

ISRO releases the special issue on 'Reusable Launch Vehicle-Technology Demonstrator'

The Indian Space Research Organisation (ISRO) published the special section on Reusable Launch Vehicle-Technology

Demonstrator (RLV-TD) in the 10 January 2018 issue of *Current Science*. In a release event planned at the ISRO head-

quarters on 21 March 2018, the issue was released by the ISRO Chairman K. Sivan. S. Pandian (Director, ISRO Propulsion Complex), B. N. Suresh (Chancellor, Indian Institute of Space Science and Technology) and S. K. Satheesh (Chief Editor, *Current Science*) were also present during the release and addressed the gathering. ISRO successfully launched the RLV-TD on 23 May 2016 from Sriharikota. Drawing from the experiences of the development, ISRO came up with the special section of 12 technical papers that address the complexities of the cutting-edge technologies used in RLV-TD. The successful flight of RLV-TD will help ISRO pursue development efforts to master reusable technologies to reduce launch cost and achieve faster turnaround time.



MEETING REPORT

The role of technology in charting India's progress towards climate change goals*

Technology is considered as one of the three key pillars along with policy and finance in achieving a nation's climate goals, and thereby forms a critical element in international climate negotiations. Equally important for a developing country like India is garnering financial assistance for technology development or transfer from developed countries. Within this context, the key challenge that arises, is assessing the technological needs of the country for contributing to adaptation and mitigation goals. This assessment needs to be carried out under multiple lenses that address important issues such as the availability of technologies in the country; their scale and level of deployment; approximate finance required, and technical, financial

and policy barriers for technology acquisition and transfer. Hence, the overarching objectives that need to be achieved are to identify, evaluate and prioritize environment-friendly technologies that have proven capacity for solving country-specific problems and will ultimately lead to fulfilling national climate goals mainly set in the Nationally Determined Contributions (NDCs).

Comprehending these complex issues for an emerging economy like India is not straightforward, especially given the country's diverse physical and socio-economic attributes. Considering a 'one size fits all' approach while problem-solving complex climate-related issues technically will not be an option. Diverse technologies have to be identified that are affordable, accessible and reliable.

Any study directed towards a nation's technology requirement assessments has to be country-driven, inclusive of all regions and a participatory process. Such

top-to-bottom approach will involve discussion with multiple stakeholders at the national, regional and local level for capturing technological gaps and problems, thereby giving a dynamic perspective of technical gap analysis prevalent in the country.

In this backdrop, a herculean task is presently being undertaken by India to identify, evaluate and prioritize technologies required for the country. In view of this national initiative, a validation workshop was recently held to assess and validate the progress of work towards the same. It also served as a platform for experts to engage and build consensus on the domestic front for cutting-edge technologies that will assist India in achieving its climate goals.

The objective of the workshop was mainly to discuss the technologies identified so far amongst different groups of experts with a view to understanding the appropriateness of the technologies in the climate change context. To be more

*A report on 'National validation workshop on Technology Needs Assessment', jointly organized by MoEFCC and TIFAC at Indira Paryavaran Bhawan, New Delhi during 9 March 2018.

specific, the following issues were discussed during the workshop:

- (a) Assessing the technology needs of the country at large, and identify key areas for intervention.
- (b) Identifying priorities and gaps in current practices to be imbedded in the ongoing Technology Needs Assessment (TNA) report.
- (c) Recognizing financial and technical barriers for technology development and transfer.
- (d) Creating awareness and knowledge on technologies within the 10 prioritized sectors.

The workshop comprised of 10 sessions, viz. Industrial product and processes; coal and energy; renewables; transport; habitat; waste; water; health; agriculture, and forestry. Presentations were made by expert group members representing each sector, followed by a roundtable discussion that provided a broader introspection sector-wise and similarly, facilitated knowledge-sharing and opportunities to delve into any inadequacies within a sector. Experts involved in multiple sectors discussed and debated the status quo of technologies within the country and areas for technology transfer, also highlighting policy issues, gaps and suggestions for their successful implementation.

Key outcomes emerged from this workshop that give a proper direction to the ongoing TNA process and point out vital areas to be deliberated upon.

- Main concerns were related to strengthening India's negotiating position in international climate forums. The overarching question on how India needs to bargain effectively for financial and technical assistance in international climate talks dominated the narrative of the entire workshop proceedings. The TNA Committee felt the need for a clear strategy to be chalked out, that leverages India's strengths, mainly its huge market dynamics and a large population base.

- Technologies should be identified that are either not available in India or

need incremental development, most importantly, develop more clarity on technology transfer. Technology roadmaps that look beyond the present state of technology to a broader futuristic assessment or disruptive technologies should be prepared that mainly capture technology barriers and its implementation to narrow the gap in some areas.

- India's huge population presents a cause for concern for constructive action against climate change; hence supporting its marginal population and accommodating their needs within the present study is important. For instance, technology usage and its impacts could differ among sections of population and such factors need to be taken into account while selecting technologies.

- One of the objectives realized was to identify and present at least around 8–10 technologies within each sector, that demonstrated more potential for fulfilling the country's NDCs, with added socio-economic benefits.

- In the energy sector, since phasing out coal is not possible until near 2070, thrust should be given to enabling cleaner coal technologies for making the coal industry more sustainable, by focusing on advanced coal technologies (ACT), carbon capture and utilization technologies (CCUS), and development of indigenous technologies for high-ash coal. For renewables, reducing imports and indigenization of technology especially in the solar sector was highlighted as the need of the hour, whereas gaps in the manufacturing process for wind sector were recognized.

- Important issues that emerged within the transport sector were performing life cycle analysis (LCA) for various fuels for future traction technologies and stress on urban mass transportation systems with an emphasis on bio-CNG concept. An important theme that emerged from the health sector was generating awareness and preparedness towards diseases such as yellow fever, bird flu, etc.

- Within the forestry sector, technology gaps were identified in the mass

production of superior planting stock, research on synthetic trees, fire control and detecting systems. Efficient irrigation methods and nutrient management techniques, as well as weather forecasting were deemed important for the agricultural sector. For the water sector, major points highlighted were augmenting water resources by recycling, aquifer and groundwater recharge, and decreasing contamination from heavy metals, chemicals, etc.

- A dire need was felt for addressing financial aspects of the technologies and outlining them in the TNA report, as this would strongly assist in requesting for financial grants under the Global Environment Facility (GEF) and Green Climate Fund (GCF) mechanisms.

- LCA of each technology needs to be carried out for evaluating its environmental footprint, and the technologies preferred should be carbon neutral if not carbon negative.

The findings and observations from the TNA process will culminate in the formation of a report to be submitted to United Nations Framework Convention on Climate Change (UNFCCC). Hence, the TNA process is significant in terms of showcasing and attracting funds for technologies that need to be deployed immediately for mitigating and adapting to negative impacts of climate change. Another relevant feature of conducting the TNA process is its ability to merge with and complement other national missions and strategies, thereby contributing to larger developmental goals of a nation. Moreover, it highlights technologies that are crucial for achieving India's NDCs and additionally ensure its socio-economic progress.

Shanal Pradhan* and **Gautam Goswami***, Technology Information, Forecasting and Assessment Council, Department of Science and Technology, Shaheed Jeet Singh Marg, New Delhi 110 016, India.

*e-mail: shanal.pradhan@gmail.com; goswamig@hotmail.com