INDUSTRY SPEAK

Make Renewable Energy Technologies Work Together to Create True Impact, Growth and Prosperity

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Distributed biomass based co-generation is a vital complement to an energy system with centralized solar and wind

Biomass is on the verge of making a big comeback into the modern energy system – in the shape of its incarnation **gasification based co-generation**. These are highly energy efficient and advanced high temperature technologies that can play pivotal roles in energy systems, and support growth and prosperity building while respecting flora, fauna and human needs.

Biomass' key contributions to the future proof energy system are;

- **Distributed generation** for redundancy, speed of deployment, and cost;
- **Thermal generation** for high final energy efficiency;
- **Local fuel sourcing** for social and economic impact by creating jobs, reducing waste, and use of marginalized land for plantation;
- **Municipality approved solutions** for complete location flexibility, and;
- Reliable baseload energy in commercial scale for a local entrepreneurial eco-system.

Renewable energy on the world scene

The world over, an unprecedented amount of investment is going into renewable energy. As per the Renewables 2015 Global Status Report from REN21; the renewable energy sector attracted $270bn in investment in 2014, representing 58.5% of net addition to global power capacity.

The Energiewende model from Germany was long considered a leading reference model for this shift; and to a large extent inspired by the German model, almost $150 billion of investment has gone into solar technologies and $90 billion into wind technologies globally in 2014. India, on its part, has set an ambitious plan to add 100GW of solar energy capacity and 60 GW of wind projects by 2022 – most of them at utility scale.

Investments in utility scale solar and wind in Germany has been driven by subsidies, fiscal incentives, and grid priority. It has created an impressive installed name-plate base, but has also resulted in a) high incentive costs, b) massive infrastructure investments to cope with prioritised intermittent generation in the grid, and c) a complete profitability crash in conventional centralised generation. A conventional generation that remains (a crippled but vital) backbone of the German energy system, just as it does in most economies – and in several European countries incentives to intermittent generation are now being reduced or removed.

A complete societal impact system approach can give India a unique leap-frog opportunity

India and other developing countries have had the opportunity to watch the policies and investments in solar and wind, and has a unique opportunity to learn from it and leap-frog to the next generation energy system, just like they had, and took, the opportunity to largely skip a fixed telephony for a mobile ditto, and also with the internet now.

Key to building a resilient energy system for growth and prosperity is to avoid a silo approach; and to look at how not only power, but also thermal energy, fits into the complete societal system. And realize that there is not one or two silver bullet technologies, no one ready made and functioning system solution to import and implement; but rather look at local demand and potential supply and infrastructure – and come up with a truly Indian solution where resilience, final energy efficiency, and cost efficiency is the mantra.

- **Intermittent technologies** carry high hidden costs from an energy- and societal system perspective and will continue to do so for a long time to come. Recent studies in India as well confirm this picture. 'Free fuel' is far from free. In addition to hidden costs there is also land use; and in the case of CSP in India typically astonishing amounts of water consumed per MWe produced, in areas where there is little of it. But intermittent generation have their place in the system, no doubt about it.
- **Conventional centralized large-scale generation** has its place too, with the massive power demand growth that will continue. But adding capacity takes time, land, and money; and it is costly and slow to build a grid that can deliver all that power to end-users. Lagging transmission capacity growth has already brought down the average Plant Load Factor to 65% by the beginning of 2015.
- **Distributed co-generation from solid fuels such as biomass**, has an absolute key role to play in an energy system that is built with a societal impact and local prosperity building as the main criteria – and what other criteria is of any relevance at the end of the day.

Distributed co-generation from biomass as a tool for societal impact and local prosperity building

The Indian government clearly understands that biomass is an important part of a future energy system. A biomass potential of 18GW has been established, a target of 10GW by 2022 has been fixed, tariffs are being fixed, and investors are invited to invest in biomass.

But more can be done to understand the vast potential of distributed co-generation from a complete system impact perspective. And implement processes to ensure that the total cost and benefits to society are considered and evaluated when PPAs or project proposals are evaluated. Rather than pitting technology X against technology Y on a limited set of factors; many situations call for a base of solution X, a section of solution Y, and complemented with technology Z.

Distributed co-generation from biomass for instance has a number of characteristics that India should ideally be considered in any evaluation process:

Speed, flexibility and redundancy of distributed generation

Many small units hooked up to interconnected mini-grids can create redundancy by design over large areas, without requiring costly and time-consuming transmission investments. Especially important in

> Distributed generation has an important role to play all the way from the smartest of cities to the most remote of underdeveloped areas

situations of rapid urbanization where high energy density is required and heavy infrastructure cannot keep up with the urban sprawl. It also reduces energy system complexity while ensuring control and energy security through local sourcing and operation. Distributed generation has an important role to play all the way from the smartest of cities to the most remote of underdeveloped areas.

High final energy efficiency from thermal generation

Bringing down scale, turns 'excess heat' into 'success heat'. The 1.5+ MWth of thermal energy from a 1MWe cogeneration plant can provide onsite heat and steam for manufacturing industries or power cold storage that would boost food security and/or reduce produce

> Bringing down scale, turns 'excess heat' into 'success heat'

wastage in a rural area considerably. Or both power and cool hospitals, data centres, and office complexes.

Local long-term jobs and revenues from local fuel sourcing In contrast to 'free fuel' solutions, biomass co-generation becomes a positive part of the local socio-economic system and improves the regional trade balance. It creates local jobs at all skill levels – from biomass supply, to operation and maintenance. And in agricultural regions it can create revenues from both crop residue problems and marginalized land.

Low environmental impact to communities and environment

Exceptionally low environmental impact and community nuisance, in combination with the local socio-economic contribution makes biomass gasification one of few 'IMBY' energy technologies (welcome 'In My Back Yard') as opposed to any of the centralized solutions that are all opposed in a BANANA way ('Build Absolutely Nothing Anywhere Near Anything') creating very real issues with delays in permitting and committed rollout schedules.

Low system costs and high energy security from local base load generation

Base-load generation on small industrial scale improves energy security and can power local industries and entrepreneurs, hospitals and schools, and remote communities; in a way that intermittent generation cannot in a cost effective way.

See the illustration for an overview of several key factors – and biomass defending its position as an important part of a resilient energy system.

	1 MWe PV	1 MWe	Biomass 1 MWe
Capacity Utilisation Factor	19%	20%	85%
Power Output MWe	1665	1755	7445
Thermal Output MWth	-	-	13400
Final Energy Output MWe+th	1665	1755	20845
Output Profile			
Hidden Cost (Transm., Storage)	High	High	-
Local Long term jobs			

©Boson Energy SA, 2015 (Solar and wind CUF from MNRE/CSE)

Conclusions

India has an opportunity to adopt a societal impact- and prosperity building approach to the development of a resilient energy system. We are pleased to see that some steps are already taken in that direction through studies on socio-economic and environmental effects of different technologies. For example under the MNRE-UNDP/GEF Project on "Removal of Barriers to Biomass Power Generation in India".

KPIs that we encourage government, industry, and investors to apply widely when assessing complete system solutions include:

(a) **Capacity Utilisation Factor (CUF),** capturing the ratio of power generated compared to the name-plate capacity

(b) **Final Energy Efficiency (FEE),** demonstrating combined efficiency in delivering energy in the final form in which it is consumed

Source - EVO and Boson Energy

(c) **Societal Cost of Electricity (SCoE)** generation: an assessment of capital-, operational-, and socio-economic cost on a complete system level per unit of generation, over the lifecycle of a particular project

(d) **Local socio-economic and environmental impact**: including local jobs and sourcing revenues, skills development, eco-system, nuisance, and community acceptance.

(e) **Technology and project resilience:** Risk of the technologies involved becoming obsolete or changing policies affecting project business case

An integrated approach will help unlocking the estimated 18GW of biomass potential – and create more

fundamentals before the investment is written off.

An integrated approach will help unlocking the estimated 18GW of biomass potential – and create more. And develop clear economic drivers towards a structured, market driven feedstock supply chain with important certainty around quality, quantity, and price.

Such a development would attract foreign investment at a different scale, and minimise the need for fiscal support.

Boson Energy is committed to contribute to realising the full biomass energy potential in India – including research and skills development in a Centre of Excellence; capacity building across the complete value chain; and rolling out distributed high-efficiency co-generation technology for biomass to the market – together with global and local partners.

Please feel free to contact us at india@bosonenergy.com.

Aditya is responsible for developing Boson's markets in Asia, and in particular India – where the focus is on smart distributed energy solutions based on local solid fuels. Aditya has 17 years of India experience and 6 years in Europe, working with global leaders in metals & mining, energy and finance. Aditya is a Certified Energy Risk Professional from GARP, an MBA in Finance, a Cost and Management Accountant and also a Chartered Secretary with fellowship.

Heike is a seasoned strategy-, management-, and communications consultant. Prior to Boson, he spent eight years with Gurgaon based global research- and analytics power house Evalueserve – focused on operations and business development primarily in Europe. He has also spent three years at AOL Europe, where he was the lead-client of analytics services executed from India. Heike holds an MSc in Accounting & Managerial Finance and Marketing from the Stockholm School of Economics, Sweden.

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