

NATIONAL AWARD FOR EXCELLENCE IN ENERGY MANAGEMENT

technology and humanity
join hands for a better future.

 **HYUNDAI**
Lal Ka
Amrit Mahotsav

HYUNDAI MOTOR INDIA

Energy Team,
Production Division

Balamurugan (Head)
Selvanathan (CEA)

About Hyundai Motor India

Foundation

6th May '96 (Mass Production Sep '98)

Plant/HO Location

Chennai, Tamil Nadu

Contracted demand

50,000 KW

Energy used

Electricity, Propane, Diesel

Consumption

~ 80,000 TOE/Year

Capacity

700,000 cars/Year

Production Model
(10)

P1 (6): Creta, Elantra, Tucson, Venue, Kona, Alcazar
P2 (4): Elite i20, Grand i10 NIOS, Verna , Aura

Co-company

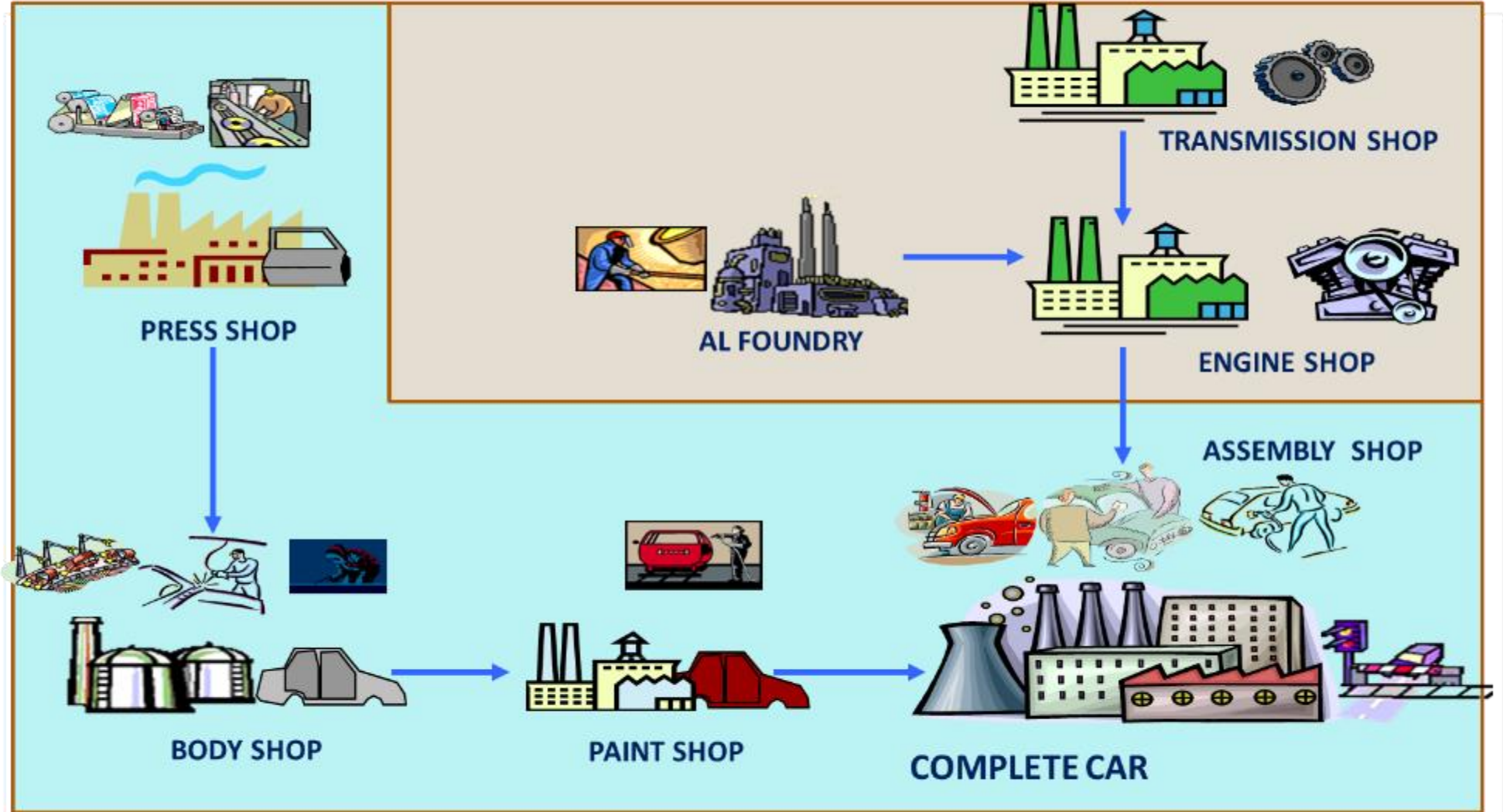
- 152 Vendors (Korean-43, Indian-109)

Plant operation

8.5 + 8.5 + 7 Hrs. (3 shift operation)



Process Flow



Energy Policy

Date: 04-01-2022

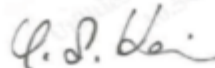
Revision No.: 04

Hyundai Motor India Ltd (HMIL), a world class Passenger car manufacturer, firmly believes that Energy Management system is an integral part of its success and growth.

Hyundai Motor India Ltd is committed to reduce specific energy consumption through continual improvement and energy conservation measures.

To fulfil this, HMIL management shall ensure,

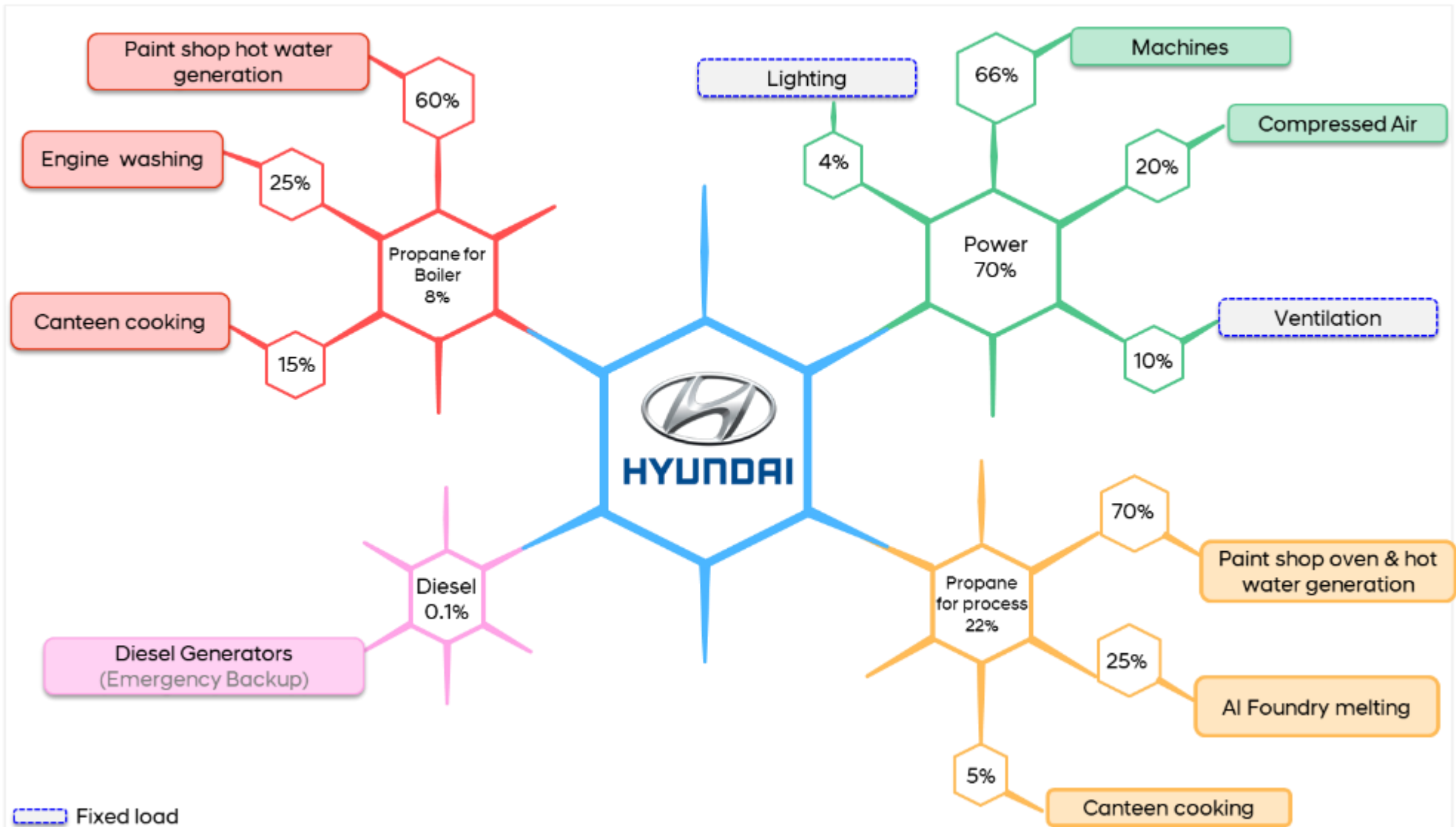
- Continual improvement through conservation of natural resources, optimization of processes and minimizing energy wastages by setting goals and targets to improve energy performance.
- Systematic framework provision for setting & reviewing energy objectives & targets.
- All essential information and resources available to achieve objectives and targets.
- Comply with all applicable legislations and other requirements identified within the scope of Energy Management system.
- Techno-commercial design and purchase of Energy, Energy Efficient products & Services to optimize energy consumption and ensure carbon foot print reduction.
- Continuous training to enhance energy conservation awareness among all employees, and suppliers



UNSOO KIM
MANAGING DIRECTOR

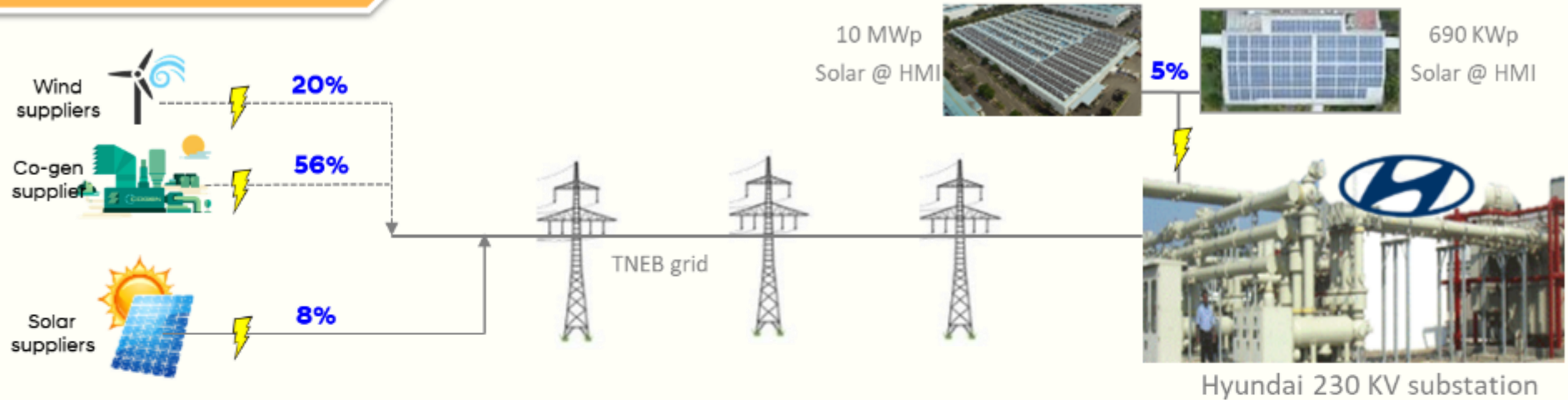


Energy consumption overview

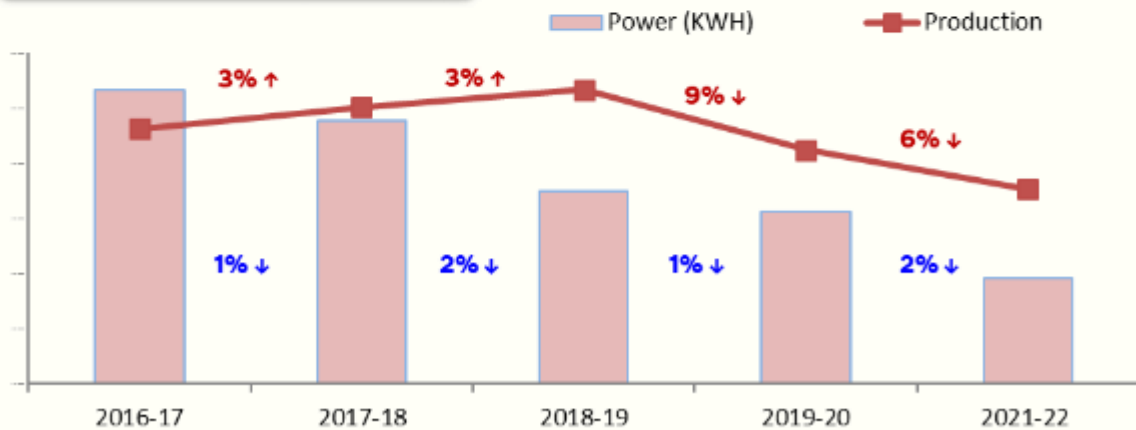


Energy consumption overview

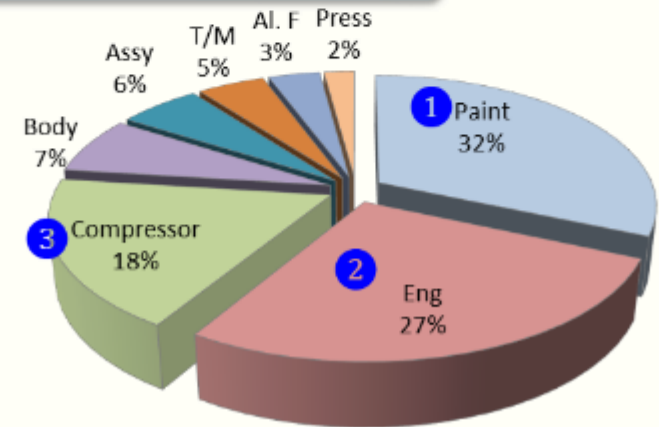
ELECTRIC ENERGY



Power consumption trend

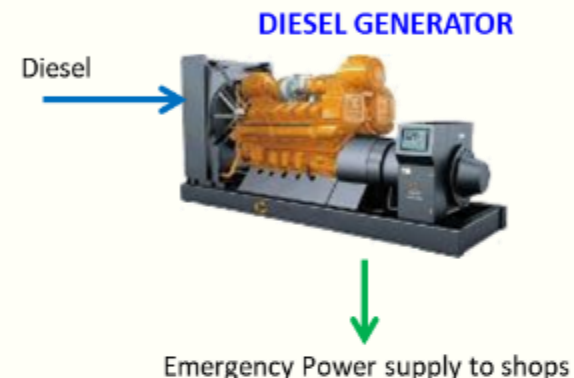
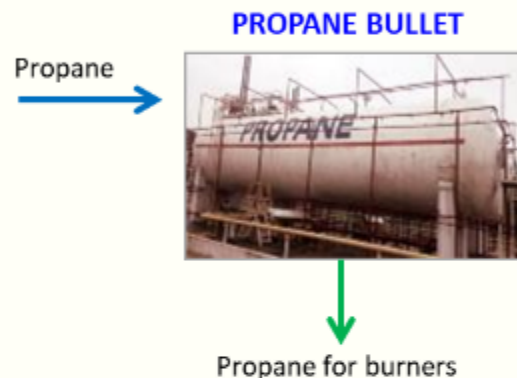
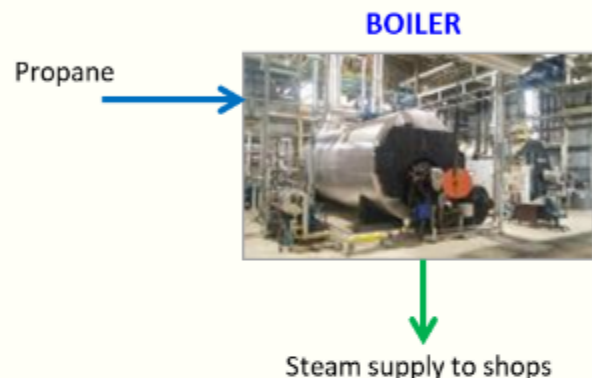


Shop wise power Distribution

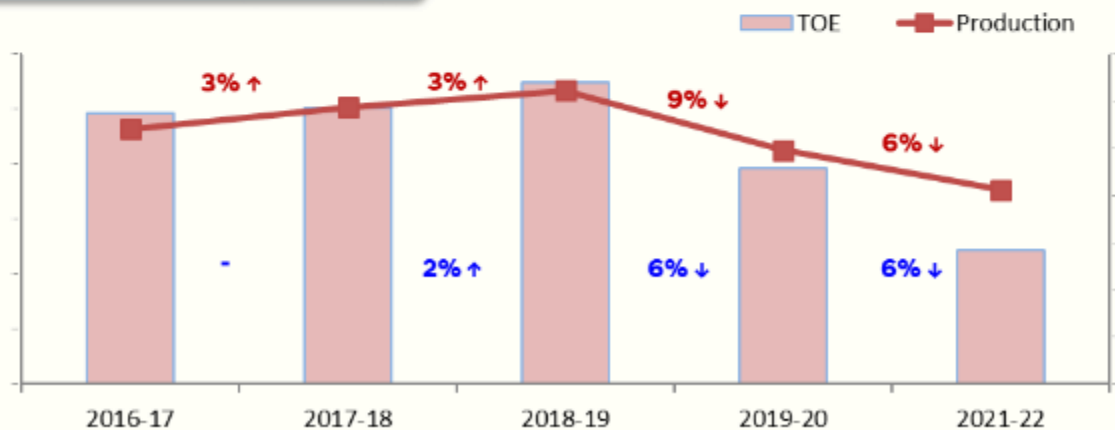


Energy consumption overview

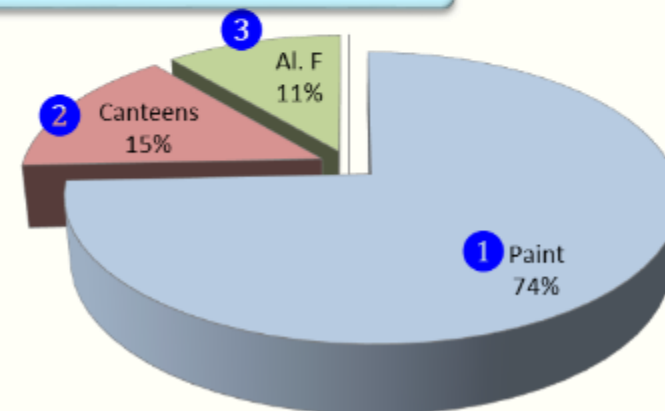
THERMAL ENERGY



Shop wise power Distribution



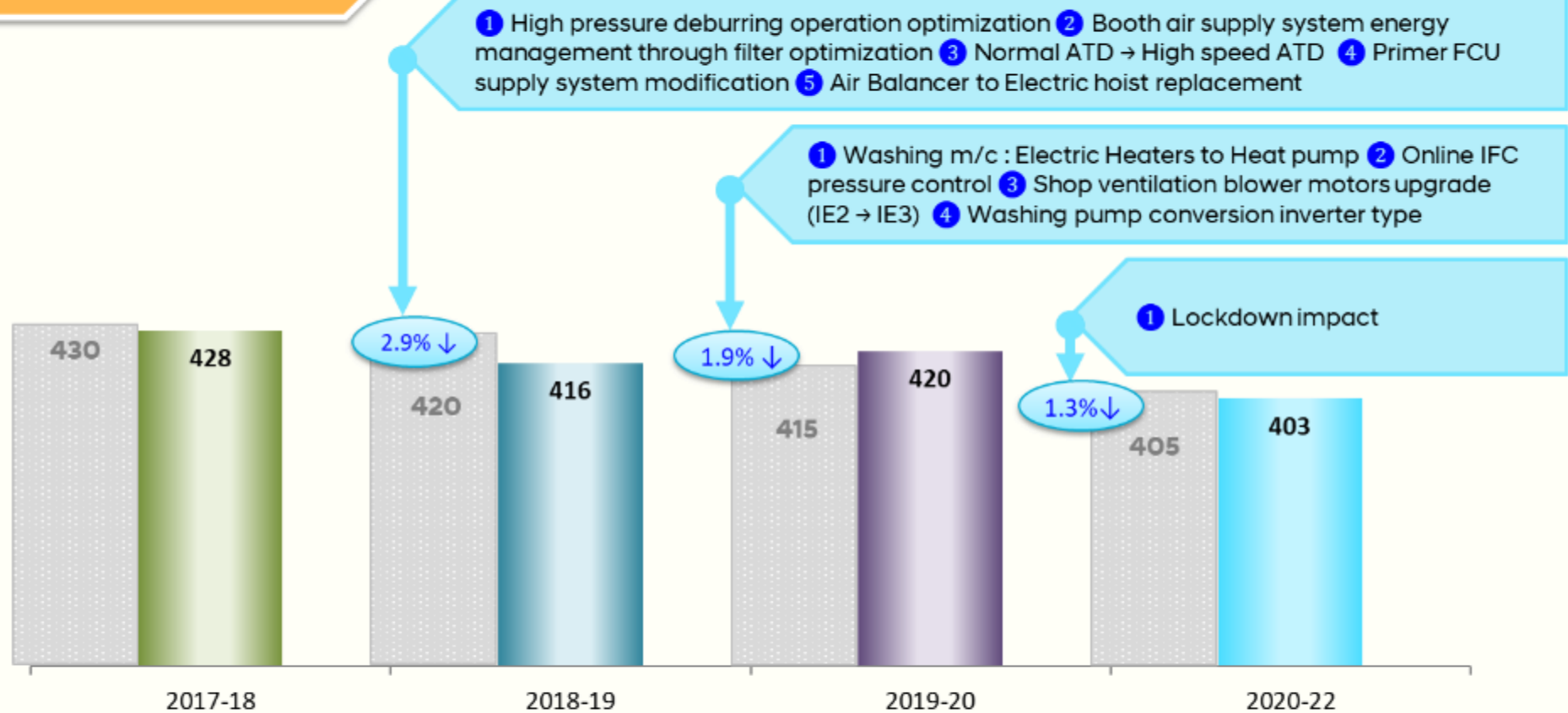
Shop wise power Distribution



Specific energy consumption in last 3 years

KWH/ Eqv. vehicle

Specific Electric Energy



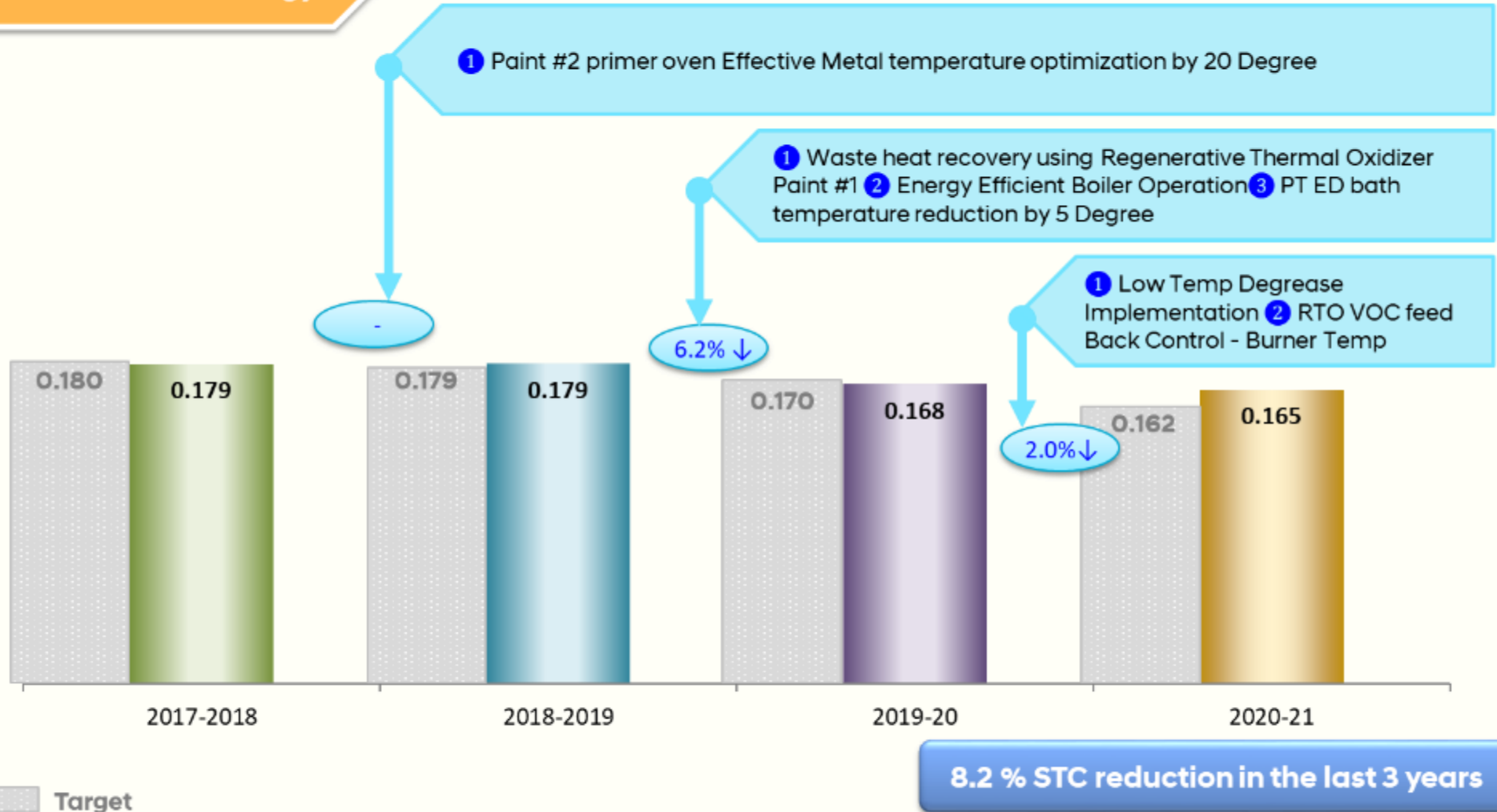
Target

6.1 % SEC reduction in the last 3 years

Specific energy consumption in last 3 years

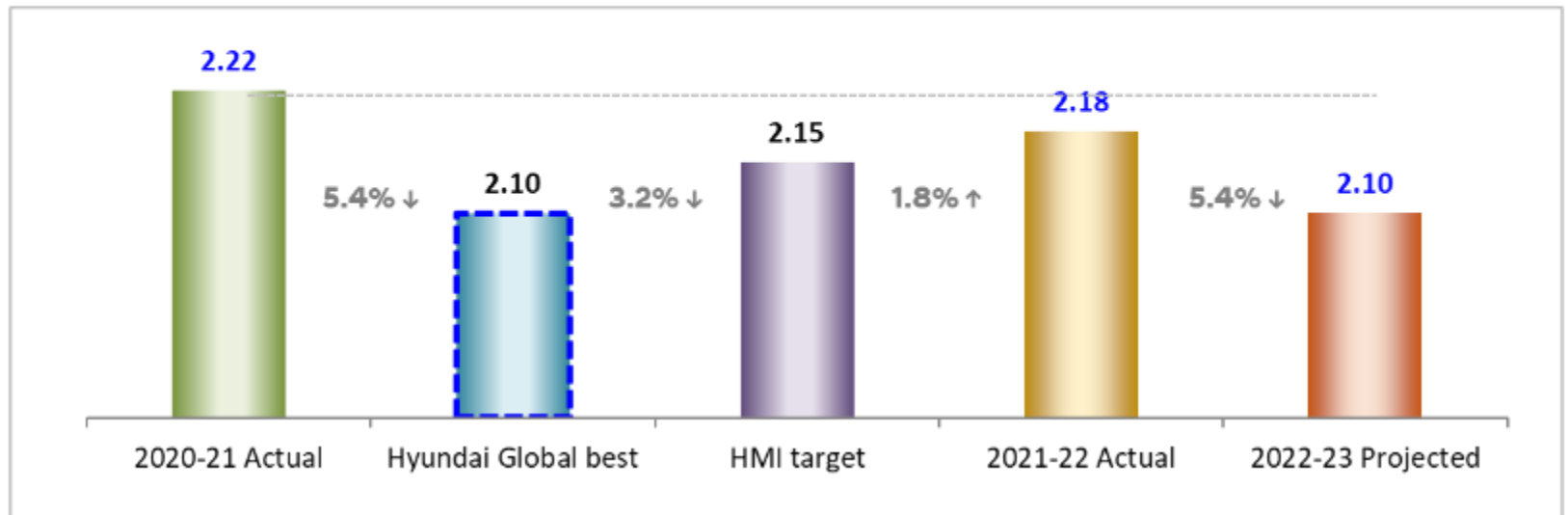
Specific Thermal Energy

Million Kcal/ Eqv. vehicle

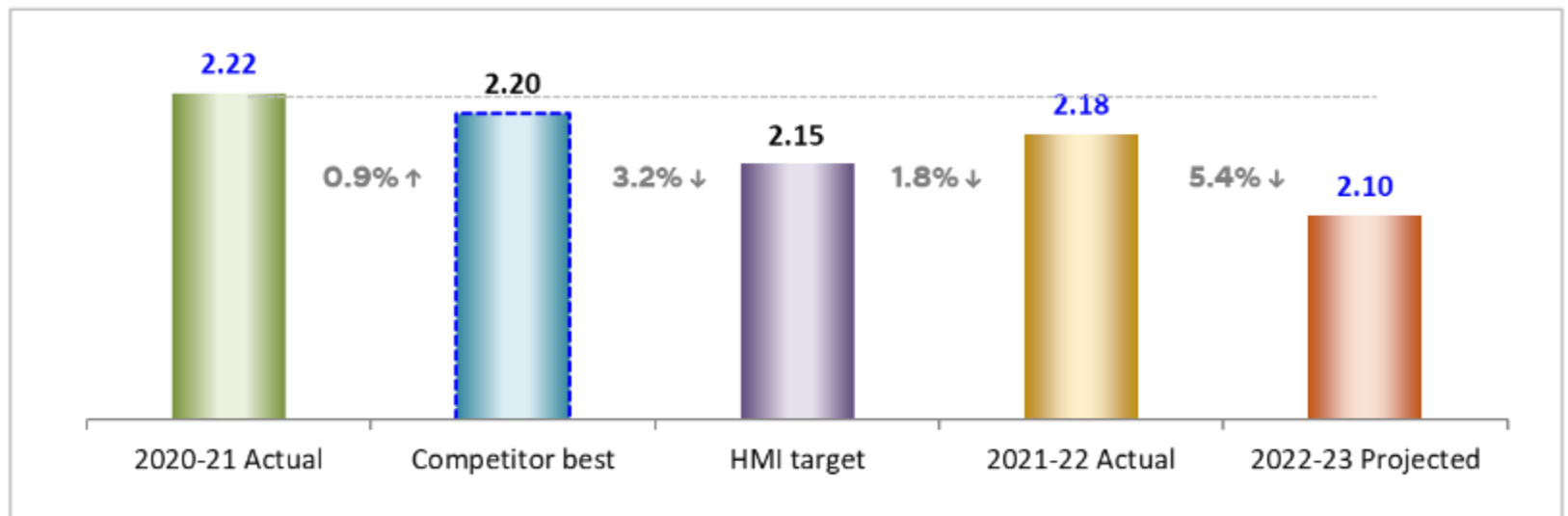


Information on Competitors, National & Global benchmark

Global
(HKMC overseas)
Benchmark
(in GJ/car)



National
Benchmark
(in GJ/car)



Summary of Energy Saving projects

No of Energy Saving Activities

Energy Saving In TOE/Yr.

Year	No of Energy Saving projects	Investment	Energy Saving	Cost Saving	Payback	Impact on SEC
		Rs Cr	TOE	Rs Cr	Months	
2019-20	132	32.41	4210	13.89	28	5.6%
2020-21	144	41.25	4420	15.47	32	6.1%
2021-22	192	54.10	4,650	13.62	48	6.3%

Unit: Tons of Oil Equivalent/Yr.



Major Activities planned for 2022 ~ 23 :

- 1) Replacement of conventional chillers with Turbo chillers (5 Nos) : 0.34 KW/TR : 645 TOE/Yr.
- 2) Standardization of all blowers & fans with BLDC & EC fans : 460 TOE/Yr.
- 3) Thermo ceramic coating of Paint booth ovens to control radiation losses : 140 TOE/Yr.

Energy Saving projects implemented in FY 2021-2022

S. NO	Major Project	Energy	Investment Rs Lakhs	Annual Savings KWH / Ton of fuel	% impact on SEC
Technological Upgradation					
1	Energy Optimization of Compressors – Load sharing	Power	140	23,87,000	0.72%
2	BLDC modification in blower	Power	42	1,87,568	0.05%
3	VFD Inverter control Washing pump	Power	12	1,20,358	0.04%
4	Process steam elimination through WHR	Fuel	2.6	542	2.20%
5	EBW washing energy saving through heater temp. down	Power	3.4	3,66,461	0.10%
Idle time Elimination					
1	C/HEAD CCS pump running qty optimization	Power	-	4,11,263	0.12%
2	OSi-EV & NX4 Side panel hemming power pack motor optimization	Power	-	25,672	0.07%
3	Oven Burner sequential switch off at Final stage	Fuel	-	39.1	0.16%
4	Wax booth exhaust fan optimization	Power	-	6,37,200	0.22%
5	Side LH/Rh #701 Sliding jig movement elimination	Power	-	47,532	0.14%
Energy Efficiency Improvement					
1	Work duct #2 cooling coil modification 3→way type	Power	15	5,22,720	0.18%
2	AHU Silencer Chamber Insulation Type Change	Power	36	2,26,171	0.08%
3	IE UK20-80 Washing pump conversion inverter type	Power	18	2,14,128	0.08%
4	Boiler relocation to reduce transmission loss	Fuel	248	594	2.60%

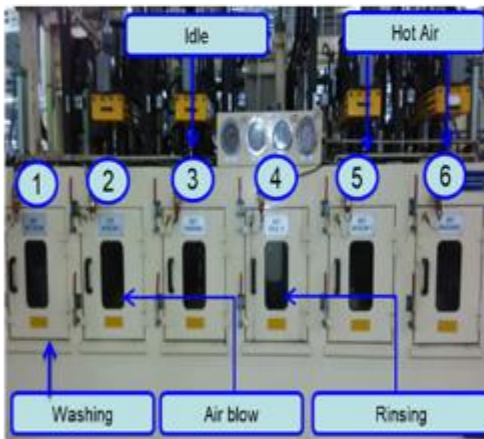
Innovative Projects 2 : Washing machine temperature optimization

Case name	EBW washing energy saving through heater temp. down						
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Before ▶ Washing m/c heater temp reduction **60°C ± 10° C**

- Clean tank
- Rinse tank
- Hot blower heater

2&4 EBW Washing m/c



After ▶ Washing m/c heater temp reduction **40°C ± 5° C**

- Clean tank
- Rinse tank
- Hot blower heater

2&4 EBW Washing m/c



Temperature Setting



Trial started from
27th Nov'21

POWER & ENERGY				
Item	Unit	Value	Unit	Value
WU	R	0.15	0.08	0.31
WU	R	0.30	0.12	0.36
WU	R	0.32	0.05	0.13
PF	R	0.43	0.05	0.60

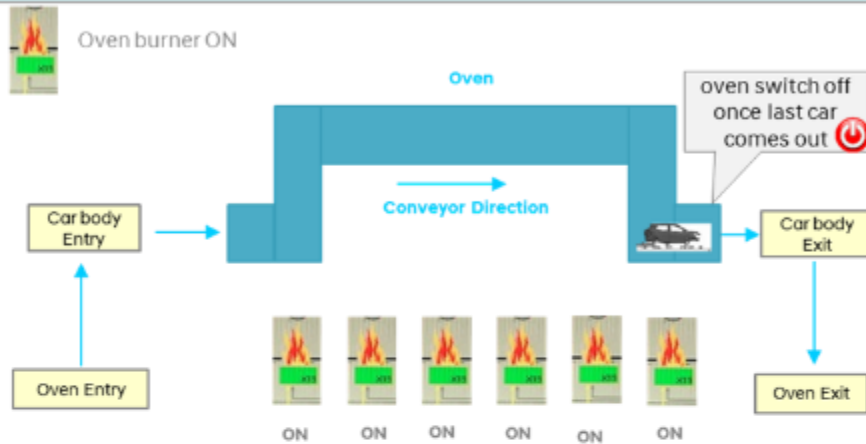
Energy meter calculation

Excellent Content	Washing heater temperature reduction 60°C to 40°C			Improvement Classification	Productivity	Quality	Cost	Logistic	Safety	Etc.
	Energy saving 897 kwh/day						●			
Investment Cost	Nil	Effectiveness	20,000,00 INR	Application Date	08.12.21			Importance		
								H	(M)	L



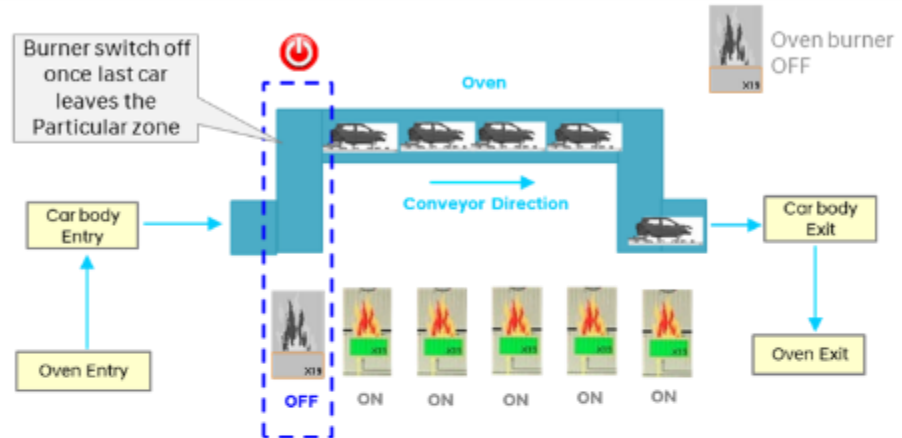
Innovative Projects 3 : Oven burner sequential switch OFF

PRESENT



- During Sunday/Holidays, oven will be Switched off after last car body comes out of the oven
- All Burners are in ON condition till last car body leaves the oven
- Propane Energy consumption ↑

PROPOSED



- PLC Program Modified to switch off Individual oven burners, once last car body crosses the particular zone (4 ovens)
- Expected Propane Saving/Year : 39.4 Tonne
- Expected cost savings/Year INR : 19,70,000 (\$ 25,921)

Oven	Process modification	Trial	QC confirmation	Remarks
ED	•	•	•	QC Trial OK
Primer	•	•	•	
Top coat #1	•	•	•	
Top coat #2	•	•	•	

EFFECTIVENESS

- Energy savings (Propane : 39.4 Tonne /Year)
- Cost saving/year : 19,70,000 (\$ 25,921)

IMPLEMENTATION DATE

31.01.2022

Top Management Support

Advanced technologies implementation

① EC blowers in supply & exhaust ASU

Plan : 24 Nos (286 TOE/Yr.↓)



② BLDC fans (Wall mounted & Ceiling)

Plan : 1,680 Nos (180 TOE/Yr.↓)



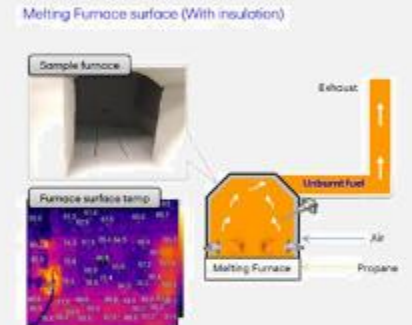
③ 100% heater → Heat pump

Plan : 36 Nos (420 TOE/Yr.↓)

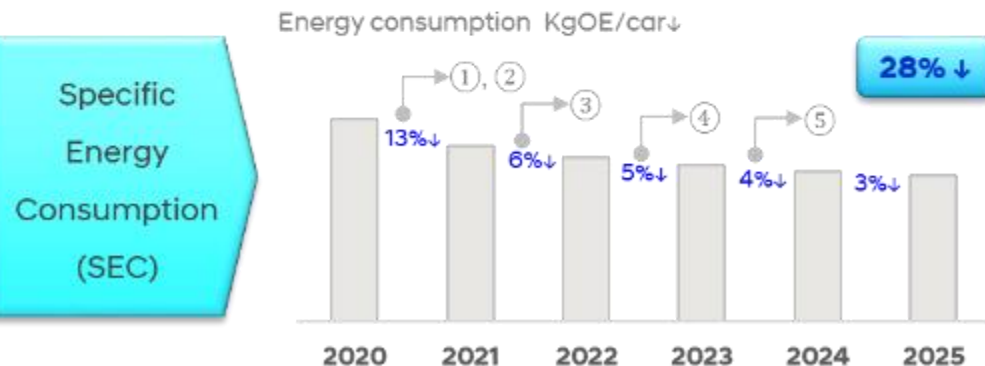


③ Thermo-ceramic coating

Plan : 16 Nos (170 TOE/Yr.↓)



Total Investment : 42 Rs Cr



Specific Energy Consumption (SEC)

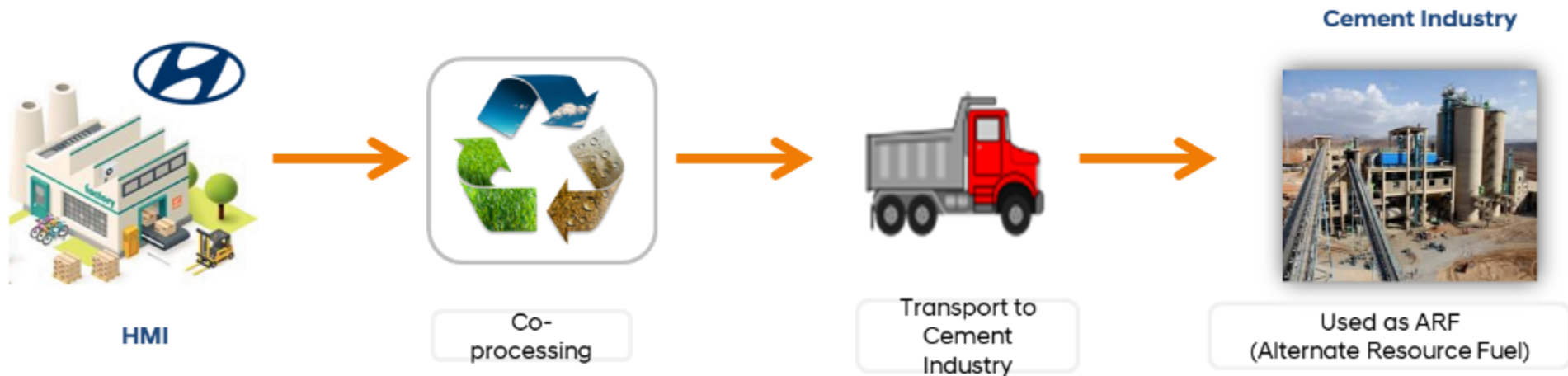
Major Activities Planned	Year	Savings Rs Cr/Yr	% ↓
① Boiler relocation for transmission loss↓	2021	5.2	8%
② Compressor optimization by load sharing	2021	1.8	2%
③ Steam elimination through WHR	2022	3.2	4%
④ 100% Replacement of heater → heat pump	2023	2.4	3%
⑤ Energy Efficient preferable purchase	2024	4.0	6%

Top Management Support

Monthly Energy Review

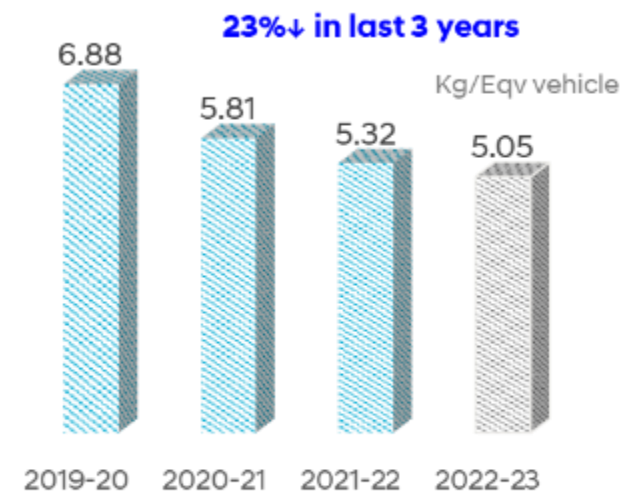


Utilisation of waste material as fuel



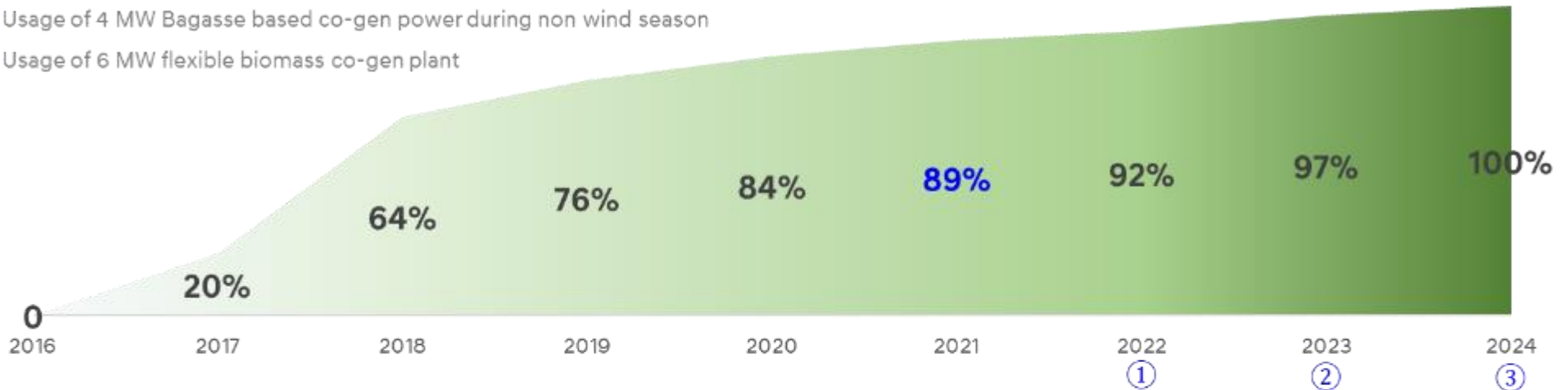
S. No	Waste material	Processing method	Annual Tons / year
1	Paint sludge	Transported to Cement industries for blending with fuel.	820 Tons / Year
2	Chemical sludge	Transported to Cement industries for blending with fuel.	50 Tons / Year
3	Sealant sludge	Processed into powder form → Briquetted → Fuel for co processing in cement industry	350 Tons / year

Waste generation trend

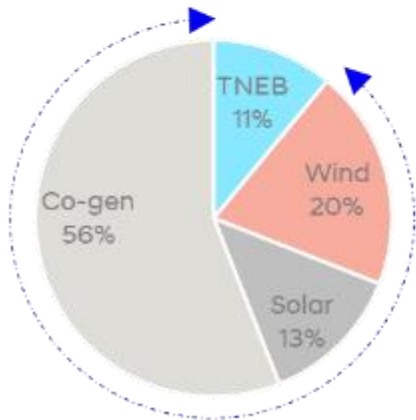


Utilisation of renewable energy sources

- ① Installation of 6 MW solar plant over car parking yard
- ② Usage of 4 MW Bagasse based co-gen power during non wind season
- ③ Usage of 6 MW flexible biomass co-gen plant



Renewable Energy Status



Source	Type	Capacity (MW)	% of overall
Solar PV	Onsite	10.7	5.3%
Solar PV	Offsite	15	7.7%
Wind	Offsite	37.5	20%
Co-Gen	Offsite	20	56%
Total	-	-	89%

89% account for 26.7 Cr KWH

89% Renewable power

Renewable Energy Roadmap

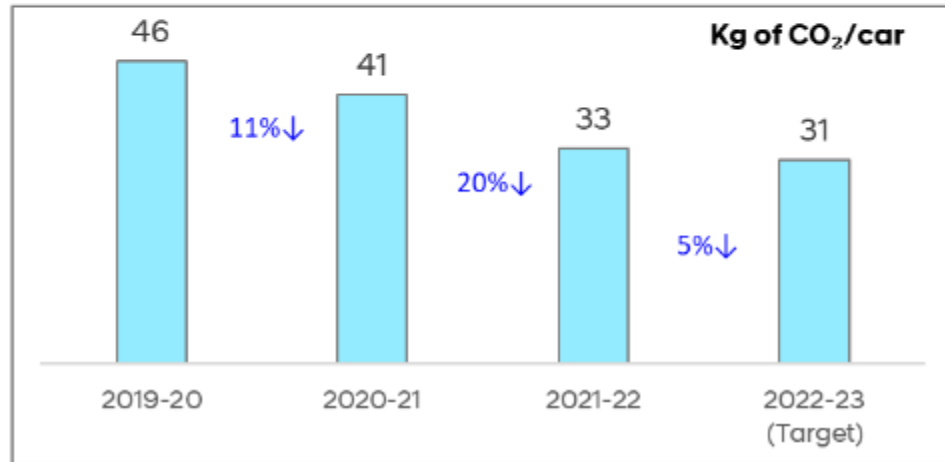
Hyundai Motor Affiliates to Join Climate Group's RE100, Aim to Expand Renewable Energy Use

RE 100



GHG Inventorisation

Scope 1

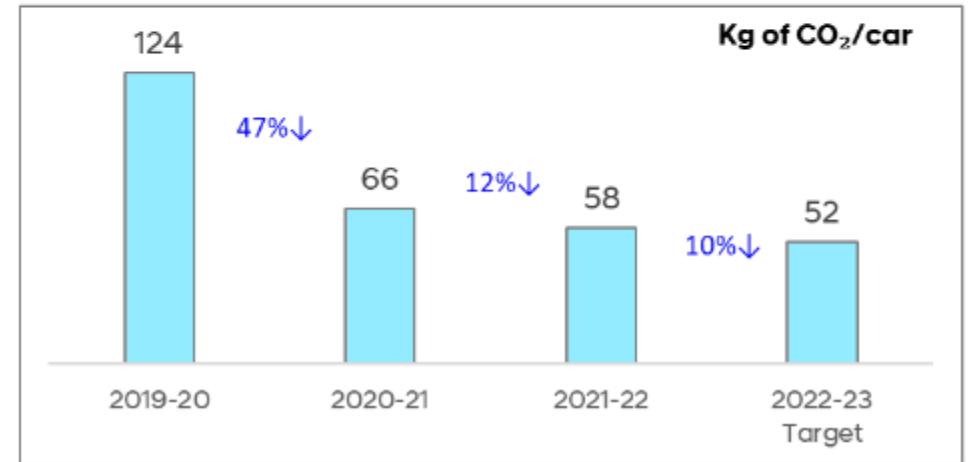


Overall 33%↓ in the last 3 years

Scope 1 includes :

- Emissions from sources owned or controlled by HMI
- Usage of propane for oven heating & cooking
- Usage of Furnace oil for generation of steam
- Usage of diesel in generators & internally driven vehicles

Scope 2



Overall 58%↓ in the last 3 years

Scope 2 includes :

- Indirect Emissions from HMI
- Generation of purchased electricity consumed
- Excluding the renewable energy consumed (onsite/offsite)
- Considering the net conventional electric energy usage

Green Supply Chain

Inbound

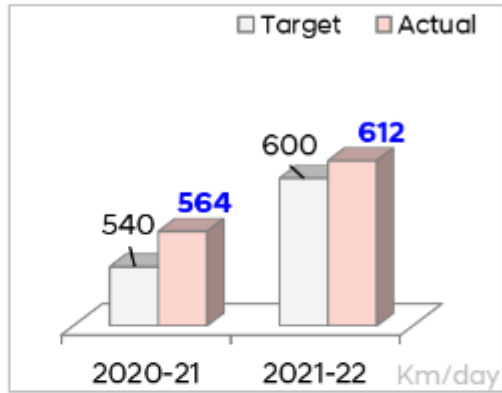
Optimization of vehicle movement inside factory

Move parts closer

Feeding quantity ↓

Bin size ↓

Job reallocation



CO₂ ↓ : 8,247 tons

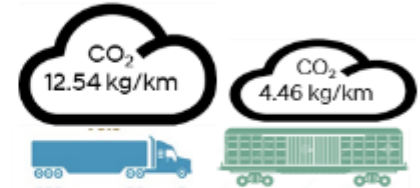
Outbound

Optimization of vehicle movement outside factory premises



2509 Km optimized till July'21

CO₂ EMISSION REDUCTION



For moving 125 cars/km

CO₂ ↓ : 7,683 tons

Supplier Energy Assurance

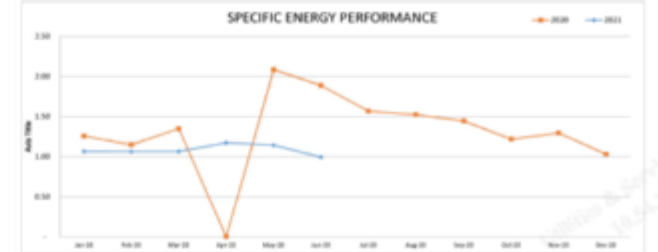
Green Purchase Policy

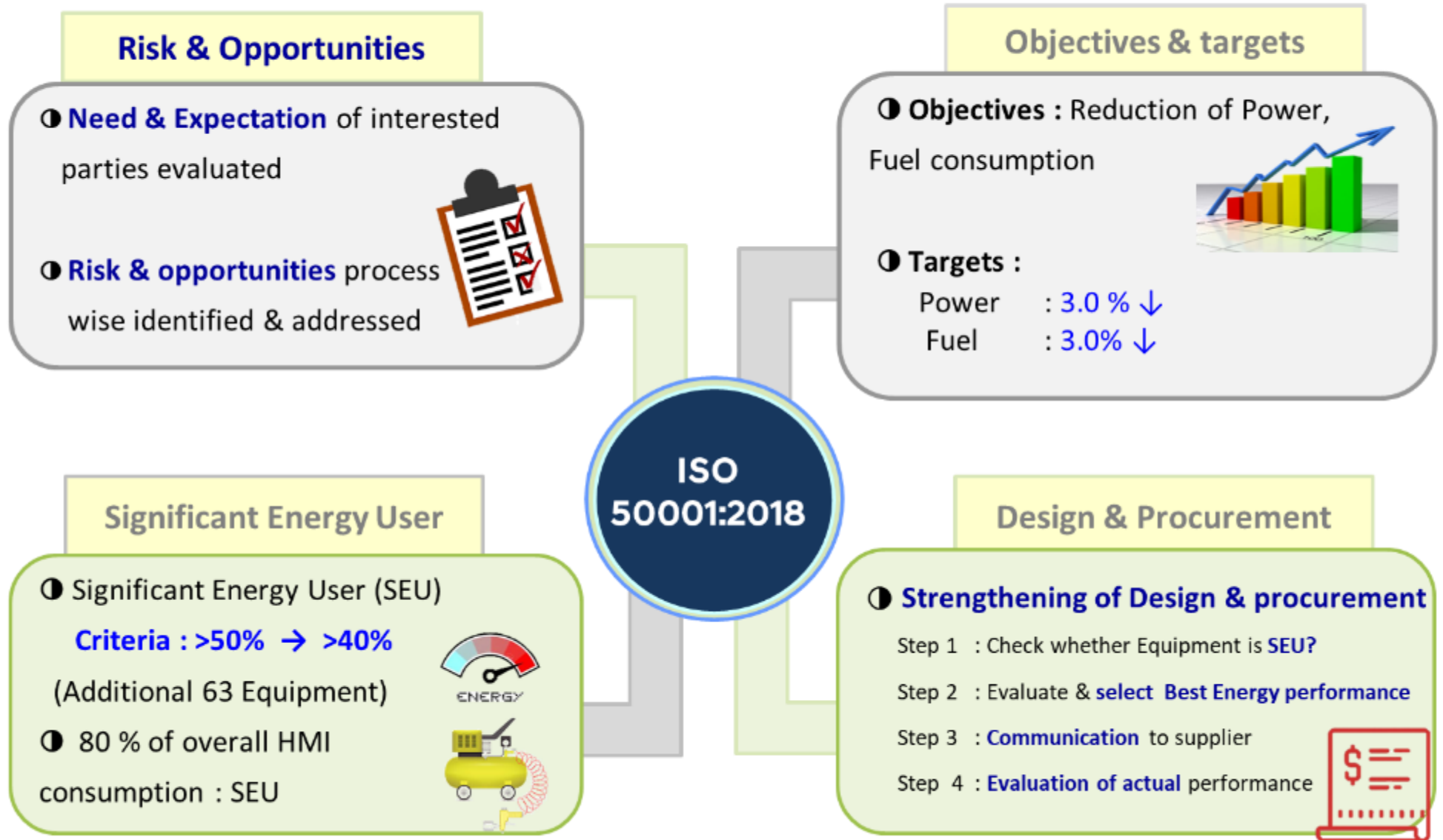
- Rev No : 1 24/05/21
- Hyundai Motor India revised this guideline in light of the Environmental Challenge 2026 and external trends. The overview of each is follows.
- 1. Establishment of Environmental & Energy Management System (Enhanced Initiative)**
In order to perform supply chain management entirely, business partners and your upstream business partners (e.g. tier 1 or tier 2 suppliers) are required to enhance the environment & energy management system. You are also required to consider environmental & energy impact throughout the product life cycle when you promote the environmental & energy management system.
 - 2. Reduction of Greenhouse Gas Emissions (Enhanced Initiative)**
Business partners are requested to develop products and services that reduce greenhouse gas (GHG) emissions, and reduce GHG emissions at your operation base and in logistics.
 - 3. Reduction of Impact on Water Environment (Enhanced Initiative)**
Business partners are required to reduce impact on natural environment caused by water usage at operation base.
 - 4. Promotion of Resource Recycling (Enhanced Initiative)**
In order to promote usage of recycling materials, Hyundai Motor India requests that business partners develop technology and products that use recycling materials or recyclable materials and products considering proper treatment. Furthermore, you are required to reduce waste at operation base and usage of packaging materials in logistics.
 - 5. Management of Chemical Substances (Updated details)**
Management of elimination or reduction in use of chemical substances in relation to "parts, accessories, use material" for vehicles and outsourcing development vehicles including packaging materials for these products.
 - 6. Establishment of a Society in Harmony with Nature (New)**
Business partners need to consider biodiversity in the product and service, and implement various initiatives to establish a society in harmony with nature.

Details / Criteria	Vendor		Total
	Korean	Indian	
No of vendors	43	109	152
EMS certified	34	87	111
EnMS certified	4	18	22
Min RE %	20%		
Energy review	Mandatory		

Energy review: M/s DWSI, Heat treatment comp.

ENERGY REVIEW OF OUTSOURCED OPERATION					
Outsourced Operation details: Heat treatment			Company: DWSI		
ENERGY SOURCES					
Source Type	Category	Measurement Unit	Value-YEARLY (19-20)	Equivalent in kWh for 1 unit	Equivalent "kWh"
Electricity - Renewable	Solar	kWh	0	1	0
Electricity - Renewable	Wind	kWh	0	1	0
Electricity - Renewable	Bio Gas / Fuel	m ³	0	6	0
Electricity	Non Renewable	kWh	1,35,00,305.04	1	1,35,00,305.04





Industry 4.0 「World Class Manufacturer though Energy control」

01

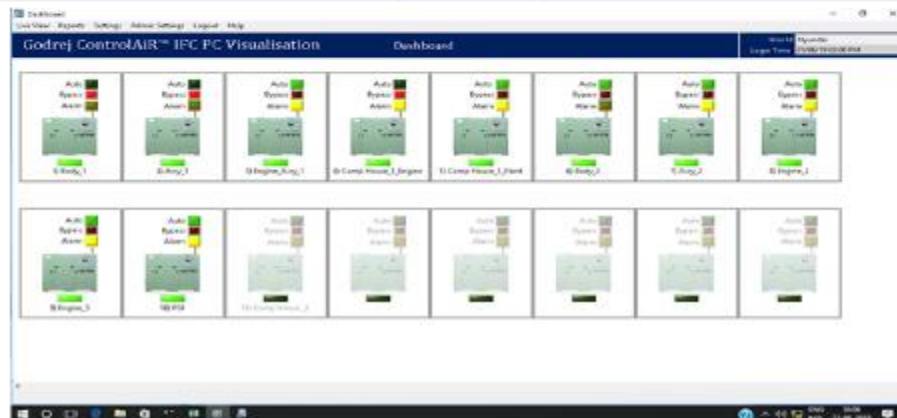
Smart Solution

o Digitisation for **controlling direct energy consuming equipment's**

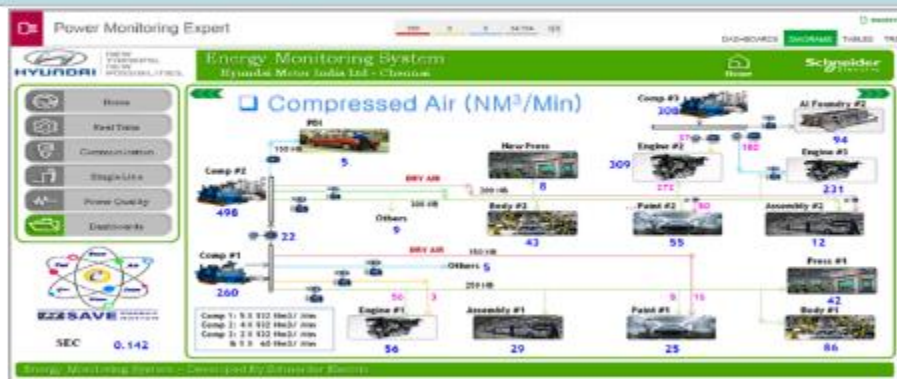
Online monitoring & control of all AC units



Real time monitoring & control of IFC for compressed air pressure ↓



Global Energy Monitoring System (GEMS)



Industry 4.0 「World Class Manufacturer though Energy control」

02

Smart Solution

○ Digitisation for **controlling direct energy consuming** equipment's



Energy Monitoring - Overall Status As On 23/08/2021 4:55:44 PM



Overall Summary

KWH Analysis

Peak and Startup Analysis

Production Analysis

Cost Analysis

Secondary Meter Monitoring

PLANT

SHOP

YEAR

MONTH

DATE

DAY

SHIFT

HOUR

SHOPGROUP

METERTYPE

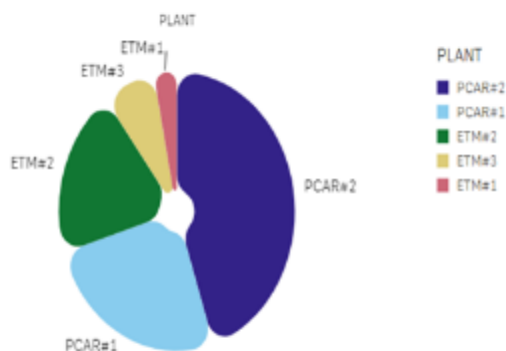
SOURCE ID

BREAK TYPE

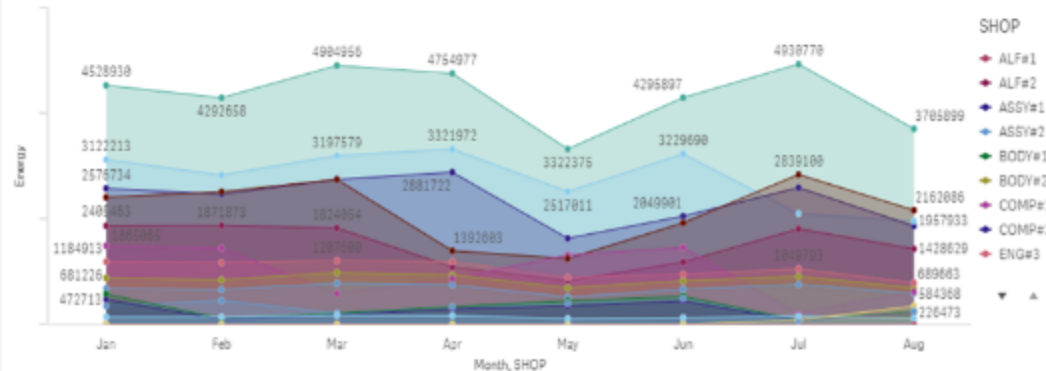
SAP WORK TIME

PEAK

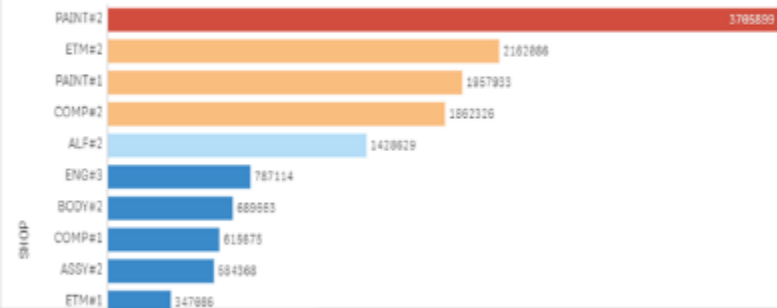
Plant Contribution for the Month Aug-2021



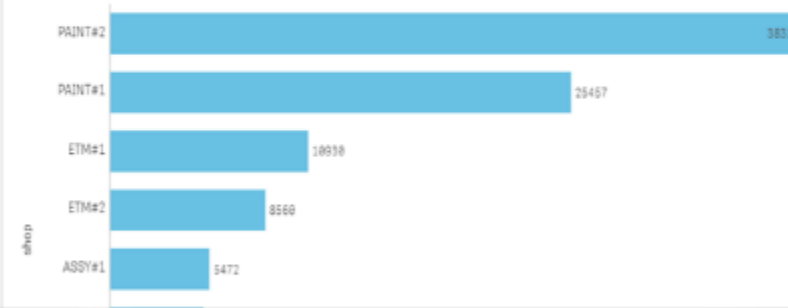
Month Status for 2021



Monthly Contribution KWH -Overall Aug-2021



Monthly Consumption KWH during Non-Working Hrs Aug-2021

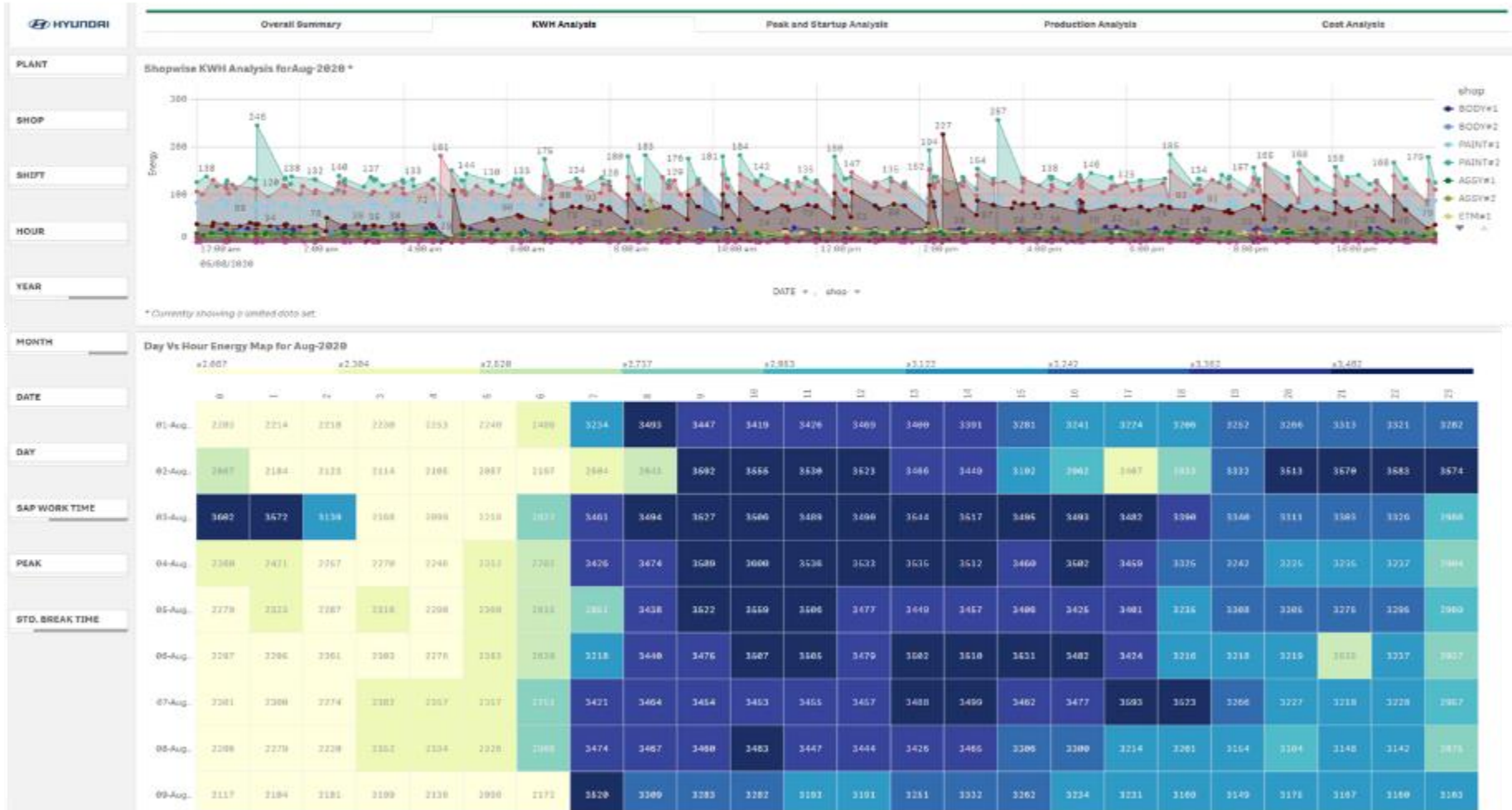


Industry 4.0 「World Class Manufacturer though Energy control」

03

Smart Solution

○ Digitisation for **controlling direct energy consuming equipment's**



Industry 4.0 「World Class Manufacturer though Energy control」

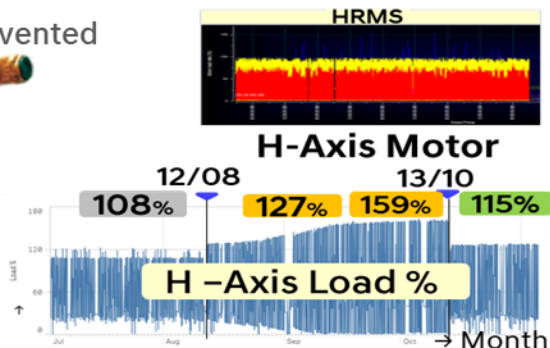
04

Smart Solution

○ Digitisation for **controlling the variables affecting the energy performance**

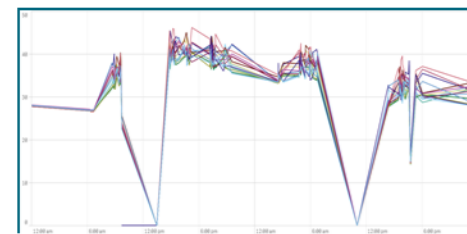
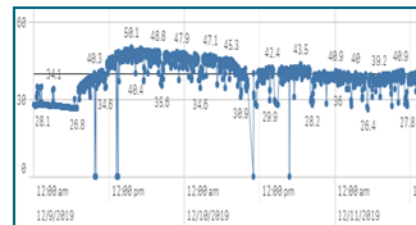
HRMS Data Analysis

Robot **drive failure** prevented



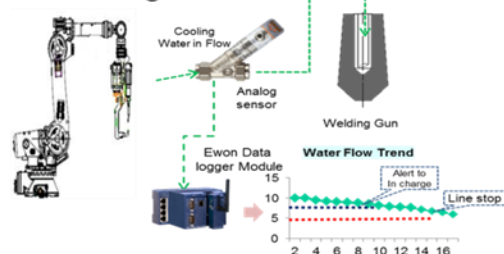
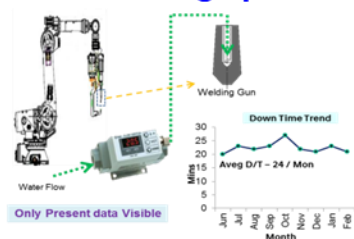
Water flow Data Analysis

Weld water flow optimization



WQMS Data Analysis

Robot **welding tip** Real time Monitoring



Real time Temperature Monitoring

Bearing Temperature analysis & control



Smart Products & solutions

Smart Equipment

Automation & Robotics

Digital Modeling

Additive Manufacturing

IT Systems & security

Big Data analytics

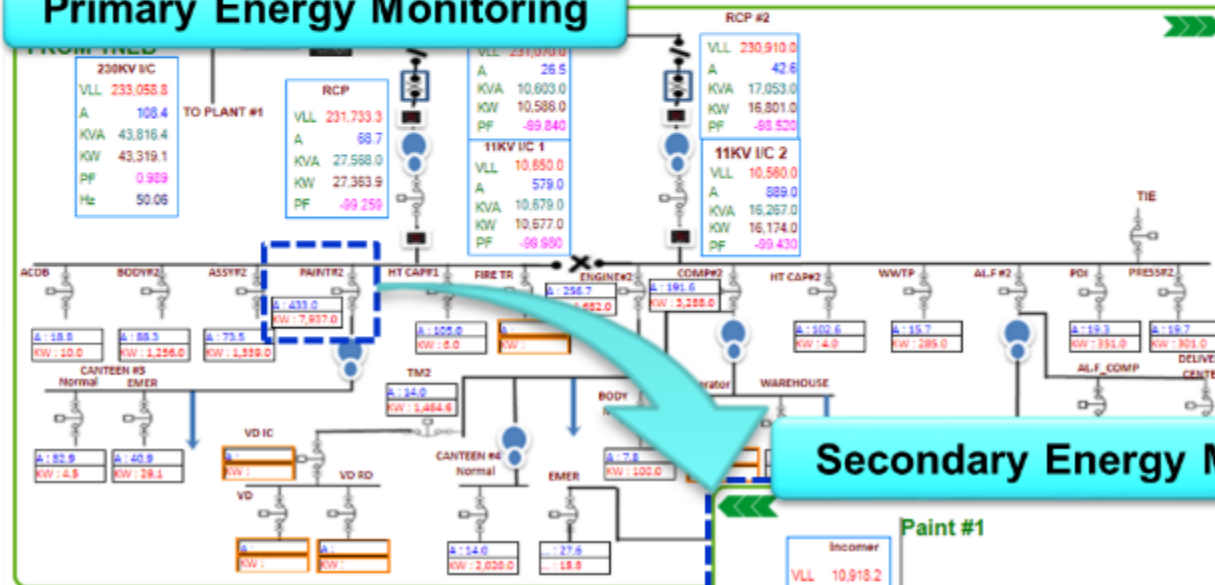
Cloud computing & usage

AI/ Self learning M/Cs

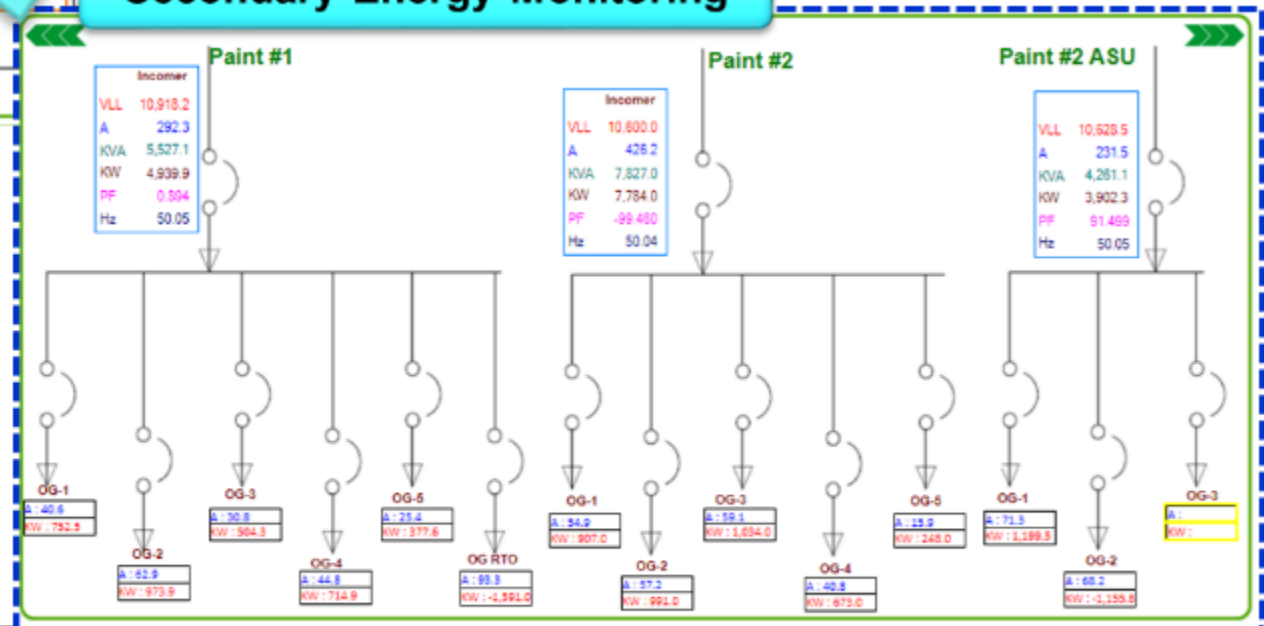
Augmented Reality

Strengthening Monitoring 「Secondary Monitoring System」

Primary Energy Monitoring



Secondary Energy Monitoring



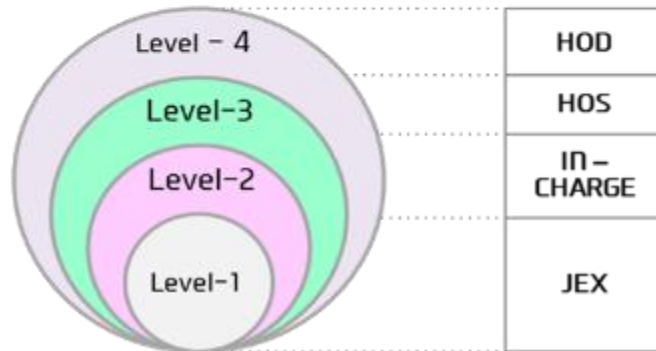
Monitoring Internal Benchmarking

Start up Power consumption reduction

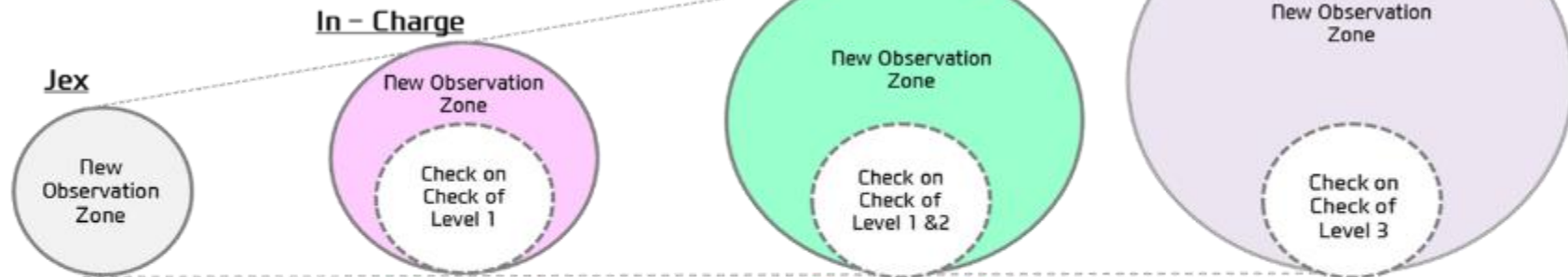


Team work - 「Daily Management System」

(Microscopic → Telescopic)



Exploded View of DMS Circle



Energy wastage control	Energy optimization	Energy Technology	Motivation & Budgetary support
Check list control	Idle time optimization	Advanced & new tech implementation	HOS's Energy 360° Verification

Employees Involved : 1,357 → Identified 23,800 points
Systematic Internal audit of 31 departments by 21 Auditors

Employee Involvement 「 Training & Awareness 」

HYUNDAI



'15,000+ TOTAL EMPLOYEE INVOLVEMENT'

