Pacific Power Utility Benchmarking

PURPOSE AND FUTURE DEVELOPMENTS

Benchmark Workshop Program Day 1

- Understand Benchmarking and Purpose
- 2017 FY benchmarking Results

Background

PPA's involvement with Utility benchmarking for over a decade

In 2002 first benchmarking manual was published which was funded by ADB.

In 2012 based on utilities feedback improvement were made.

Annually Pacific Power Utilities Benchmarking report/ statistics published for utilities

Sharing information across jurisdiction has led to improvement in utility performance

What is Benchmarking

Benchmarking is the systematic comparison and evaluation of businesses, either as a whole or at an individual functional level, to identify differences in performance and therefore opportunities for either breakthrough or continuous improvement towards best practice.

KEY ELEMENTS

Benchmarking has four key elements:

- Systematic – needs to be part of an on-going disciplined program in order to maximise results;
- Comparative – involves evaluating relative performance;
- Focussed on best practice – looks towards examples set by best performers;
- About achieving quantum breakthrough or incremental continuous improvements.

Types of Benchmarking

Methodologies for benchmarking generally fall into two groups

1. Statistical Benchmarking

   Statistical benchmarking focuses on statistical relationships between resources consumed (e.g. labour or material) and outputs delivered (kWh of electricity distributed).

   Favoured by some because it is comprehensive and facilitates the prescription of best practice results to other utilities i.e regulating prices and service levels.

   Disadvantage of statistical benchmarking – becomes overly complex

Types of Benchmarking

2. Management Benchmarking

Involves the use of comparisons. For example, key performance indicators (KPIs) and compare with performance indications (IPs) to measure differences in the relative performance of both service level and the efficiencies of various power utility functions.

Management Benchmarking is essentially operational and is much easier to understand and explain, especially in respect of the causes and effect of differences in practices and performances.

Two Level of Management Benchmarking

1. Overview – a general assessment of the overall service levels and/efficiency across all or most power utility functions.

2. Detailed – conduct at a process level in order to specifically assess particular service levels and/or efficiencies of individual process.

Disadvantage

- Focused on one KPI at a time provide partial overview.

Compensation of Drawbacks

1. Management benchmarking requires compensation using

a) Balance scorecards;

Requires that KPIs and PIs be considered as balance baskets of measures and not be considered individually.

Focus Area	Strategic Intent	Vision, Mission, Value	Strategies	Measures and Targets	
				Budget Year	In 3 Years
Finance					
Customer					
Business Process					
Heath and Safety					

1.Balance Scorecard

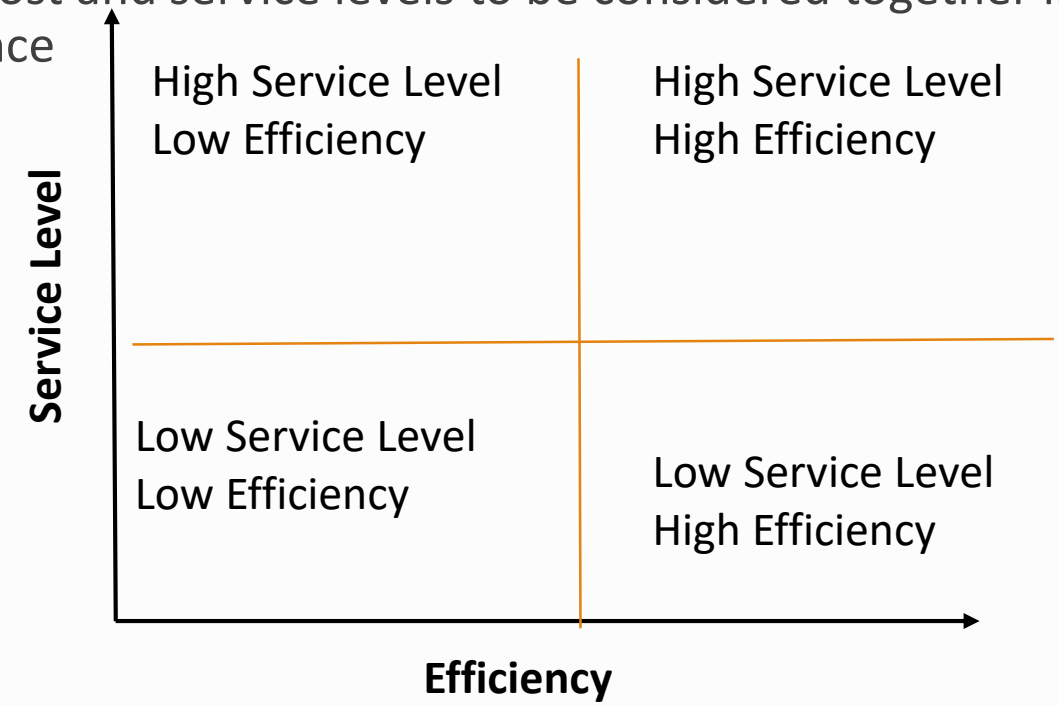
Balanced scorecards allow power utilities to contextualise customer and other important stakeholder requirements, particularly shareholders, staff and the community. Knowing these requirements allow managers and operators to maximise results by focusing benchmarking activities on areas of importance.

Ideally the balanced scorecard approach encourages managers to focus on the handful of measures which are most critical (i.e. most relating to results for key stakeholders and customers)

Four Basic Questions	Aspects to be Measured	Typical Measures
What do we look like to our shareholders?	Profitability, growth and shareholder value	Return on equity
How does the customer see us?	Time, quality, service and cost/price	Customer satisfaction
What must we excel at? What are our core competencies?	Process measures of outputs, efficiencies, cycle times, defect rates.	• SAIDI • SAIFI • Plant availability • Capacity factor
Can we continue to improve and create value?	Extent of innovation and improvement (highly reliant on staff contributions)	• % of revenue from new products • % of savings achieved • Lost time injury duration (LTID) • Lost time injury frequency (LTIF) • Total lost time due to industrial disputes (TLID)

2.Performance Quadrants

Requires cost and service levels to be considered together in order to identify benchmarked performance



Using Management Benchmarking

Can be used to conduct internally/or externally

- Internally from one period to another
- Externally, either comprehensively between organisations

PPA uses the management benchmarking as a practical way of enabling pacific power utilities to learn from best practices and improve performance.

Why Benchmarking?

- Benchmarking is a powerful management and operational resource that can allow a utility to improve their performance and gain efficiencies.
- It is a tool that utility managers use to demonstrate the possibility of better performance through actual work.
- Allows Managers to contribute to the process from ground up, rather than being instructed from top down.
- Is used to plan improvement rather than assessing past performance.
- Combining Benchmarking with scorecard will provide a excellent planning tool. Set corporate targets and benchmark against best practice.

Long Term Benefits

This includes:

1. Increased levels of effectiveness
2. Increased levels of efficiency
3. Empowerment of employees
4. Promote learning in organization. Whereby team taught to manage core competencies in a disciplined way.

Purpose for Performance Benchmarking

Involves find best practices and then being able to apply that experience and knowledge in a meaningful context to improve performance.

Benchmarking is a valuable instrument for comparing performance of a utility over time as well as performance between similar organizations and between regions

It allows better understanding of performance gaps and allow one to derive reasons for underperformance, improved decision making within power utilities and increases efficiency, and improved performance of participating power utilities.

Purpose for Utility Power Benchmarking

Key Performance Indicators (KPI's) provide a means for utilities to monitor, assess and improve their performance over time by performance with other similar utilities

Transparent and reliable information is useful to a wide range of decision makers, including own utility, financial analysts, investors, policymakers and consumers.

Promotes improvement – provides a way to learn from better performers.

Maximize efficiencies and knowledge sharing

Operational decision making in electrical industry as a centralised engineering optimisation problem

Given

- An inventory of existing generation, network and demand side electricity equipment:
- Technical parameters, operating costs, industrial benefits, operating constrains
- Uncertainties in performance, cost &benefits
- Ability to control all generation, network & end-use equipment

Calculate a strategy to maximise IBOT (Industry Benefits of Trade):

- Solve a stochastic non-linear dynamic optimisation problem for operating decisions in generation, network and demand side equipment
- Operating and control challenges

Objectives & challenges of benchmarking in electricity industry

Desirable objective to enhance:

- Economic Efficiency, Operational Efficiency, Data Reliability, Gender Balance, Good Governance, Accountability

Accountability challenges

- Expose decision maker to associated risks

What Performance Should Be

Frist : Compare Performance:

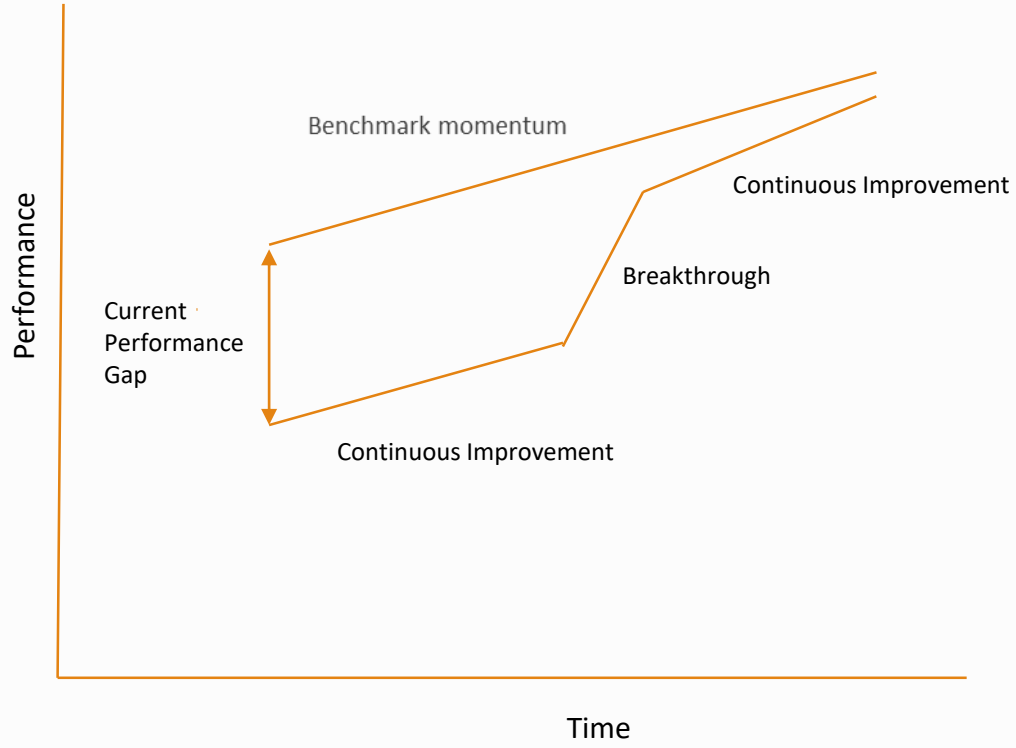
- Service Levels
- Efficiency

- Identify Gaps between current and better performance.
- Project Trends, i.e. will gap get bigger or smaller overtime?
- Establish targets for closing gaps, near and long term.

Second: Determine what performance should be

- Measure the difference between benchmark and current performance.
  - The gap needs to be evaluated in terms of
  a) Quantum of Difference
  b) Prospect for the future, i.e. is the momentum actually closing or widening the gap over time. This will determine the extent and nature of improvement required.

Momentum Line and Performance Gap



Formulate an Improvement Plan

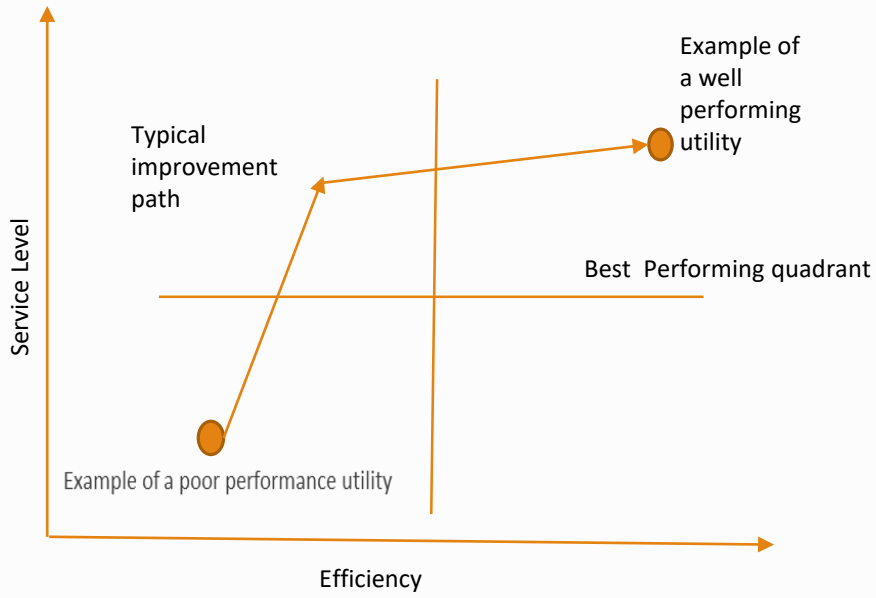
Improvement plan will include

1. Improving Service Levels
2. Improving efficiency

Achieved through a combination of

1. Breakthrough improvements
2. Continuous improvement

Service & Cost Trade-offs and Best Performance Quadrants



When benchmarking managers should be looking at measuring and improving processes.

By repeating this cycle, breakthrough and continuous improvement may be possible.

Improvement can be breakthrough or continuous.

Breakthrough improvements are more likely to occur as a result of strategic and overview benchmarking

Continuous improvement is more likely to occur in operational benchmarking where decision are more tactical than strategic.

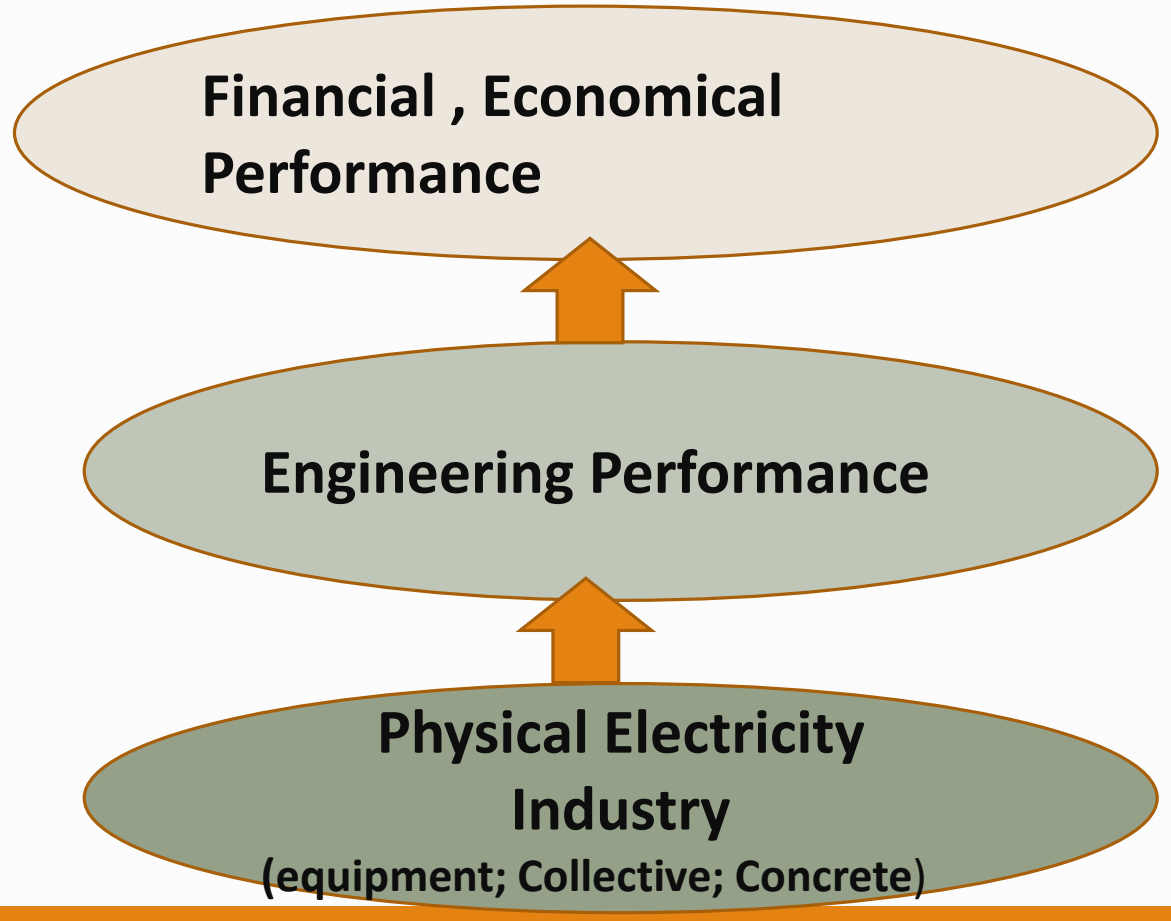
Improvement Team for Benchmarking

Set up a team to address each component
For example SAIDI, Generation and Distribution performance need to analysed and strengthened.

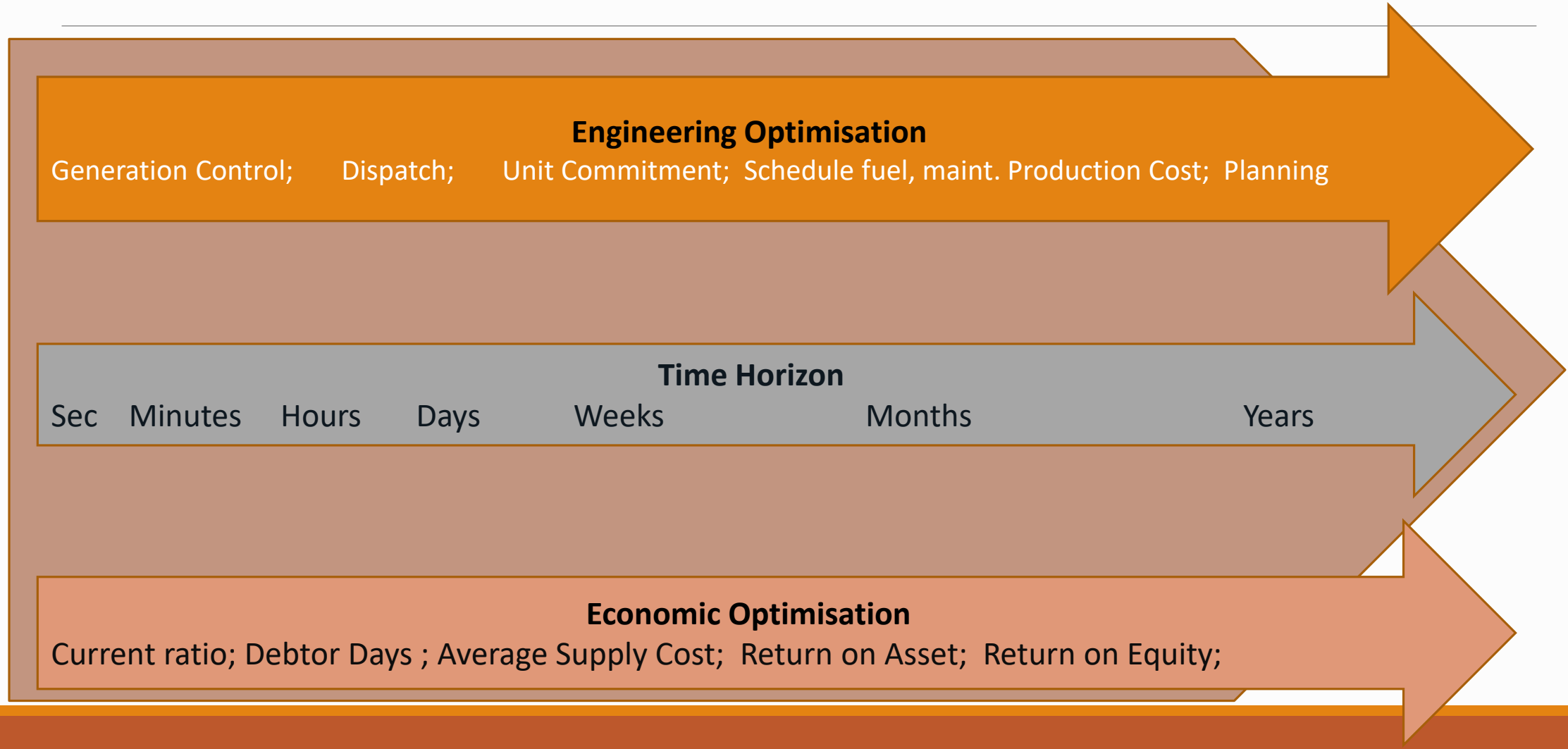
Quantify and document the gains to be made

Allocate ongoing improvement target plans

Monitoring Performance Level



Benchmarking- a decision making Tool for Utilities



Security of Supply – availability, quality of Supply

Electricity industry is a flow industry

- Lack of cost-effective storage of electrical energy
- Social expectations of uninterrupted energy service

Key measures of 'health' of the flow industry

- (un) availability of supply at the point of end-use:
  - Frequency & duration of Supply outages

Quality of Supply at the end–use

- Voltage and Frequency
- Voltage surges, waveform purity, phase balance

Ever-present threats to availability and quality

Economics

Highly complex economics

- High asset intensity in network and generation
- Long Lived assets
- Challenges establishing value of electricity service
- Costs and value depend on combined/coordinated operation of all supply and demand
- Externalities

Nature & Purpose of Production Costing

Nature of Production costing:

- Simulation of future operation of the existing power system for a specified time period (e.g. 7 to 365 days)

Purpose of production costing:

- Estimating future system operating cost & reliability
- Informing energy constraint management
- Simulating system operation in expansion planning

Key challenges in production costing :

- Specifying supply & demand side uncertainty
- Characterising supply and demand uncertainty
- Simulating operation and characterising performance

Supply & Demand Side Costs & uncertainties

Supply side cost, such as :

- Start up & shut down cost, fixed and variable cost while operating , maintenance cost, network losses.

Demand side cost, such as:

- Cost of un met demand (lost load)

Supply side uncertainties, such as :

- Forced full and partial outages of generator and network
- Generator failure to start

Demand side uncertainty, such as;

- Demand forecast uncertainty (eg weather dependence)

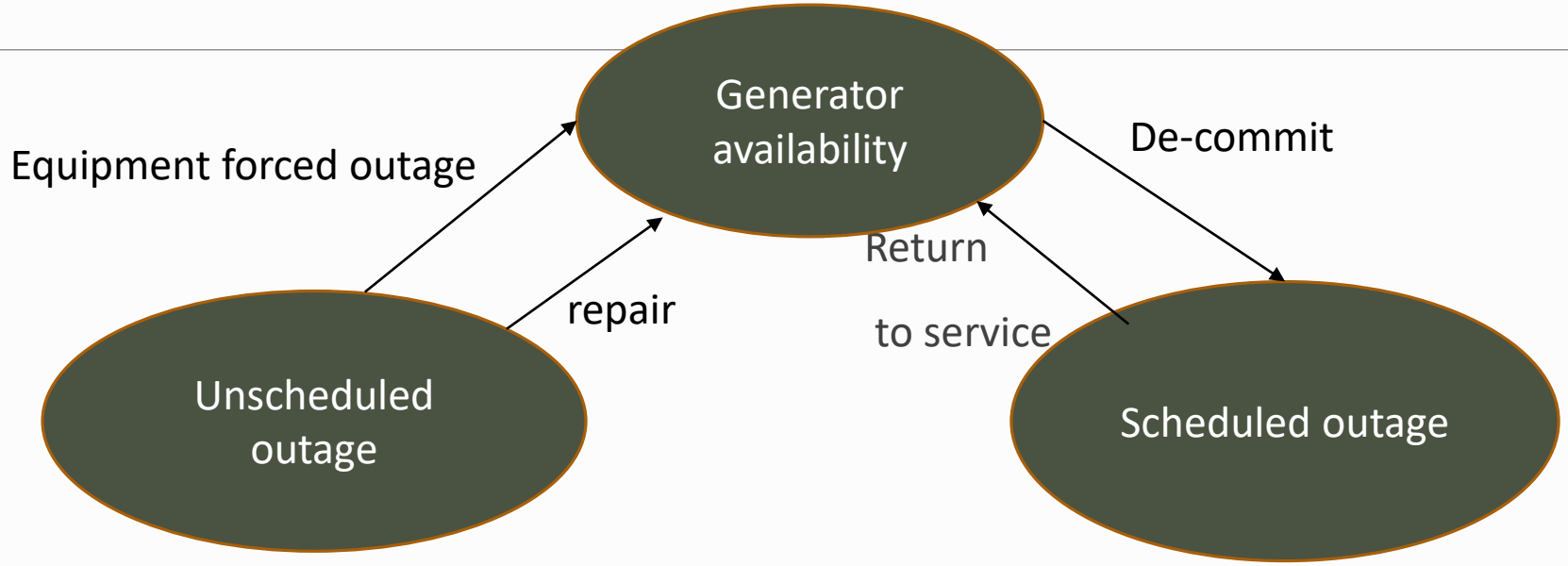
Measure of future power system performance

Reserve plant margin:

- $$\frac{installed\ generator\ capacity - maximum\ demand}{installed\ generator\ capacity}$$

- **Power system reliability:**
  - How often (operating generator capacity) < (demand)
- **Expected unserved energy (EUE):**
  - Demand that would have been met if supply available
- **Expected power system production cost:**
  - Expected total variable operating cost to meet demand

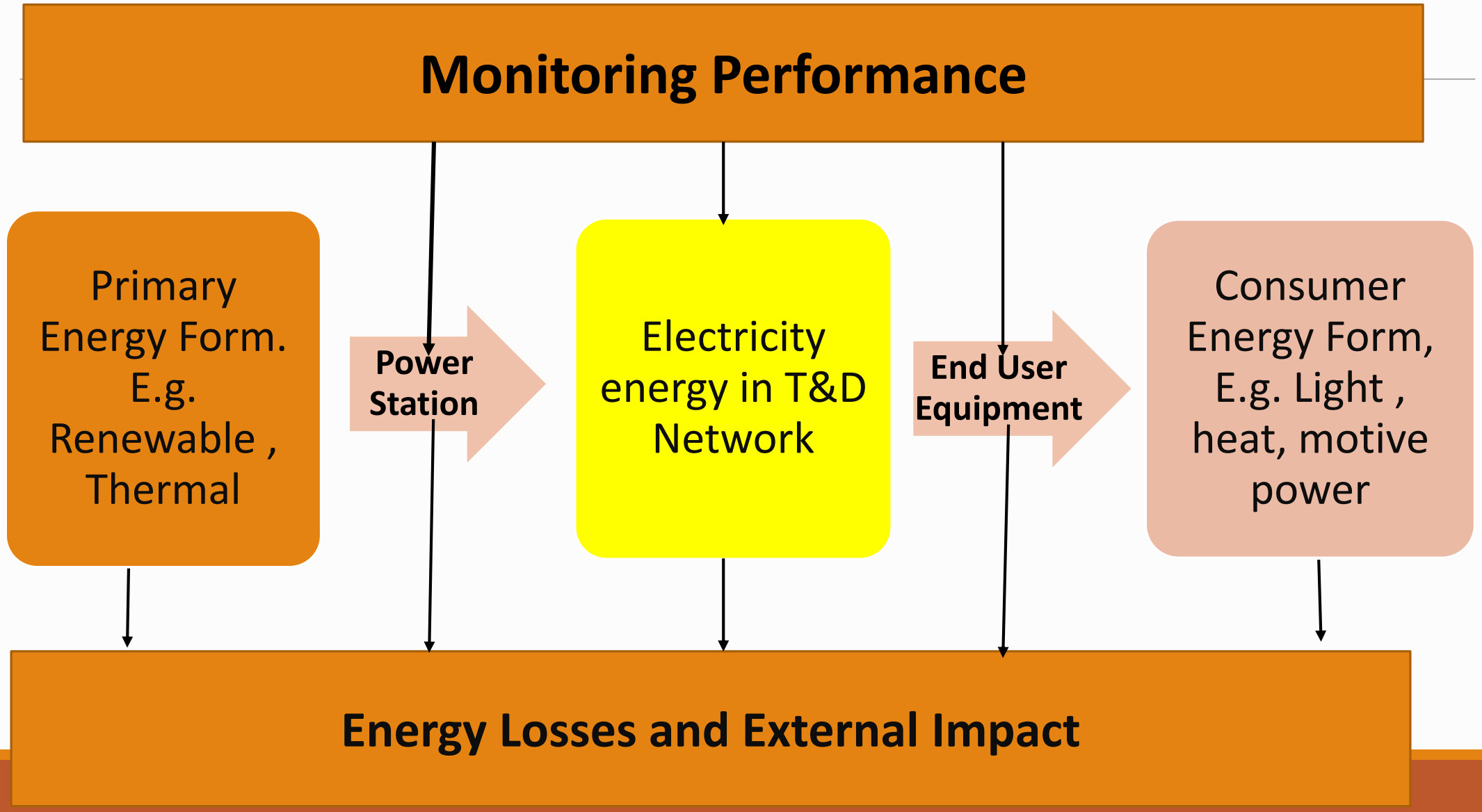
Modelling generator uncertainty



Forced outages rate (q_n): $\frac{\{hours\ of\ unscheduled\ outages\ in\ period\}}{\{total\ hours\ in\ period\}}$

Probability that generator is available : $p_n = 1 - q_n$

Conversion Chain



Current Benchmarking Process

2017: 22 utilities participated in the benchmarking survey

Follow guidelines set in Power Benchmarking Manual

Benchmarking process uses set of questionnaires to evaluate Key Performance Indicators

Results circulated for comment and changes

Print and Distribute annual Benchmarking Report

Allows to use benchmarking results for development of Performance Improvement plan

Manual Benchmarking Process

- Standard Microsoft Excel data collection spreadsheet provide
- Benchmarking Liaison Officers submit Questionnaire
- Data is Collected and Validated
- Provide performance trending for last three years
- Provide summary and recommendation
- Provide benchmarking workshops and training

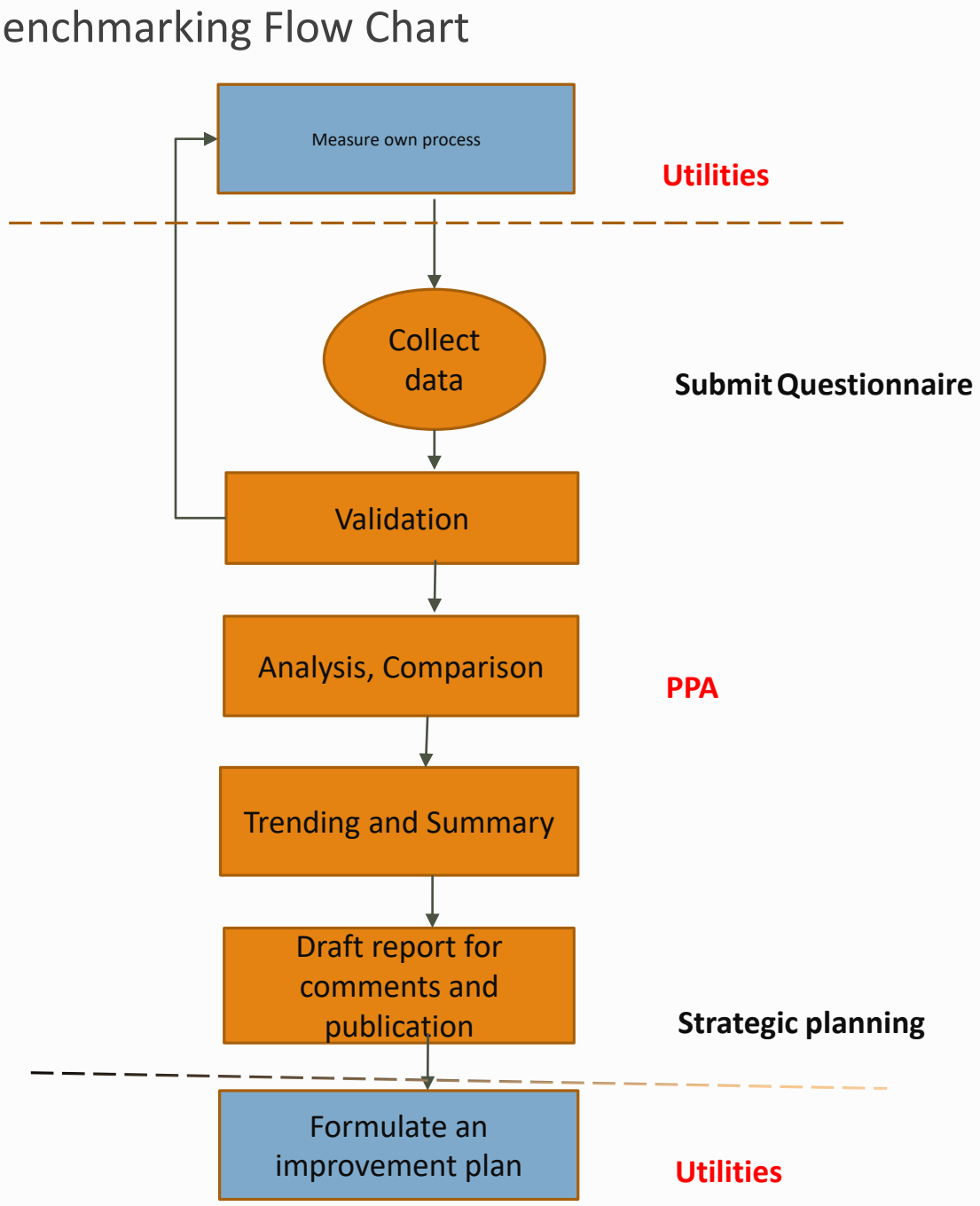


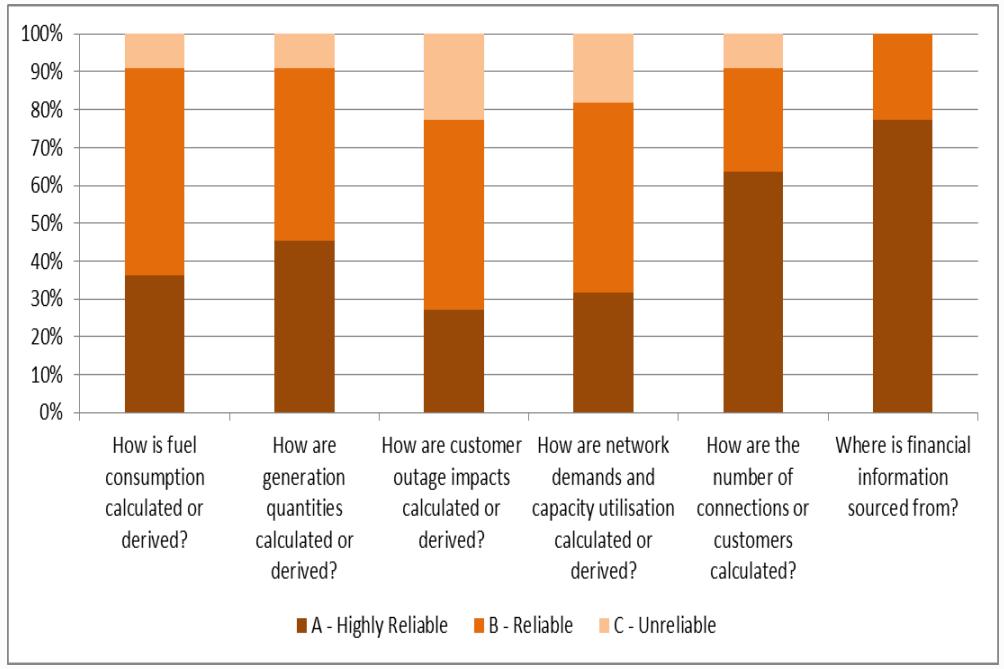
Table G.1: KPIs 2017 (Generation)

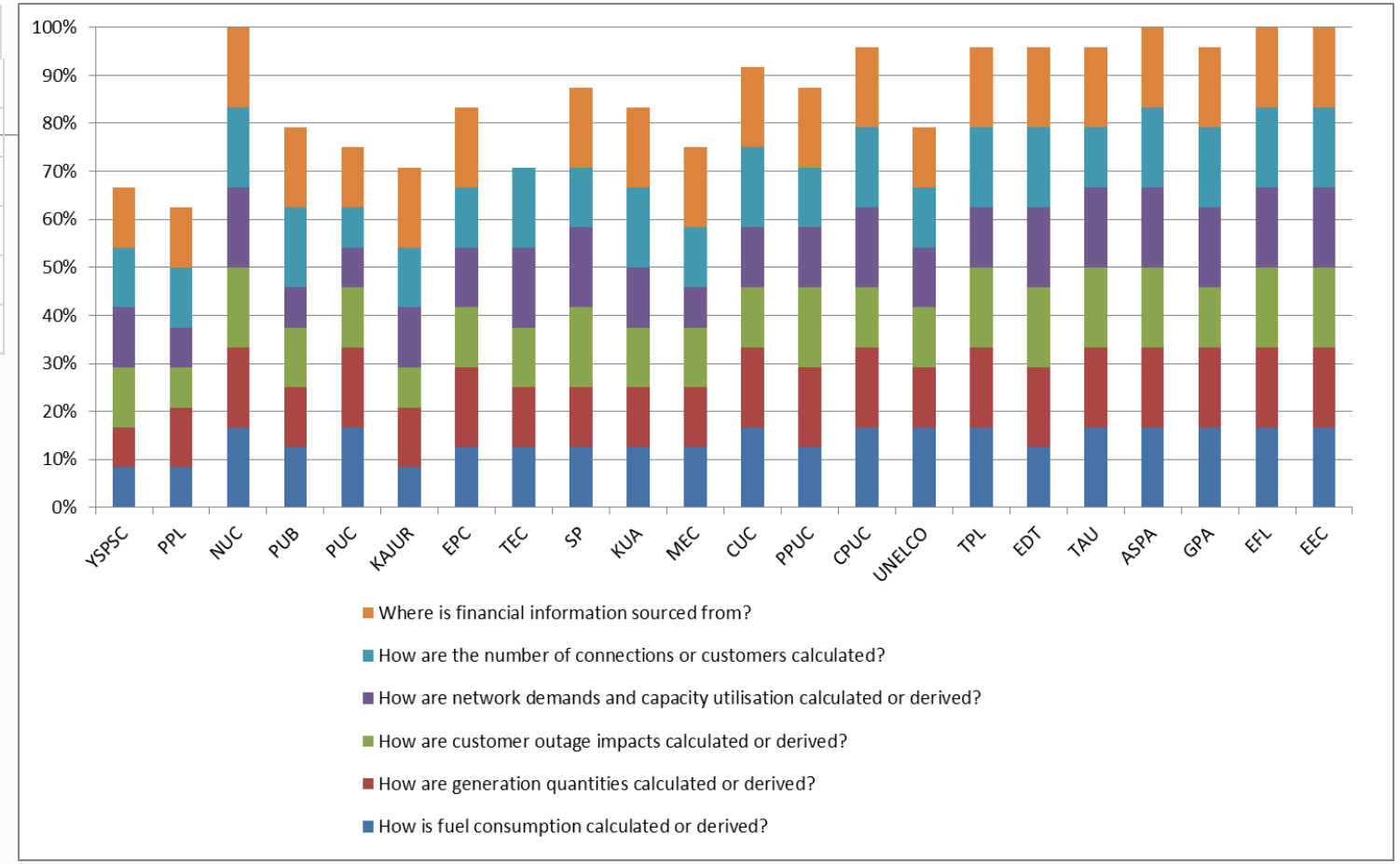
Utility	1	2	3	4	5	6	7	8	9	10	11	12	13
	Load Factor	Capacity Factor	Availability Factor	Generation Labour Productivity	Specific Fuel Oil Consumption (volume)	Specific Fuel Oil Consumption (weight)	Lube Oil Consumption	Forced Outage	Planned Outage	Generation O&M Costs	Power Station Usage	RE to Grid	IPP Energy Generation
	%	%	%	GWh/FTE gen employee	kWh/L	kWh/kg	kWh/L	%	%	US$/MWh	%	%	%
ASPA	72.4	33.3	99.14	1.99	3.79	4.51	771	0.38	0.25	47.48	4.88	2.26	0.00
CPUC	65.8	23.3	99.99	0.98	3.94		1348	0.00	0.01	24.52	0.52	2.04	0.00
CUC	92.48	34.32	93.31	4.19	3.83	3.83	343.05	1.95	4.74	32.98	4.73	1.76	0.01
EDT	62.5	28.3	89.45	4.81	4.35	4.56	694		7.21	57.03	2.85	38.71	2.38
EEC	59.2	25.09	100	15.58	4.90	5.64	1012.50	0.0000	0.0000	20.91	0.50	7.33	91.77
EPC	61.60	29.38	99.989	1.92	4.11	4.94	1997	0.01	0.00	25.53	1.17	33.14	11.20
EFL	67.92	1.17	100.00	7.00	4.43	4.70	1113	0	0	9.70	0.000	52.56	1.23
GPA	77.113	43.677	80.655	6.051	3.556		30935.019	8.045	11.300	25.921	6.054	2.472	38.267
KAJUR	78.675	53.021	98.884	0.362	3.624	3.624	1154.561	0.249	0.867	15.120	3.525	0.000	0.000
KUA	53.225	24.424	99.937	0.821	3.060		967.445	0.063	0.000	59.471	1.108	6.946	0.000
MEC	82.556	23.950	67.144	1.145	3.798	4.51	829.729	29.221	3.635	77.387	6.933	1.249	1.249
NUC	78.583	52.220	100.000		3.487		521.774	0.000	0.000	318.942	0.545	3.348	0.000
PPL	52.681	19.022	99.972	0.647	4.14		3936.993	0.028	0.000	0.000	4.775	41.88	58.119
PPUC	81.026	28.430	87.591	1.355	3.934	4.683	1337.269	7.602	4.807	58.787	3.726	1.321	0.000
PUB	59.745	43.768	100.000	0.756	4.058		3778.714	0.000	0.000	0.000	8.680	6.038	0.00
PUC	70.140	32.432	99.906	0.68	3.387	3.445	265.224	0.031	0.063	17.801	1.517	4.282	10.667
SP	61.167	30.362	100.000	0.999	4.105	#DIV/0!	786.644	0.000	0.000	65.892	4034.296	1.442	0.000
TAU	69.198	24.772	100.000	1.911	3.759		642.143	0.000	0.000	30.769	2.535	16.222	11.607
TEC	43.646	42.337	100.000	0.266	3.777	4.497	1635.482	0.000	0.000	266.121	8.048	18.792	0.000
TPL	69.233	46.722	99.999	1.729	4.149		1140.171	0.001	0.000	30.914	3.825	5.849	0.000
UNELCO	62.507	28.612	98.445	32.355	3.833	4.640	487.583	1.555	0.000	29.233	1.441	8.661	1.625
YSPSC	64.667	11.461	99.320	0.300	3.753		807.175	0.220	0.460	35.096	6.564	2.962	0.000

- Data organization
- Check for correctness
- Compare data, check for irregularities
- Any deviation from expected
- Check for missing data
- Correspond with benchmarking liaison officers to get data checked
- Make correction and analysis

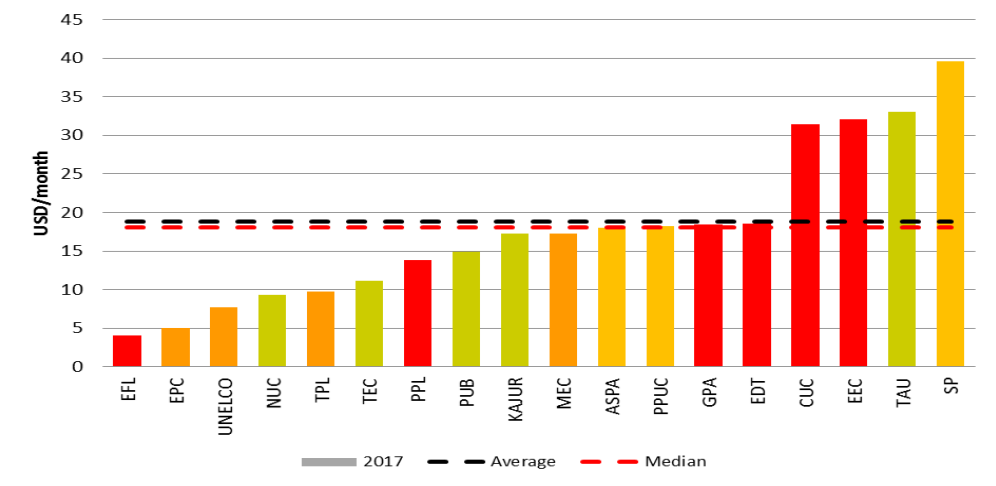
Data Reliability Analysis

2017	DATA RELIABILITY	ASPA	CPUC	CUC
i.	How is fuel consumption calculated or derived?	A	A	A
ii.	How are generation quantities calculated or derived?	A	A	A
iii.	How are customer outage impacts calculated or derived?	A	B	B
iv.	How are network demands and capacity utilisation calculated or derived?	A	A	B
v.	How are the number of connections or customers calculated?	A	A	A
vi.	Where is financial information sourced from?	A	A	A

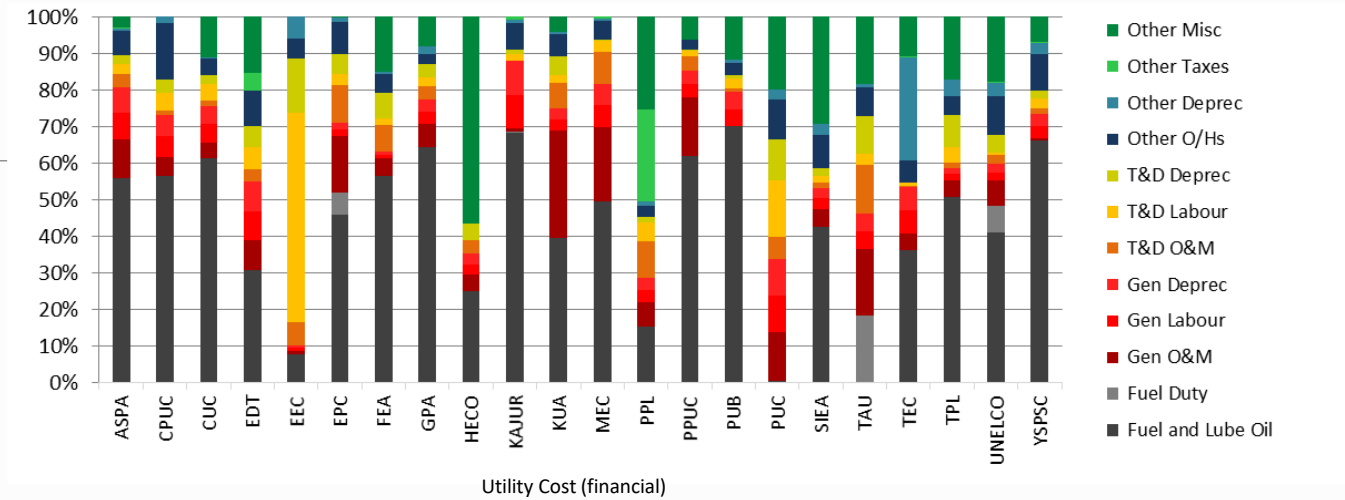




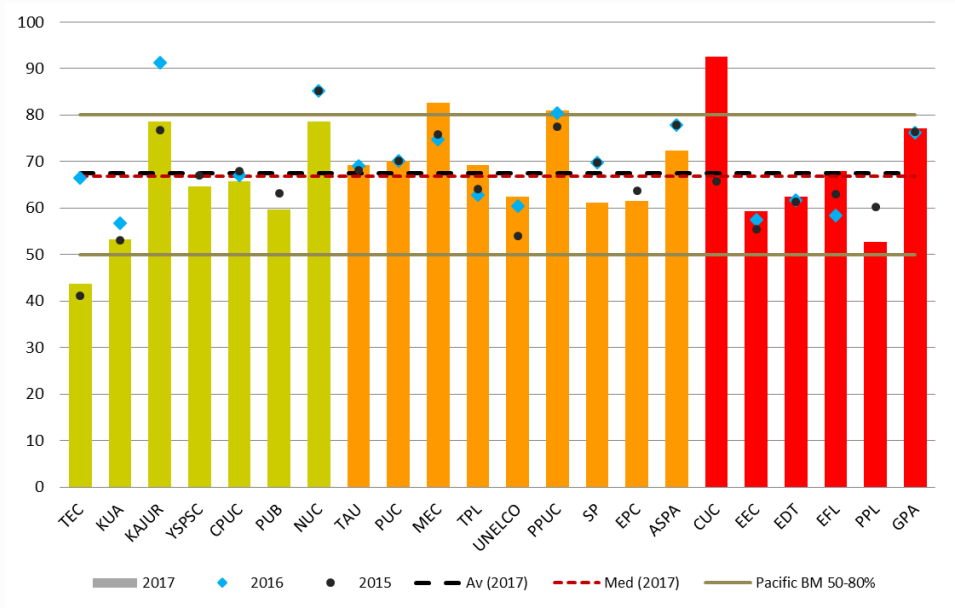
Benchmarking Analysis



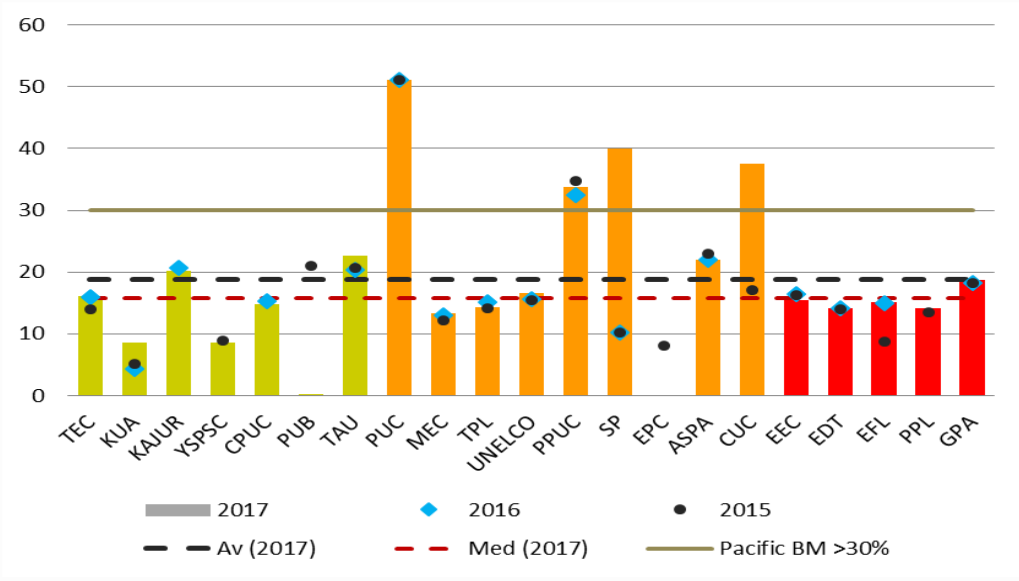
Commercial Tariff (2017)



Utility Cost (financial)



Load Factor (%)



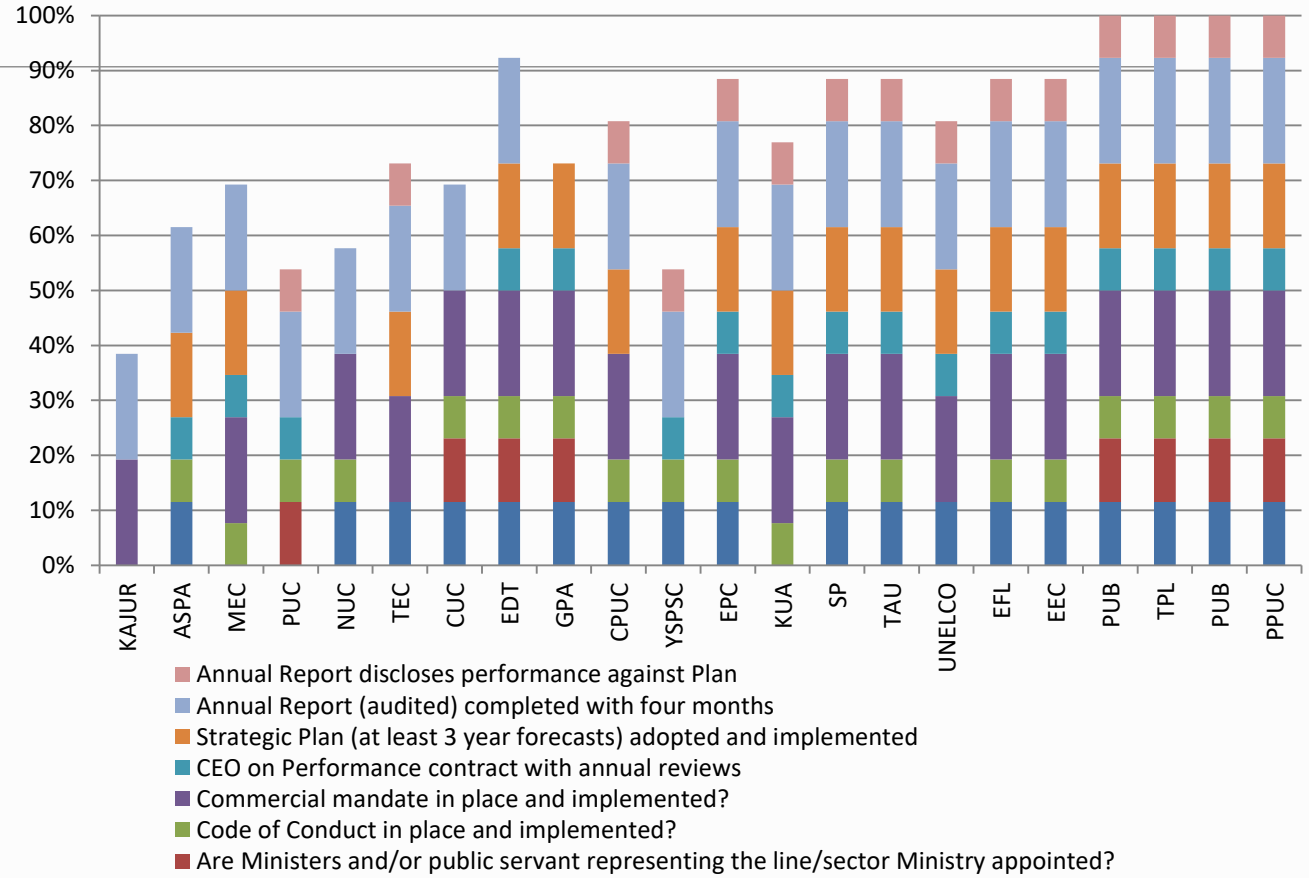
Distribution Transformer Utilization

Gender Analysis

Gender Question		Totals for all Utilities	%	ASPA	CPUC	CUC	EDT
1. Total number of staff in the organisation	*Total number of staff*	*6889*		450	84	402	513
	Total number of male staff	*5663*	*82.2%*	363	76	316	401
	Total number of female staff	*1226*	*17.8%*	87	8	86	112
2. Technical staff in the organisation (Generation, Transmission, Distribution Depts)	*Total number of technical staff*	*3292*		128	43	300	353
	Total number of male technical staff	*3147*	*95.6%*	122	42	290	327
	Total number of female technical staff	*144*	*4.4%*	6	1	10	26
3. Is the CEO/General Manager/first officer in charge male or female? (M/F)				Male	Male	Male	Male
4. Is the second officer in charge of the organisation male or female? (M/F)				Male	Male	Male	Male
5. Senior Staff reporting directly to the CEO	*Total number of senior staff*	*129*		12	2	12	4
	Total number of male senior staff	*97*	*75.2%*	6	2	9	4
	Total number of female senior staff	*32*	*24.8%*	6	0	3	0
6. Number of senior female staff in the organisation, according to role	*Finance*	*34*	*21.4%*	3	1	7	2
	Procurement / Supply	*13*	*8.2%*	1		1	2
	Human Resources	*17*	*10.7%*	1		0	1
	PR/Cust Service/Comms	*44*	*27.7%*	4		1	7
	Admin	*22*	*13.8%*	1	1	1	5
	Other	*29*	*18.2%*			0	5

Governance

Question	Weighting	ASPA	CPUC	CUC	EDT	EEC
1. Are government ministers appointed to the board?	12%		No	Yes	Yes	No
2. If government ministers or other public servants are appointed to the board, do they represent their line and/or sector ministry?	12%		No	Yes	Yes	
3. Does the Board have a conflict of interest policy and a code of conduct that is being fully implemented?	8%		Yes	No	Yes	Yes
4. Is the utility operating within a clearly defined commercial mandate?	19%		Yes	Yes	Yes	Yes
5. Is the CEO of the utility on a performance contract which has annual reviews?	8%		No	Yes	Yes	Yes
6. Does the Board develop a forward looking business plan, with financial, operational and capital expenditure projections that covers a minimum time period of three (3) or more years?	15%		Yes	Yes	Yes	Yes
7. Is an audited annual report completed withn four months of the closure of each financial period?	19%		No	Yes	Yes	Yes
8. Does the annual report disclose the companies performance against the srategic plan?	8%		Yes	Yes	No	Yes



Challenges

Validation is labour intensive and time consuming

In complete questionnaire submitted

Data availability

Incorrect data

Change of Benchmarking Liaison Officer

Difficult to generate special report for individual utilities

Looking Forward

Benchmarking not to be seen as the finish line, but as a way to empower your staff to look for breakthroughs and opportunities for continuous improvement.

Thank you

Q&A