Using the PI System to manage energy for a more sustainable future

Kevin ROSATI

Presentation agenda

- 1. About Toyota
- 2. European energy monitoring strategy
- 3. Implementing PI System at TME
- 4. Developing plant's Energy Monitoring Systems
- 5. Learning points & Next steps
- 6. Conclusion

1. About Toyota

2. European energy monitoring strategy

3. Implementing the PI System at TME

4. Developing plant EnMS

5. Learning points

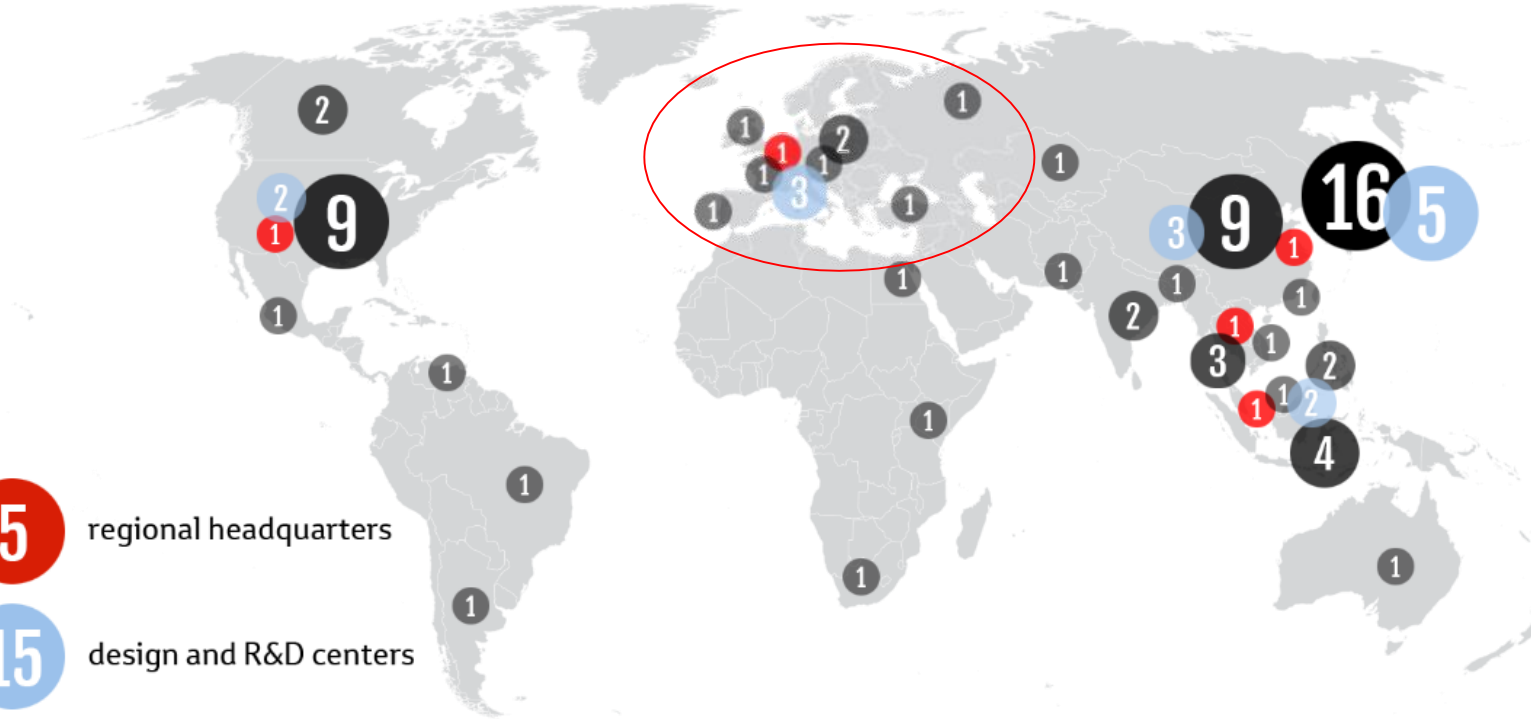
6. Conclusion & Next steps

1. About TOYOTA

Toyota – in the World

- Established in **1937**
- **53** manufacturing companies in **28** countries and regions, outside of Japan
- Vehicles sold in more than **170** countries and regions worldwide
- **10.594** million vehicles sold worldwide in CY 2018
- Market share: **45.6%** in Japan, **14.0%** in US in CY 2018
- More than **13** million cumulative hybrid sales
- Operating income totalled **€19.3** billion in FY18-19
- Around **370,000** employees worldwide

Toyota – in the World



5 regional headquarters

15 design and R&D centers

69 manufacturing companies worldwide*

*includes wholly owned companies as well as joint ventures, KDs and contractual manufacturing

Toyota – in Europe

- Began selling cars in **1963**
- **9** manufacturing plants in **7** countries
- Over **€9** billion invested since 1990
- More than **€6** billion spent with European-based suppliers per year
- **1,035,430** vehicles sold in CY2018
- More than **2,000,000** hybrid vehicles sold in Europe
- **5.0%** market share in CY 2018
- Employees (approx.): **20,000**
  (direct / including TPCA, 50/50 joint venture Toyota/PSA Peugeot Citroën)

Manufacturing facilities

TMUK – Engine Plant (incl. hybrid)

TMUK – Corolla (Hybrid & Touring Sports)

TMMP-J - Engine Plant

TMR – Camry & RAV4

TMMP-W - Engine & Transmission Plant

TMMF – Yaris & Yaris Hybrid

TPCA - AYGO

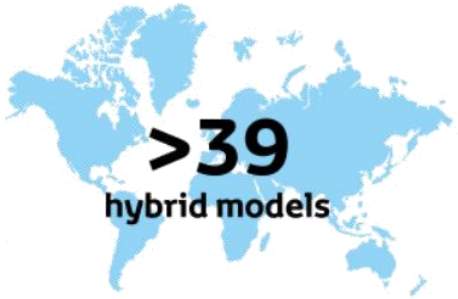
Toyota Caetano Portugal - Land Cruiser

TMMT – Corolla, Toyota C-HR (Hybrid)

Driving sustainability

First hybrid vehicle in 1997

Toyota Prius (1997)

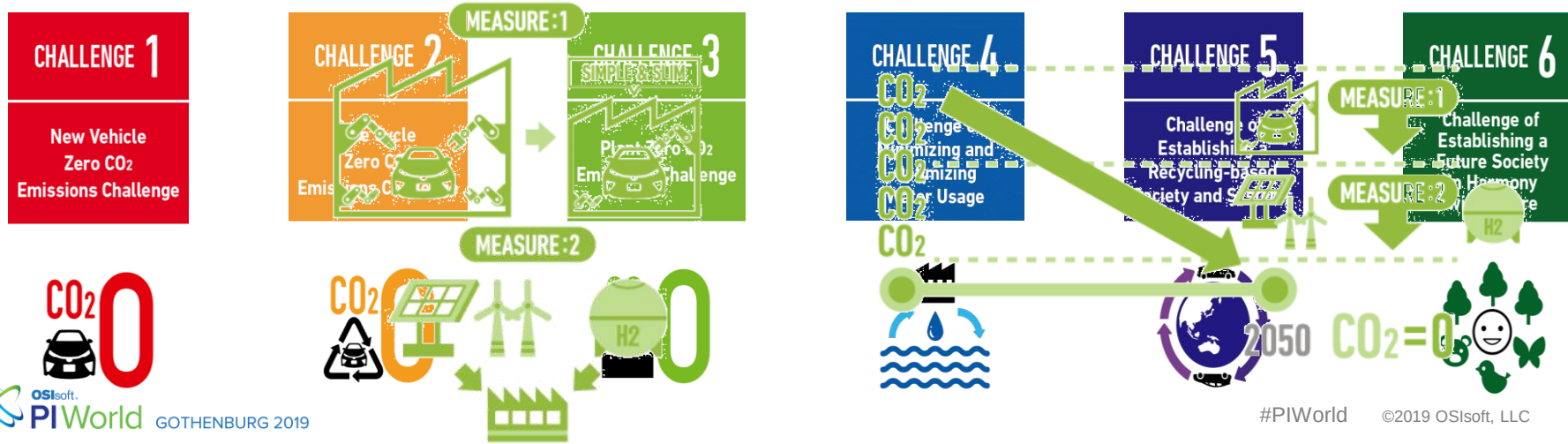


Worldwide hybrid cars development

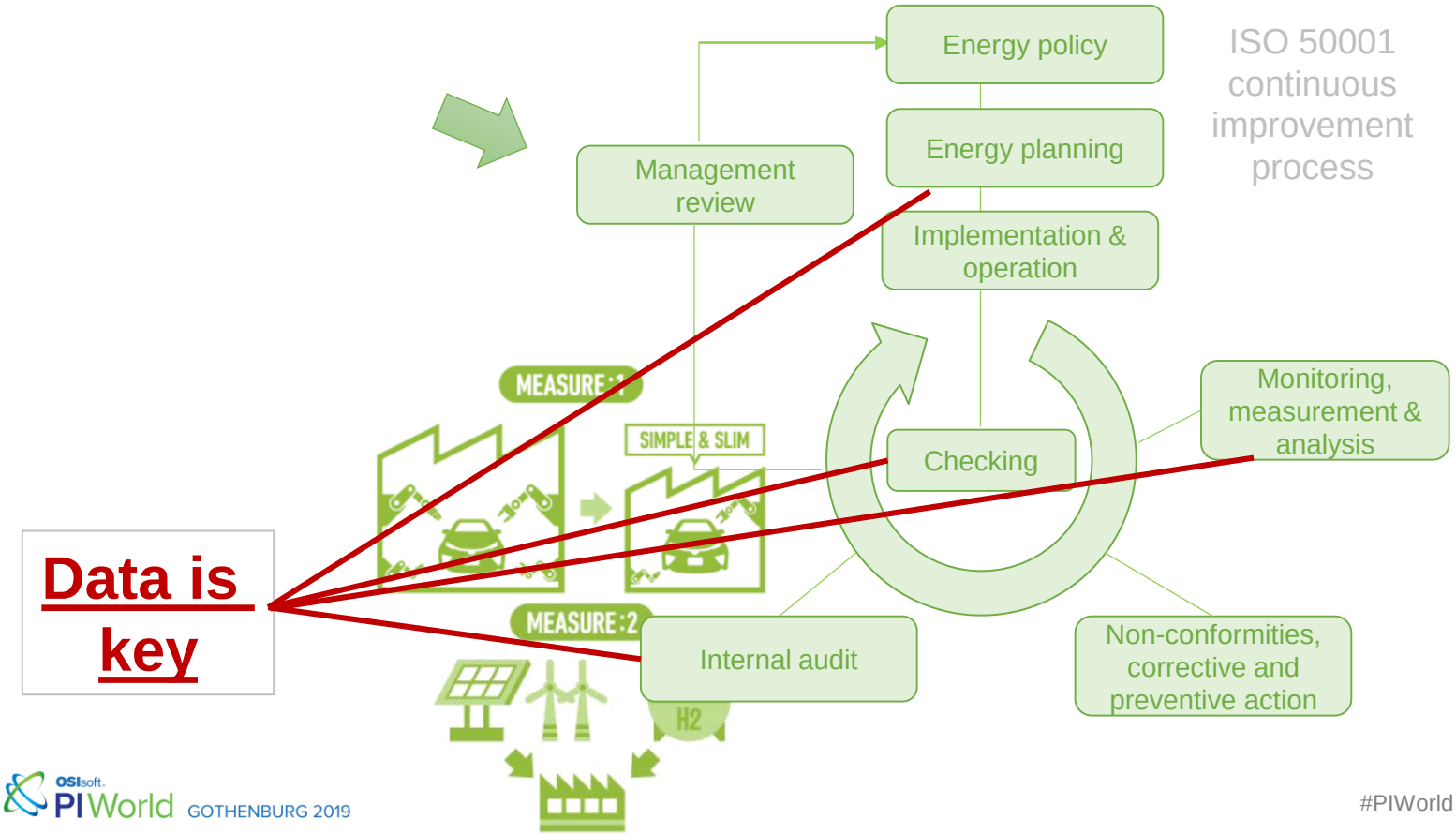
First mass produced H_2 car

Toyota Mirai (2014)

TOYOTA ENVIRONMENTAL CHALLENGE 2050

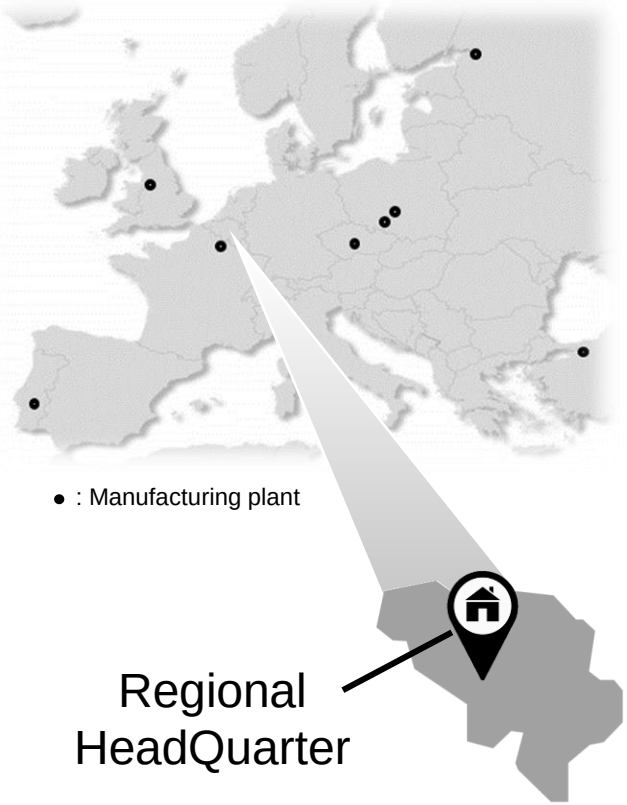


Data : a key element of energy reduction



2. European energy monitoring strategy

From a time consuming process…



Plant by plant :

- 8 different plants using 8 different EnMS

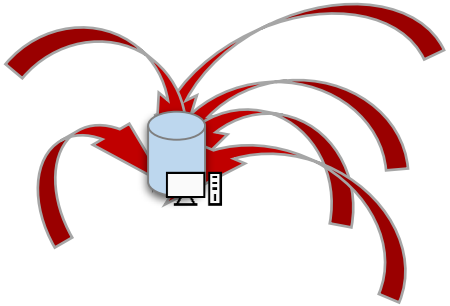
EnMS = Energy Monitoring System

- No monitoring standard, difference in capabilities
- Benchmark is very difficult and time consuming

From headquarter point of view:

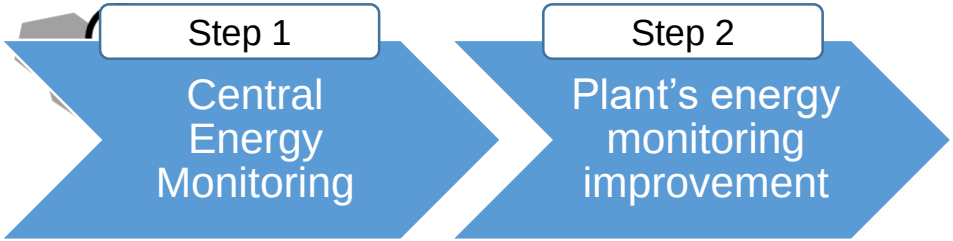
- When doing analysis, long time to gather data (upon demand)
- Need to combine all data, match formats (timestamps / units)
- Probability of man error is important

… to an ideal quick access to data



- 1 system to communicate with all plants devices
  Centralized infrastructure in headquarter
- Easy observation / comparison
  Curve superposition, intuitive trend analysis
- Smart reporting
  Automated detailed reports, easy to update

How to implement :



3.Implementing the PI System

Target :

- Implement a central EnMS
- Keep plant's local system operational
- Keep possibility for plant to use
- Optimize resources investment

Why OSIsoft PI System ?

1. Pi System offers a good flexibility

   Possibility to build framework as we want, and adapt on European level / Plant level

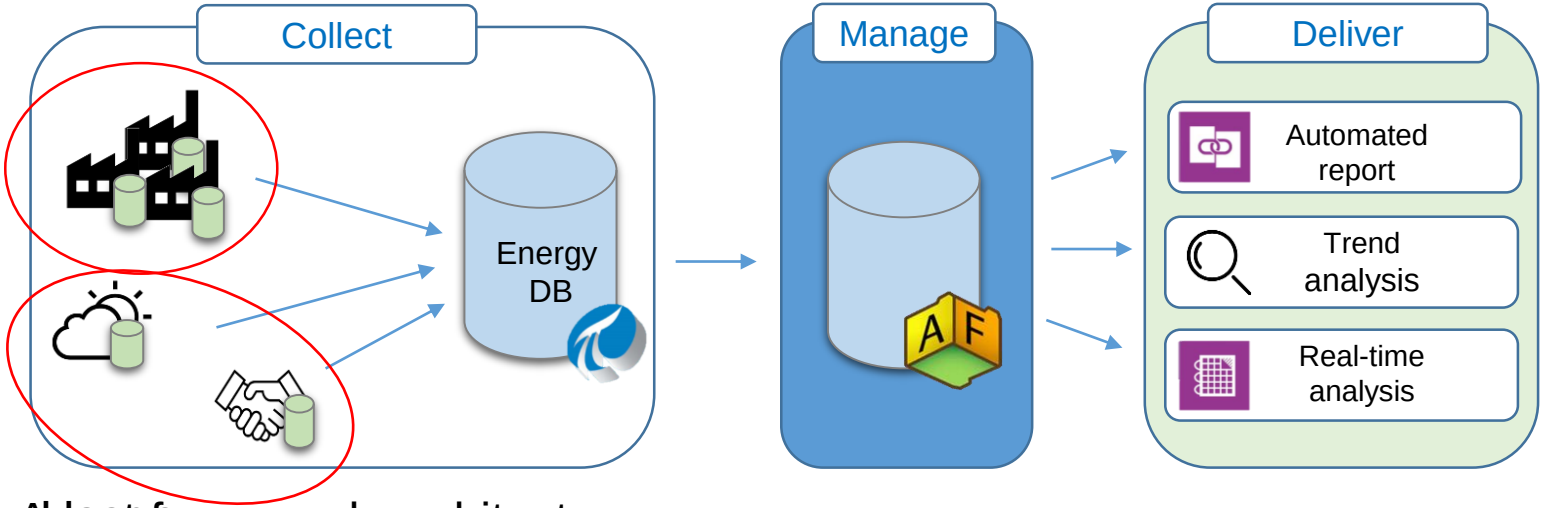
2. It was a proven solution

   Several implementation cases available, good references

3. It can work with any protocol

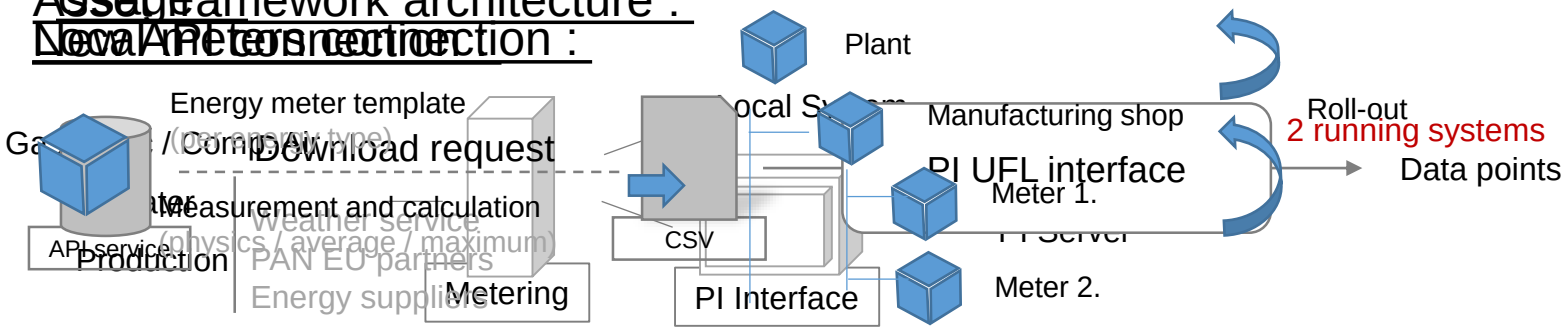
   Plenty of interfaces, possible to connect the different systems that we have

Implementing the PI System

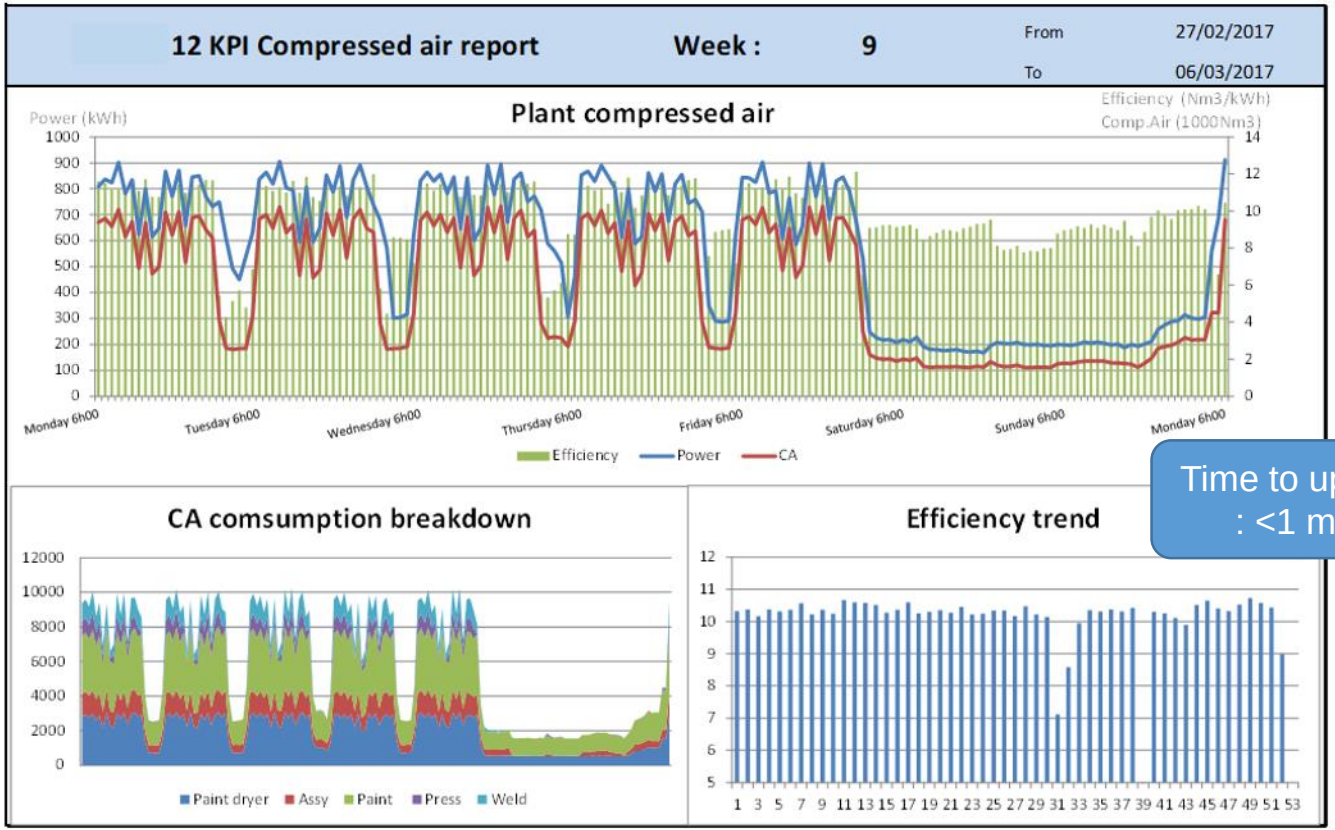


Asset framework architecture :

Local interconnection :



Equipment performance report



Time to update : <1 min

Moving one step further

STEP 1

EU-Monitoring improvement

STEP 2

Plant's energy management improvement

- Central EnMS
- Plant's local system operational
- Possibility for plant to use
- Minimize ressources investment

How to proceed ?

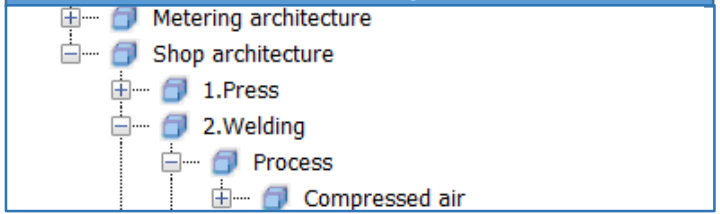
Developing plant EnMS

STEP 2

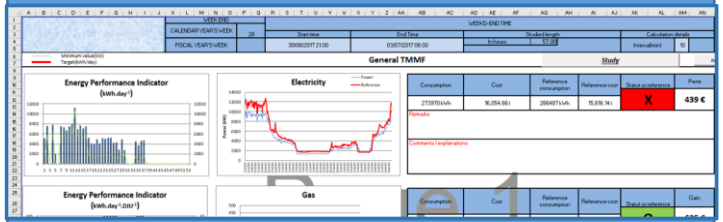
Plant's energy management improvement

Pilot project in 1 plant

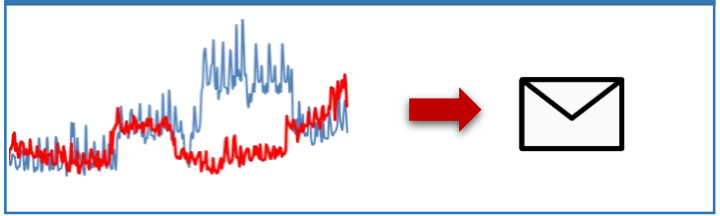
Make data usage easier



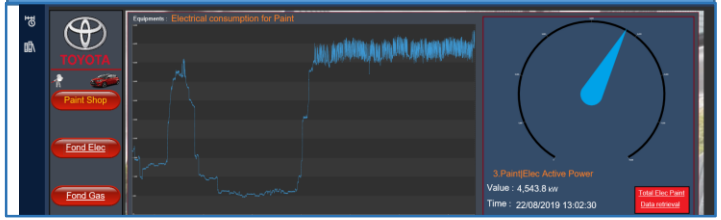
Reduce reporting time



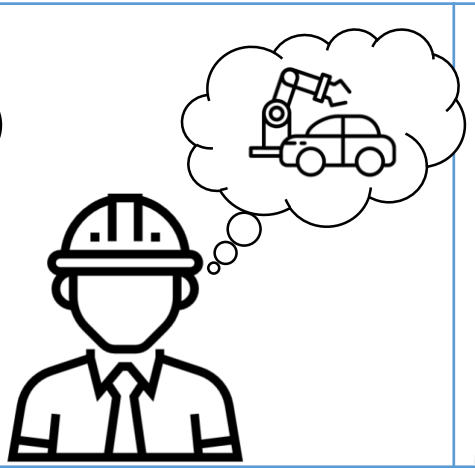
Optimize abnormality management



Grant acess to data for a large public

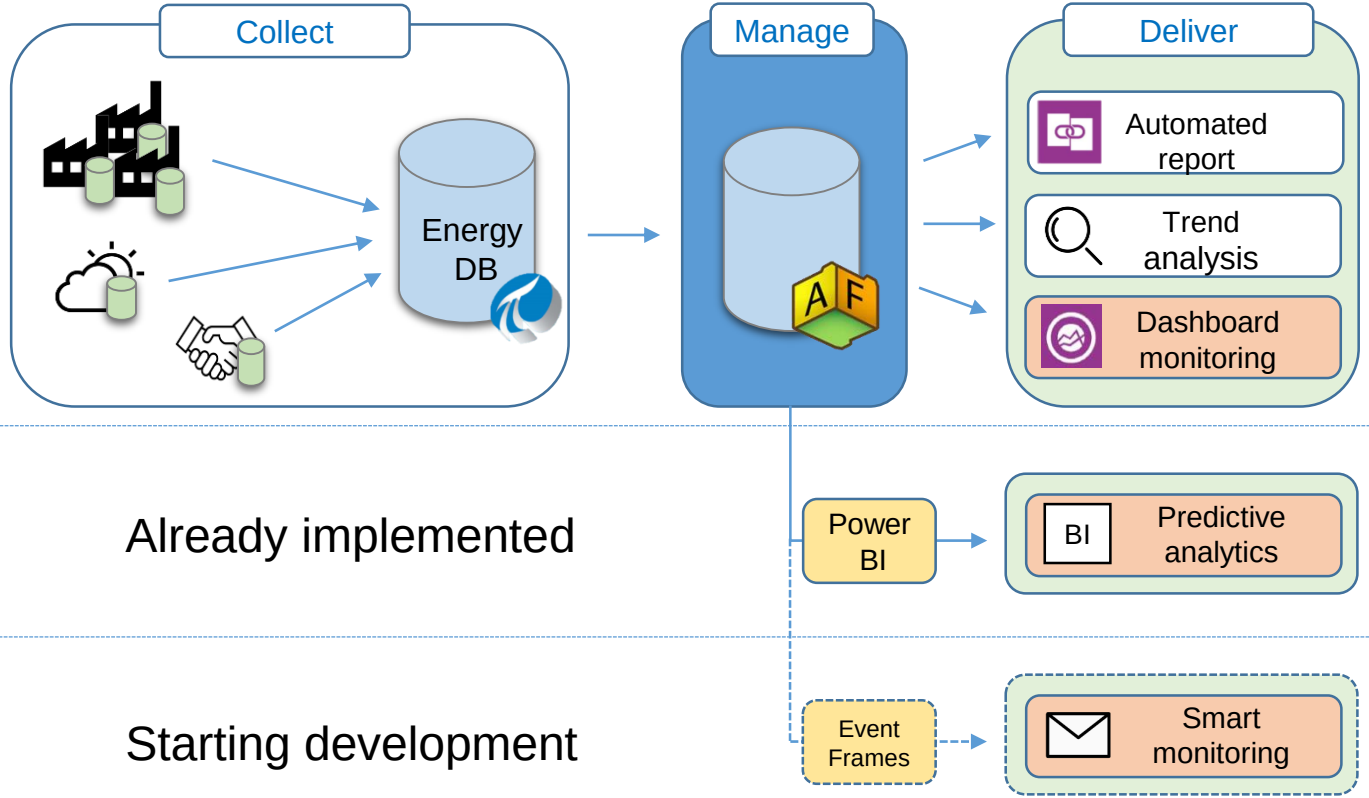


Who want to see data ?

		
Facility engineer	Shop engineer	Plant management
Energy reporting, energy supply optimization, equipment management	Project follow-up, troubleshooting, abnormality management, start/stop management	Strategic planning, business impact

TOYOTA

Developing plant EnMS

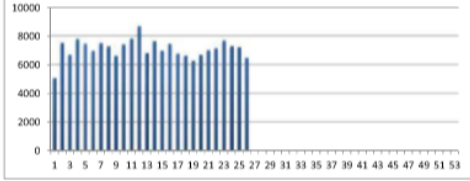


WEEK-END CONSUMPTION Report	WEEK END		WEEKD-END TIME					TMC Requirements
	CALENDAR YEAR'S WEEK	26	Start time	End Time	Studied length		Calculation details	
	FISCAL YEAR'S WEEK		30/06/2017 21:00	03/07/2017 06:00	In hours	57.00	Interval(min)	10

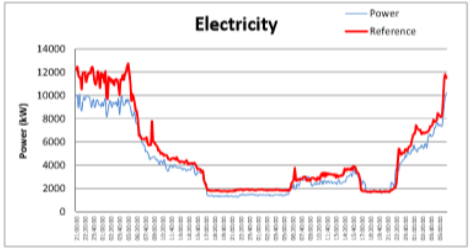
Minimum value(kW)
Target(kWh/day)

Plant's result

Energy Performance Indicator (kWh.day-1)



Electricity



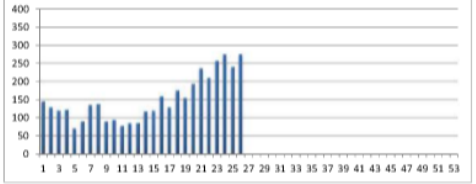
Consumption	Cost	Reference consumption	Reference cost	Statut vs reference	Savings
236130 kWh	13,837.20 €	279200 kWh	16,361.12 €	O	2,524 €

Remarks

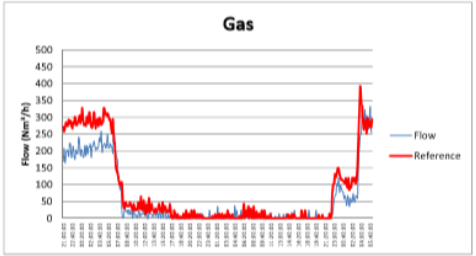
Comments / explanations

Ratio min/max
12.73%
Min
1304.15
Peak consum.
10243.66

Energy Performance Indicator (kWh.day-1.DJU-1)



Gas

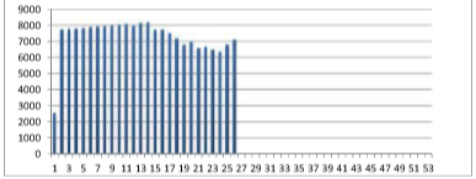


Consumption	Cost	Reference consumption	Reference cost	Statut vs reference	Savings
152942 kWh	4,588.25 €	210740 kWh	6,322.19 €	O	1,734 €

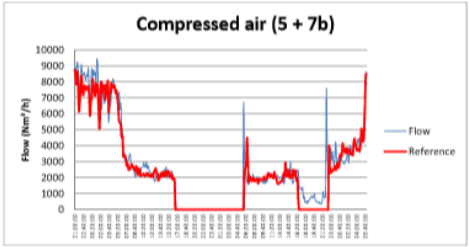
Remarks

Comments / explanations

Energy Performance Indicator (m³.day-1)



Compressed air (5 + 7b)



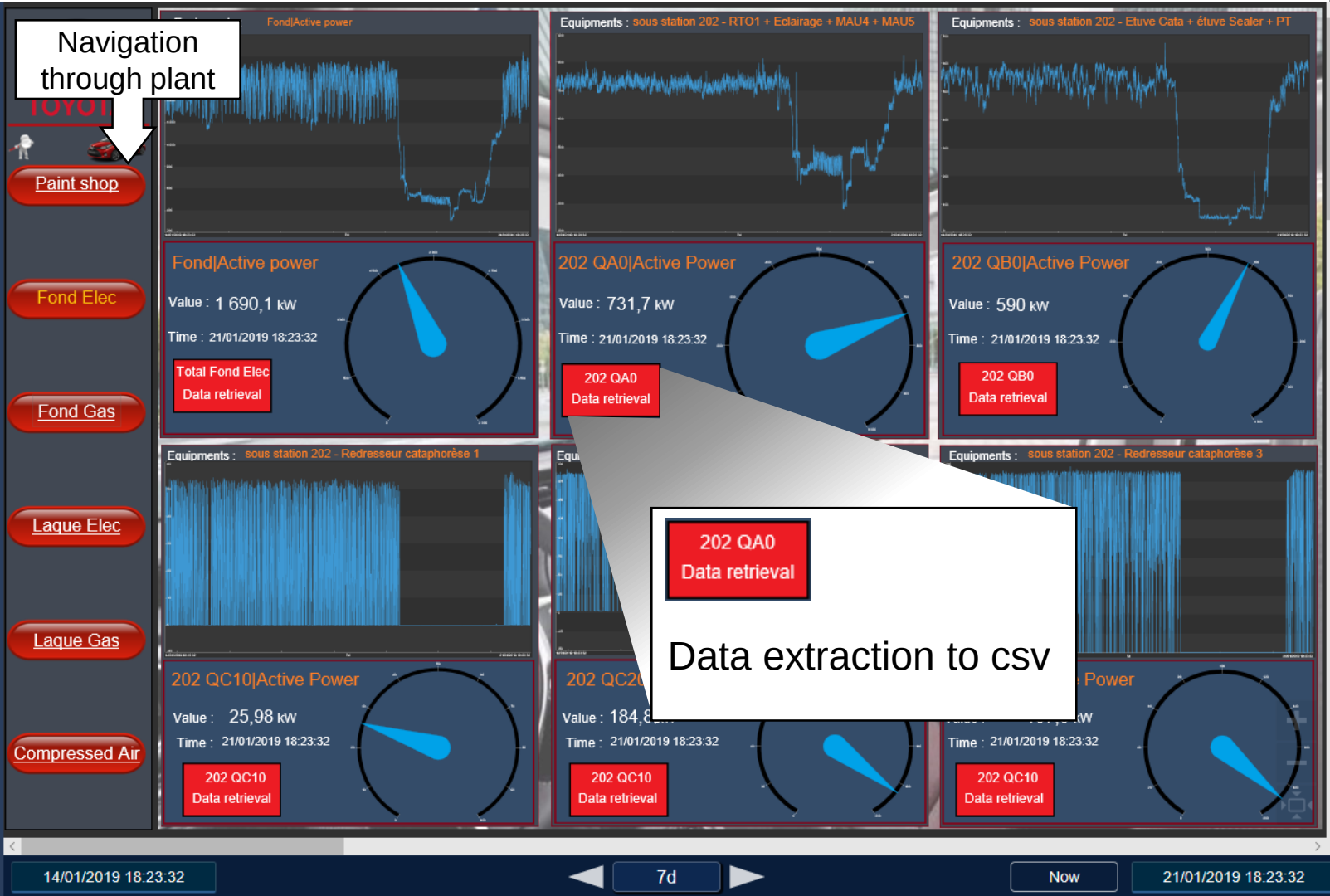
Consumption	Cost	Reference consumption	Reference cost	Statut vs reference	Loss
155409 m³		142165 m³		X	

Remarks

Comments / explanations

Ratio min/max
3.57%
Min
336.8
Peak consum.
9438.2

Steps



TOYOTA

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5. Learning points

#	Step	Learning point
1	All	It is easy to connect a lot of data points, but we must be sure about the accuracy and the reliability of the data
2	Implementation	It is better to spend more time to build an efficient Asset Framework to simplify delivery tools development
3	Implementation	Plant's members involvment is a difficult but mandatory step
4	Monitoring	It is important to keep enough people trained to maintain the system
5	Delivering	Discussion with « end-customer » is important to build an efficient delivery tool (dashboard / report)

Next steps : Finish pilot trial and roll out to other plants

6. Conclusion

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TOYOTA

CHALLENGES

- No sufficient energy data flow from manufacturing plants
- No standard for energy monitoring in manufacturing plants

SOLUTION

- Implementing a centralized European framework
- Develop a plant size monitoring structure and roll-out in every plant

BENEFITS

- Hard benefits : Tangible energy reduction in pilot plant
- Soft benefits : Empowering our engineers to take more efficient actions

“We managed to combine business application with significant step toward our corporate vision. Let’s continue to improve and transform our industry.”

Chris TORFS, Senior Mngr, Plant & Environment div.

Kevin ROSATI

- Facility engineer
  Energy monitoring, Energy Reduction, Facility management improvement
- Toyota Motor Europe
- kevin.rosati@toyota-europe.com

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember to…

Complete Survey!

Navigate to this session in mobile agenda for survey