



Council of Enviro Excellence

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Venue: Hyatt Centric, Janakpuri,
New Delhi

FLEXIBLE OPERATIONS IN THERMAL POWER PLANT

Thermal Power Plants in the era of Renewables

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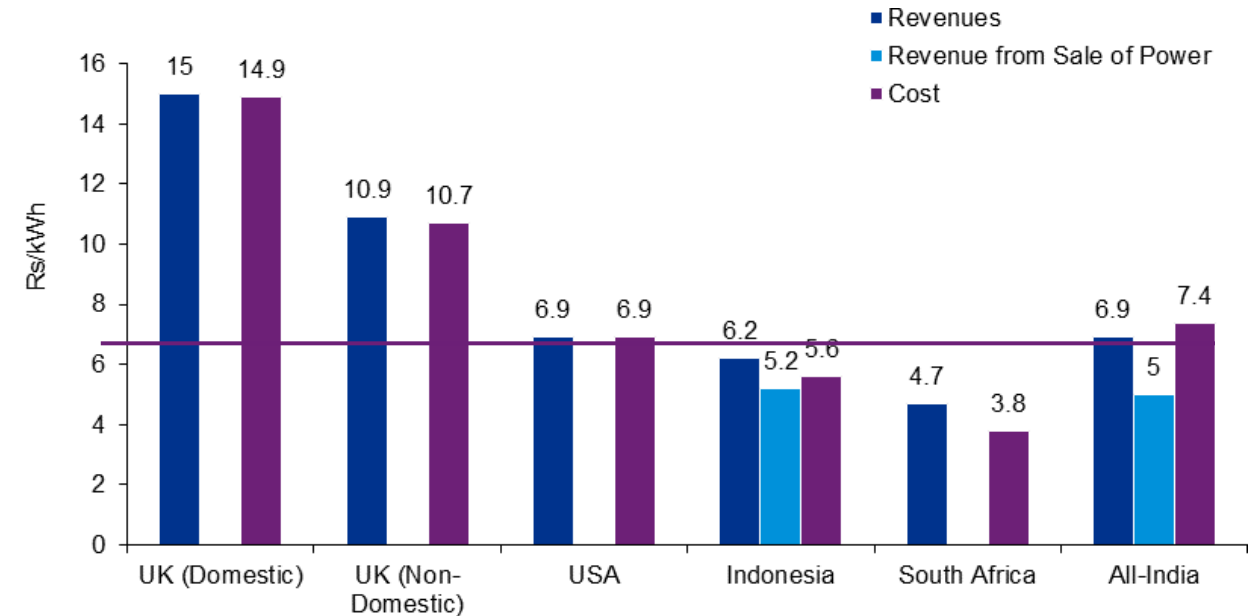
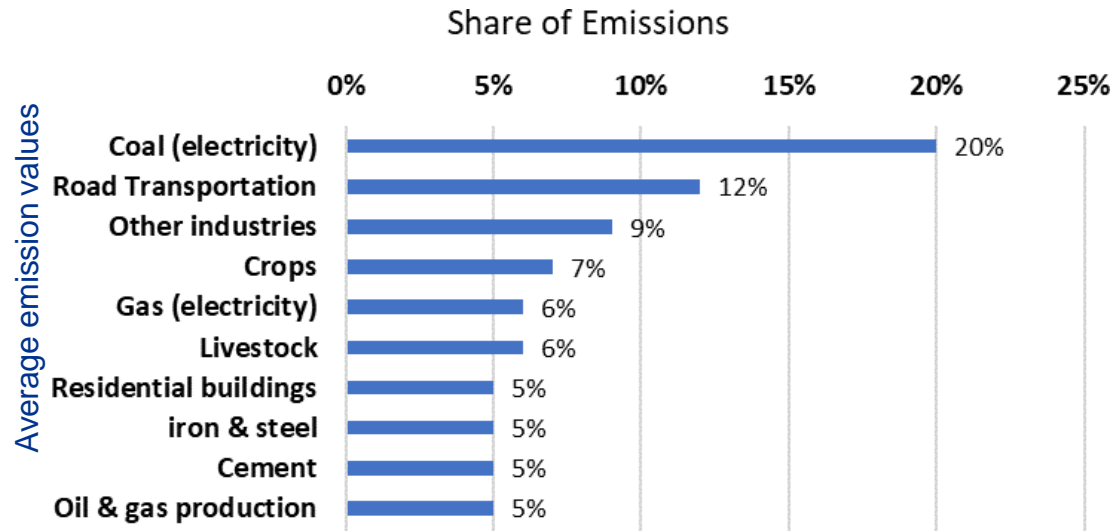
Thermal Power Plants in the era of Renewables

Sandeep Chittora

1st October 2024

Thermal Power Plants in World

India is 3rd largest power producer and 2nd largest power capacity by coal



Most efficient thermal power plants of the world

Plant	Country	Salient Technology
Isogo 2	Japan	SNCR, FGD
Guodian Taizhou II, unit 3	China	CCUS, Low NO _x
Maasvlakte Power Plant 3	Netherlands	CCS, Biomass cofiring

Though low cost and abundant coal, India's power generation cost is not cheap compared to world's coal reserve countries, this is due to

- ✓ System inefficiency
- ✓ Less Digital adoption
- ✓ Inflexible IT systems

Therefore, it is not about coal or gas, it is about right choices of technology being implemented

New Build 800 MW Or Modernize 4x200 MW with 4x100 MW Solar



Recent bids opened for 2x800 MW at > 7Cr/MW

Total Capex for 800 MW unit = 5900 Cr

EPC includes FGD to reduce SO_x emissions

Advanced supercritical parameters estimated net efficiency = 42%

1x800 MW Ultra supercritical plant (Green Field)



4x200 MW modernized with subcritical parameters can yield net efficiency of 35%

To offset CO₂ emissions due to inefficient thermal plant, solar plant needed = 4x100 MW

Capex Requirements: 3000 Cr



4x200 MW modernized subcritical plants

Modernizing 4x200 MW units	4 x 130 Cr
FGD installation in 4x200 MW	0.9 x 4 x 200 Cr
Flexibilization of thermal plant	0.4 x 4 x 200 Cr
New build solar plant (4x100)	3.5 x 4 x 100 Cr

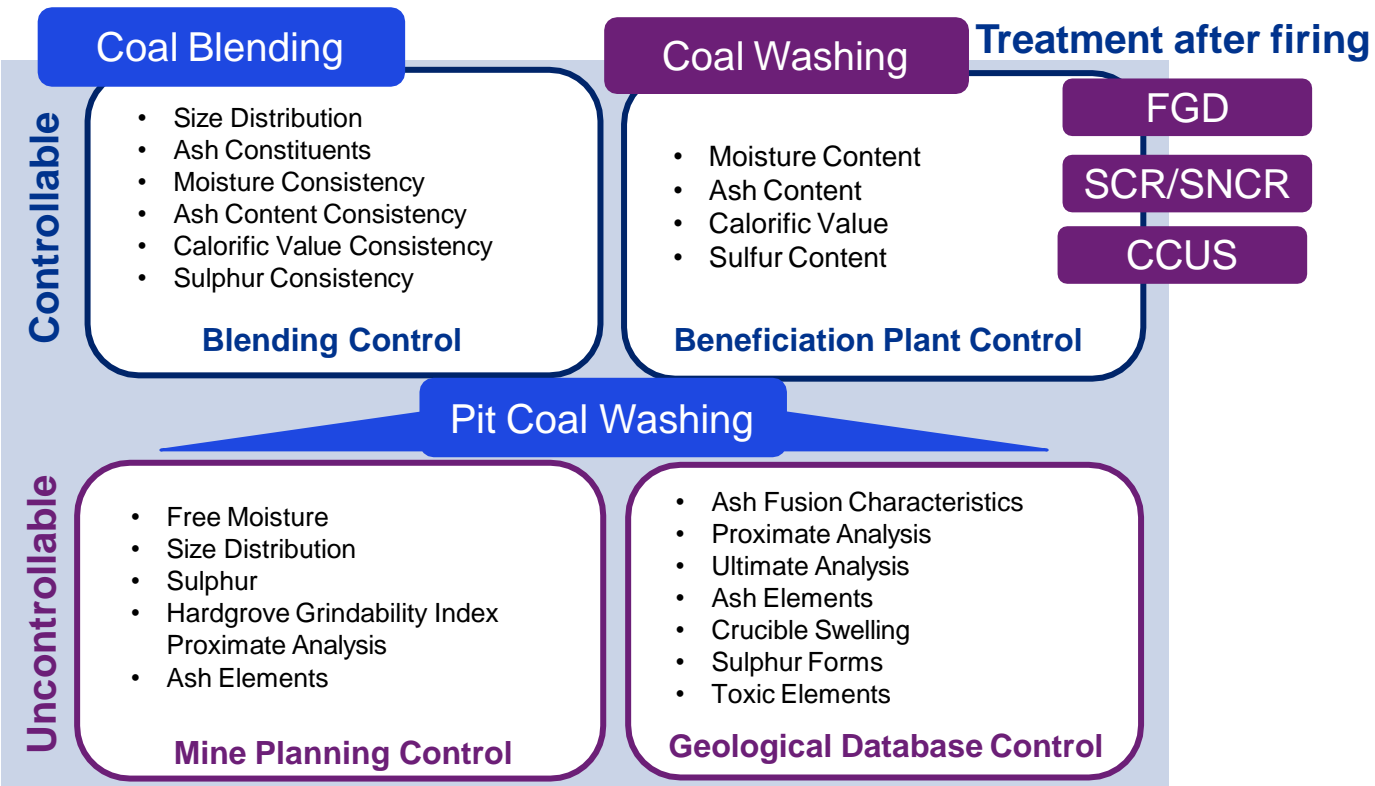


4x100 MW new built solar plants

	Green Field	Retrofit + Solar
Capacity (MW)	800	800 + 400
PLF (%)	70%	70% + 25%
Annual Generation (MU)	4900	4900
Annual CO ₂ (million Ton)	3.7	3.7
Annual SO _x	...	same
Availability	>85%	>87%!
Flexible	Yes	Ultra
Capex (Cr)	5900	3000

Optimizing Coal Value Chain of thermal energy!

Treatment in plant



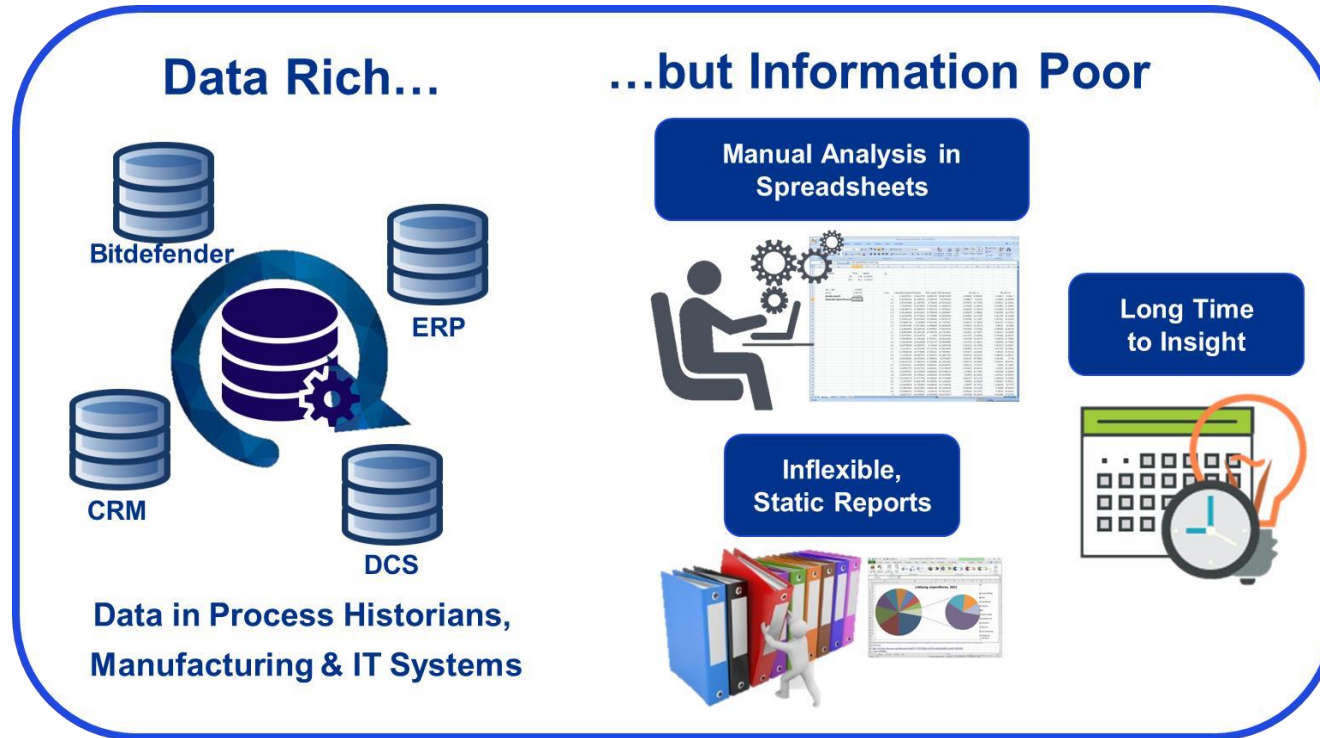
Cost Centric Fragmented to optimized value chain

Existing	With beneficiation
Fuel/ Mine Specific <ul style="list-style-type: none">Linked mine/single rank/single location	Unlimited Fuel Flexibility <ul style="list-style-type: none">Multiple mines/multiple ranks/multiple countriesBlending Ready CHPs
Fuel Sourcing <ul style="list-style-type: none">Limited ContractsAcquire Mines domestic / overseas	Fuel Sourcing Strategic Multiple tie up for multi location sourcing
O&M Contracts – Guarantee Centric <ul style="list-style-type: none">Efficiency/APC/BMCR	O&M Contracts – Functions Centric <ul style="list-style-type: none">Reliable/ Safe/Optimal
Cost Centric Design (fragmented)	Optimal Design (Value Chain)
Product Centric	Service Centric Operations

Data Rich but not inherently intelligent..

Data usage for process optimization is very limited in India

An advanced thermal power plant generates about 1 Terabyte of data every week ... that stays in historians without being used for improving operation and maintenance



Power Generation Use cases using Data

- Thermodynamic Modelling
- Start-Up Analysis
- Tube Leak RCA
- Combustion Dynamics Analysis
- Steam Turbine Bearing clearance validation
- Generator Phase Voltage Anomaly
- Steam Separator Trip Analysis
- Steam Turbine Performance Monitoring
- Transformer Age and Health Analysis
- Pump Performance Analysis
- Unit Trip Deviation
- Digital Twins
- Asset Performance Management

Power Plant 4.0 for flexible, reliable, efficient and sustainable

Predictive Analytics for dispatch planning

to get ahead in merit order

Drones bases stockyard monitoring/ Hot spot detection. **Incident Inspection** for Boiler Tube Leakages etc.

Automated Predictive spare parts requirements to optimize inventory level and requisitions from suppliers



AR / VR for visitors safety and workers training



Advanced Combustion optimization to meet SOx, NOx, PM and environmental norm

Remote expert centre to optimize real time performance with contextualized dashboards

Digital Twins for continuous heat rate, auxiliary power optimization

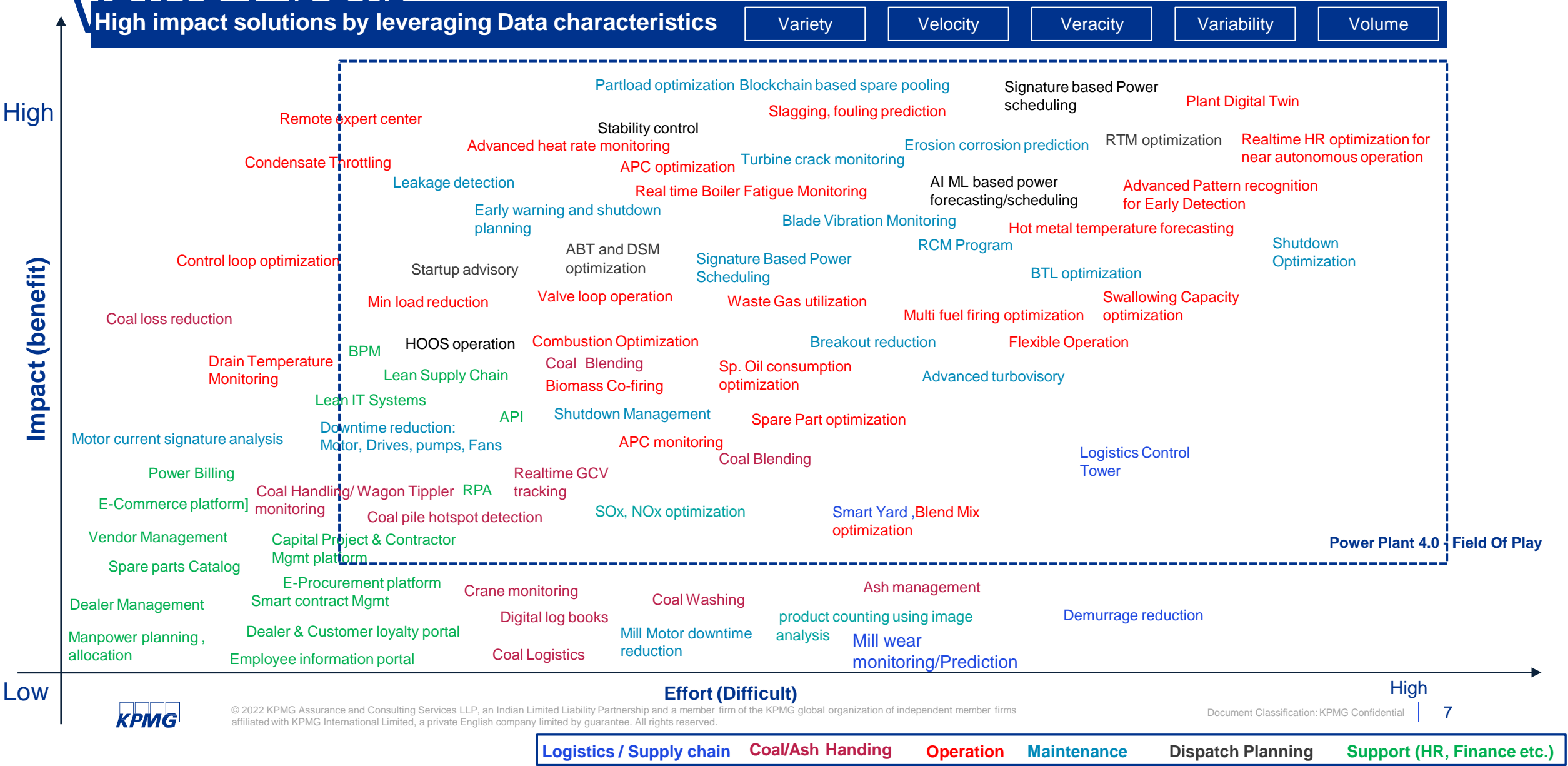


Machine Learning models for start up advisory

RPA generated workflow management tools to create efficient orders reducing shutdown time

Co-firing and Realtime fuel requirement and ash generation predictions

Power Plant 4.0 IT/OT Interventions Across Value Chain



Thank You



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THANKING YOU!
ON BEHALF OF



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