UMS group

IGBC: Overview

Remco Frenken

Confidential

Table of Contents

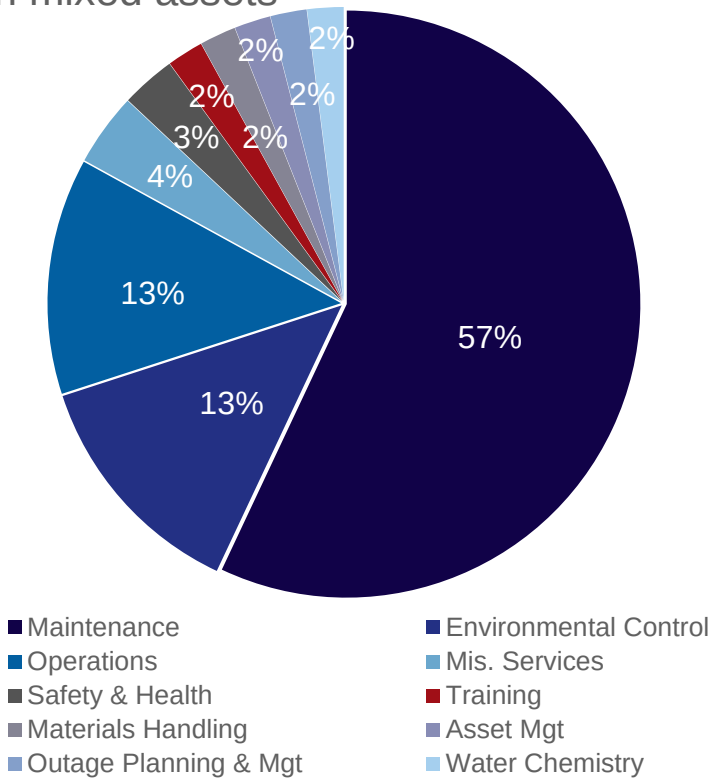
IGBC Objectives, Approach & Methodology

- The prime objective of IGBC is to provide a global comparative analysis of your operating and maintenance costs and service levels
- Results will show you how you perform against your peers; costs wise and performance wise
    - Where are you ‘best in class’ ?
    - Where is there improvement potential ?
    - How much is the improvement potential ?
        - OPEX/CAPEX cost savings
        - revenue from performance improvement
        - Safety / Environmental, etc.
- Fundamental to the analysis is use of UMS Group’s International Generation Benchmarking Consortium (IGBC) database, containing performance data on many of world’s leading generation fleets and plants from Europe, USA, Australia and Asia. All data is adjusted for inflation and exchange rates
- Participants are supplied with a datapack, highlighting the data to be collected along with a definition set of how the data should be provided to ensure **credible, comparative** results
    - Data is typical collected for 3 years,
    - Data is split over 10 core areas;
    - In total, 200+ data points are being collected.
    - Thanks to the hierarchical data structure, our analyst can deal with ‘missing data’ in the lower part of the hierarchy

We benchmark Costs versus Performance

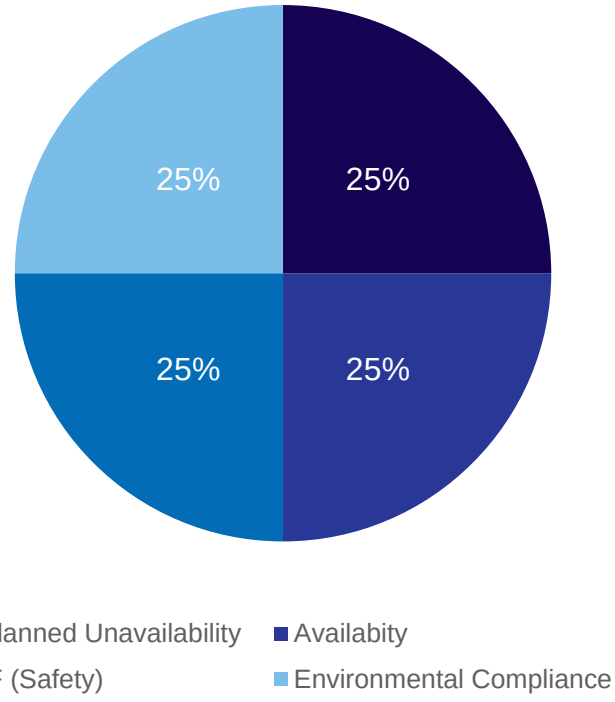
All costs are allocated to 10 core areas

Example: Resulting cost allocation in fleet with mixed assets



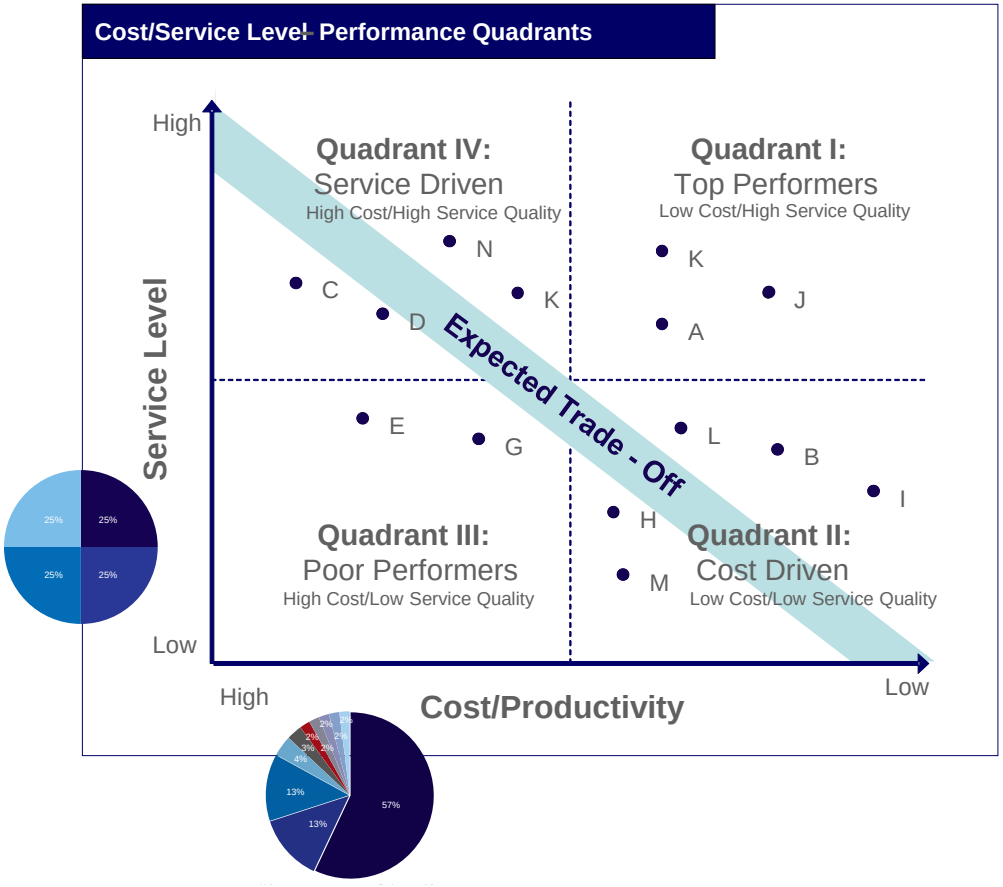
Plant level performance is measured by 4 factors. In addition, for each core area a specific performance definition is made

Example: Performance definition on plant level



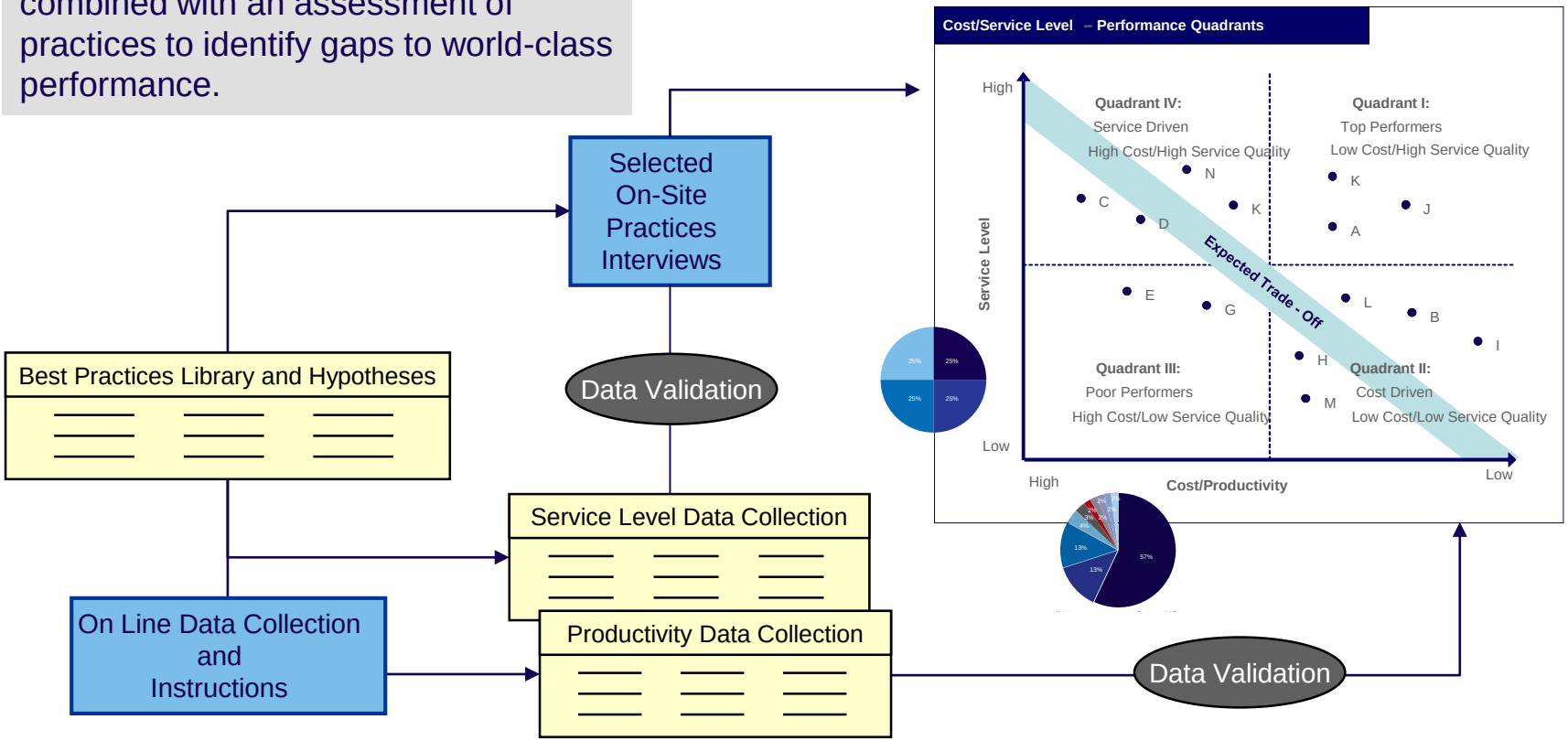
Zooming in on methodology: benchmarking “value for money”, rather than “cost only” by using quadrants

- UMS Group’s benchmarking methodology assesses performance in terms of cost AND service level
- Our benchmarking methodology drills down into the detail behind each benchmarked function, as we assess productivity, efficiency, cost, and service levels
- This methodology provides a comprehensive and meaningful benchmark comparison for your company
- We report our results in so called Quadrants (see picture)

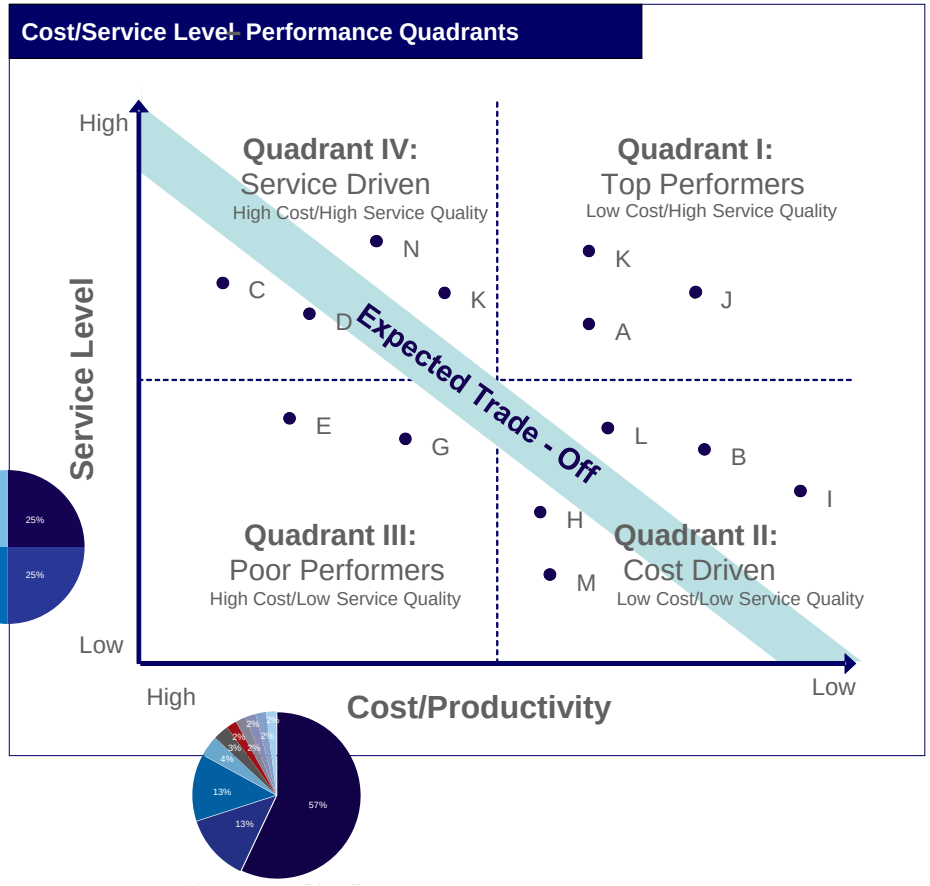


The methodology includes rigorous data collection, data validation and practices assessment

Data collection and analysis can be combined with an assessment of practices to identify gaps to world-class performance.



Once data gathering is complete, we begin profiling performance and identifying key distinctions



- Our conventional x:y scatter plots illustrate the performance of comparable companies, fleets, and plants on 2 dimensions: cost and effectiveness
- While one may expect a certain "tradeoff" between cost and effectiveness, we've found that "breakout companies" often surface
- Studying "breakout companies" can be a very effective exercise in organizational learning and best practice discovery
- By exploring these companies, we often find very clear differences in processes, technology, and organizational infrastructure

Comparison Is Made To Plants And Units In The Same Segment

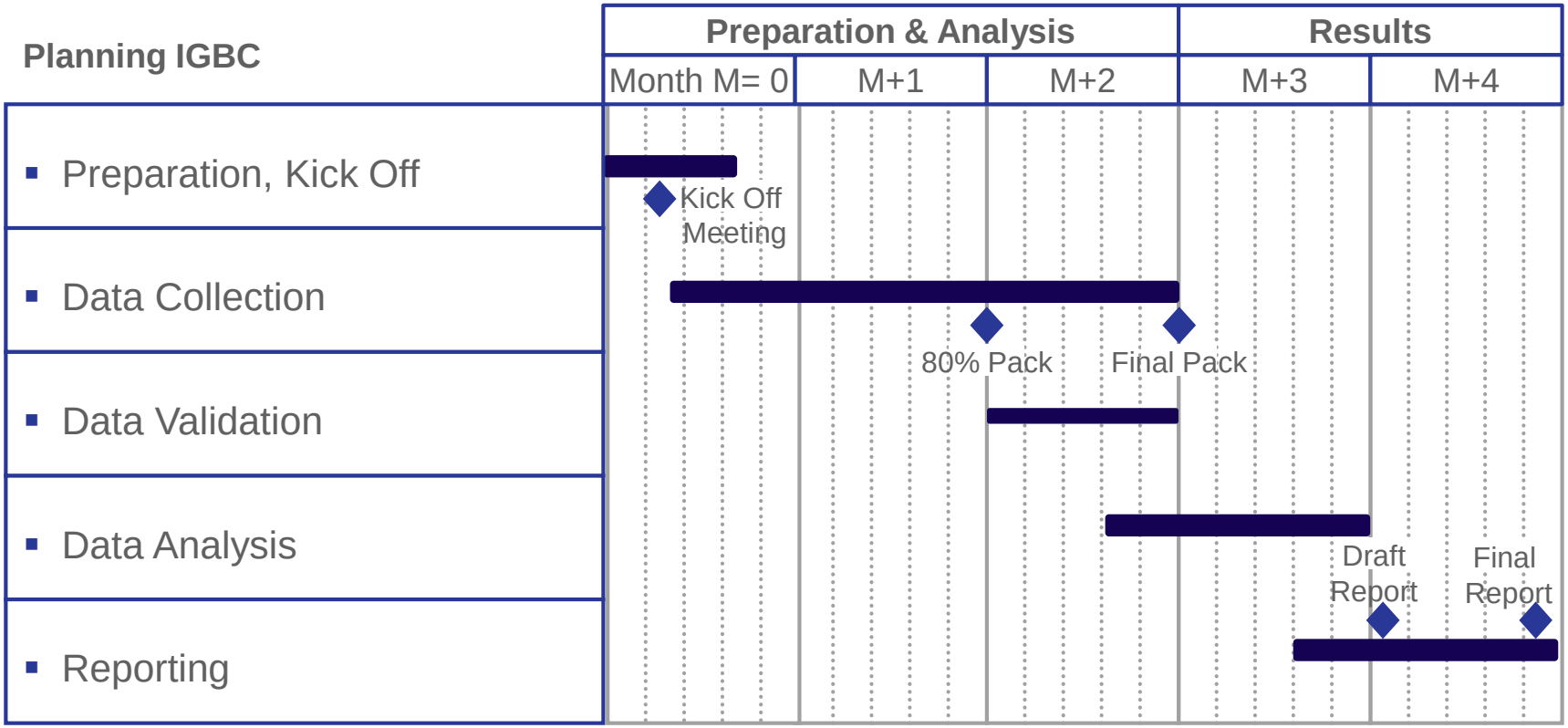
COAL / LIGNITE SEGMENTATION					PLANT MW SEGMENTATIONS			UNIT MW SEGMENTATIONS			
Plant / Unit Name	Fuel Type	MW*	MRY Utilisation	Approx. Age**	(1500+)	(500-1499)	(<500)	(550+)	(350-549)	(200-349)	(<200)
Kyoto	Coal	628	59%	23		•					
KYO1	Coal	260	64%	23						•	
KYO2	Lignite	368	54%	11					•		
Amsterdam	Coal	380	51%	21			•				
AMS1	Coal	380	76%	21					•		
Manila	Coal	390	68%	29			•				
MLA3	Coal	390	25%	29					•		

* Maximum Net MW Capacity Reported (used in segementing peers)

** Approximate age based on difference between study year and year of commercial start

For Coal/Lignite, there are 4 peer groups (>150 units)
For Gas/Oil, there are 3 peer groups (circa 40 units)
For CCGT, there is a single peer group (circa 40 units)

An IGBC benchmark takes typical 5 months and has 5 milestones



At least one "On Site" Meeting
Bi-weekly progress calls

Benchmarking is an evolutionary “process” where impact increases significantly over time

	“Learn” The Process	“Leverage” The Findings	“Integrate” The Insights
Measurement Performance	What should I measure?	What’s my relative position?	Am I achieving desired targets?
Compare Performance & Practices	Where should we focus	How can I best realize benefits? (Quick & effective implementation)	How can I create a learning & adaptive organization?
Analyze Opportunities	Use as example to break NIH syndrome	Team implementation success factors	Collaborate on best practice development
Develop Improvement Initiative Recommendations	Confidentiality screen & facilitator	Coach	Partner

Table of Contents

Structure IGBC report

The report is in power point format and structured as follows

1. Management Summary (1 page)
2. Summary Results (circa 25 pages)
3. Gap Analysis (5 pages)
4. Conclusions & Recommendations (2-5 pages)
5. Overview Methodology (10 pages)
6. Detailed Results (100-200 pages, depending on type / mix of units and size of the fleet)

Example slides: Summary results (about 25 pages)

The relevant peer group for company X-fleet consists of 115 units (mainly from western Europe, USA and Australia)

Company X units:

PEER GROUP 2 COAL-LIGNITE UNITS 350-549 MW

	MAX	MIN	AVG
Utilization in MRY	93%	25%	66%
Age at MRY Data	41.00	9.00	26.82
Net MW I	536.00	350.00	455.60
Count	60		

Kyoto 2
Amsterdam
Manila

PEER GROUP 3 COAL-LIGNITE UNITS 200-349 MW

	MAX	MIN	AVG
Utilization in MRY	92%	27%	64%
Age at MRY Data	51.00	12.00	33.21
Net MW I	345.00	232.00	298.28
Count	39		

Kyoto 1

PEER GROUP 2 GAS-OIL UNITS 300-499 MW

	MAX	MIN	AVG
Utilization in MRY	70%	0%	22%
Age at MRY Data	48.00	13.00	34.81
Net MWI	445.00	322.00	373.06
Count	16		

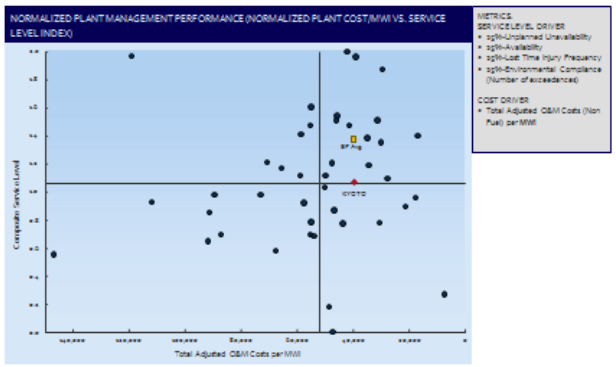
Sydney 1
Berlin 2

Results Summary - Amsterdam

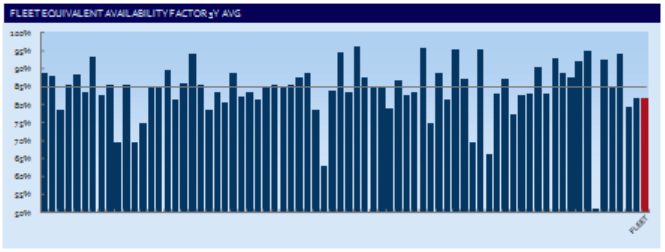
Plant Level Functional areas	Major Drivers
Plant Management per MWI	Planned Unavailability
Plant Management per MWhr	Planned Unavailability
Materials Handling	Material Handling cost, Byproduct costs
Safety & Health	Contractor LTIF, emply. LTIF
Asset Management	3 Yr Ave UU, Availability
Training	Training emphasis
Miscellaneous Services	Above average miscellaneous costs

Unit Level Functional areas	Major Drivers
Operations	Forced Outages, UU
Maintenance	Availability, UU, Maintenance cost
Outage Planning & Management	No data — Insufficient data to plot performance
Water Chemistry	Make up water volume, Chemistry cost
Environmental Control	Environmental Cost

Plant management Kyoto: Best Performers Quadrant (per MW-installed)

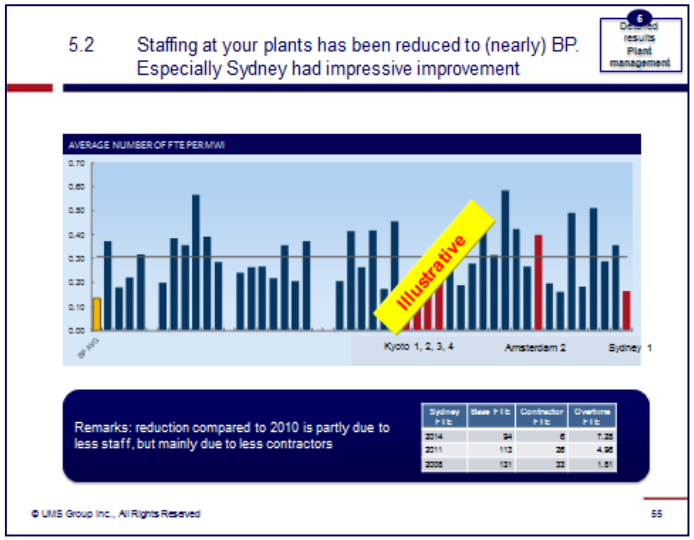


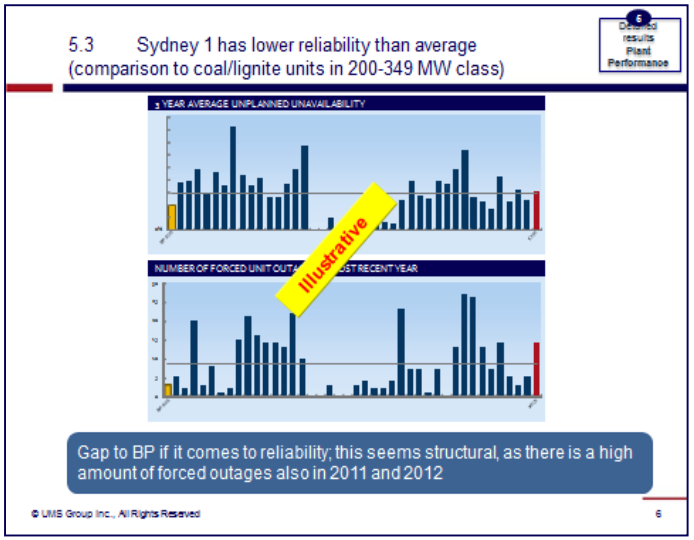
Fleet: the availability of your fleet is below average. Key improvement areas are Sydney 1 coal plant and both of the Dublin units.

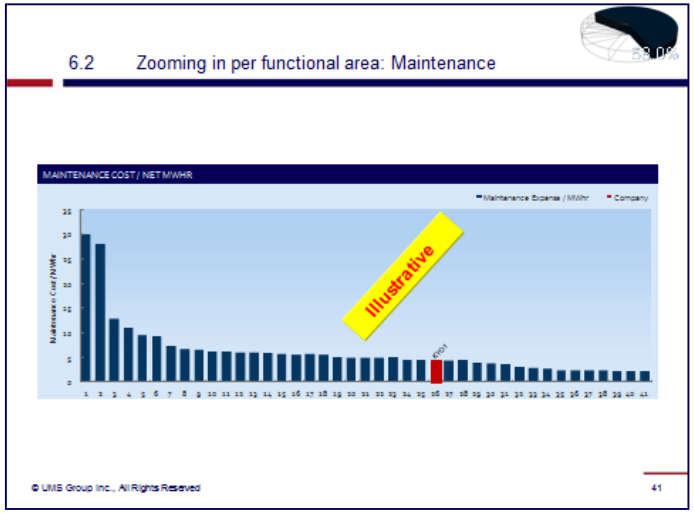


Please note that even if corrected for the major outage of Sydney 1, your availability would still be below average (see slide #)

Example slides: Detailed results (100-200 pages)







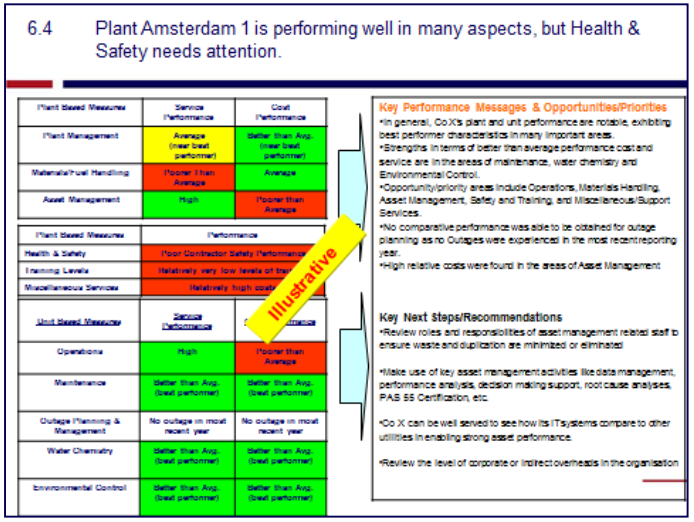


Table of Contents

Frequently Asked Questions

Q: Can we also purchase the raw data ?

A: No, the raw data is not for sale. However, in case you need any specific analysis, we are happy to provide that; typical costs are 250 euro per slide

Q: We just want the benchmark data, but do not want to deliver data ourselves. Is that possible?

A: It is important for all participants that the database keeps on growing. We therefore only supply benchmark results for those areas where you have submitted your data

Q: I am afraid we do not have all the data; how can we deal with this?

A: The data has an hierarchical structure. In our experience, the top level data (Availability, staff, costs, produced MWh etc.) is always available and provides you the most relevant insights. We seldom have companies who submit all 200+ data points; our analysts are used to dealing with this. Please note that if you do not provide data on a certain topic, you will not be benchmarked in that area.

Q: **How complex is it go gather all the relevant data ?**

A: Most companies need one month for this effort. If needed, we can support you with one of our analysts (at an additional fee) to help you with data collection.

Frequently Asked Questions

Q: How does data collection work ?

A: We will send you a tool to collect the data (based on Excel). The tool will allow comments and various settings for units (e.g. MWh, MMBTU etc.). It has also a dashboard to give an overview of the data collection progress. Please note that one person in your company should be appointed as 'point of contact'. UMS will only communicate via that person and only accept data from that person.

Q: How does data validation work?

A: We typical get a "80%" datapack back after 3 weeks. We will then compare that datapack with our database and feed back to you where your submitted data differs significantly from our database. In addition, on of our experts will do a 'sensibility' check. You have than 2-3 weeks to upgrade the data; the revised datapack will be validated again; if needed, you can submit one more version (without additional costs).

Q: I want results in 4 weeks. Is that possible?

A: Our experience is that the limiting factor is the data collection and the 'follow up' on validation questions.

Q: I only want to be benchmarked on a subset of data. Is that possible?

A: This is possible in principle, please contact us to discuss.

Frequently Asked Questions

Q: Are you also benchmarking efficiency?

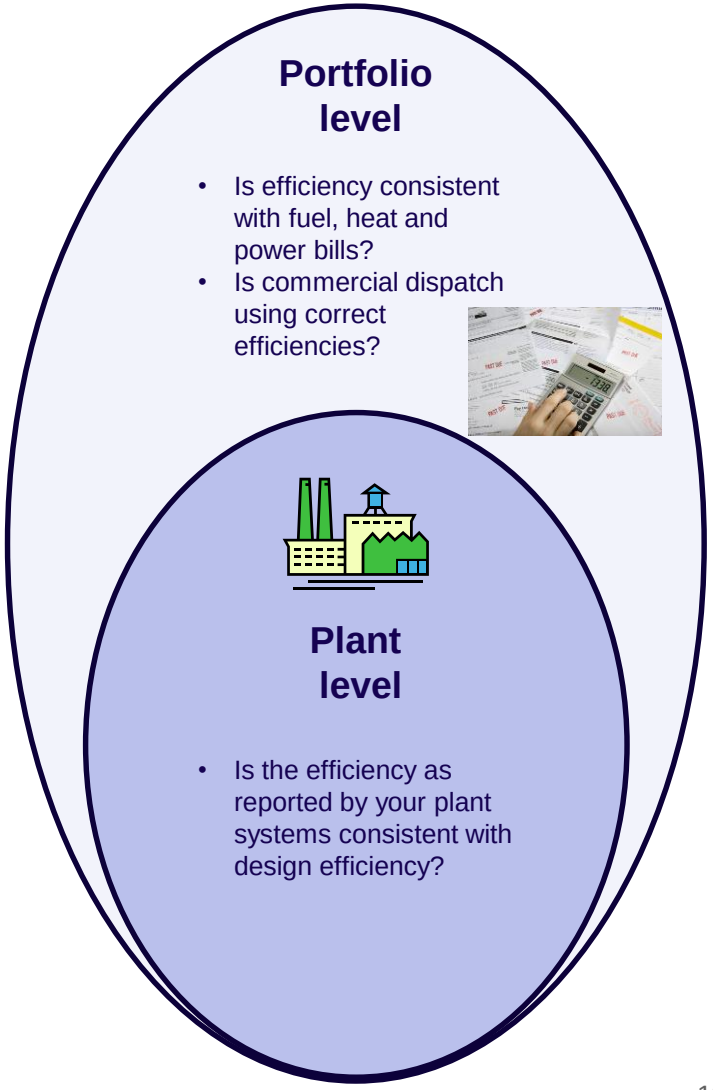
A: We will collect efficiency related data, however our view is that efficiency is too complex to 'just benchmark'. We hence do tailor made efficiency analysis, where we compare the actual efficiency against design efficiency including the impact of ' modus operandi'. Please contact us if you are I interested, as this is not included in IGBC

Q: My plant is also delivering steam and/or district heating. Can I still participate in IGBC ?

A: Yes, we have more cogeneration plants in our database. Please note that the datapack allows for splitting out costs over power and heat/steam

Q: I would like to meet some other participants. Is that possible?

A: We provide references on request. Also, on request, we organize conferences for IGBC participants to discuss 'best practices"



Frequently Asked Questions

Q: Are you normalizing the data and if yes, how does this work?

A: We normalize for exchange rates and labour costs. Other factors are handled via segmentation. A detailed description is available and will be provided in the final stage of contracting.

Q: …but my plant is specific, as it had an extended outage/is close to the ocean /is inland on high elevation /is doing special service for the System Operator /etc.

A: We are aware that every plant has it's own peculiarities, but we prefer using that as an explanation for differences, rather than 'normalizing' it away. Please note that we use 3 year average data and have an extensive database with plants from various countries. The unsmoothed results might come across as "hard", but it will enable you to focus your improvement efforts. As one of our clients remarked: "we thought we were a cost leader, but IGBC showed us where we had further room for improvement"

Q: I am afraid my definitions of availability/costs/safety/etc. are different from your definitions. How can we deal with this?

A: In our experience, definitions are pretty similar c.q. conversions can easily be made for all the relevant indicators. Our experts will go through the definitions during the kick off meeting and be available for telephone support (no additional fee)

Frequently Asked Questions

Q: Do you also provide benchmarking for hydro plants ?

A: We provide benchmarking for hydro plants as well (about 200 units in our database), however due to the peculiarities of hydro we do not have a programmatic approach. Contact us to learn more about alternatives available

Q: And what other benchmarking programs do you provide?

A: We can provide benchmarking for distribution grids (gas and power), transmission grids (power) and water. We are proud to say that some of our benchmarking projects are already running for 25 years!

Table of Contents

Contact

UMS group

Remco Frenken
Managing Partner

UMS Group Europe B.V.
Amstel Business Park
Joop Geesinkweg 901-999
P.O. Box 94013
1090 GA Amsterdam
The Netherlands

Mobile: +31 6 83970398
Office: +31 20 5617033
Fax: +31 20 5616666

rfrenken@umsgroup.com
www.umsgroup.com