GOVERNMENT OF INDIA
MINISTRY OF POWER

पावरग्रिड

USAID
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SMART GRID KNOWLEDGE CENTER

STRATEGIC ROADMAP

FOR BECOMING A CENTER OF EXCELLENCE

JUNE 2020

BACKGROUND

The Indian power sector is amidst a paradigm shift as it transitions towards a more distributed consumer centric ecosystem. Two way power flows and enhanced intelligence are likely to become the norms of this new energy future. The key mandates shaping the power sector landscape are:

- **24x7 quality power supply and sustainability of Distribution Companies (DISCOMs):** Modernization of DISCOMs to improve their operational and financial sustainability are key strategic priorities of the Government of India (GOI). Recently, the GOI announced a slew of policy and regulatory reforms to boost efficiencies, promote competition and improve power supply to consumers[1]. These reforms, announced as a larger part of the economic package to rebuild the nation post the COVID-19 pandemic, are expected to inject new life into the power utilities and lead them on a sustainable path.
- **Consumer centricity:** Consumers are expected to become more demanding and embrace distributed energy resources. Proposed tariff policy reforms also emphasize protecting consumer rights and enhancing consumer service levels. To meet customer expectations, utilities need to develop consumer-focused strategies including innovative digital solutions for transparency and consumer empowerment.
- **Enhanced penetration of Renewable Energy (RE) into the grid:** The GOI has an aggressive target of 450 GW[2] of RE capacity by 2030. This necessitates grid flexibility, and strong network visibility and control for dynamic grid operations.
- **Emergence of embedded generation and new loads:** Distributed energy resources and electric vehicles are expected to introduce challenges in peak load management and at the same time open up new opportunities for distribution companies.

NEED FOR A STRONG ECOSYSTEM

The policy and regulatory reforms are indeed a positive development. However, what will determine their success is the ability of stakeholders—utilities, technology providers, entrepreneurs, consumers, etc.—to play their critical roles in the roll out. DISCOMs will have to induct new processes, technologies and resources in consonance with their operational and financial sustainability. Thus, there is a need to build the capacity of stakeholders, develop a strong knowledge capital, and create an enabling ecosystem that will foster partnerships and innovations in the sector. Such multifaceted interventions can be accelerated by a platform that focuses on showcasing smart grid technologies, nurturing new ideas, training of power sector professionals & sharing best practices, etc. The Smart Grid Knowledge Center (SGKC) is strategically well positioned to address these gaps of the power sector.

[1] https://pib.gov.in/PressReleseDetail.aspx?PRID=1624536
[2] Announced by Hon'ble Prime Minister of India in New York Climate Week in September 2019

ABOUT THE SMART GRID KNOWLEDGE CENTER

The SGKC is a state-of-the-art platform for demonstration and outreach of smart grid technologies. Established by the POWERGRID, with support from the Ministry of Power (MOP) and the National Smart Grid Mission (NSGM), the SGKC showcases smart grid technologies through demonstrations and provides training and capacity building support to power distribution companies. The SGKC is located within the POWERGRID Academy of Leadership (PAL) complex at Manesar, Haryana.

The smart grid demonstrations at the SGKC include smart meters, smart homes, microgrids, outage management, etc. Through multimedia visual aids, stakeholders can get first-hand experience of how these interventions function and what benefits they offer. The SGKC is also equipped with state-of-the-art training platform with hostel facilities.

EXISTING INFRASTRUCTURE AT THE SGKC

Live Demonstrations

- **Advanced Metering Infrastructure**

  Smart meter integration on different communication technologies, data acquisition and analytics for utilities and consumers, energy audits, protocol emulation, pre and post-paid meter functionalities, theft warnings, etc.

- **Smart Home Energy Management System**

  Enables monitoring and controlling of home appliances based on signals such as Time of Day tariffs. The setup is equipped with IP camera, safety and security sensors, modern appliances such as AC, TV, Refrigerator, etc.

- **AC Microgrid**

  Integration of different RE sources, generation forecasting, simulation under various operating conditions including storage.

- **Utility-Scale-Grid-Connected RE**

  Utility-scale-grid-connected RE generators (wind and solar) demonstrate workings of wind firms and solar parks. Different configurations of wind turbines, solar panels and grid connections (including poling sub-stations, transmission lines and GSS) are deployed.

- **Outage Management System**

  Model demonstrates fault location, isolation and service restoration technologies to reduce impact and duration of outages.

- **Training Infrastructure**

  Conference room with advanced hardware and software systems, meeting rooms, computer laboratory for hands-on training of participants.

- **DC Microgrid**

  Established with solar as the source of RE and integrated with battery storage - appliances operate on DC power, thereby reducing conversion loss.

- **Power Quality Measurement Laboratory**

  Advanced laboratory set-up to demonstrate power quality parameters such as lux levels, harmonics, etc. for different light sources. Enables research and development, training on power quality management.

Training Infrastructure

The PAL complex is home to state-of-the-art electrical and training facilities which the SGKC stakeholders can leverage to build their capacity. Some key features include:

- **National Transmission Asset Management Centre (NTAMC)**

  Remote asset monitoring center of POWERGRID. There are currently 160 sub-stations connected with the NTAMC.

- **400 kV GIS Sub-station**

  Technologically advanced sub-station of POWERGRID.

- **Laboratories for Research and Development (R&D)**

  Technical areas for R&D include sub-station automation, metering, material, oil testing, phasor measurement, etc.

- **Training Facilities**

  Equipped with varied configurations of training venues (seven 35-70 seater classrooms, 250 seater auditorium, 50 seater computer lab, six conference halls, six syndicate rooms), along with modern hostel and entertainment facilities for participants.

PROPOSED VISION OF SGKC: ESTABLISH INDIA'S LEADERSHIP IN SMART GRID

The SGKC aims to be one of the leading Centers of Excellence globally to foster partnerships, innovation and entrepreneurship in smart grid technologies and create capacities in the power sector. It will assist stakeholders embrace the new era of innovation, leverage collective knowledge, and make meaningful connections. The overall vision is to accelerate the deployment of smart grid technologies by providing enabling services and solutions under one platform for benefit to all.

The United States Agency for International (USAID), in partnership with MOP, under its bilateral program Smart Power for Advancing Reliability and Connectivity (SPARC), is providing technical assistance to the SGKC in developing it as a global Center of Excellence of Smart Grid.

Figure 1 showcases the existing features of the SGKC, and the strategic activities planned to take it forward.

SGKC: ONE-OF-ITS KIND RESOURCE CENTER

- Build institutional and human capacity on smart grid
- Build value proposition of smart grid for different stakeholders (power utilities, policy makers, regulators, etc.)
- Address market gaps in research and development in power distribution

Figure 1: SGKC – Strategic Roadmap for the Way Forward

SGKC STRATEGIC ROADMAP

EXISTING INFRASTRUCTURE

- Demonstration of Smart Grid Use Cases including Advanced Metering Infrastructure, Smart Home, Outage Management System, Microgrids, etc.
- State-of-the-art training facilities including simulation labs

CENTER OF EXCELLENCE

PROPOSED ACTIVITIES

INNOVATION PARK

Platform for live demonstration of innovative smart grid technologies with potential to address key sectoral needs and priority areas.

TECHNOLOGY INCUBATION HUB

Platform for innovative ideas to bridge the “concept to market” gap by providing mentorship support and facilitating access to national and international platforms.

CAPACITY BUILDING AND OUTREACH

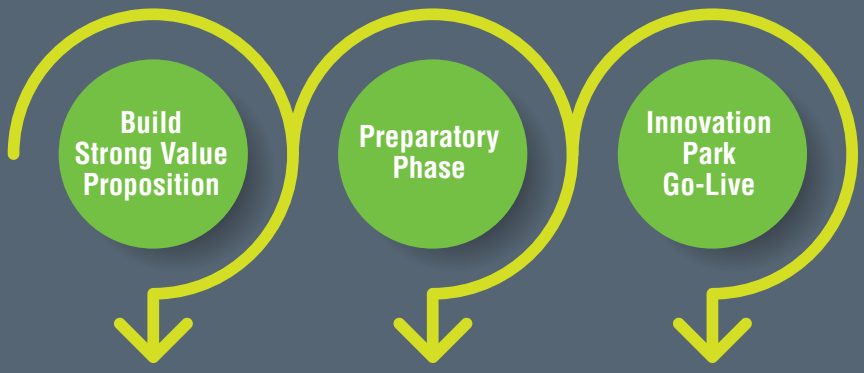
Platform for workforce development though customized trainings and exchanges.

Innovation Park

The Innovation Park will serve as a platform to demonstrate frontier products and technologies relevant to the power sector. It will showcase cutting-age solutions to varied stakeholders (utilities, researchers, policy makers, and consumers) through physical assets, technology or software solutions and virtual demonstrations. This will help in capacity building, knowledge sharing and innovation.

SGKC's expert panel will select the technologies basis their relevance to address major needs of power sector in India and similar emerging economies. They will also review the validity of technologies/solutions demonstrated periodically—the demonstrations will be showcased for a pre-specified period, post which the technologies will be updated, refurbished or replaced keeping the park at the cutting edge of innovative sustainability. The park will function as a networking and knowledge exchange hub for smart grid technologies.

Approach



Build Strong Value Proposition

Build strong utility interphase: trainings, capacity building & exposure visits

Twinning arrangements (India & global)

Strong communication & outreach plan

Preparatory Phase

Develop guiding framework

Finalize business model - fixed rental for private sector. Serve as a forum for showcasing innovation by government agencies & academia

Outreach activity for creating awareness on innovation park

Innovation Park Go-Live

Call for application/EOI and selection for demonstration

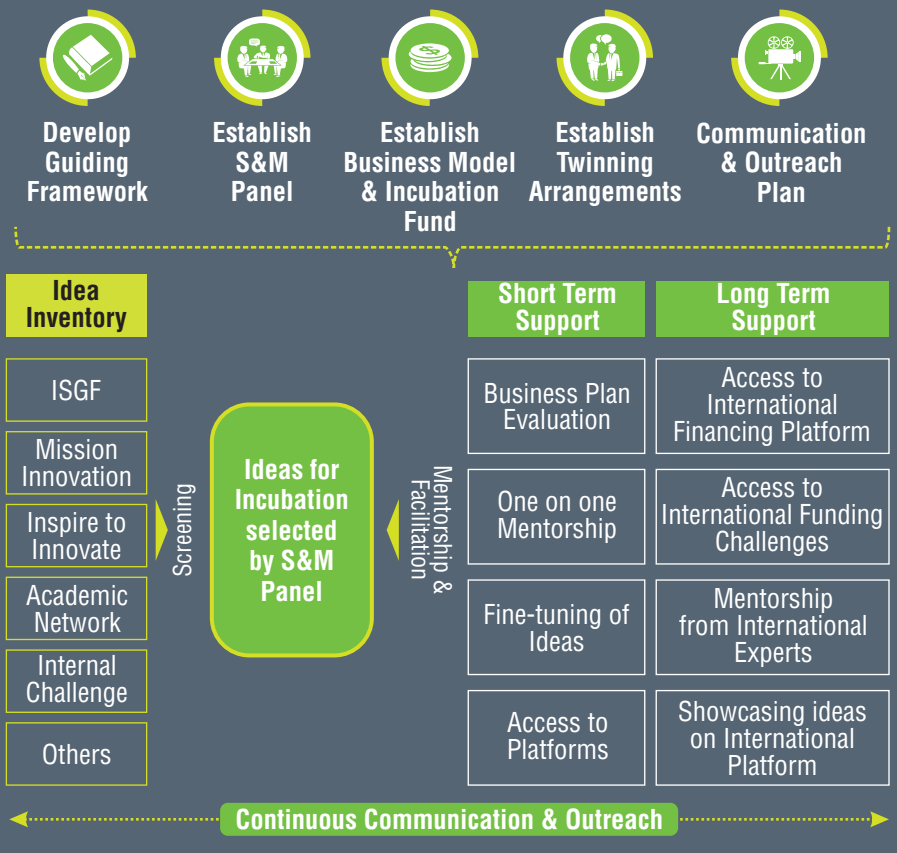
Review and monitoring of outcomes and areas/themes applicable for demonstration

Outreach activity for creating awareness on demonstrations under innovation park

Technology Incubation Hub

The Technology Incubation Hub will support innovative ideas to become commercially viable products/solutions. The core idea is to synergize startups, academia, technology developers, etc. to drive transformation and innovation for a more resilient, smart, and secure power sector.

The ideas will be selected based on their potential in the current and emerging power sector context. The SGKC will provide mentorship (through empowered groups comprising national and international experts) and facilitate access to national and international platforms through the lifecycle (technical, financing, challenge competitions, etc).



Capacity Building and Outreach

The SGKC will serve as the go-to platform for all power sector related trainings. Tailored training programs on relevant topics for stakeholders including utilities, policy makers and regulators will be supported by technical webinars, conferences, industry conclaves, international forums, etc.

The Augmented and Virtual Reality (AR and VR) setups proposed at the SGKC will provide hands-on knowledge building and experience sharing. This is critical for the post COVID-19 era where the focus of most capacity building initiatives will be online.

To realize this vision, the SGKC will partner with national and international entities and leverage collective expertise and experience. This will include technology providers, academia, technical institutes, amongst others.

Approach

Course Design & Options	Menu of course options	Course pedagogy (mix of classroom & site visits)	Course certifications	Annual training calendar
Delivery	Online training through e-learning portal	Classroom-based training	Virtual site visits through AR/VR demonstrations	Physical site visits
Outreach	Digital & social media	Knowledge sessions & conclaves	Marketing collaterals	Rewards & recognition programs


EXIT


USAID


Solar PV Technologies
DC Hut

ABOUT THE SMART GRID KNOWLEDGE CENTER

The Smart Grid Knowledge Center has been established by the POWERGRID with support of the Ministry of Power and the National Smart Grid Mission (NSGM) to act as a resource center for providing technical support to the NSGM. The Center is housed within the PAL campus at Manesar, Haryana and equipped with demonstrations of smart grid use cases. The Center is envisioned to be a hotbed of innovations in smart grid technologies.

ABOUT THE POWERGRID ACADEMY OF LEADERSHIP

The Powergrid Academy of Leadership (PAL) is a state-of-the-art institute of learning set up by POWERGRID at Manesar, Haryana. The campus, spread over an area of 22 acres, is equipped with world class training infrastructure that includes smart class rooms, computer labs, auditorium, conference halls and modern hostel facilities. With dedicated subject matter experts, the institute offers best-in-class classroom training combined with hands-on learning and exposure visits. Experts of PAL are part of core apex level committees set up by Ministry of Power, Central Electricity Authority, Central Electricity Commission, etc.

ABOUT THE USAID SPARC PROGRAM

The Smart Power for Advancing Reliability and Connectivity (SPARC) is a key initiative under USAID's Asia EDGE program. It is a three year bilateral program with the Ministry of Power, Government of India. The objective of the program is to modernize electricity distribution utilities to improve their operational and financial performance. The implementing partner of the USAID SPARC Program is KPMG Advisory Services Pvt. Ltd.

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