Access to Energy

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EDITORIAL

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According to an international report, while the electric power sector has managed to reduce its carbon emissions significantly by adopting solar and wind, there has been no reduction in carbon emissions in the building sector arising from direct use of fossil fuels for heating and cooking. This poses a challenge for the cities that are trending towards becoming net zero emission cities in near future as they realise that decarbonising electricity and transport sector alone will not suffice. Glasgow, for instance, where the COP26 will be held, has just undertaken an ambitious programme to become a net zero emissions city within only 11 years and is focusing on public schools, waste management and transport.

Options available to cities to meet their climate goals have increased manifold, both at centralised level and at distributed level. The variable renewables i.e. solar and wind are already cost competitive sources of electricity supply, but firm dispatchable renewables i.e. a combination of generation and storage options are becoming competitive as one of the articles in this newsletter discusses. The Indian ministry of new and renewable energy has recently drafted a policy for the supply of Round-The-Clock (RTC) power which would be a mix of renewable energy and electricity generated in coal-based plants.

Distributed solar, both PV and thermal for electricity and heating needs of buildings are already popular, not only because of their cost-competitiveness, but also due to pro-active policies and an enhanced awareness and commitment of city dwellers towards sustainability. Further, in addition to electric vehicles, the transport sector is likely to see hydrogen -powered vehicles as viable option in near future.

Apart from widescale adoption of renewable energy and energy efficiency measures, resource efficiency, targeting at minimising waste will also be a big contributor towards making cities net zero emission. The proposed Resource Efficiency Policy by the Indian ministry of environment, forests and climate change is expected to give a thrust of this sector. The climate strategy of any city, state and country needs to shift from *-produce, use and discard* to *reduce, reuse, recycle, redesign, remanufacture and refurbish*.

Significance of CSP for enhancing dispatchability of RE

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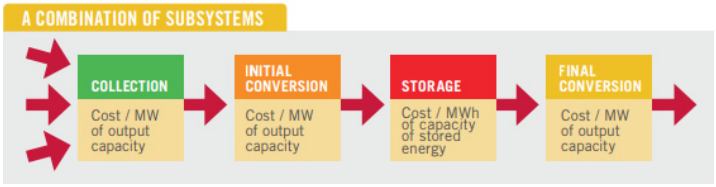
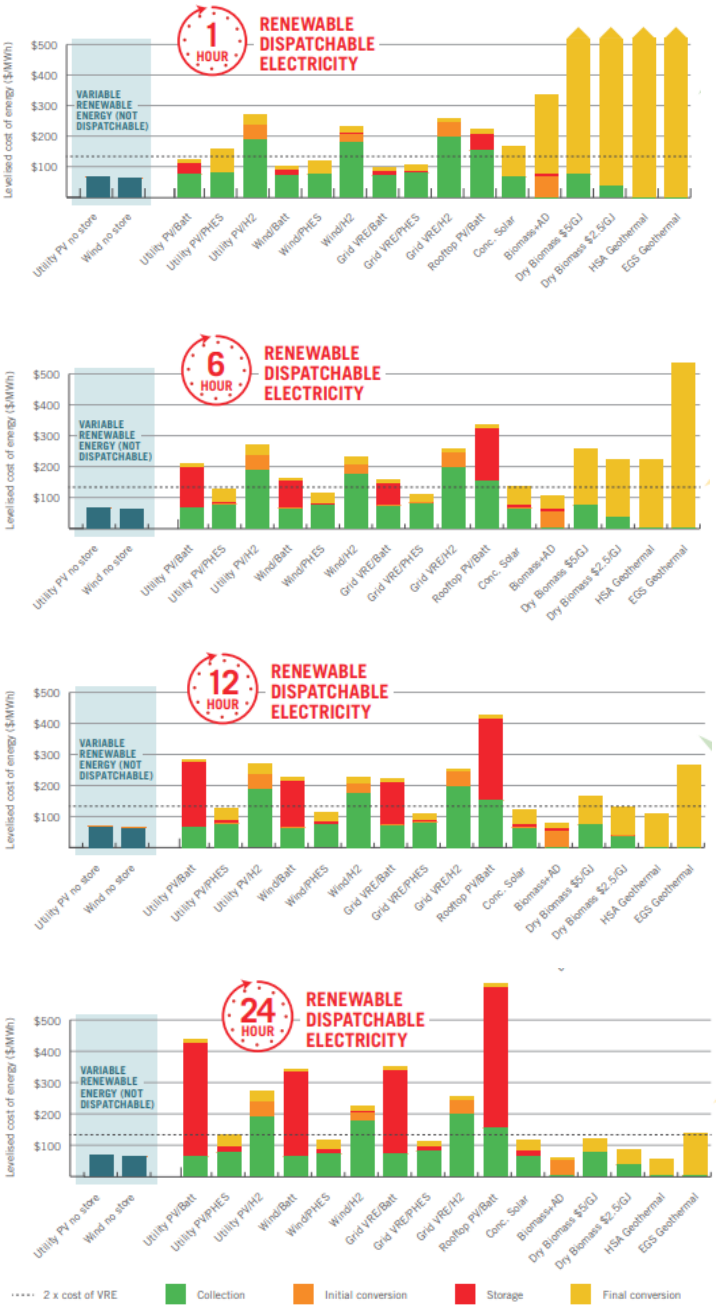
Dispatchable renewable electricity supports a secure, reliable and affordable electricity system with a higher share of renewable energy. There are several options considered around the world for commercial dispatchable renewable electricity:

- Utility scale Wind or PV generation or a grid sourced mix of two in combination with:
  - Large network connected batteries
  - Pumped hydro storage
  - Hydrogen storage (electrolysers, fuel cells, and combustion)
- Behind the meter PV generation and batteries
- Bio Energy
  - Anaerobic Digestion plus gas engine
  - Combustion boiler plus steam turbine
- Concentrating solar power (CSP) with thermal storage
- Geothermal generation

The likely least-cost future electricity system solution is a mix of both variable and dispatchable renewable technologies, durations and locations with an average cost of electricity considerably lower than dispatchable generation alone. The installed cost model that combines subsystems is:



The dispatchable renewable energy is costlier than variable renewable energy but also substantially has more value. A comparison of levelized cost of electricity for different storage period for 100 MWe nominal capacity systems was conducted at 6.5% weighted average cost of capital.



At each timescale there are various cost competitive options for firm dispatchable renewable electricity generation which are one and a half to two times

higher than the cost of variable renewable energy (VRE) when used on regular basis. Over all timescales there are many options that lie within a typical least-cost band.

Costs are expected to fall for all renewable energy technologies with respect to increase in their growth in global deployment. This will improve the economical position of dispatchable renewables compared to gas or coal plants. Growth rates achieved around 25% per year in dispatchable renewables could speed up with coal and enable a systematic shift to a larger share of renewable energy.

At six hours or higher duration of storage,CST systems seem to appear competitive. The lower values of LCOEs for long durations show the low cost of stored energy in the form of molten salts, whereas the rise in higher values of LCOEs for short storage durations depict the comparatively high cost of power related components.The minimum LCOE is observed in around 15 hours of storage.

The first commercial CST with molten salt storage was launched in 2006. Since then around 40% per year of average compound growth rate of deployment has been found. However, this growth rate is very much reliant on the countries' policy settings that have deployed it.

CSP proves to be a promising dispatchable option for countries having high Direct Normal Irradiance (DNI). The deployment is growing rapidly across the world with reduction in cost. Tower systems with molten energy storage are increasingly favoured. The CSP technologies that are trending are direct salt heating in linear systems, hybrids with PV and bio energy, combined heat and power and CST systems with solar fuels.

This article is based on the presentation made by Dr. Keith Lovegrove, Managing Director, ITP Thermal Pty Ltd, Australia at a discussion organised by TERI in association with TERI Alumni Association on December 9, 2019 at TERI, New Delhi.

Addressing India's 2030 climate target: A perspective

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As the Twenty-fifth edition of the Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC) draws to a frenetic close with closed door discussions among global leaders, there is more felt urgency to adopt affirmative action on climate change.

India is a signatory to the Paris Agreement on climate change, which charts a new course on the mission to address climate change at the global level[1]. India has indicated its intention to reduce emission intensity of GDP by 33 to 35 per cent from its 2005 levels, by the year 2030[2]. Although not part of government of India policy, the market expects India to adopt a voluntary commitment under Kyoto Protocol, in a post-2020 scenario that appears nebulous today in terms of specific commitments.

Voluntary GHG emission registries in India, such as the one being set up under the Network for Certification and Conservation of Forests[3], are expected to assist stakeholders in the purchase of quality emission reductions from Indian projects. It is also set up in wider anticipation of a possible cap-and-trade regime that could assist the Indian government in meeting its climate goals. The market

[1] The Paris Agreement entered into force on November 4, 2016; for more information: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

[2] https://pib.gov.in/newsite/PrintRelease.aspx?relid=128403

[3] https://www.nccf.in/carbon-registry.html

for energy efficiency credits (called Energy Saving Certificates or ESCerts) and renewable energy credits (called Renewable Energy Certificates or REC) are at various levels of maturity, with their own registries and trading platforms. One expects a similar stream of activities to roll out, with a domestic regime on GHG emission reductions.

So what would determine the trajectories of climate mitigation actions in India? The INDC commitments would evidently be driven by the renewable energy (RE) and energy efficiency (EE) / conservation (EC) sectors, in addition to net change in sinks (forests and water resources). As a result, any adverse impact in the RE and EE sectors would shift the trajectory of emission reductions downward. Over the past two years or so, regulatory issues and the uncertainty in tariff payments by power distribution companies (DISCOMs) to IPPs in India (average delays of 600 days and more) have led to a weakened outlook for IPPs including RE based IPPs, leading in turn to slower growth in capacity additions. The RE sector added 8,532 MW in 2018-19, just over 50% of that year's target of 15,602 MW[4]. Schemes like UDAY and Saubhagya have not met their desired outcomes. On the other hand, the Perform – Achieve – Trade (PAT) scheme suffers from an excess supply of ESCERTs leading to depressed prices.

For India to meet her climate commitments and encourage a robust emission trading regime, strong RE and EE sectors are needed to create opportunities for climate mitigation. It remains to be seen if the government is able to drive clean energy markets with positive action at the regulatory and market levels.

[4] https://www.thehindubusinessline.com/companies/power-capacity-additions-slow-down-in-2018-19/article26995825.ece

Clean cooking scenario in India

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Clean Energy Access Network (CLEAN) organized **India Clean Cooking Forum 2019** on December 3rd bringing together stakeholders from clean cooking sector and welcoming discussions around the current scenario of clean cooking in India, its challenges and barriers, future scopes, initiatives to be taken for its enhancement in terms of technology and its expansion. I had an opportunity to attend the Forum and am happy to share my takeaways from the event:

- Energy consumption is going to increase in the next ten years and clean cooking could be one of the major sectors in creating job opportunities, apart from supporting a healthy environment
- The Government of India has recognized clean cooking as a critical issue and NITI Aayog has been working on creating a possibility of a National Mission on clean cooking
- The increased focus on climate change points out that LPG is an intermediate fuel option but not an ultimate one. So, to move towards a cleaner and greener world, renewable energy should be highlighted as the only alternative for clean cooking. Various clean cooking options should be considered, and not just solid biomass fuelled cookstoves
- There is a need to expand the clean cooking sector, adding innovative technologies and making efforts for end users to adopt clean cooking options
- With a continued focus and targeted implementation efforts, clean cooking can benefit across some of the SDGs- such as SDG 3, 7, 8, 11 and 13 and to contribute to an enabling environment for achieving the entire agenda 2030

- Innovations such as biomass cookstoves have been made in the past and have proved to be successful.There are some interesting innovations in the pipeline that can help to achieve the demands of the sector
- There is a need for R&D to reach people. There is also a need to provide proper training to the people on how to use the product in order to increase the efficiency of clean cooking appliances
- As innovations and technologies for clean cooking sector are being developed and deployed, it is important to collectively make an impact in terms of increased adoption of clean cooking applications and the corresponding quantified benefits by approaching the right set of investors. Opportunities need to be created to receive incentives for generating environmental benefits and develop markets for clean cooking applications
- There is a need to develop mass markets for clean cooking applications

Renewables: Progress and opportunity in Malawi and Africa

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On 28 November, without a great deal of fanfare, the Government of Malawi endorsed a new energy policy and renewables strategy. One reason for the muted celebrations was that the documents have effectively been published for the last couple of years and are in wide circulation. Since I had been part of the team to draft the renewables strategy while working for the government of Malawi in 2016, the launch event feltlike a good time to reflect on the country's progress in renewables since I left Lilongwe almost three years ago.

Utility Reforms and Signs of Progress

Since 2017, installed capacity on Malawi's grid network has increased by around 10MW following the development of large-scale diesel generators -complete with eye-watering power costs. So far not so much progress. However, reforms to the state-owned utility ESCOM in 2016 split the group into two entities, a supply businessand a generation business. This allowed private sector developers to compete tosell power to the state-owned supplier for the first time. A resulting auction process for remaining capacity on the gridled to the first ever private sector-led power purchase agreements (PPAs) being signed by the Government of Malawi.

The most advanced development is a 60-megawatt solar array at Salima, already in construction, led by local developers Matswani in partnership with JCM Capital from Canada and InfraCo Africa – a development finance group which has support from the UK Government, among others.

Alongside the utility reforms, the US Government's Millennium Challenge Corporation has worked on upgrading parts of Malawi's aging grid network resulting in additional capacity on the grid. Coupled with the PPA signings, this has piqued the interest of a number of international players looking to kick-start projects in Malawi.

The Minister of Natural Resources Energy and Mining Bintony Kutsaira said during the launch of the new energy policy that the power sector needs a total of $2.5 billion to achieve set targets to more than triple the country's power generationto 1,200-megawatts.

At ITPEnergised we are utilising our strong local network alongside our market-leading technical and environmental expertise to be ready to assist developers looking to enter the market in Malawi.

The Off-Grid Challenge

Despite the signs of progress, the grid network still only reaches around 10% of Malawi's 18 million citizens.Off-grid solutions are urgently required for the vast majority, particularly those in rural areas where planned network extensions will not reach.

Government reforms for energy access include a levy on fuel to contribute towards rural electrification. Some of this funding, alongside support from the international community, is spent on developing new pilot mini-grid developments. Pioneering developments like the hydro scheme at Mount Mulanje may only serve a few hundred people but they are vitally important in understanding the steps to be overcome to make the roll-out of mini-grids a reality.

For those who aren't lucky enough to benefit from a pilot mini-grid scheme, there is still the option of household-scale solar panels and batteries to meet basic energy needs.ITPEnergised recently reported on a number of British organisations making progress in Sub-Saharan Africa in the off-grid sector, and Malawi's strong ties to the UK could see these businesses and charities increasing their activity in the country.

Disappointingly, many prominent off-grid companies are not yet operating in Malawi. This is possibly due to affordability issues, with Malawi's income per head behind some of its neighbours, with relatively more wealthy countries like Kenya and Tanzania pioneering the use of mobile money alongside the spread of solar products to help citizens purchase and use power off-grid. Although the sector is not yet flourishing in Malawi, it has the potential to move quickly across borders, meaning advancements in other parts of East Africa should bring increased hope for Malawi.

Grid Integration and Cooperation

As the price of renewable power continues to reach record lows across Africa (the International Renewable Energy Agency notes the average solar electricity cost of $0.085/kWh produced by projects commissioned last year is set to fall to $0.048 next year), Malawi is looking outwardly to increase grid integration with neighbours to take advantageof exporting and importing power.

The World Bank and other donors are supporting the development of a $130m interconnector with Mozambique which will initially see excess power from hydro transmitted into Malawi,along with the prospect of being able to export power to the wider region. Although the technical solution has been found, the agreement between Malawi and Mozambique is yet to be formalised, a situation all too common with other cross-border energy trading agreements throughout Africa.

With appetite for investment in renewables across Africa at an all-time high, Governments and the international community now have to back the industry and workto ensure other political obstacles are overcome.The recent launch of the new and ambitious policy for energy and renewables from Malawi's leadership is a small but encouraging step.

For more information and advice about environmental and technical support to help develop renewable energy projects in Africa, please don't hesitate to get in touch.

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