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GOVERNMENT OF INDIA
MINISTRY OF POWER

Greening the Grid (GTG) Renewable Integration and Sustainable Energy (RISE) Program

A JOINT INITIATIVE BY USAID/ INDIA AND
MINISTRY OF POWER, INDIA

Transition Towards Coal based Flexible
Power Generation in India

A GTG-RISE Pilot with NTPC and GSECL

Date: October 16, 2020



Pilot Summary



Stage 1: Techno Economic Assessment & Roadmap

- Technical due diligence and detailed feasibility assessment
- Establishing reliable costs of flexibilisation – capex as well as opex

Stage 2: Regulatory Pathway and Fleet Level Strategies

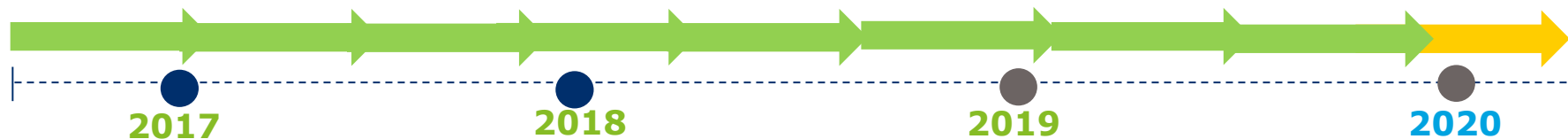
- Assistance in framing Regulatory Mechanisms for Flexibility
- Assistance in building fleet level strategies for NTPC / GSECL

Stage 3: Pilot Implementation

- Technical Assistance in pilot / fleet level implementation to NTPC
- Leverage private partnerships and contribution in investments

Stage 4: Scale up

- Assist in fleet-wide implementation and national scale up
- Capacity building of operators – Procedures and Operational Toolkits



- Pilot Conceptualization
- On Boarding of Technical Assistance (TA) Firm
- Stakeholder Discussions & Data Collection
- TA Implementation Plan

- Technical Assessment reports completed for NTPC and GSECL units
- Executive Exchanges to US
- Knowledge Dissemination Workshops

- Regulatory Frameworks for flexibilization to CERC & GERC
- Pilot Test Runs & Fleet Wide Strategies
- Changes to Operating Procedures
- Executive Exchanges & Knowledge Dissemination Workshops

- Facilitate fleet-wide adoption and National scale up
- Knowledge Dissemination Workshops

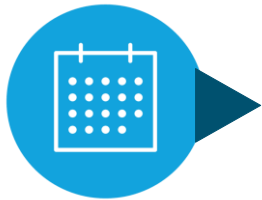
Key Recommendations



Compensation for Flexible Operations



Fleet wide Strategy



Operational Practices



Low Load/ Ramp Test Procedures



Scalability



Capacity Building

Way Forward

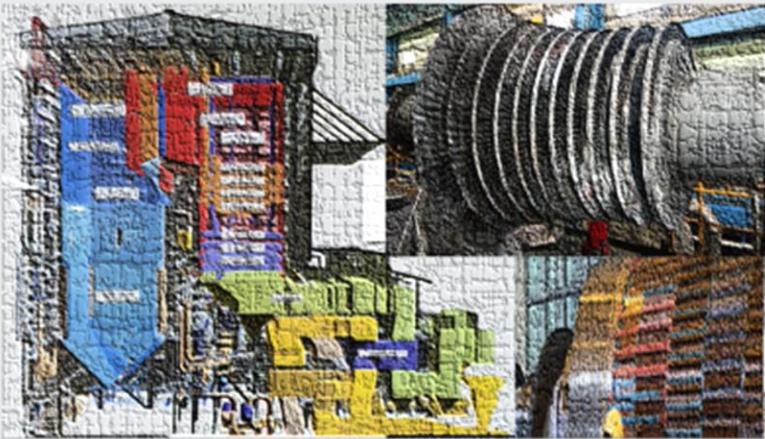
- Implementation of fleet wide strategy by NTPC and GSECL in a phase wise manner
- Low Load Test Run Procedures have been publicly released for wider dissemination and outreach. These can be accessed at <https://www.gtg-india.com/resources/>
- Stakeholder Consultations on Cost Compensation for Flexible Operations
- Knowledge Dissemination and Capacity Building Initiatives should continue to be taken up at central and state utility level.

Please visit <https://www.gtg-india.com/resources/> for all reports, presentations and other documents on the Coal Flexibility Pilot

Recipe book for flexibilisation of coal based power plants

Best practices and operating procedures for flexible operation

by Anjan Kumar Sinha



Supported by:



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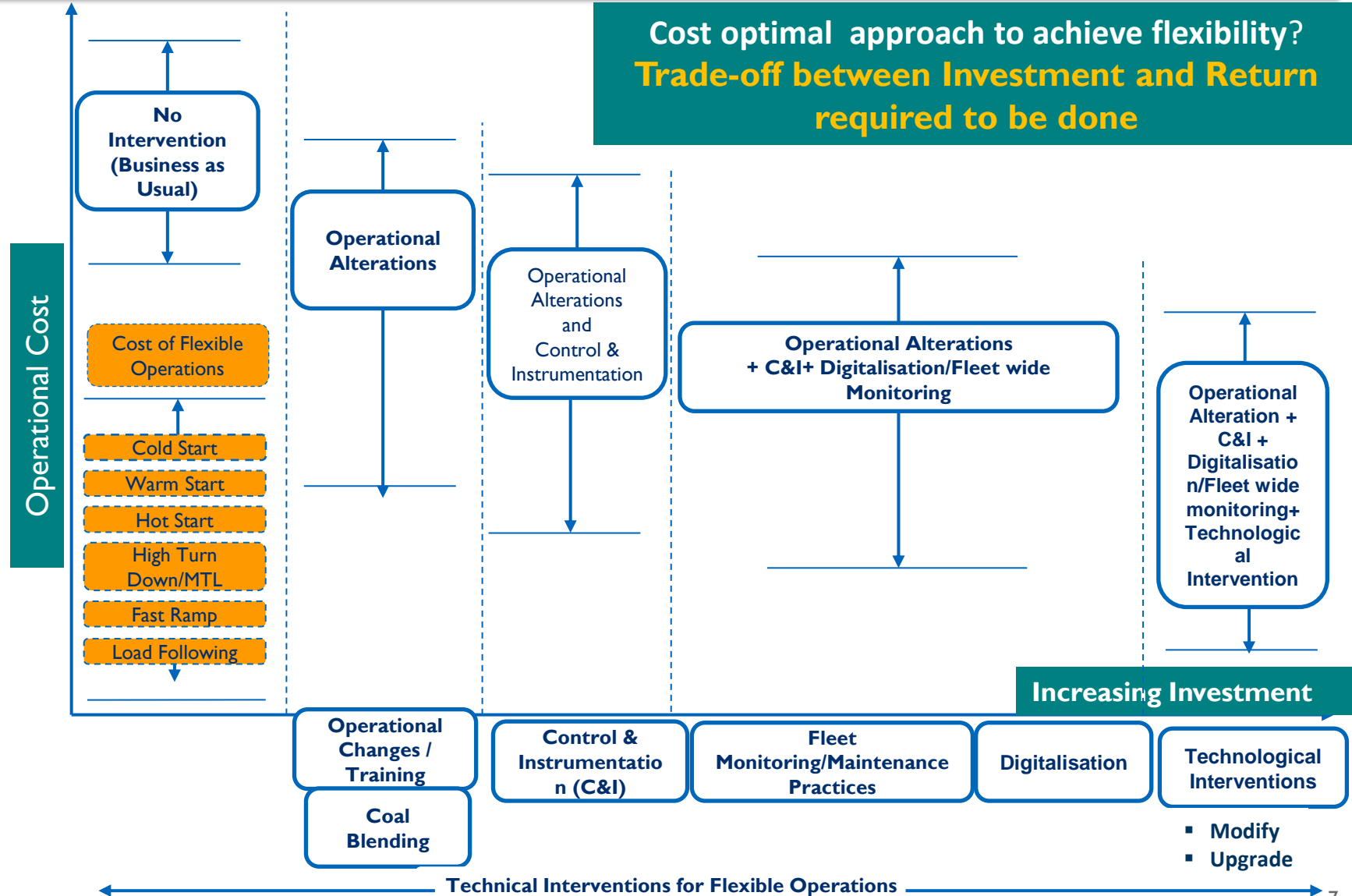
- **Safety during low load operation**
- **Damage Mechanisms during flexible operation and flexibilization costs**
- **Review of operating procedures**
- **Strategies for unlocking flexibility from existing plants**
- **Part load efficiency**
- **Optimisation of start-up**
- **Case Studies**
- **Retrofit options**
- **Lay-up techniques**
- **Combustion Optimisation**
- **Best Practices**

Approach in Preparing the book

- The Indian reality needs a different approach:
 - Context of Markets, Coal, training facilities/simulators
- Though there is a general applicability of the procedures mentioned in the book, it is particularly customised for the Indian context

- Literature Review
- Questionnaires/Interviews - 25 stations
- International Practices in Utilities (Duke, Excel, Uniper, RWE, VGB, Steag)
- Inputs from Experts- International conferences
- Pilot Studies and Test runs (IGEF, GTG, Jcoal)
- Inputs from OEMs (GE, Siemens, BHEL)
- Inputs from EPRI, Intertek, Engie, IEA.
- Blending with my own experience at NTPC

Options vs Costs for Coal Flexing in India





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