



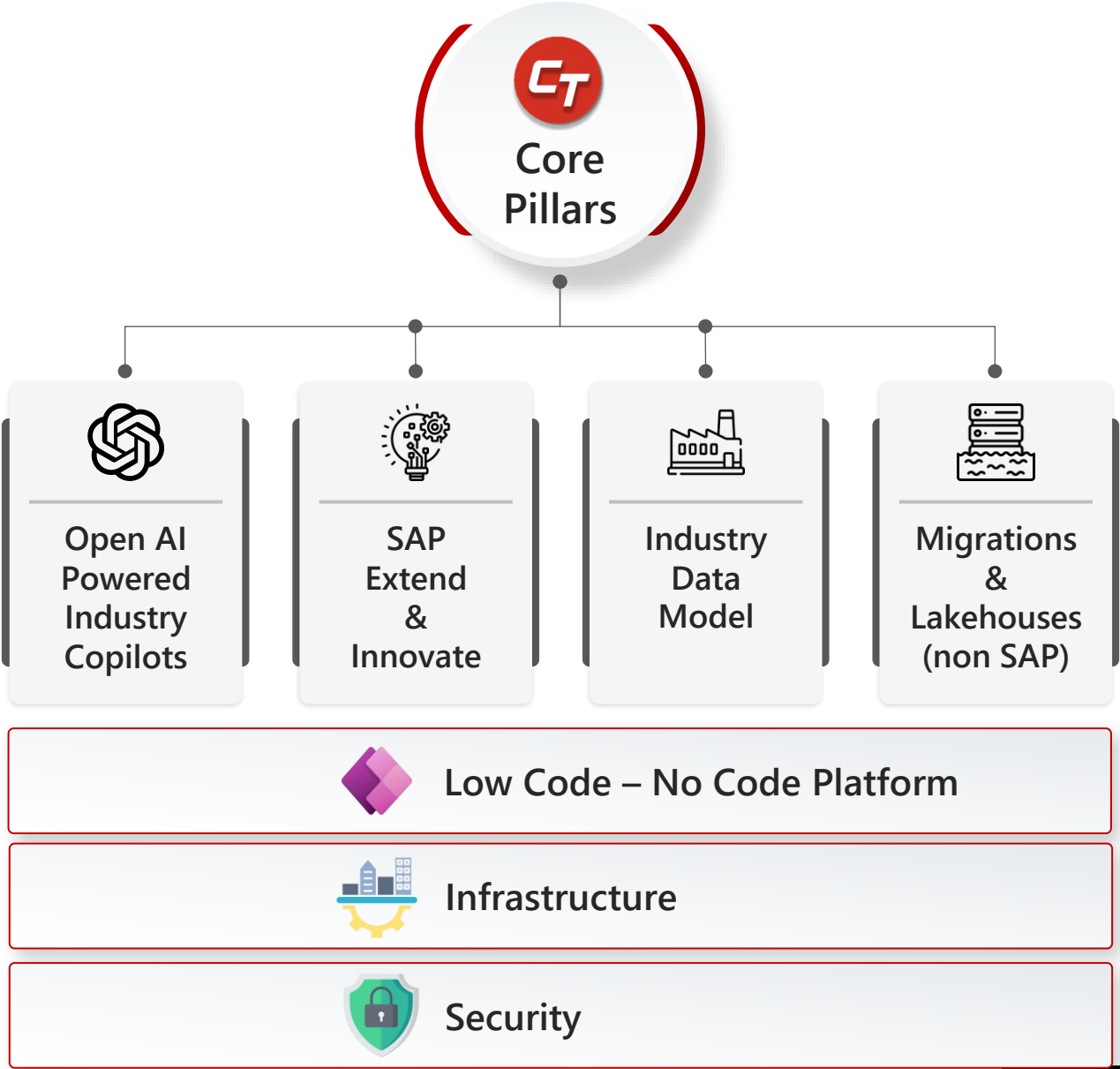
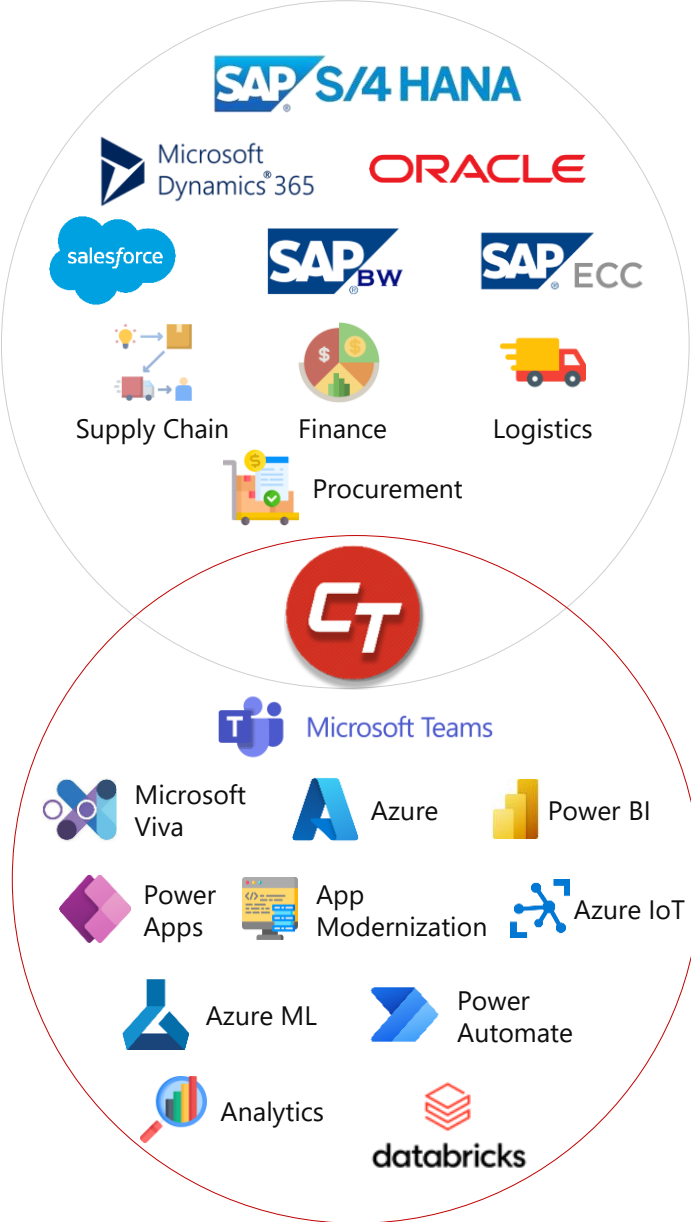
Sustainability 2.0



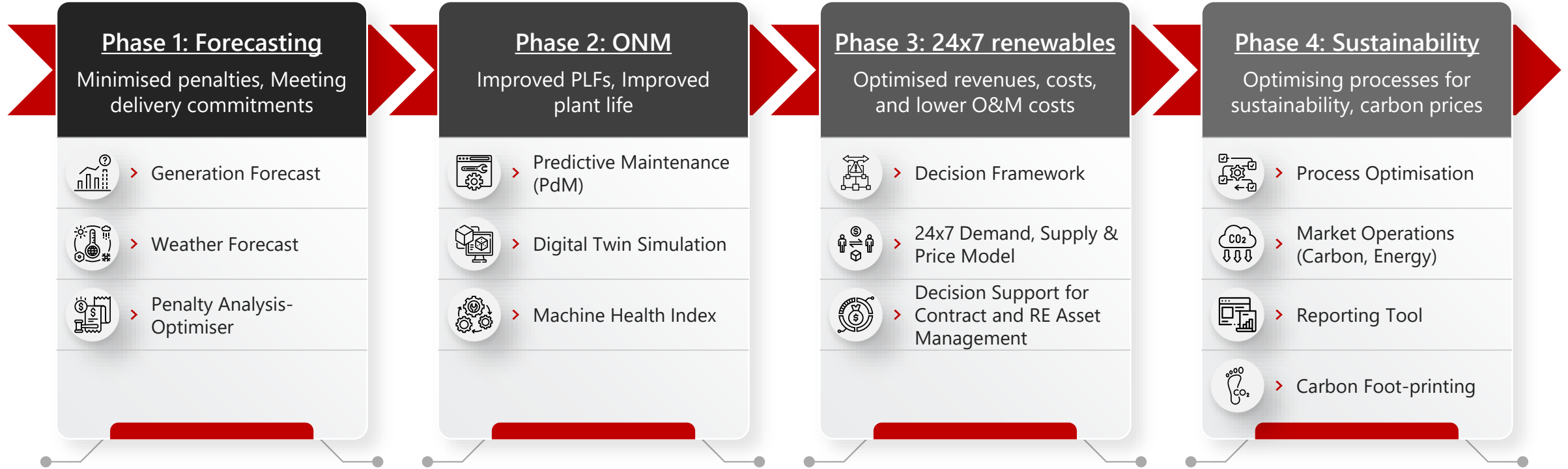
- Infrastructure (Azure)
- Data & AI (Azure)
- Digital & App Innovation (Azure)
- Security
- Biz Applications



Celebal Core Pillars



Clean Energy Solution - Phase wise approach



Advance Operations and Maintenance

Phase 1

Predictive Maintenance

- ✓ Predictive maintenance of equipment
 - Fault diagnostic, Fault Prediction, RUL Prediction etc.
- ✓ Equipment Health Analysis.

This analysis platform can support

- ✓ Maintenance task allocation to the O&M team.
- ✓ Early alerts can minimize irreversible degradation and loss of life.
- ✓ Warranty claims for equipment.

Reduced Loss of Plant Performance- long-term as well as short-term.

Phase 2

Preventive Maintenance Management

- ✓ Automation of Preventive Checklist with a handheld digital tool. Observations can be fed back to the predictive maintenance module.
- ✓ Real-time Alerting for anomalies while doing the checks.
- ✓ Smart checks and preventive actions based on data gathered. Experts from a central control room can support this.

Future Scope

Phase 3

Integrated Maintenance Management

- ✓ Integration of predictive and preventive maintenance with breakdown maintenance.
 - Breakdown analysis; root-causal analysis.
 - Maintenance Performance Tracking.
 - Correlating maintenance actions with plant performance.
 - Performance tracking of O&M vendors/staff.
 - Spares management; getting spares in time and preventing production loss.

24x7 Renewables

Phase 1 A

24x7/ RTC Contracting



- ✓ Performance modelling
 - Required resource mix (generation capacities, generation performance, energy storage)
 - Matching with demand-pattern of the customer
 - Modelling of contract fulfilment, revenues, costs, penalties, investments etc.
 - Help define acceptable or optimal contract conditions

Phase 1 B

24x7/ RTC Supply Management

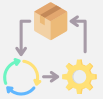


- Dynamic forecast for supply surpluses and deficits, based on plant conditions, weather, client demand, energy price models etc.**
- ✓ Placement of surplus power on exchanges/ customers (Day Ahead, Term Ahead)
 - ✓ Procurement of additional power (exchanges, others)
 - ✓ Maintenance actions to support value optimization

Future Scope

Phase 2

24x7/ RTC Supply Optimizations



- ✓ Decision. Support System for Optimized actions. Scenario, simulation tools
 - Sourcing of power – exchanges, short-term/long-term Contract with third parties, based on prices, availability
 - Choice of additional short-term customers to get flexibility
 - Additional resource capacities (e.g. RE Capacity energy storage)

24x7 Renewables

GreenTech
Plant Name: Customer: Month:

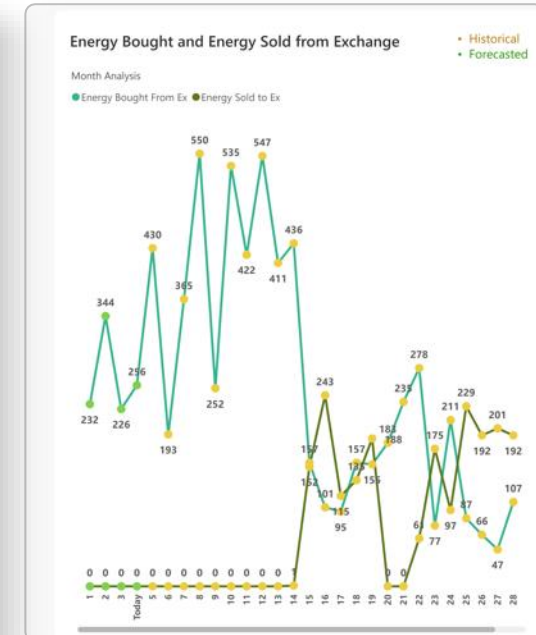
Historical Data

Total Generation (MWh) 32,680	Total Demand (MWh) 31,750	Total Cust Sale (MWh) 23,992	Total Realization Cust (Rs.) 133,502,431
Total Losses in Tsm (MWh) 327	Total Deficit (MWh) 7,757	Total Supplied by ESS (MWh) 26,987	Total Purchases from Ex. (Rs.) 28,575,654
Total Losses in Energy (MWh) 5,693	Sold to Exchange (MWh) 1,981	Stored in ESS (MWh) 28,407	Net Realization (Rs.) 763,159,331

Generation vs Demand (MWh)

Month - Nov & Day Analysis

Day	Supply (MWh)	Demand (MWh)
1	1105	1085
2	942	1073
3	885	1061
Today	1036	1064
5	791	1043
6	847	1218
7	1033	1068
8	603	1049
9	623	1051
10	575	1050
11	768	1017
12	828	1072
13	780	1048
14	1063	1280
15	1086	1485
16	1078	1381
17	1271	1328
18	1054	1236
19	1062	1050
20	1056	1039
21	1047	1078
22	1028	1436
23	1078	1459
24	1058	1429
25	1056	1462
26	1054	1439
27	1055	1158
28	1068	1030
29	1068	760
30	1030	760



Sustainability Manager



Process Optimizer

Predictive Maintenance of Process:

- ✓ Machine health, residual time to fail.

Process Optimizers:

- ✓ AI/ML/DT used to find optimal process conditions
 - Minimize Emission/unit of throughput
 - Minimize Direct Cost+ Emission Cost/unit of throughput.



Energy and Credit Manager

Calculates Off Set Requirements:

- ✓ Actual emissions vis-à-vis net zero trajectory.

Bids for Green Energy purchase:

- ✓ Exchange, long term contracts.

Buys carbon credits from exchanges:

- ✓ Long term contracts.



ESG Tracker

ESG Goals:

- ✓ v/s achievements; facility wise.

ESG Index:

- ✓ Operations, supply chain.

ESG Assessment Reports

Sustainability Reports

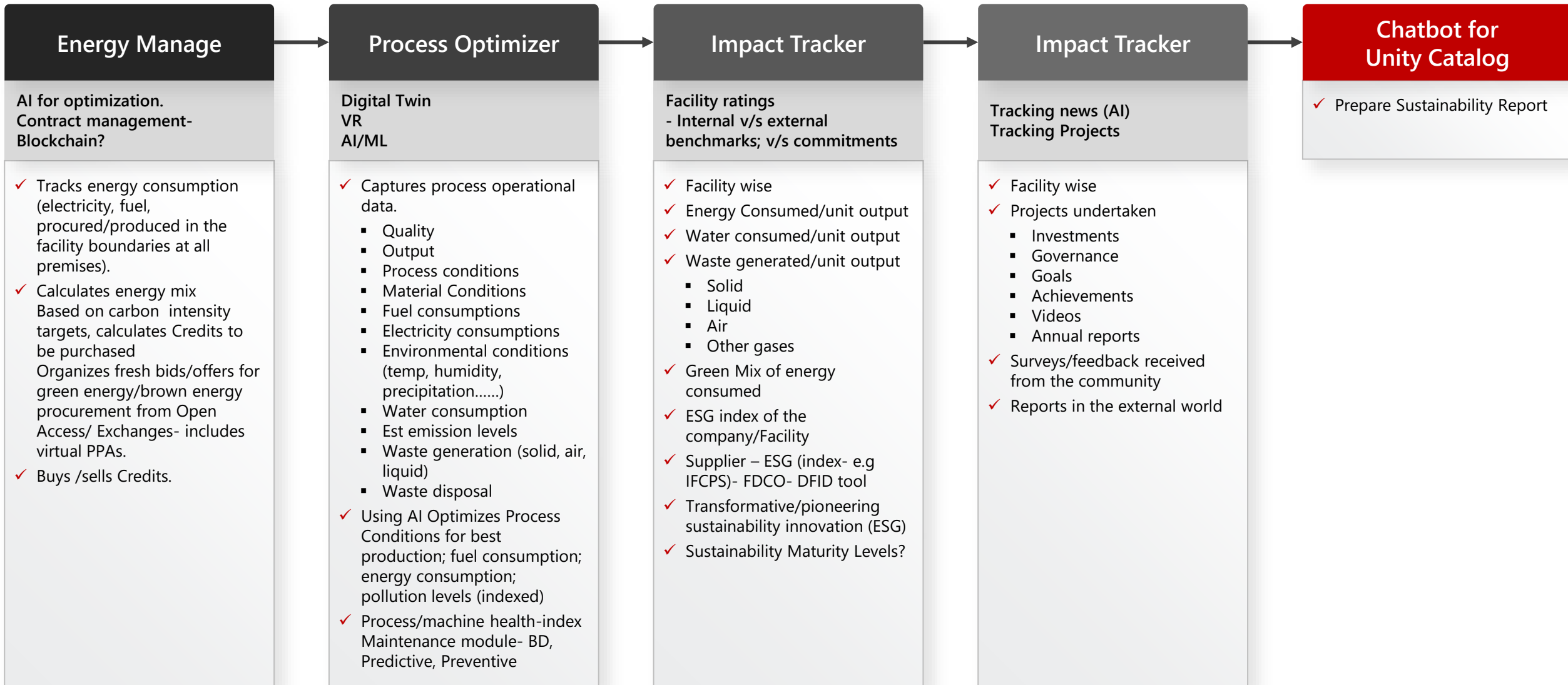


Sustainability Project Manager

Tracks Sustainability Projects Undertaken in the community:

- ✓ Impacts
- ✓ Feedbacks

Sustainability Manager- Functionalities



Value Propositions

Impacts: ● High ● Moderate ● Low

To deliver a strategic mission - A dedicated digital team to Support Initiatives.

Value Propositions	Forecasting	ONM	24x7	Sustainability
<ul style="list-style-type: none"> ✓ Ability to meet emerging forecasting regulation ✓ Ability to participate in emerging 24*7 bids ✓ Optimizing vis-a-vis Dynamic Pricing (emerging regulations in Malaysia, other regions) 	<ul style="list-style-type: none"> ● ● ● 		<ul style="list-style-type: none"> ● ● ● 	
<ul style="list-style-type: none"> ✓ Plant RoC's - Create operating and maintenance related decisions ✓ Cost optimization – Operations ✓ Improving equipment and overall Plant efficiency ✓ Improving PLF and Plant life 		<ul style="list-style-type: none"> ● ● ● ● 	<ul style="list-style-type: none"> ● ● ● 	
<ul style="list-style-type: none"> ✓ Revenue maximization & cost optimization ✓ Minimizing penalties and delivery commitments ✓ Scenario analysis - what if scenarios e.g.. storage vs trading, vs capacity enhancements 	<ul style="list-style-type: none"> ● ● ● ● 	<ul style="list-style-type: none"> ● ● 	<ul style="list-style-type: none"> ● ● ● ● 	
<ul style="list-style-type: none"> ✓ Optimizing process for sustainability- improved sustainability scores ✓ Monetizing carbon value ✓ Dynamic ESG Reporting 				<ul style="list-style-type: none"> ● ● ●



CELEBAL
TECHNOLOGIES

Thank You

Feel free to
Contact us at

enterprisesales@celebaltech.com