian insurance companies indicate that, in respect of fuel supply and pricing risks, failure to procure fuel cannot be considered to be an **insurable risk**, since they are business risks attributable to the relative efficiency of supply chain management and financial capacity. Moreover, the absence of organised market and pricing transparency makes **loss assessments** difficult and subjective. Insurance products cannot hedge risks of fuel availability and pricing therefor. Credit defaults can be insured through existing credit insurance products. There are no instances of insurance products to insure fuel supply risks, and credit insurance products are not popular with power sector.
7. Crestar Capital India Private Limited conducted this Feasibility Study for the United Nations Environment Programme, in collaboration with 3 insurance companies in India.

1 BACKGROUND

- 1.1 **Slow Growth of Renewable Energy Industry:** National development strategies in many emerging and developing economies include the ambition of increasing the share of renewable energy production within the overall energy mix. However the high real and perceived risks associated with Renewable Energy Technologies (“RET”) and projects in developing countries have slowed the growth of the sector and restricted debt and equity financing.
- 1.2 **Industry Risks:** The main risks for Renewable Energy projects (“RE Projects”) are:
- Construction risk
 - Fuel supply /Resource risk
 - Technology risk
 - Country /Political risk
 - Regulatory risk
 - Credit risk
- These risks vary from one RET to another, and across different regions. For instance, in the case of **Biomass Power Plants**, one issue that comes up repeatedly when seeking finance is security of fuel supply and fuel price volatility, preventing the projects from reaching financial close.
- 1.3 **Risk Mitigation Instruments inadequate:** Risk management instruments, such as **insurance** products, can be used to mitigate or transfer certain risks associated with the financing of RET projects, thereby mobilizing capital flows to the sector. To take an example, a form of business interruption cover is required as well as instruments to secure long-term fuel supply contracts in the case of Biomass Power Plants. However, no such products are available yet. Even standard business interruption cover can be difficult to purchase for Biomass Power Plants dependent upon continuity of fuel supply.
- 1.4 **Catalysing the RET Market - UNEP/GEF Initiative:** The UNEP/GEF Project *Assessment of financial risk management instruments for renewable energy technology* is working to identify promising new financial risk mitigation solutions for RE Projects in developing and emerging economies.
- 1.5 **India Feasibility Study:** The United Nations Environment Programme, Division of Technology Industry and Economics, Energy Branch, Renewable Energy & Finance Unit, at Paris, France (“UNEP”), through its collaborating agency Basel Agency for Sustainable Energy at Basel, Switzerland (“BASE”), commissioned Crestar Capital India Private Limited, Mumbai, India (“Crestar”), to conduct this Feasibility Study to introduce Insurance Products tailor made for the needs of the **Biomass Power Industry** in India. The Feasibility Study, conducted during the period December 2007 – July 2008, identifies specific risk concerns relevant to the design of Insurance Products for mitigating fuel supply and receivable default risks in consultation with insurers and Project sponsors. It also analyses the relevant insurance products that are available and may be customised to mitigate risks for the Biomass Power Industry.

2 APPROACH, METHODOLOGY AND FINDINGS

Fuel Supply - Risk assessment

2.1 **Consulted existing and new Biomass Power companies on their fuel procurement strategies:** Crestar met and discussed with several Biomass Power Plants¹ across several States in India the status and performance of their upcoming projects and Plants. The general consensus is that the market for Biomass² is under-developed and fuel supply and pricing are significant risks. Several Projects are unable to obtain equity and debt financing³. Insurance companies do not have any products that can help mitigate the industry's risks.

2.1.1 Findings from consultations⁴ with **Biomass Power Projects, Suppliers & Consultants** • *Turboatom-TPS Projects* • *Jansui BPP* • *Desi Power* • *BERI* • *Development Alternatives* • *Malavalli Power* • *Jalkheri Power* • *Santoshimatha Power* • *Shalivahana Projects* • *ASN Power* • *Punjab Biomass* • *Chattisgarh PP* • *M K Raju Consultants* • *Shriram EPC* • *N C Jana* • *Win-Win Energy Systems*

- Fuel non-availability is the biggest risk facing Biomass Power industry
- Currently, prices of fuel are volatile, but are expected to stabilise in the medium term
- Efficient procurement of fuel hinges on several smart sourcing strategies
- There are technological barriers in using certain types of fuel
- Captive power plants enjoy comparative cost advantage over Independent Power Plants⁵.
- Some are exploring innovative sourcing from outside India
- Crop failures (of underlying crops) seldom affect availability of agro waste
- Prices vary widely across States, regions and seasons
- Fixed tariffs for sale of power⁶ adversely impact feasibility when fuel prices go up
- Interruptions in operations as a result of non-availability/ high prices of fuel are normal
- Credit risks differ from State to State, depending on credit-worthiness and contracting
- Clear State Government policies are a pre-requisite to establishment and operation
- Very few projects have contemplated insurance products for fuel and credit risks
- Insurance companies are perceived to be non-responsive and risk-averse to new products
- Insurance coverage will comfort banks/ investors

2.2 **Consulted Banks and Equity Investors on financial feasibility of Biomass Power projects:** Views of Commercial banks and equity investors, who are hesitant to finance upcoming Biomass Power Projects, were assessed for their key concerns relating to stability of cash flows and safety of loans.

¹ The power plants are conventional thermal power plants which use Biomass as fuel

² Biomass Power Plants use agricultural waste sourced from small farmers and crop processors

³ Several Biomass Power Projects are not being implemented because they are unable to attain financial closure

⁴ Consultations were conducted with various stakeholders, and this is an indicative list of those consulted and those whose presentations have been considered for arriving at these findings

⁵ Independent Power Plants – those who supply to the grid

⁶ Typically, rates for sale of power are pre-determined, with ceiling on cost escalation

2.2.1 Findings from consultations⁷ with Banks & Equity Investors: • IREDA • Bank of Maharashtra • ICICI Bank • Emerging Asia Clean Energy Fund • Acumen Fund

- Several projects are approaching banks for financing capital expenditure
- Many projects are not bankable, being unable to convince them on fuel and credit risks
- Business Interruptions arising from plant shutdowns can jeopardise debt servicing
- Banks and equity investors appreciate suitable insurance products to mitigate fuel risks
- There have been instances of poor loan performance in the case of Biomass projects

2.3 Studied the evolving scenario for availability of Biomass: Crestar discussed the emerging scenario with regulatory bodies, project sponsors, project advisors and both equity and debt financiers. The Government of India's Ministry for New and Renewable Energy ("MNRE")⁸ has formulated several policies to promote the establishment and operation of Biomass Power Plants. Besides, the different State Governments have framed policies⁹ for encouraging Biomass Power Plants in their respective regions. The Biomass Power Industry is witnessing high levels of activity at present, and looks to multiply generation capacity several times in coming years.

2.3.1 Assessment of the Ministry for New and Renewable Energy¹⁰

2.3.1.1 Approach: The Biomass power/cogeneration programme is implemented with the main objective of promoting technologies for optimum use of country's biomass resources for grid and off grid power generation. Biomass materials successfully used for power generation include bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc. The technologies being promoted include combustion/ cogeneration and gasification either for power in captive or grid connected modes or for heat applications.

2.3.1.2 Potential: The current availability of biomass in India is estimated at about 500 millions metric tones per year. Studies sponsored by the Ministry has estimated surplus biomass availability at about 120 – 150 million metric tones per annum covering agricultural and forestry residues corresponding to a potential of about 16,000 MW. This apart, about 5,000 MW additional power could be generated through bagasse based cogeneration in the country's 550 Sugar mills, if these sugar mills were to adopt technically and economically optimal levels of cogeneration for extracting power from the bagasse produced by them.

2.3.1.3 Technology: The thermo chemical processes for conversion of biomass to useful products involve combustion, gasification or pyrolysis. The most commonly used route is combustion. The advantage is that the technology used is similar to that of a thermal plant based on coal, except for the boiler. The cycle used is the conventional ranking cycle with biomass being burnt in high-pressure boiler to generate steam and operating a turbine with generated steam. The net power cycle efficiencies that can be achieved are about 23-25%. The exhaust of the steam turbine can either be fully condensed to produce power, or used partly or fully for another useful heating activity. The latter mode is called cogeneration. In India, cogeneration route finds application mainly in industries.

⁷ Consultations were conducted with various stakeholders, and this is an indicative list of those consulted and those whose presentations have been considered for arriving at these findings

⁸ The Ministry lays down policy and provides financial support to the RE industry, and is supplemented by equivalent support in different States

⁹ These lay down rules regarding, inter alia, location of power plants, Biomass potential, controlling unhealthy competition, liberalising movement of biomass, etc.

¹⁰ Excerpts from the MNRE's web-site

2.3.1.4 *Deployment*: The Ministry has been implementing biomass power /co-generation programme since mid nineties. A total of 167 biomass power and cogeneration projects aggregating to 1252 MW capacity have been installed in the country for feeding power to the grid. In addition, around 171 biomass power and cogeneration projects aggregating to 1850 MW of electricity are under various stages of implementation. Cogeneration projects in sugar mills includes 82 projects with installed capacity aggregating to 690 MW. Another 107 projects are under implementation aggregating to 1280 MW. States which have taken leadership position in implementation of cogeneration projects are Andhra Pradesh, Tamil Nadu, Karnataka and Uttar Pradesh, The leading States for biomass power projects are Andhra Pradesh, Karnataka, Chattisgarh, Maharashtra and Tamil Nadu.

2.3.1.5 *Promotional Policies*: Various financial and other incentives are discussed in **Appendix A**.

2.4 **Evaluated different States for robustness of their respective Biomass Power policies, especially with respect to allocation of biomass resources amongst various Biomass Power companies**: Crestar directly and indirectly evaluated select State regulatory bodies on their policies and regulatory issues to gain an understanding of problems facing the Biomass Power Industry. States are in various stages of evolving policies and progressing new projects, and there are variations in their approach and the intensity of projects under implementation¹¹. **Appendix B** reproduces relevant excerpts from State policies for the States of Haryana and Madhya Pradesh.

2.4.1 Findings from consultations¹² with **Regulators & Associations**: • *MNRE* • *Haryana Renewable Energy Development Authority* • *Punjab Energy Development Agency* • *MITCON* • *Maharashtra State Cooperative Sugar Factories Federation*

- Biomass Power is emerging as an important option in energy planning
- Only some States have formulated clear policies; there is no uniformity in approaches
- Certain States suffer from geographical disadvantages for alternative fuels¹³
- Open access¹⁴ is not permitted for sale of power except in the even of default
- Fixed-price tariffs are determined by State Regulatory Commissions¹⁵
- Unlike conventional thermal power plants, Biomass Power Purchase Agreements (“PPA”) may not have Take or Pay/ Guaranteed offtake arrangements¹⁶

2.5 **Analysed price patterns for Biomass**: Data on region-wise Biomass resources is incomplete – although there are databases for quantum availability of Biomass, databases for price histories are non-existent even for current prices, there being neither organised market nor price indices. Prices vary widely in different regions and seasons of the year, and depend on the business acumen and bargaining clout of the buyer and seller in individual transactions.

2.6 **Studied business risk mitigation strategies and built in safeguards**: Biomass Power Plants are adopting different business models to tackle fuel supply problems. In some

¹¹ Biomass Power Plants are clustered in a few States, based on availability of Biomass and friendliness of State Government policies

¹² Consultations were conducted with various stakeholders, and this is an indicative list of those consulted and those whose presentations have been considered for arriving at these findings

¹³ For example, proximity to coal fields

¹⁴ Selling to more than one buyer, trading in power, etc

¹⁵ State Regulatory Commissions, in each State, determine tariffs for supply of power to the grid

¹⁶ Typically, PPAs stipulate pre-determined power generation, failing which penalties are payable

States, regulators are planning/licensing capacity to stabilise demand-supply and curb unhealthy competition. Fuel supply risks differ from region to region in view of the variations in sources and quantities, availability of alternative fuels¹⁷ and ability to build linkages with local farming communities. Firm long-term procurement contracts are uncommon and the fragmented nature of Indian farming further magnifies supply chain problems.

- 2.7 **Evolved threshold loss limitation limits:** Business models adopted by Biomass Power Plants are robust enough to overcome Fuel Supply risks and minimise duration of Plant shutdowns. Stipulating ceilings on duration of plant shutdowns and/ or limiting claim amounts to debt servicing/ penalty commitments would limit losses for insurers selling business interruption insurance products.

Sale of Power - Risk assessment

- 2.8 **Assessed the credit worthiness of the power sale arrangements of Biomass Power companies:** Power purchase policies of different States follow generally accepted Power Purchase Agreement (“PPA”) contracting norms, although tariff determination, billing/ payment and dispute resolution mechanisms may vary from State to State. Nonetheless, the monopolist situation of State-owned utilities puts Biomass Power Plants in a poor bargaining position¹⁸. State Governments have often failed in their payment obligations under PPAs. Banks and equity investors perceive credit defaults as a significant risk for Biomass Power Plants, and establishment of new Plants is skewed in favour of States who have relatively better credit records.
- 2.9 **Evaluated the risks of cash flow delays and defaults:** In general, creditworthiness of State-owned power utilities is not good, although this varies from State to State. Disputes and delays in payments are not uncommon, although Biomass Power Plants are being accorded high priority by regulators and power utilities.
- 2.10 **Evolved threshold loss limitation limits:** In the event of default, PPAs may, in certain circumstances, permit power plants to seek other buyers and mitigate their risks of perpetual default by State-owned utilities; nonetheless, Plants may have to shut down generation for long periods of time till alternative sale arrangements are made. For insurers providing Credit Insurance support, limiting claims to 1-2 months of billing will limit losses, although there are doubts whether it is possible to segregate claims that arise from genuine financial difficulties as against disputed billing non-payments¹⁹.

¹⁷ Most Biomass Power Plants use diverse fuels, including Coal as alternatives

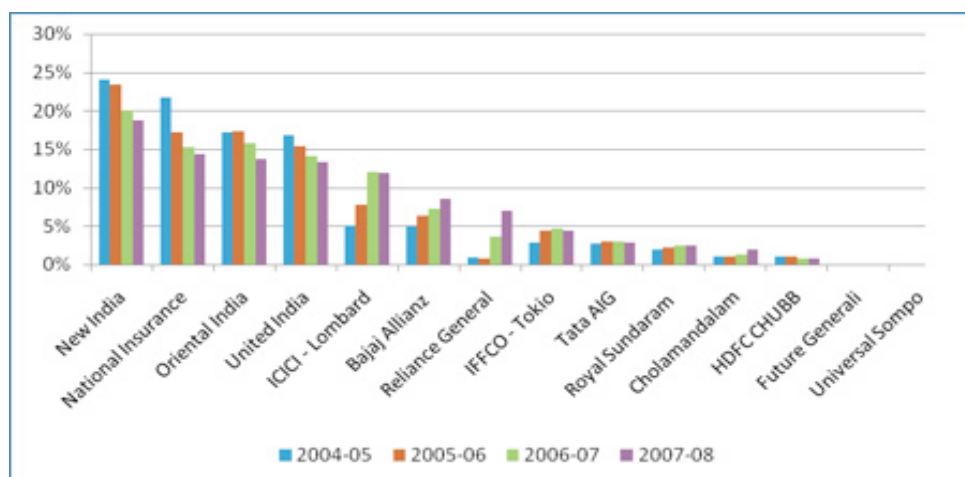
¹⁸ Typically, Biomass Power Plants face problems relating to unresolved disputes, delays in payments and restrictions on selling powers to other prospective buyers.

¹⁹ Payments are often held back citing disputes in performance and billing, which will prevent insured from filing insurance claims

New Product Development

- 2.11 **Studied existing insurance policy structures in India and abroad:** Insurance Industry in India follows standard product templates. However, tariffs till recently were regulated for several insurance products. Despite intense competition amongst both State-owned and private insurance companies, there is limited product innovation. New products have to be cleared by the IRDA prior to launch.
- 2.12 **Identified partner-insurance company to design and introduce the product:** Crestar collaborated initially with IFFCO-Tokio General Insurance Company Limited, a private insurance company, and extended to National Insurance Company Limited, State-owned and one of India's largest insurance companies and also discussed the proposed products with ICICI Lombard General Insurance Company Limited, India's largest private general insurance company. Discussions were held with each of these insurance companies on the business opportunities, insurable risks and marketing strategies.
- **Iffco-Tokio General Insurance Company Limited**
Iffco-Tokio is a private insurance company, owned by the Indian Farmers Fertiliser Cooperative Limited, one of India's largest fertiliser companies, and Tokio Marine & Nichido Fire Insurance Company, part of the Mitsubishi Group, Japan's oldest and largest general insurance company.
 - **National Insurance Company Limited**
National Insurance Company Limited, incorporated in 1906, is fully owned by the Government of India, and is one of the largest public sector insurance companies of India, carrying out non life insurance business. It has a network of about 1000 offices across India.
 - **ICICI Lombard General Insurance Company Limited**
ICICI Lombard General Insurance Company Limited is a joint venture between ICICI Bank Limited and Fairfax Financial Holdings Limited, one of Canada's oldest property and casualty insurers. ICICI Lombard, which commenced general insurance business in August 2001, is now India 's number one private general insurance company.

Table 1: Market Share of General Insurance Companies²⁰



²⁰ IndiaInfoline

2.13 Discussed feasibility of new insurance products: Discussions have been held with the collaborating insurance companies to cover the risks within the ambit of existing Business Interruption and Credit Insurance products. A **Risk Management Protocol for Small Scale Biomass Power Projects** (discussed in *Section 5*) has been devised to help insurers evaluate projects and rate risks.

2.13.1 Findings from consultations²¹ with Insurance Companies & Brokers: • *Iffco-Tokio* • *National Insurance* • *ICICI Lombard* • *Future Generali* • *HSBC Reinsurance Brokers* • *Saviour Insurance Brokers*

- There are no special insurance products for the RE industry, barring wind generation
- Insurers lack understanding of the upcoming opportunities in the Biomass industry
- There are limited capabilities to map and evaluate key risks in the Biomass industry
- Insurance companies are already fulfilling the normal insurance needs of the industry
- After removal of tariff restrictions²², pricing is market-driven and not risk-based
- Qualitative and Quantitative analytical techniques are not prevalent, and modern risk management practices are in a state of evolution
- Adverse claim ratios in some insurance products has led to cross-subsidisation in tariffs
- Databases for risk evaluation are generally insufficient
- Credit insurance policies have limited appeal for power projects in India
- Conventional crop insurance products are not suitable for Biomass power industry
- There are no insurance products to mitigate risks of fuel availability and pricing
- New product filing requirements with regulator IRDA²³ are cumbersome
- Existing insurance products cover fuel losses due to fires, accident and other perils

²¹ Consultations were conducted with various stakeholders, and this is an indicative list of those consulted and those whose presentations have been considered for arriving at these findings

²² Till recently, insurers had to price products based on a pre-determined common price list

²³ Insurance Regulatory and Development Authority

3 OVERVIEW OF BIOMASS POWER INDUSTRY IN INDIA

- 3.1 **Spreading clean energy movement:** Consequent to the announcement of the new national energy policy a few years ago, Indian electricity regulators are pushing power generating companies to source renewable energy power; in many cases, Biomass Power Plants are expected to dominate renewable energy power generation in India. Various State governments²⁴ have embarked on ambitious plans to increase the number of Biomass Power generation capacity by formulating clear policies and allocating biomass resources to private developers. Several projects are in various stages of design, financing and construction.
- 3.2 **Huge growth opportunities in the Indian Biomass Power industry:** India is implementing one of the world's largest programmes in renewable energy. Renewable sources already contribute to about 5% of the total power generating capacity in the country.²⁵
- 3.3 **Abundant Biomass:** India produces a huge quantity of biomass material in its agricultural, agro-industrial, and forestry operations. According to some estimates, over 500 million tonnes of agricultural and agro-industrial residue alone is generated every year. Studies have indicated that at least 150–200 million tonnes of this biomass does not find much productive use, and can be made available for alternative uses at an economical cost. This quantity of biomass is sufficient to generate 15,000–25,000 MW of electrical power.²⁶
- 3.4 **Major expansion in power generation capacity:** Currently, installed capacity of Biomass Power Plants is over 1400 MW²⁷. Biomass Power Plants with aggregate capacity of 1,700 MW are in the project pipeline. A cumulative biomass power potential of about 16,000 MW from the surplus agro residues have been estimated in the country²⁸. The States of Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal have potential for Biomass Power Plants of 100 MW or above.
- 3.5 **Biomass supply chain:** The upcoming projects propose to use agricultural waste²⁹ bought from small farmers in the surrounding region. Prices of biomass are negotiated directly with sellers, and there is significant price volatility.

²⁴ The most active States appear to be Punjab, Haryana, Chattisgarh, Madhya Pradesh, Maharashtra and Andhra Pradesh, judging from the number of projects coming up in their regions

²⁵ MNRE Booklet on Biomass

²⁶ MNRE Booklet on Biomass

²⁷ MNRE Booklet on Biomass, as on March 31, 2008

²⁸ National Biomass Resource Atlas, MNRE

²⁹ Agricultural waste is currently burnt or destroyed after harvest, there being no use or market

- 3.6 **Biomass resource availability has been mapped:** The Government has prepared a National Biomass Resource Atlas to map the availability of Biomass across India. Besides, the respective State Governments gather information on crops and Biomass availability regularly, and this data is available for several years. New Biomass Power Plants rely on Government data to decide on location of plants and capacities. In addition, localized surveys are commissioned by the individual projects themselves to validate the data and develop procurement strategies.
- 3.7 **Sugar-based Captive Power Plants vs. Biomass Power Projects:**
- 3.8 **Minimal Technology risk:** Technology for Biomass Power Plants is well established and risks of interruptions in Plant operations on this count are minimal, except when certain types of Biomass³¹ are used.
- 3.9 **Major Risks faced by Biomass Power Plants:***Fuel Availability:* Non-availability of Biomass, despite favourable preliminary assessments of resources and strong procurement strategies, could lead to business interruptions. Most Biomass Power Plants use diverse fuels and alternative non-biomass fuels to partly mitigate this risk.
- **Fuel Pricing:** High prices of Biomass make operations unviable, and wide swings in prices increases uncertainties.
 - **Credit Default:** Non-payment by buyers of power exposes them to credit defaults.
- 3.10 **Impact of shortages in Fuel:** Non-availability/ price volatility in Biomass could result in temporary shutdowns of the Power Plant. In the event of plant shutdowns, servicing of debt to banks (who have financed the Project) could be affected; besides, penalties may be payable under the terms of the PPAs that the Biomass Power Plants have with the buyers of power.
- 3.11 **Selling power to local grids:** Most States mandate sale of power generated by Independent Biomass Power Plants to State-owned utilities. Policy, contractual and tariff issues vary from State to State. PPAs usually follow generally accepted formats, although they may not provide adequate payment protection to the sellers. In some States, PPAs stipulate payment of penalties to the buyer in the event of non-generation of power by the Biomass Power Plants. Most electricity utilities are in poor financial shape and payments against bills for power supply are often delayed. Such delays can disrupt cash flows and cause losses to the Biomass Power Plant.
- 3.12 **Impediments to financing of Biomass Power Plants:** Biomass Power Plants face difficulties obtaining debt and equity finance from banks and investors in view of adverse risk perceptions about fuel availability and pricing. Availability of suitable Insurance products would help increase the attractiveness of the industry for financing. In the event that suitable Insurance Products are available, banks and investors are likely to stipulate mandatory insurance coverage as a pre-requisite to their financial

³⁰ This Report is concerned with only the fuel and credit risks facing the IPP Biomass Power Plants

³¹ It is essential that the Plants are designed for use of diverse sources of biomass and also handle special technical problems associated with their use

commitment. Insurance companies³² are not familiar with the industry; moreover, they lack the skills to conduct a comprehensive risk assessment.

- 3.13 **Customise Insurance Products:** Business Interruption Insurance Products³³ can mitigate the risks arising from erratic fuel availability and fluctuations in fuel prices. The Credit Default risks can be mitigated through Credit Insurance Products to protect the company against bad debts. Indian insurance companies offer both these categories of insurance products. However, insurers need to be sensitised to the special risks attaching to this industry. Designing a special insurance product requires a team of domain experts and in-depth understanding of the industry. Currently, the insurance industry is growing at a fast pace but there is considerable pressure to peddle standard off-shelf products instead of putting in efforts to innovate and originate new product development. Moreover, the long-winded new product filing requirements with IRDA also elongate development times.
- 3.14 **Pricing of insurance cover:** A stand-alone insurance product may be too expensive for the insured without offering inbuilt safeguards for the insurer. High premiums on insurance policies would deter Biomass Power Plan customers, although devising smart loss limitations will help price such products reasonably. Insurers may insist on insured adhering to suitable risk management protocols as a pre-requisite to selling them insurance products to mitigate the special risks. Further, bundling a suite of insurance products will also facilitate cross-subsidisation of tariffs across different insurance products comprising the package.
- 3.15 **Reinsurance:** Indian insurers reinsure a large chunk of their cover with reinsurers both in India and abroad. For any special policies, reinsurance support is crucial in influencing the insurer's decision. It may be appropriate to explore the options to seek reinsurance support from specialised overseas reinsurers.

³² India has a large insurance industry that comprises both state-owned and private companies, some of them with foreign affiliations.

³³ Insurance policies which pay compensation for loss of profits due to plant closures arising as a consequence of specific insurable risks

4 ANALYSIS OF RISKS

Fuel Supply Risk

- 4.1 **Summary of Risk – Non-availability:** The Key Risks/barriers associated with RE Projects³⁴ is the non-availability of Biomass Fuel required to run Biomass Power Plants. Without a continuous supply of Fuel, the Power Plant will have to shut down generation of power, entailing business interruption losses.
- 4.2 **Description of the Risk:** The Biomass Power Plants use agricultural waste that is left over after crops are harvested. The type of biomass fuel used will depend on the location of the power plant, but in many States, Rice Husk, Mustard crop waste, Cotton crop waste, etc are the most popular fuels. Failure to procure Biomass in adequate quantities is a significant risk. Availability of biomass depends on the success of the underlying crop, whose agro wastes are used as fuel. There being no organised market for Biomass, the Biomass power plants have their own captive sources of supply, but also face a larger open market risk. Intensity of competition for sourcing Biomass may vary depending on State policies and the level of exclusivity in procurement regions.
- 4.3 **Risk Mitigation:** Biomass Power Plants use several strategies to streamline supplies of Biomass:
- 4.3.1 *Multiple fuels:* The Power Plants are designed to use different types of Biomass so as to diversify the sources of fuel and thereby reduce risks of non-availability and price rises; it also reduces dependence on any single crop
- 4.3.2 *Committed suppliers:* The supply chain for Biomass is currently under-developed, but long-term supply contracts guarantee reliable supplies. Even where there are no long-term commitments from suppliers, it is possible to spread the risk across several small suppliers. Sourcing of Biomass is usually through several channels.
- 4.3.3 *Government Policy:* Biomass Power Plants locations are licensed where biomass is available in adequate quantities and the respective State Government regulates the licensing of Biomass Power Plants, thus protecting against unhealthy competition between different power plants competing for the same resources. Prudent State Government policies provide assurances of an exclusive biomass procurement zone and prevent export of Biomass outside the region.
- 4.3.4 *Mapping of Resources:* Biomass Plant locations are determined based on sustained availability of Biomass, and this is backed up by Government data³⁵ for several years.
- 4.3.5 *Resource assessments:* Biomass Power Plants also conduct their own biomass resource studies to validate the data on availability of biomass in their respective command areas and frame their sourcing strategies and organizational framework.

³⁴ *Financial Risk Management Instruments for RE Projects*, UNEP/SEFI Study, 2004 (“UNEP/SEFI Study”)

³⁵ State Governments collect and disseminate data relating to underlying crop production

- 4.3.6 *No problems of crop failures*: Concerns about underlying crop failure affecting the procurement plan for biomass are minimised since there is enough buffer stock in the hinterland of the Biomass Power Plant.
- 4.3.7 *Alternative Fuels*: Most plants also are designed to use alternative non-biomass fuels such as coal to overcome shortages of Biomass. For this purpose, they also enter into stand by supply arrangements with reliable coal suppliers.

Fuel Pricing Risk

- 4.4 **Summary of Risk – Price Volatility**: Rise in prices of biomass exposes Biomass Power Plants to high price volatility and may result in business interruption losses.
- 4.5 **Description of the Risk**: Biomass Power Plants face contingencies of price volatility in respect of fuel. Typically, they supply power to utilities at pre-determined fixed rates and have limited flexibility to pass on cost escalations. Such price volatility is a consequence of (a) over-dependence on one type of fuel or source of supplies, (b) high degree of competition for the same resources, and (c) unforeseen shortages in supply of Biomass. If prices of Biomass are too high, the Biomass Power Plant may be compelled to reduce or stop power generation for such period of time till prices are restored to normal levels.
- 4.6 **Risk Mitigation**: Biomass Power Plants face up to the market circumstances and use several strategies to blunt the impact of rising prices of Biomass:
- 4.6.1 *Temporary Price spikes*: The price volatility results from contingent market circumstances and corrects to normal levels in a short period. Since there are no other outlets for sale (apart from the Biomass Power Plant), price spikes are often temporary in nature and the market witnesses quick corrections. Moreover, price increases of Biomass are limited by the fact that export of Biomass outside the region it is produced is not viable.
- 4.6.2 *Maturing of Market*: Agro waste is being used in a large scale for commercial purposes for the first time in India. There is no organised market for trading in Biomass, since farmers and aggregators destroyed most of the agro waste; there is also no database of past prices. The market for agro waste is evolving and prices are expected to stabilise soon.
- 4.6.3 *Increasing bargaining power*: Use of a variety of Biomass reduces dependence on one source of fuel and the swapping of fuels helps bring down prices.
- 4.6.4 *Alternative fuels*: By switching over to alternative non-Biomass fuels such as Coal, the Biomass Power Plant is able to improve its bargaining position in the local market, thereby bringing down prices.

Credit Risks from sale to State-owned Utilities

- 4.7 **Summary of Risk – Credit Defaults**: Recoveries of dues from State-owned utilities who buy power from Biomass Power Plants is a problem, often resulting in credit defaults.

- 4.8 **Description of the Risk:** Some of the State-owned utilities that buy all the power generated by Biomass Power Plants have poor credit histories. Despite having PPAs, the Biomass Power Plants face uncertainties and delays in payments of their monthly dues. Since the utilities are the sole customers, defaults and delays could result in shutdown of power generation and consequential business interruption losses. PPAs with state-owned utilities have been contested, mostly due to non-uniform contract protocols, poor payment/ security structures and inadequate dispute resolution mechanisms.
- 4.9 **Risk Mitigation:** Credit Defaults is perceived as a lesser risk by Biomass Power Plants:
- 4.9.1 *Operate in creditworthy States:* Credit ratings of utilities vary from State to State, and several States have good payment records.
- 4.9.2 *Contractual protection:* PPAs drafted as per best practices and with sound payment/ security structures and dispute resolution mechanisms will help streamline payment of dues to Power Plants. The PPA will follow well-accepted formats and institute suitable safeguards for the Biomass Power company

Table 2: Risk Assessment Issues in Insurance Companies: Some industry views

Risk Management in Indian Insurance Companies: “The process of risk acceptance, till recently, was based entirely on the prescribed tariff premium rating structures. It did not require the insurers to undertake application of a risk-based analytical mind. It was also rather unnecessary, as such learning and understanding and application would not have helped insurers in pricing them eventually. Driving a message to the customers of their need to insure rather than assisting them to improve their risk management practices became the only desirable goal to be pursued by the insurers. In one sense, they perceived their roles more as providers of insurance covers and less as risk managers to their insured. The industry was paternally led by the *Tariff Advisory Committee* (“TAC”), a statutory body created to deal with harmonisation of rates. Now, with de-tariffing, insurers have been suddenly thrust into a new universe of risks about which they have little or no personal experience from a rating point of view. Differential and competitive pricing is permitted, whether or not the characteristics of the anatomy of risks differed. The expertise to categorise them on an evaluation of their risk exposures and pricing them independently calls for different levels of knowledge relating to the particular property to be insured and a set of analytical skills to interpret the data collected to price the risk exposures. Insurers have become price-takers, not price-makers.”

- *National Insurance Institute, Newsletter, Mar-Apr 2008*

Develop Underwriting Skills: “It is essential to moor pricing on sound technical base to prevent market going out of control. Underwriters and actuaries have to ensure that rating is based on sound technical considerations. Insurers need to engage the major clients in dialogue to guide competition along right lines and not just buy the cheapest. Underwriting staff at various levels have to be identified and trained.”

- *C N S Sastry, Advisor, IRDA, prior to de-tariffisation, Mar 2006*

Poor databases: “The market’s challenge will be to develop a database of reliable premium and claims information upon which insurance pricing can be based. Historically, India’s insurance industry has lacked such a database.”

- *Clive Baker, Guy Carpenter Views, June 2004 Marsh & McLennan Companies publication*

“Appointed Actuaries can only be effective if the statistical base is created in a manner that it can support rating of risks. Even those insurers who claim to have the availability of statistics should see if the statistics are adequate to support rating by every hazard factor.”

- *C N S Sastry, Advisor, IRDA, prior to de-tariffisation, Mar 2006*

Yet to devise risk evaluation protocols: “Insurers should develop databases of identified major risk exposures in each homogeneous category of risks. The types of risk management measures expected for each major risk exposure within each category should be specified. The insured’s current practice must be examined for the extent of compliance against the standard in respect of each hazard and each risk exposure. Similar databases in respect of claims that had occurred in respect of each homogeneous category of risks should be available. The causes of accidents, the extent of losses, the possible preventive measures, should be listed against each claim to decide what package of risk management process has to be devised along with the price. Having done this, the minimum and maximum pricing range can be suggested depending on the degree of acceptable compliance by an insured to the warranties to be imposed.”

- *National Insurance Institute, Newsletter, Mar-Apr 2008*

5 RISK MANAGEMENT PROTOCOL FOR SMALL SCALE BIOMASS POWER PROJECTS

- 5.1 The Biomass industry is in a nascent stage in India despite that there are a few Biomass power plants located across India. The sudden interest amongst regulators and project developers in biomass power has exposed the state of under-development in the supply chain for fuel and is causing demand-supply mismatches in the short-term period. The level of knowledge on the industry is low and insurance companies have poor knowledge base to evaluate risks for Biomass Power Plants. At this stage, parameters have to be defined for appraising risk and rating the quality of the project for the purpose of lending, investing and insuring. Adherence to such parameters will help mitigate fuel supply, pricing and credit risks that Biomass Power Projects face in the coming years. Some of the key issues that would help mitigate risks are discussed.

1: Supply Chain for Biomass must be well developed

- 5.2 Since there are **no organised markets** or **price indices** for agricultural wastes, the Biomass Power Plant must plan its supply chain intensively on its own – diversified supplier base, dispersed geographies, multiple fuel suppliers/ channels, dedicated supply contracts, long-term contracting and strong linkages with local farming communities. Intelligent procurement strategies and good management of operations mitigates both Supply and Price risks. Arrangements with commodity aggregators and traders are preferable to farm-based collection of Biomass. There may be advantages in regions where there is free movement of agricultural waste since it enables import of Biomass from other regions where it may be available in higher quantities or at lower prices. Government **policies** are key facilitators/ barriers in Biomass procurement.

2: Conduct independent Biomass resource assessment studies

- 5.3 Power Plant locations are decided based on **resource assessment studies** conducted by MNRE and State Governments. Site-specific validation by reputed independent experts to assess feasibility will help optimise use of resources.

3: Use multiple fuels

- 5.4 Plants must be located in and designed for use of **multiple** types of Biomass Fuels, which (a) are available in sufficient quantities, (b) can be supplied through the year, and (c) reduce price volatility. Dependence on one source of fuel is dangerous since the Plant also runs the risk of facing shortages resulting from potential crop failures and changes in cropping patterns over the years.

4: Non-Biomass fuels should be on stand by

- 5.5 Thanks to the seasonality of crops and occasional shortfalls, the Plants may be designed to use **Coal** as a stand by fuel in the event that Biomass is not available or is too expensive. Thereby, the Plant must be both close to sources of coal (such as mining belt) and have contracted for **linkages** (i.e. entered into stand by supply

contract). Proximity to sources of coal is an important criterion to assess the feasibility of a Biomass Power Plant, and if located far away from sources of Coal, the risks of Biomass availability and price Risks are higher.

5 Ensure technological compatibility for multiple fuel use

- 5.6 Use of multiple fuels, especially some like Rice Straw³⁶, can cause operating problems and additional maintenance costs in some situations. It may be appropriate to use only fuels that are technologically compatible and proven in use in Indian conditions.

6: State Policies should protect against overuse of Biomass

- 5.7 Each State has different policies regulating Biomass Power Plants - policies on licensing, priority over biomass resources and pricing. It is prudent to invest in regions where State policies provide assurances of an exclusive biomass procurement zone, import/ export of biomass outside the Power Plant's command area and grant protection against over-use of biomass resources. Unhealthy competition for Biomass resources amongst Biomass Power Plants should be curbed by State policies.

7: Competition from captive biomass power plants must be limited

- 5.8 Opportunity costs and revenue profiles vary significantly in respect of Biomass Power Plants meant to supply captive power and those that operate as Independent Power Plants, selling to the grid. IPPs face unequal competition for biomass resources from captive power plants, which are less hindered by high prices for Biomass. Intense concentration of captive power plants can be prejudicial to the interests of IPPs.

8: The seller of power should enjoy strong contractual protection

- 5.9 Purchase of power generated by the Power Plants has to be contracted by way of PPAs which have clear payment and security structures to minimise the risks of credit defaults, determine tariffs clearly and protect the seller in the event of disputes

9: The State utilities must be creditworthy

- 5.10 Since the credit-worthiness of State-owned power utilities vary, choice of States with better credit histories will improve the chances of debt recovery and minimise defaults.

10: Contingency plan for restarting plant is in place

- 5.11 Business interruptions resulting from non-availability, high prices of Biomass or defaults by the buyers of power have adverse financial impact. Biomass Power Plants must devise contingency plans to ensure continuity of power generation and restarting of the Power Plant by restoring fuel supplies or sourcing alternative renewable or non-renewable fuel and enhancing financial capacity to deal with cash flow crises.

³⁶ Problems with use of Rice Straw as fuel have been reported

6 DESIGN OF INSURANCE PRODUCTS

- 6.1 **Consultations with Insurance Companies:** Crestar worked with insurance companies in India to analyse the risks and evaluate the feasibility of introducing suitable insurance products to mitigate the fuel supply, pricing and credit risks for Biomass Power Projects.
- 6.2 **Slow development of new products:** Insurers have limited understanding of most RE projects and associated risks³⁷; they prefer to offer traditional products and have limited expertise to insure specific risks pertaining to renewable energy businesses. Underwriting processes and mentalities are rigid and inflexible to change and innovation. This institutional inertia is reflected in the tendency of the insurance industry to adapt existing products rather than develop new ones specifically for the RE sector.³⁸

Conventional Insurance Products

- 6.3 Insurance companies in India offer a suite of insurance products intended to cover risks associated with fire, special perils, business interruption, etc. These are widely available to Biomass Power Plants also, and insurance coverage is insisted upon as a pre-requisite for financing by banks and equity investors.
- 6.3.1 **Erection All Risk Policy:** Covers all risks associated with the construction/ erection of Biomass Power Plants. Project financiers insist upon these policies. Normal construction periods range from 12-18 months. Such policies do not distinguish between Biomass Power Projects and equivalent thermal power projects. Assuming an average plant size of 10 MW and a capital cost of Rs 30 – 40 million per MW, insured value is high. **Risk covered** – Construction of Biomass Power Plant
- 6.3.2 **Fire & Special Perils Policy:** Covers Fire and Special Perils (such as earthquakes, terrorism, etc). The biggest chunk of insurance coverage for Biomass Power Plants is in respect of Biomass inventories, which can be a significant quantity and value – sometimes exceeding 3 months' requirements – depending on the type of Biomass in stock and the region where the Plant is located. Inventories held in the Plant premises and at other premises, including those of stockists and agents, are also covered. **Risks covered**³⁹ – Inventories of Biomass, Biomass Power Plant

³⁷ UNEP/SEFI Study

³⁸ UNEP/SEFI Study

³⁹ Standard Fire risk cover is priced at Rs 1.50 per '000 sum insured. Extensions for covering risks of earthquake, terrorism, etc. are priced extra; earthquake cover would also depend on the location of the insured's premises, ranges from 0.10 to 1.00 per mille, and terrorism attracts premium of Rs 0.25% per mille (*Source*: National Insurance Company)

Table 3: STANDARD FIRE& SPECIAL PERILS POLICY⁴⁰

Categories of Risks covered:

- Fire
- Lightning
- Explosion/Implosion
- Aircraft Damage
- Riot, Strike, Malicious and Terrorism Damage (“RSMTD”)
- Loss of or visible physical damage or destruction by external violent means directly caused to the property insured
- Storm, Cyclone, Typhoon, Tempest, Hurricane, Tornado, Flood and Inundation
- Loss of or visible physical damage or destruction caused to the property insured due to impact by any Rail/ Road vehicle or animal by direct contact
- Loss, destruction or damage directly caused by Subsidence of part of the site on which the property stands or Land slide/Rock slide
- Bursting and/or overflowing of Water Tanks, Apparatus and Pipes
- Missile Testing operations
- Leakage from Automatic Sprinkler Installations
- Bush Fire
- Loss of earnings, loss by delay, loss of market or other consequential or indirect loss or damage of any kind or description whatsoever
- Loss, or damage by spoilage resulting from the retardation or interruption or cessation of any process or operation caused by operation of any of the perils covered
- Loss by theft during or after the occurrence of any insured peril except as provided under Riot, Strike, Malicious and Terrorism Damage cover
- Any Loss or damage occasioned by or through or in consequence directly or indirectly due to earthquake, Volcanic eruption or other convulsions of nature.

- 6.3.3 **Machinery Breakdown Policy:** Covers costs incurred due to Electrical/ Mechanical Breakdown of Plant. This policy does not cover plant shutdowns due to other reasons. **Risk Covered** – Breakdown Costs for Biomass Power Plant
- 6.3.4 **Transit Policy:** Covers risks associated with Transport of Fuel from suppliers. Will apply only after the ownership of Biomass stocks has passed on to the insured. This is a normal risk, which is covered by most Biomass Power Plants. **Risk Covered** – Loss in transit of Biomass procured by Biomass Power Plant
- 6.3.5 **Crop Loss Policy:** Covers risks associated with loss of crop and reduction in yields, available only to farmer. Not relevant in the case of Biomass Power Plants because they are only buying crop wastes, do not cultivate the underlying crops themselves. **Risk Covered** - None
- 6.3.6 **Business Interruption - Consequential Loss (Fire) Policy:** Covers Loss of Profits resulting from reduction of sales turnover due to business interruption caused by Fire or Special Perils at the Plant. **Risk Covered** – Loss of Profits arising from fire or special perils.
- 6.3.7 **Business Interruption - Machinery Loss of Profits:** Covers Loss of Gross Profit resulting from reduction of sales turnover due to business interruption caused by Machinery breakdowns. **Risk Covered** – Loss of Profits arising from machinery breakdowns
- 6.3.8 **Credit Insurance:** Covers Losses resulting from non-payment by customers. Such policies are yet to become popular in India. Although payment defaults by State-owned

⁴⁰ As recommended by the Tariff Advisory Committee, and followed by Indian insurance companies

utilities affects all kinds of power plants, insurance companies have not written any Credit Insurance policies against credit defaults. **Risk Covered** – Credit Defaults by customers

Table 4: PRICING OF INSURANCE PRODUCTS

The Indian general insurance industry is going through a challenging period following de-tariffing⁴¹ of most segments since January 2007. With intense price-based competition in the post de-tariffed scenario, concern for market share has overridden price discipline in the industry in the last few months. Insurers have since discounted their rates by 50% or more in their quest to retain or win market share⁴². These practices will translate into weaker underwriting performances in the short term. To ensure orderly transition to the de-tariffed regime, the regulator IRDA set initial limits on maximum price cuts. The current free pricing regime has set the backdrop for risk-based pricing over the longer term. Gradually, the industry players are expected to focus on franchise building (via improved client servicing), cost competitiveness, and product differentiation⁴³

Insurers were never in the game of having to learn anything earlier thanks to tariff environment. Underwriting, the process of fixation of rates commensurate with the insurers' evaluation of risk exposures, was of academic interest. Insurers are driven to being price takers and their marketing and underwriting talent seems immobilised, making it difficult for them to choose a right pricing response⁴⁴. The de-tariffing regime has led to virtual breakdown of the general insurance system through rank indiscipline of quoting rates to cheat the competition⁴⁵.

For example, de-tariffication resulted in a major correction in fire rates; reflected in an 11.7% decline in gross fire premium for 1H 2007-08. Historically, the fire portfolio has enjoyed a favorable claims ratio due to its tariffed pricing structure. The loss ratio is expected to deteriorate following de-tariffing⁴⁶.

Evaluation of Special Insurance Products

Business Interruption Insurance Products

- 6.4 **Type of insurance product required:** Internationally, it is accepted that a form of business interruption insurance product is required as well as instruments to secure long-term fuel supply contracts. However, no such products are available yet. Even standard business interruption cover can be difficult to purchase because of the length of the reinstatement period for biomass plants which are dependent upon continuity of fuel supply⁴⁷
- 6.5 **Risks causing Business Interruption:** Biomass Power Plants in India face high risks in procuring fuel and managing their price volatility. In the event that fuel is not available, the Power Plant will be forced to shut down power generation. Increase in

⁴¹ Tariffs for most insurance products were fixed at constant rates by the Tariff Advisory Committee, and there were no price differentials between different insurance companies

⁴² Moody's-ICRA Global Insurance: Indian General Insurance Industry Outlook, April 2008

⁴³ Source: IndiaInfoline

⁴⁴ National Insurance Institute, Newsletter, Jul-Aug 2008

⁴⁵ National Insurance Institute, Newsletter, May-Jun 2008

⁴⁶ Moody's-ICRA Global Insurance: Indian General Insurance Industry Outlook, April 2008

⁴⁷ UNEP/SEFI Study

fuel prices beyond a certain level will make operations unviable, imposing financial losses or forcing the Power Plant to shut down.

- 6.6 **Consequences of Business Interruption:** The financial impact of fuel shortages and price escalations may be the following situations:
- Higher prices paid to procure alternative biomass and non-biomass fuels
 - Loss of power generation revenue due to plant shutdowns
 - Reduction in profitability margins
 - Penalties payable under the PPA for non-generation of power
 - Reduced cash inflows affecting servicing of loans availed from Banks to finance the establishment and operation of the Power Plant
- 6.7 **Perspective of Insurer:** The business issues before the insurance company are:
- There are tremendous growth opportunities in the Biomass Power Plant industry
 - Offering a special insurance product improves competitive position
 - Early-stage customer relationships for upcoming Power Plants could gain comprehensive insurance business during construction and operational phases
 - Bundling a suite of insurance products cross-subsidises product tariffs and improves claim ratios
 - This pioneering business initiative helps retain existing client relationships and gain new clients
- 6.8 **Evaluation of Insurance Product:** Present Business Interruption policies offered by all insurance companies in India can be examined to ascertain whether they can be tailored to fit the needs of Biomass Power Plants. Insurers need to resolve the following issues:
- 6.8.1 ***Claims linked to Plant shutdowns:*** The insurance policy covers only situations where the Power Plant is shut down and not when it is forced to operate in a higher-cost framework. In other words, in a typical Business Interruption policy, claims do not get triggered off unless the Power Plant is shut down. Often, Power Plants are compelled to operate using fuels procured at high costs and/ or alternative fuels, in which case insurance protection will not be available. Losses incurred when the Plant continues to run will not be insurable.
- 6.8.2 ***Period of shutdown:*** The nature of the loss must be definite and financially measurable. Plant shutdowns could be indefinite, which necessitates that the insurer must stipulate strict loss limits, such that (a) number of days of interruption are capped, and (b) there are ceilings on the quantum of losses.
- 6.8.3 ***Accidental Loss?*** The loss must be entirely fortuitous or accidental, and events that trigger claims should be also beyond the control of the insured. Ordinary business risks are not insurable:
- Biomass is procured in the open market, and failure to source adequate Biomass cannot be considered to be an insurable risk, since non-availability is not the result of any accident or loss
 - Even if there are long-term procurement supply contracts, failure to supply Biomass is a business risk, and will not be an insurable risk.

- The Power Plant is shut down by voluntary action and not caused by any accident or loss. Business Interruption results from the insured's failure to obtain Biomass; such a failure cannot be an insurable risk.
 - Prices for Biomass are established through direct negotiation and there are no transparent indices/ reference price mechanisms; moreover, pricing is dependent on the strategy, channels and procurement policies followed by the insured. Insurance policies cannot hedge price volatility. In this instance, price fluctuations are a consequence of demand-supply pressures which are not only influenced by unforeseen events such as crop failures, natural disasters, fire, etc but also due to several other business factors.
- 6.8.4 ***Not insurable risks:*** The losses that occur due to the fuel supply risks are not the result of insurable risks. They are due to market circumstances and incapability to procure adequate quantity of fuel at remunerative prices. The business interruption is a direct consequence of fuel non-supply and pricing factors, both of which cannot be considered to be insurable risks.
- 6.8.5 ***No equivalent products:*** There do not appear to be any equivalent insurance products in India or anywhere in the world. In any case, the Indian Biomass market is materially different from that prevailing in those in Europe, Japan and America, where biomass procurement is mostly through organised market channels and pricing is a transparent process.
- 6.8.6 ***Loss assessment issues:*** There are also concerns that there is (a) no database for history of Biomass prices, and (b) current price behaviour is not transparent and determined by private contracts. In such circumstances, it would be impossible to validate claims and determine formulae for limiting losses.

Credit Insurance

- 6.9 ***Product is available already:*** Credit Insurance products in India offer protection against protracted defaults or delayed payment by Debtors. Normally, defaults due to trade disputes are excluded, which are very common. The cover extends to defaults by State-owned entities. Insurers are willing to extend credit insurance cover in respect of outstanding of Biomass Power Plants and no major modifications are required for this purpose.
- 6.10 ***Credit Risk mitigation is not a priority:*** Biomass Power Plants typically sell power to state-owned utilities, many of them having poor creditworthiness. However, most Biomass Power Plants do not perceive credit defaults as a significant risk, although suitable insurance products would help mitigate the financial impact.
- 6.11 ***Not popular:*** Credit Insurance products are not popular in India. Billing disputes between Biomass Power Plants and buyers are not uncommon. However, claim procedures are perceived to be complex and cumbersome. This may be one of the reasons where the Power Industry in general has not bought any Credit Insurance products.

Table 5: MACHINERY LOSS OF PROFIT INSURANCE POLICY – Brief Product Specifications⁴⁸

⁴⁸ Tariff Advisory Committee, <http://www.tac.org.in/tariffs/engg/lop.doc>

In the event that the business carried on by the Insured at the premises is interrupted or interfered with in consequence of an Accident which shall mean sudden and unforeseen physical damage, as defined in the Machinery Insurance/Boiler and Pressure Plant Insurance Policy of any specified machinery then the Insurance Company shall indemnify the Insured against the amount of loss as hereinafter defined resulting from such interruption or interference.

The Insurance Company shall not be liable for any loss resulting from interruption of or interference with the business directly or indirectly attributable to any of the following causes:

- i) Willful act or willful neglect or gross negligence of the Insured or his responsible representatives.
 - ii) Loss or damage to machinery or other items even if the consequence of material damage to an item indicated in the list of machinery insured is involved.
 - iii) Loss or damage caused by any faults or defects existing at the time of commencement of this insurance within the knowledge of the insured or his responsible representatives whether such faults or defects were known to the Company or not.
 - iv) Shortage, destruction, deterioration and spoilage of or damage to raw materials, semi finished or finished products or catalyst or operating media (such as fuel, lubricating oil, refrigerant, heating media and the like) even if the consequence of material damage to an item indicated in the list of machinery insured is involved.
 - v) Any restrictions on reconstruction or operation imposed by any public authority.
 - vi) An extension of the normal repair period for more than 4 weeks on account of -
 - a) the inability to secure or delays in securing replacement parts, machines or technical services.
 - b) the inability to carry or delays in carrying out repairs.
 - c) the prohibition to operate the machinery due to import and/or export customs & other restrictions or by statutory regulations.
 - d) transport of parts to and from the Insured's premises.
 - vii) Alterations improvements or overhauls being made while repairs or replacements of damaged or destroyed property are being carried out.
 - viii) Loss damage and/or liability caused by or arising from or in consequence directly or indirectly of -
 - a) War, Invasion, Act of foreign enemy, hostilities or War like operations (whether war be declared or not), Civil War, Rebellion, Revolution, Insurrection, Mutiny, Riot, Strike, Lockout and Malicious Damage, Civil Commotion, Military or usurped power, martial law, conspiracy, confiscation, commandeering a group of malicious person or persons acting on behalf of or in connection with any political organisation, requisition or destruction or damage by order of any government de jure or de facto or by any public. Municipal or Local Authority, an act of terrorism or the action of any lawfully constituted authority in suppressing or attempting to suppress or minimise the consequences thereof.
 - b) Nuclear reaction, nuclear radiation or radioactive contamination.
- The cover provided under the Policy shall be limited to loss of gross profit due to (a) reduction in output and (b) increase in cost of working and the amount payable as indemnity thereunder shall be
- a) In respect of Reduction in output the sum produced by applying the rate of gross profit to the amount by which the output during the indemnity period shall in consequence of the damage fall short of the standard output.
 - b) In respect of Increase in Cost of Working; the additional expenditure (subject to provision of memos) necessarily and reasonably incurred for the sole purpose of avoiding or diminishing the reduction in output which but for that expenditure would have taken place during the indemnity period in consequence of the damage, but not exceeding the sum produced by applying the rate of gross profit to the amount of the reduction thereby avoided.

Less any sum saved during the indemnity period in respect of such of the Insured standing charges as may cease or be reduced in consequence of the damage. *Provided* that if the sum insured is less than the sum produced by applying the date of gross profit to the annual output, the amount payable shall be proportionately reduced.

6.12 Summary of insurance coverage for Fuel Supply and Credit Risks

No.	Nature of Loss	Whether Insurable or not?	If so, how is it insurable?
FUEL SUPPLY			
6.12.1	Loss in storage in PP premises	Insurable Risk	YES, under existing Fire & Special Perils Policy ⁴⁹
6.12.2	Loss in storage in agents' premises	Insurable Risk	YES, under existing Fire & Special Perils Policy
6.12.3	Loss in transit to PP or agents' premises	Insurable Risk	YES, under existing Fire & Special Perils Policy
6.12.4	Reduced supply due to Crop Failures ⁵⁰	Not an Insurable Risk ⁵¹	NO, risk is insured only for actual farmer who faces crop failures, and not for consequential losses
6.12.5	Suppliers' failure to supply under contract	Not an Insurable Risk	NO, contractual failure is a normal business risk
6.12.6	Failure to procure from the open market ⁵² , arising from:		
6.12.6.1	- shortages	Not an Insurable Risk	NO, inability to procure failure is a normal business risk
6.12.6.2	- high prices		
6.12.7	Procurement at high prices	Not an Insurable Risk	NO, the higher prices are caused by either prevailing market circumstances or poor business acumen
6.12.8	Suppliers' failure to supply alternative fuel under contract	Not an Insurable Risk	NO, contractual failure is a normal business risk
6.12.9	Loss of profits resulting from non-generation or less generation of power due to Fuel short-supply	Not an Insurable Risk	NO, business interruption insurance coverage is available only if cause of loss of profits arises from an Insurable Risk
6.12.10	Loss of Profits resulting from higher prices for Fuel		
6.12.11	Loss of Profits resulting from penalties payable to contracted buyers for non-supply		
CREDIT DEFAULT			
6.12.12	Receivables Default by several contracted buyers of power	Insurable Risk	YES, under existing credit insurance products. However, typically, Biomass Power Projects have only 1 buyer
6.12.13	Receivables Default by one dedicated buyer of power	Insurable Risk	YES, under existing credit insurance products; however, it is infeasible because PPA are long-term arrangements ⁵³

⁴⁹ These insurance products are already available for Biomass Power Projects

⁵⁰ Biomass Power Projects face risks when underlying crops fail and agro waste is reduced

⁵¹ Not covered by the family of causes stipulated for coverage in standard Indian insurance contracts

⁵² Failure to procure is caused by inefficiencies in supply chain management by the Insured, notwithstanding circumstances beyond the control of the Insured

⁵³ In the event of a claim, the Insured is not entitled to a cover for the same buyer the second time

7 CONCLUSIONS

- 7.1 Insurance Companies offer a range of products to cover several categories of risks that Biomass Power Plants face in establishment and operation. Such policies, which cover fire, special perils, business interruption, etc., were traditionally priced based on regulated tariffs, but premiums are now market-determined. Policy structures and conditions are well established and in respect of certain assets such as machineries and inventories, banks and investors mandate compulsory insurance coverage. Current databases for assessing such risks are either not available or may be inadequate.
- 7.2 Insurance companies are not familiar with the dominant risk that confronts Biomass Power Plants – the uncertainties regarding supply of fuel and prices therefor. In view of varied business circumstances across India, it is crucial that Biomass Power Plants be evaluated within the framework of the Risk Management Protocols stipulated in *Section 5*.
- 7.3 Shortfalls in fuel availability and spikes in fuel prices can affect continual and profitable operation of the Power Plants. The resulting business interruption can have serious financial impact, affecting not only cash profits but also capacity to service debt and equity. Both the financiers and the Biomass Power Plants themselves believe that a suitable business interruption insurance product would help mitigate investor risks in the industry.
- 7.4 The fuel risks do not arise from accidents or fortuitous events but are attributed to business factors and linked to the incapacity or inefficient procurement infrastructure of the insured and the dynamic market circumstances. Hence, such risks are not insurable, and any business interruption policies meant to cover such risks is not possible within the existing framework of Indian insurance laws. Therefore, business interruption insurance products to mitigate the risks of inadequate fuel supply and volatility in fuel prices are not feasible.
- 7.5 Typical credit insurance products in India restrict claims to one-time defaults by customers of the insured. Since Biomass Power Plants normally enter into PPAs with one single buyer, credit insurance products are not popular with the power industry in view of their limited applicability. Therefore, despite that credit insurance products are feasible, they are not acceptable to Biomass Power Plants.
- 7.6 Whereas Biomass Power Plants may have to confront fuel non-availability and credit default risks directly, they can look beyond the insurance industry to mitigate their fuel pricing risks through suitable price derivatives.

APPENDIX A**PROMOTIONAL POLICIES, Excerpts⁵⁴****Biomass Power/Cogeneration Programme Of the Ministry for New and Renewable Energy**

Besides the Central Financial Assistance, fiscal incentives such as 80% accelerated depreciation, concessional import duty, excise duty, tax holiday for 10 years etc., are available for Biomass power projects. The benefit of concessional custom duty and excise duty exemption on equipments. In addition, State Electricity Regulatory Commissions have determined preferential tariffs and Renewable Purchase Standards (RPS). Indian Renewable Energy Development Agency (IREDA) provides loan for setting up wind power and bagasse cogeneration projects.

Pattern of Central Financial Assistance/Incentives for Setting up of Biomass Power /
Cogeneration projects
Capital subsidy for Bagasse/biomass cogeneration projects

	Special Category States (NE Region, Sikkim, J&K, HP & Uttarakhand)	Other States
<i>Biomass Based projects</i>		
<i>Biomass Power projects</i>	Rs 25 lakh X (C MW) ^{0.646}	Rs 20 lakh X (C MW) ^{0.646}
<i>Bagasse Co-generation</i>	Rs 18 lakh X (C MW) ^{0.646}	Rs 15 lakh X (C MW) ^{0.646}
<i>Bagasse Co-generation projects by cooperative/ public/joint sector</i>	Rs. 40 lakh * Rs. 50 lakh Rs. 60 lakh Per MW (maximum support Rs. 8.0 crore per project)	Rs. 40 lakh * Rs. 50 lakh Rs. 60 lakh Per MW (maximum support Rs. 8.0 crore per project)
<i>Biomass Power using Advanced Technologies</i>	Rs. 1.2 crore X (C MW) ^{0.646}	Rs. 1.0 crore X (C MW) ^{0.646}

**For new sugar mills (which are yet to start production and sugar mills employing backpressure route/seasonal/incidental cogeneration) subsidies shall be one-half of the level mentioned above.*

Fiscal Incentives for Biomass Power Generation

Item	Description
Accelerated Depreciation	80% depreciation in the first year can be claimed for the following equipment required for co-generation systems: <ol style="list-style-type: none"> 1. Back pressure, pass-out, controlled extraction, extraction-cum-condensing turbine for co-generation with pressure boilers 2. Vapour absorption refrigeration systems 3. Organic rankine cycle power systems 4. Low inlet pressures small steam turbines
Income Tax Holiday	Ten years tax holidays.
Customs Duty	Concessional customs and excise duty exemption for machinery and components for initial setting up of projects.
General Sales Tax	Exemption is available in certain States

⁵⁴ MNRE web-site

APPENDIX B

STATE GOVERNMENT POLICIES, *Excerpts*

HARYANA GOVERNMENT⁵⁵

POLICY FOR PROMOTING GENERATION OF ELECTRICITY THROUGH RENEWABLE ENERGY SOURCES

1. OBJECTIVE OF THE POLICY

To create conditions conducive for the involvement of private sector or public –private sector participation in Renewable Energy Sources based power projects in the State.

2. TARGET

The State Govt. aims to achieve a minimum of 10%(i.e. 500 MW) of the total capacity addition of 5000 MW of conventional power to be generated through Renewable Energy Power Projects by 2012 as per Ministry of Non-conventional Energy Sources, Govt. of India's policy.

4.1 Power Generation from biomass

A potential of generation of 1400 MW of power through biomass exists in the State. The State Govt. is committed to exploit this potential.

5. NODAL AGENCY

Haryana Renewable Energy Development Agency (HAREDA) shall be the State Nodal Agency for co-ordinating all activities relating to Renewable Energy Development including generation of power using non-conventional energy sources. HAREDA shall be responsible for laying down the procedure for inviting the proposals from Independent Power Producers (IPPs), DPR preparation, evaluation of project proposals, project approvals and project progress monitoring etc.

It shall function as a single window clearing Agency for all Renewable Energy Power Projects for facilitating necessary clearances and approvals on behalf of the Govt. of Haryana.

7. ELIGIBLE PRODUCERS:

Those who intend to generate electricity from Non-conventional Energy Sources such as Solar, Wind-Electric Generators, Biomass Combustion, Cogeneration, Municipal and Industrial Waste, Small Hydro (upto 25 MW) and New Technologies like Bio-oil, Fuel Cell etc. There will be no restriction on generation capacity or supply of electricity to the grid.

8. GRID INTERFACING:

(i) Interfacing, including transformers, C & R panels duly equipped with the requisite protection schemes, marshalling kiosks, kiosk protection, metering, High Tension inter connection points from the points of generation to HVPN, UHBVN, DHBVN and any other licensee nearest Light/High Tension lines etc. as well as maintenance of LT lines will be undertaken by the producer as per the specifications and requirements of the licensee/ utilities for which he will bear the entire cost. Alternatively, those works and their maintenance could be undertaken by the Licensee/ Utilities on behalf of power producers at charges to be decided by the Licensee/ Utilities and paid by the power producer. High Tension lines shall be maintained by the power utilities as licensee. After commissioning of the project, the power producers shall transfer these lines to the concerned power utility as transfer of assets for its maintenance by the power utility till the validity of PPA.

(ii) Depending upon the generation capacity, if the sub-station capacity at 33/11 KV or higher levels, is required to be augmented for 66 KV or higher capacity, transmission lines are to be provided. This will be undertaken by the Licensee/ Utilities at the cost of power producers.

(v) The plant should have a capacity of atleast 1 MW or above that

9. WHEELING CHARGES:

⁵⁵ Issued by the Renewable Energy Department, on November 23, 2005, <http://www.hareda.gov.in/>

Licensee/ Utilities will undertake to transmit on its grid the power generated by power producers using non-conventional energy sources and make it available to the producer for captive use or to a Third Party within the State as per approved tariff including surcharge, additional surcharge, if any, notified by HERC from time to time. If H.T./ L.T. lines required to be laid beyond Licensee/ Utilities lines for wheeling the power at any desired point, then the cost of the same shall have to be borne by the promoter/ power producer. In case, the power is to be sold to a third party, the name of such party shall be indicated by the power producer at the time of making an application in the prescribed form of Licensee/ Utilities. However, in respect of third party sale, licensee/ utilities would have preference over the power generated by the power producers and third party sale would be allowed when the surplus power is not being evacuated by the licensee/ utilities.

10. PURCHASE PRICE:

(i) New Projects:

Licensee/ Utilities will purchase electricity offered by the power producers in case of new projects set up after the notification of the present policy at the rate to be decided by the Haryana Electricity Regulatory Commission as per provisions in the New Electricity Act, 2003.

(ii) For old captive/co-generation projects which are having surplus power to offer for sale to the power utilities, the tariff shall be negotiated tariff based on negotiation between the power producers and the power utilities.

12. ELECTRICITY DUTY:

Non-conventional energy sources power generation and its sale to the Licensee/ Utilities or third party or for its captive use shall be exempted from the electricity duty.

13. WATER CHARGES:

Producer will be allowed to use the water for power generation through micro/ mini/ small hydel plants. No royalty will be charged on the water used for power generation for non-consumptive use.

14. LOCAL AREA DEVELOPMENT TAX:

Local Area Development Tax will be exempted on plant, machinery, equipment that has been capitalized in view of the provisions of section 5(f) of Haryana Act No.13 of 2000.

17. TENURE OF POWER PURCHASE AGREEMENT:

The Power Purchase Agreement (PPA) to be signed between IPP and concerned power utilities / licensee shall be valid for a minimum period of 20 years or more depending on the plant's life. After this period, this shall be re-negotiated between power producer and concerned power utilities/ licensee. However, power utilities shall have the first right to refuse in case, it does not want to buy the power for period beyond 20 years.

18. LAND FOR THE PROJECT

18.1 The State Govt. will acquire land if necessary at the cost of Independent Power Producers (IPP) if a request to that effect is made.

20. PROCEDURE FOR SETTING UP OF NRSE POWER PROJECTS IN HARYANA

20.1 HAREDA shall invite proposals from private national/international investors through press advertisement.

20.2 A Technical Appraisal Committee (TAC) shall be constituted by the State Govt. to appraise the proposals / bids in terms of technical and financial capabilities, scrutinizing the techno-economic feasibility. The TAC is authorized to seek any additional information from the bidders to supplement the proposals and will submit its report within two months.

20.3 Project upto 5 MW capacity will be considered and approved by the Board of Governors of HAREDA on the recommendations of TAC within two months time.

20.4 For the projects above 5 MW capacity, a High Powered Committee constituted by the State Govt. under the chairmanship of Chief Secretary, Govt. of Haryana (Appendix-I) shall consider the report of Technical Appraisal Committee, shortlist, prioritize and approve / reject the investment proposals for allocation of sites for preparation of Detailed Project Reports (DPR) by the private

investors within two months time. The High Powered Committee can co-opt any other members /experts as its member for a particular meeting with the approval of the Chief Secretary.

20.5 Once the proposal has been approved by the Board of Governors of HAREDA / High Powered Committee, HAREDA will enter into an MOU with the private investors for preparation of DPR and implementation of the project within one months time.

20.6 After approval of DPR by the HAREDA, the private investors is required to enter into PPA with the concerned power utilities/ licensee for the sale of power to it or to the third party after getting necessary approval from the Haryana Electricity Regulatory Commission (HERC)

20.7 The Power Producer and the concerned Power Utility/ licensee shall make efforts to enter into Power Purchase Agreement within two months time from the date of providing the clearance. In case there is delay beyond this period then either party can approach the Haryana Electricity Regulatory Commission for decision in this matter within another two months.

MADHYA PRADESH GOVERNMENT⁵⁶

Madhya Pradesh Urja Vikas Nigam has carried out a number of biomass assessment studies in selected areas of Madhya Pradesh which conclude that there is a potential for generating at least 200 MW of power using rice husk, mustard crop residue, soya husk, groundnut shell, bagasse, and cotton stalk among others.

Biomass assessment studies are still underway in other parts of the state. Apart from the setting up of large combustion based projects, the Corporation also encourages the use of small biomass gasifier units ranging from 100 to 500 KWH capacity in smaller units. Already a capacity of 4 MW has been created in the private sector through such units.

Biomass potential in Madhya Pradesh*

Source	Kcal/Kg	Potential
rice husk	3200	50
mustard residue	3600	100
wood waste	5000	200
Others	Shajapur	50

Note:*These conclusions are the result of ongoing assessment studies in potential regions. So far these studies have been completed only in an area corresponding roughly to 25 administrative blocks of the state. (The total number of administrative blocks in the state is 459).

Tariff Order for Procurement of Power from Biomass Based Generation

(Issued by MP regulatory Commission on 7th August 2007)

S. No.	Year	Tariff in Rs. Unit
1.	Year 1	3.33
2.	Year 2	3.36
3.	Year 3	3.39
4.	Year 4	3.43
5.	Year 5	3.48
6.	Year 6	3.53
7.	Year 7	3.59
8.	Year 8	3.65
9.	Year 9	3.71
10.	Year 10	3.79
11.	Year 11	3.51
12.	Year 12	3.65
13.	Year 13	3.81

⁵⁶ <http://www.mprenewable.nic.in/index.php?show=energybiomass>

10.2 The Project holder shall be entitled to recover the above charges for generation up to a threshold Plant Load Factor level of 70%. For actual generation (excluding deemed generation) at Plant Load Factor of 75% or more calculated for the financial year, the Project holder shall be entitled to an additional incentive component at the rate of Rs.0.25 per unit. The quantum due for payment as incentive charges shall be determined at the end of the financial year based on actual generation during that financial year.

10.3 An earlier review of the Tariff Rate before the control period of five years may be undertaken under exceptional circumstances, if the need for such review is clearly demonstrated with adequate supporting material.

10.4 The Tariff Rate and Structure shall be firm, and will not vary with fluctuation in exchange rate variations or on account of changes in law or in taxes.

Power Purchase Agreement Tenure

10.5 The Commission directs that the developer and the Distribution Licensee enter into a Power Purchase Agreement for a period of 20 years from the date of the Commissioning of the plant.

10.6 The Distribution Licensees are directed to prepare a model Power Purchase Agreement in this regard for exclusive sale of electricity to them and would be required to submit the same before the Commission within 30 days of the order for approval.

Scheduling

10.8 The power generation from biomass is not infirm in nature. The fuel availability and the power generation can be predicted and thus can be considered as capable of supplying firm power. However, the individual capacity of biomass generation is typically in the range of 5-20 MW, is comparatively much smaller than that of the conventional thermal or hydro power plants. Further, there could be a large number of such small capacity plants, which due to practical considerations cannot be brought under scheduling.

10.9 The Commission also keeps the generation from biomass resources out of the purview of 'merit order dispatch principles'.

Wheeling charges

10.13 Wheeling charges and applicable surcharge on wheeling charges shall be levied as decided by the Commission from time to time for third party sale.

Payment Mechanism

10.17 The Commission prescribes that a settlement period of 30 days should be followed in order to ensure that the developer has an assurance of cash inflow for the energy, Which he delivers to the grid.

Default Provisions – Third Party Sale or sale to utility

10.19 In case of continuing default for more than three months by the distribution Licensee, the developer can sell power to the third party. In such cases, no wheeling charges would be paid for the network of the concerned Distribution Licensee but all other conditions of open access would be applicable. This condition of third party sale is being proposed to provide comfort to the investor in case the Distribution licensee defaults in paying the due amount.

10.20 Where the developer has an existing arrangement for third party supply or for captive consumption and in case the developer desires to terminate the agreement with third party and to supply to the utility, the utility with the prior permission of the Commission may purchase the power at the rate as would be determined by the Commission in which case the developers are required to execute the Power Purchase Agreement with the licensee for the remaining period of plant life of 20 years.

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List of Abbreviations

BASE	Basel Agency for Sustainable Energy
BERI	Biomass Energy for Rural India Society Project
BPP	Biomass Power Plant
IPP	Independent Power Plant
IRDA	Insurance Regulatory & Development Authority
MNRE	Ministry for New and Renewable Energy, Government of India
PPA	Power Purchase Agreement
PP	Power Plant
RE Projects	Renewable Energy Projects
RET	Renewable Energy Technologies
TAC	Tariff Advisory Committee
UNEP	United Nations Environment Programme