SHAPING MODERN INDIA'S POWER SYSTEMS

A NATIONAL OPEN ACCESS REGISTRY (NOAR) FOR INDIA: MOVING TOWARD A MORE FLEXIBLE, TRANSPARENT POWER MARKET

GTG-RISE

Innovative, evidence-based approaches

United States Agency for International Development (USAID)'s Greening the Grid-Renewable Integration and Sustainable Energy (GTG-RISE) is a bilateral initiative with the and the Ministry of Power, Government of India, under the U.S.-India Strategic Clean Energy Partnership. GTG-RISE has conducted a series of prioritized innovation pilots and demonstrations to validate technologies and models to support large-scale integration of renewable energy into the Indian power grid. USAID through GTG-RISE supported the NOAR activity as part of its efforts to pilot market-based mechanisms to address real-time imbalances. Deloitte Consulting LLP implemented the GTG-RISE pilot.

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BACKGROUND

WHAT IS NOAR AND WHY IS IT NEEDED

India's power sector is witnessing a slew of reforms aimed at shaping a robust energy landscape for the country. Real-time management of demand-supply variation — to better respond to energy requirements and to enable large-scale integration of renewable energy (RE) — is a key focus area. The June 2020 launch of the real-time market (RTM) platform in India was a landmark move in this direction. In a close follow up, the country's Ministry of Power (MoP), through POSOCO, also initiated the development of a National Open Access Registry (NOAR) to ease power trading. NOAR is envisioned as a centralized electronic platform to automate short-term open access approval processes and enable the intra-day market to operate much more flexibly.

NOAR, like other mechanisms to strengthen the energy market, assumes critical importance in view of India's plans to deploy unprecedented levels of RE into the national grid. Compared to conventional power, RE from sources like wind and solar is more variable, less predictable, and often further from demand centers. High penetration of variable RE warrants mechanisms that ensure the reliability and stability of the power grid. RE variability also leads to scenarios where states/control areas are left with demand-supply imbalances to manage. Imbalances on intra-day basis due to fluctuations in RE generation have so far largely been managed within state control areas. State distribution entities do not very actively tap into the reserves lying with other states/regions. Not only has there been no effective system for inter-state sharing of surplus power/reserves, but there also has been limited scope and incentive for state reserves to participate in the intra-day market due to technical constraints and an ineffective market model. Absence of an information technology (IT) based system to render faster short-term open access approvals has been a major hurdle, impeding the market's ability to contract and deliver power in shorter timeframes than the current turnaround time of around three hours.

NOAR aims to plug this gap. The integrated IT-based system will be a one-stop solution to automate short-term open access approval processes, through which applicants can apply for a transaction based on corridor availability and the system can grant automatic recommendation for approval. The platform will substantially reduce the response time for open access approvals and bring down the lead-time (gate-closure) in intra-day timescales to half an hour in the long run.

> **NOAR is a long-awaited initiative... Its implementation will substantially reduce the time block for real-time market further and bring it even closer to the time of delivery... The IT-based system will make things very easy for all stakeholders and avoid unnecessary litigations and hassles.**
>
> **Sanoj Kumar Jha**
> Secretary, CERC
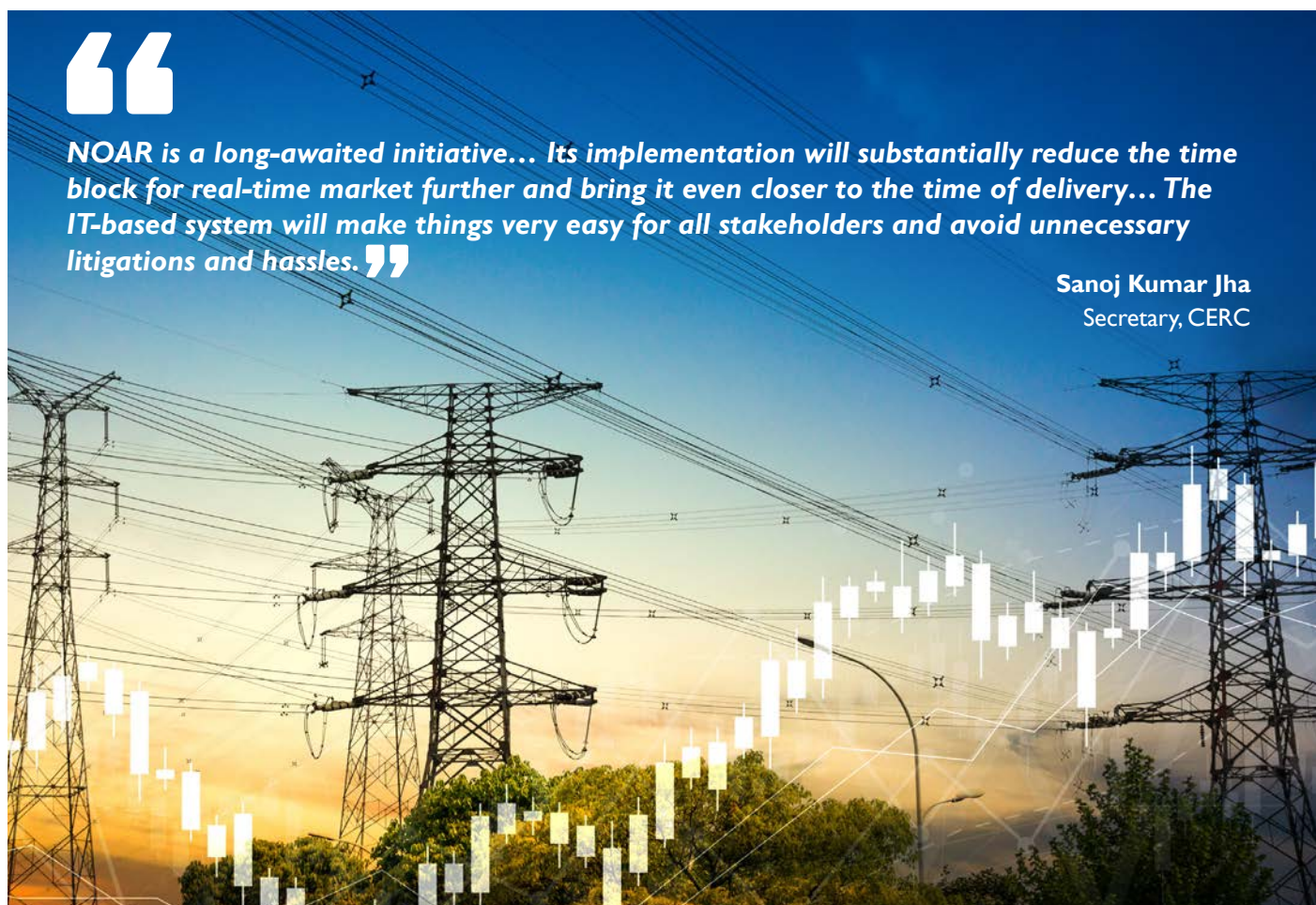
NOAR: ENABLING OPEN ACCESS TO REALIZE ITS FULL POTENTIAL

The Central Electricity Regulatory Commission (CERC), India's central regulator, looks upon NOAR as the pivotal enabling infrastructure needed to support smooth, dynamic real-time electricity market administration in India. CERC envisions the IT-based NOAR platform as a centralized, integrated system that will be accessible to all stakeholders, with a range of functionalities for automating the short-term open access approval processes.

As India's long-standing partner in the reform agenda, USAID supported Government of India in the NOAR activity through its Greening the Grid-Renewable Integration and Sustainable Energy (GTG-RISE) initiative as a pilot – titled 'regional platform for reserves sharing' — on regional coordination and market redesign.

OBJECTIVES AND SCOPE OF THE ACTIVITY

GTG-RISE's task involved assisting the Power System Operation Corporation Limited (POSOCO) to establish NOAR. The IT-based system will be accessible to all stakeholders, including open access participants, trade intermediaries, national/regional/state load despatch centres (LDCs), and regional power committees. The system will have all the functionalities for maintaining a centralized repository of information related to open access and inter-state corridor availability, interim approvals, and no-objection certificates (NOCs).

NOAR will also have the provision for a payment portal linked to alternative modes of settlement (including linkages to clearing house-based settlements). The system will include provisions to allow for future and proposed changes, such as transmission capacity allocation through e-bidding, cross-border transactions, and a payment gateway for open access clearances.

The driving aim of the pilot is to enable re-organization of the intra-day market with periodic collective auctions and gate closures, and substantial reduction in response time for open access approvals. The pilot also will help the intra-day market to operate much more flexibly, with increased volumes of balancing energy trade across states at short notices.

NOAR: A ONE-STOP SOLUTION FOR REAL-TIME ELECTRICITY TRADING
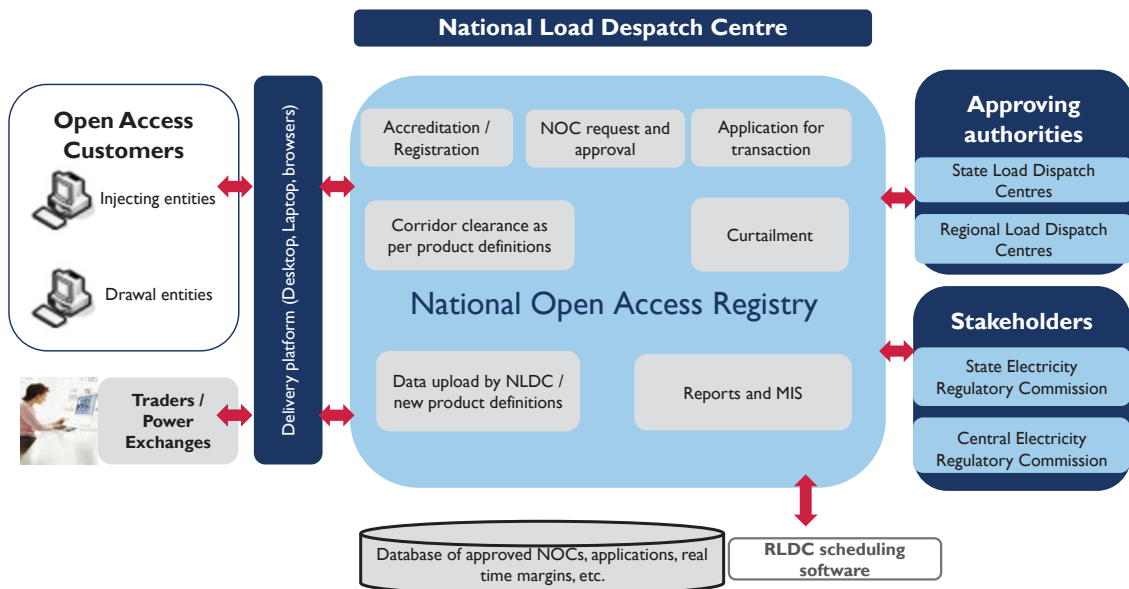
- National Load Despatch Centre will be the responsible Authority for integrated operations of the NOAR
- NOAR will interact with multiple stakeholders and have multiple data export / import points

> **"**
> *The NOAR will go a long way in modernizing power systems and building a resilient and self-reliant power sector in India.* **"**
>
> **Karen Klimwoski**
> Deputy Mission Director (Acting), USAID/India

GEOGRAPHIC LOCATION AND STAKEHOLDERS

POSOCO is the nodal agency for implementing the NOAR. POSOCO and USAID, through its GTG-RISE project, have jointly funded a single system integrator (SI) to develop, implement, and operationalize a fully functional NOAR. The IT system is to be hosted at the National Load Despatch Centre (NLDC) in Delhi, with regional load despatch centres (RLDCs) and state load despatch centres (SLDCs) at their respective locations having access to it for rendering short-term open access approvals to applicants. Once NOAR is implemented, all short-term open access applicants will be registered users of the system. The stakeholder base will, thus, include all short-term open access participants, SLDCs, RLDCs, NLDC, CERC, and power exchanges.

- ● NLDC
- ◉ NRLDC
- ◉ ERLDC
- ◉ SRLDC
- ◉ WRLDC
- ◉ NERLDC
- ▲ SLDC
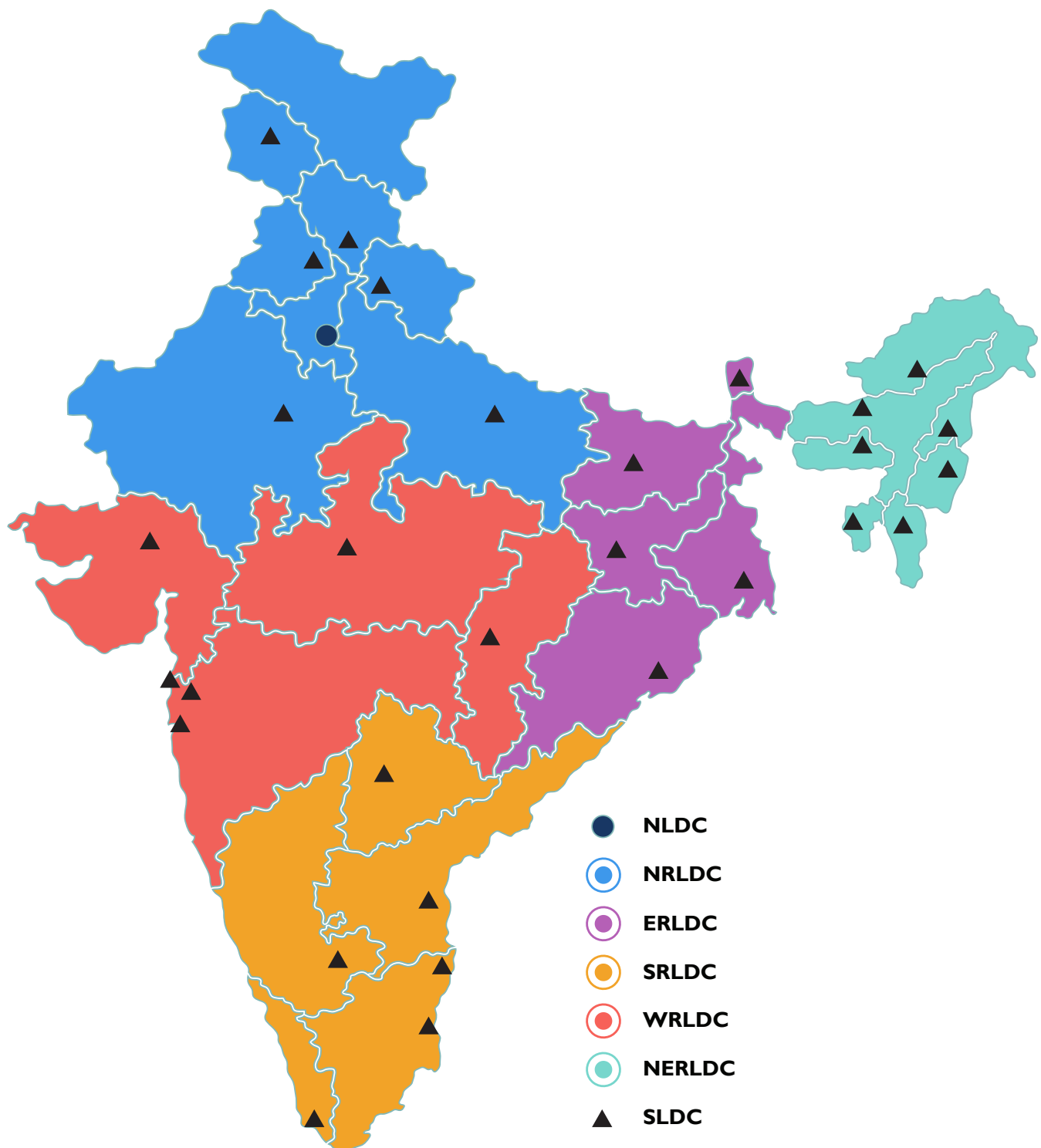
OUR APPROACH

The NOAR's creation and operationalization was a critical piece of work for GTG-RISE. The team planned NOAR implementation in four phases, as summarized in the illustration. For each phase, the GTG-RISE project team worked closely with POSOCO and a wide range of stakeholders, collaboratively identifying the issues NOAR would address and bringing in the resources to design and implement the platform.

NOAR DEVELOPMENT: SUMMARY OF STAGE-WISE INITIATIVES

Phase I

Designing of Process Maps and FRS

- Discussion and deliberations to finalise the process maps
- Seek feedback from RLDCs
- Finalisation of Process maps
- Preparation of FRS document

Phase II

IT Systems Study

- Understand the AS-IS IT landscape at NLDC
- Capture system requirements for NOAR
- Gap analysis and TO-BE architecture
- Recommend Technology alternatives and create supporting architecture

Phase III

Tendering and selection of Implementation Agency

- Formulation of RFP for selection of Implementation Agency
- Floating of RFP
- Selection of Implementation Partner

Phase IV

Execution by Implementation Agency

- Execution by Implementation Partner
- Testing and Validation
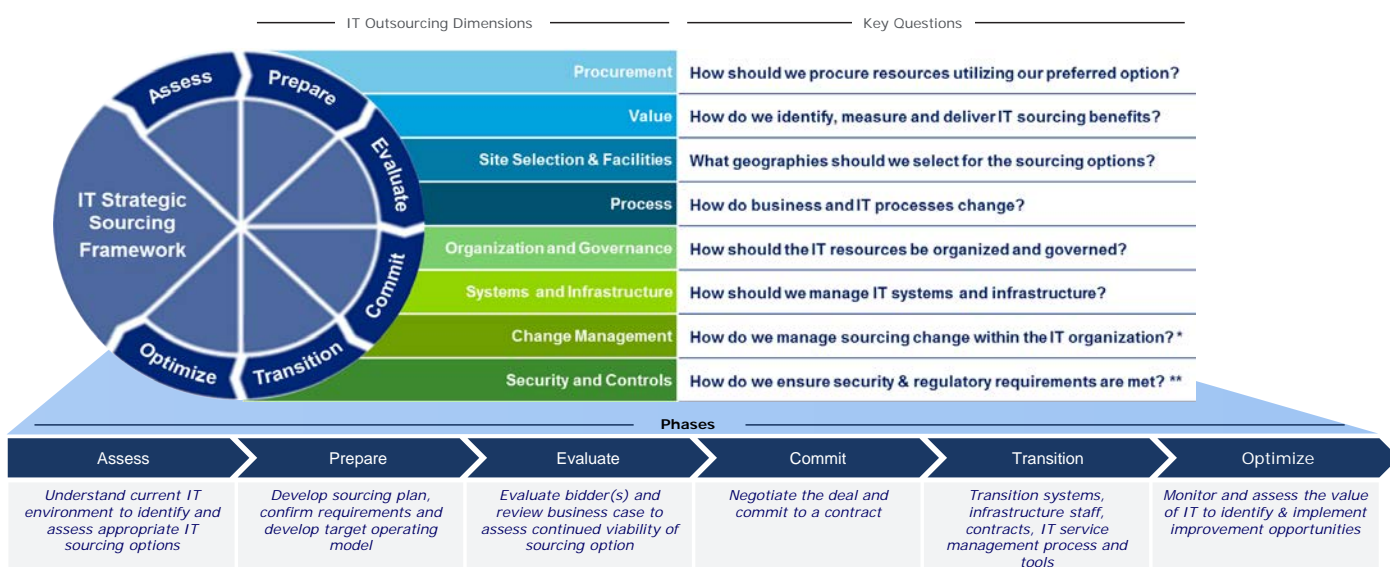- Roll out of NOAR

COMPLETED

ONGOING

I) GATHERING PROCESS AND TECHNICAL REQUIREMENTS

The GTG-RISE team held extensive discussions with NLDC, RLDCs, and SLDCs to obtain inputs on the existing processes for rendering short-term open access approvals to traders, generators, and drawal entities. The team developed the process maps for each approval and obtained inputs to design the to-be processes for NOAR. Once the process maps were finalized, GTG-RISE then proceeded to assess the existing IT systems and draft the functional requirement specifications (FRS).

II) ASSESSING THE EXISTING IT SYSTEMS

The team undertook an IT systems assessment to understand the as-is technology landscape at the NLDC, RLDCs, and SLDCs, and to determine the appropriate technology alternative needed for NOAR implementation. Based on the latter, the team designed the to-be architecture. The learning from the study of IT systems and technology alternatives went into preparing an RfA (request for application), covering the functional, system, technical, budget, monitoring, and training aspects, among others, for selecting the implementing agency.

A METICULOUS APPROACH TO NOAR DEVELOPMENT

IT Outsourcing Dimensions	Key Questions
Procurement	How should we procure resources utilizing our preferred option?
Value	How do we identify, measure and deliver IT sourcing benefits?
Site Selection & Facilities	What geographies should we select for the sourcing options?
Process	How do business and IT processes change?
Organization and Governance	How should the IT resources be organized and governed?
Systems and Infrastructure	How should we manage IT systems and infrastructure?
Change Management	How do we manage sourcing change within the IT organization? *
Security and Controls	How do we ensure security & regulatory requirements are met? **

Phases

| Assess	Prepare	Evaluate	Commit	Transition	Optimize
Understand current IT environment to identify and assess appropriate IT sourcing options	Develop sourcing plan, confirm requirements and develop target operating model	Evaluate bidder(s) and review business case to assess continued viability of sourcing option	Negotiate the deal and commit to a contract	Transition systems, infrastructure staff, contracts, IT service management process and tools	Monitor and assess the value of IT to identify & implement improvement opportunities

III) TENDERING AND SELECTION OF THE IMPLEMENTING AGENCY

USAID, as a part of its GTG-RISE project, supported POSOCO in development and issuance of the RfA document along with compliance forms for NOAR implementation. The tender document covered procurement of the necessary hardware and license components, software implementation to be completed within 12 months, and operations and maintenance of the NOAR system for 7 years after its go-live. Interested bidders were invited for a pre-bid meeting and their queries addressed. Once responses were received, a committee was formed to evaluate bids.

PWC (along with its two consortium partners, CtrlS and Wizertech) was selected as the system integrator (SI) for NOAR implementation. The selection was based on a review of the technical architecture proposed in the bid and reasonableness of the financial quote. Given the extreme criticality of NOAR implementation, the focus was on securing the service level agreement with the firm.

OUTLINE OF THE OVERALL BID AND PROJECT GOVERNANCE STRUCTURE FOR NOAR
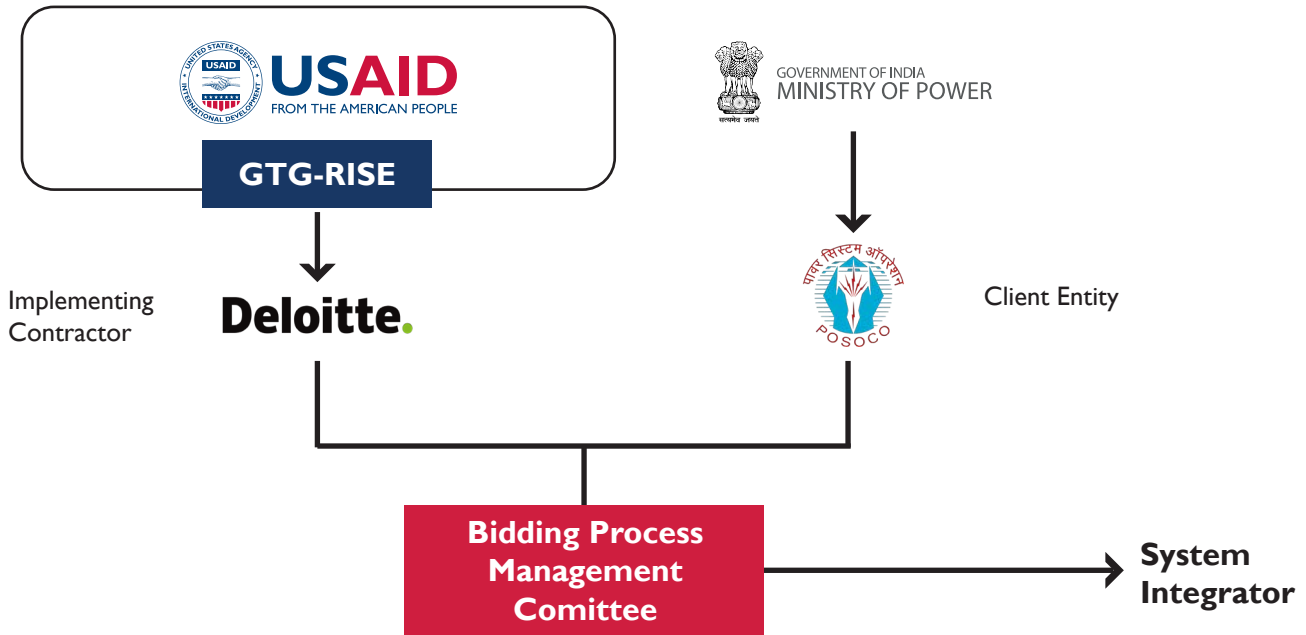
IV) EXECUTION BY THE IMPLEMENTING AGENCY

The NOAR development kicked off with a virtual contract signing ceremony, on July 31, 2020, between POSOCO, USAID and the selected SI. The platform's development is currently underway. GTG-RISE provides program management support, including review of progress, evaluation of design architecture, and validation (acceptance) of test results. The agreed progress milestones have been designed such that there is adequate buffer to accommodate any unforeseen delays. The overall project duration is fixed at 96 months and divided into two major phases: Part A - NOAR platform solution development and implementation in 12 months, and Part B - operation and maintenance of the NOAR platform for the next 84 months.

Once it is set up and implemented, the NOAR will be one of the most critical milestones on India's road to a sustainable energy future.
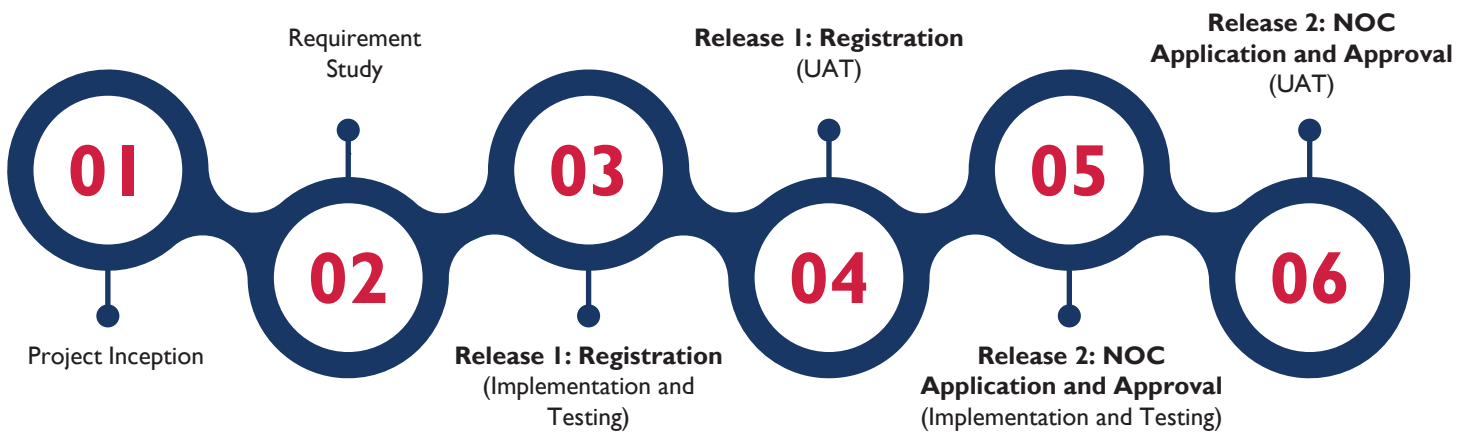
RESULTS AND SUCCESSES

Although the NOAR go-live is planned for September 2021, significant progress has been made on the interim milestones planned from the start of the activity to the end of grant award in April 2021. As part of the pilot's first phase, GTG-RISE prepared the process maps and the proposed transaction structure under NOAR. This involved stakeholder consultations at multiple levels. The finalized processes served as input for CERC in issuing NOAR regulations (fifth amendment of open access regulations). This was followed by the successful appointment of the SI, which has since delivered on the agreed milestones.

POSOCO and GTG-RISE formed the National Open Access Registry-Implementation Monitoring Committee (NOAR-IMC) to lead and co-ordinate the NOAR activity.

The SI has initiated the procurement of a data center (DC) and the near disaster recovery (NDR) infrastructure. The software application for Release 1 (Registration) module and Release 2 (NOC application) modules has been deployed on cloud. Testing of functional flows and application logic is being done on the cloud environment. All the activities related to user acceptance testing (UAT) will be performed once the DC/NDR get commissioned.

KEY MILESTONES IN NOAR IMPLEMENTATION

01 — Project Inception

02 — Requirement Study

03 — Release 1: Registration (Implementation and Testing)

04 — Release 1: Registration (UAT)

05 — Release 2: NOC Application and Approval (Implementation and Testing)

06 — Release 2: NOC Application and Approval (UAT)

> " *NOAR is a huge step in India's ongoing journey of power market reforms...The automation made possible by NOAR will bring greater efficiency and transparency to the system, a major aim of our reform effort. Expeditious development and implementation of NOAR in what is one of the world's largest synchronous power grid will be a moment of great pride for all stakeholders.* "
>
> **Ghanshyam Prasad**
> Joint Secretary, Ministry of Power, Government of India

MAJOR CHALLENGES AND LESSONS

Each state in India operates under the regulations of its respective state regulatory commission, so each state/region follows different processes. These differences presented the first major challenge for NOAR implementation, which required creation of a uniform, comprehensive, and accurate process map to show the current processes and future needs. It proved a tough ask to ensure that all the diverse processes be reflected suitably in the design. The need for accuracy was critical because the process flow diagrams form an integral part of NOAR, and correction later would be onerous. Ensuring adequate regulatory backing — though CERC's issuance of amendments to the open access regulations, specifying the key changes required to operationalize NOAR — proved to be a major aid in standardizing processes and getting acceptance from various stakeholders. GTG-RISE helped ensure timely completion in the face of multiple stakeholders and touchpoints by forming a high-level team that met regularly with senior personnel from POSOCO and CERC to finalize the to-be processes.

Another challenge emerged when the team undertook a comprehensive, detailed review of the as-is IT environment prior to recommending the best possible design. The review had to be thorough to ensure that none of the technical aspects, such as application architecture, data architecture, integration architecture, infra landscape (DC/DR/NDR components, network components, security components), were missed when preparing the system requirements. To address this critical need, the GTG-RISE team held detailed interviews to collect data from different stakeholders.

It was equally important to capture all requirements (functional requirement specifications [FRS], software requirement specifications [SRS], and infrastructure plan) prior to procuring hardware or developing software. GTG-RISE created workflows to capture all the relevant infrastructure component details, including component high-level diagrams (HLD) and low-level diagrams (LLD). POSOCO's business and IT leaders worked with the team to finalize system requirements, and formally signed off on the solution architecture.

SCALING UP AND THE WAY FORWARD

The NOAR will grant short-term open access approvals for inter-state transactions, marking a huge departure from the current practice of each state using its own procedures to grant approvals for intra-state transactions. While a few SLDCs, such as those for Gujarat and Haryana, have already developed in-house software to grant open access approvals, most states still employ manual processes for open access approvals for intra-state transactions.

Once the centralized IT-based NOAR is implemented, the state-specific open access approval processes will need to be integrated with NOAR to arrive at a unified, integrated system for short-term open access approvals. It is expected that after the piloted NOAR application goes live, there will be a further requirement of integrating with NOAR the existing open access approval systems available at each SLDC. With 33 SLDCs across the country covering all the states and union territories, this represents an immense opportunity for the pilot to be scaled up across all states. The NOAR platform can integrate the legacy systems of SLDCs into one common platform through suitable data exchange protocols, which would enable all participants to use a single platform for all their transactions.