



# Technical Assistance for Improvement of Performance-Based Tariff Regulation of EMRA For Turkish Energy Markets Through Introducing an Enhanced Monitoring System



This project is funded by the European Union

## Data Harmonization and Standardization

12 December 2019, Wyndham Hotel, Ankara





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# Data Harmonization and Standardization

- Analytics and Reporting
- Data Requirements
- Data Risk Assessment
- Data Assurance Activities





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## Data Harmonization and Standardization

- Princeton Center for Data, Analytics and Reporting\*:
  - Data model
    - Organizes data elements
    - Standardizes how the data elements relate to one another,

\*<https://cedar.princeton.edu/understanding-data/what-data-model>





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# Data Harmonization and Standardization

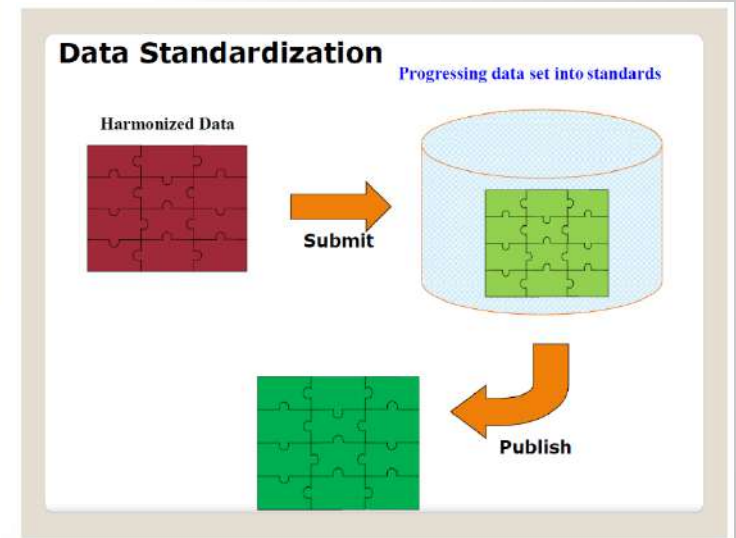
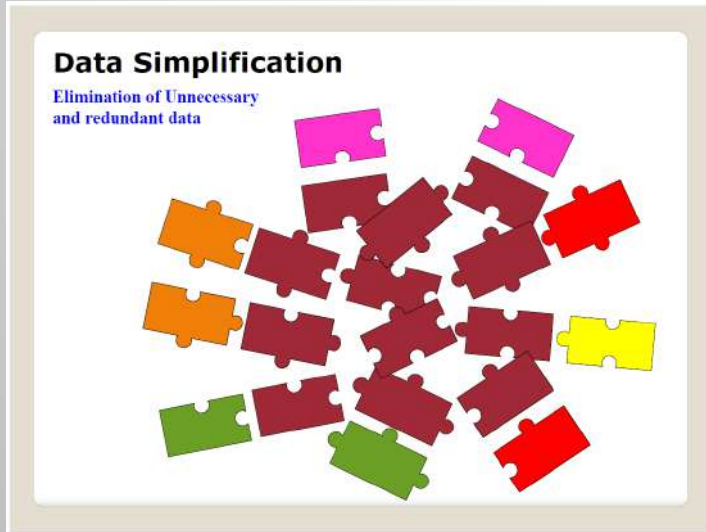
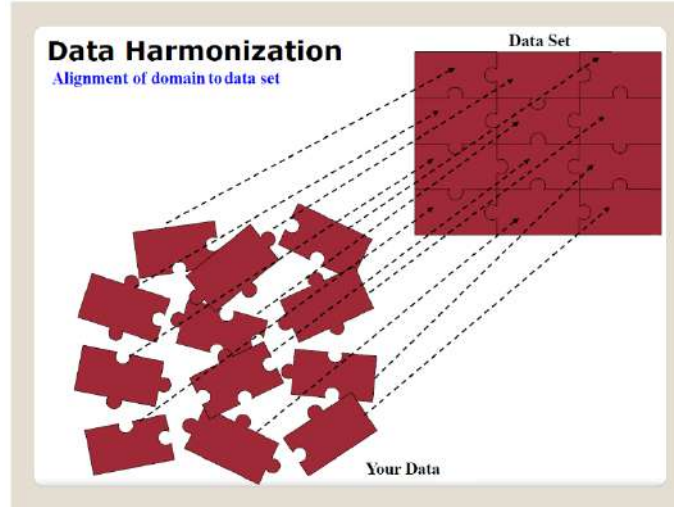
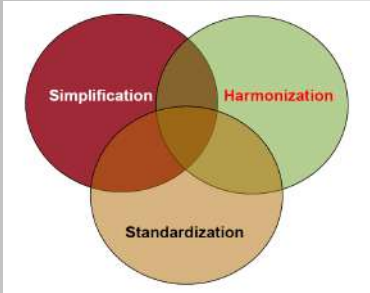


Figure: Data Simplification, Harmonization and Standardization

From: *Introduction to Data Harmonization and Modelling*





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# Data Harmonization and Standardization

- Data Harmonization and Standardization
  - Data Quality Approach
  - Improve the governance and usefulness of data across the corporation
  - Creates “Harmony” between disparate data sources;
    - by clearing away any misleading, inaccurate or inconsistent items,
    - to create a complete, cohesive picture.
- Disparate data sources:
  - Platforms where data is collected: wide-ranging and changing,
  - Data in varying formats from sensors, online, and traditional databases,
  - Different types of unstructured data,
  - Different technology or even terminology, even when referring to the same concepts
- Data harmonization:
  - Brings together data of varying file formats, naming conventions, and columns, and transforms it into one cohesive data set.
- Data Standardization:
  - Oracle: “The purpose of data standardization is to make your data consistent and clear. Consistent is ensuring that the output is reliable so that related data can be identified using common terminology and format. Clear is to ensure that the data can be easily understood by those who are not involved with the data maintenance process.”.





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## Data Harmonization and Standardization

- Define corporational goals and objectives.
- Establish harmonization and research protocols.
- Required: An equipped architecture for the IT systems and elements.
- Data integration and harmonization process:
  - Identify different data elements and variables
  - Cleans, sort, aggregate, organize and process
  - Create a data store which supports ongoing decision-making, including financial information and performance.
- Not static; periodic or real time updates can be implemented.
- Every part of the corporation can access the same up-to-date data.
  - It can be filtered and presented to suit each department's needs.





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## Data Harmonization and Standardization

- For EMRA the following alternatives can be presented:
  1. Maintaining the status quo.
    - In the current system data is received through EBIS, which uses standard templates which actually satisfies harmonization and standardization across companies. Also, bulk and granular data are transferring from all distribution companies' IT/OT systems.
    - The validation of relevant data can be provided via Ad-hoc direct system access to all IT/OT systems of the companies and manual controls.
  2. Improvement of data validation process.
    - Again, data can be received from the same approach.
    - However, some basic quality control and quality assurance rules can be defined, and these pre-defined rules can be applied automatically. The occurrences where these rules are violated are flagged automatically can be managed through deeper analysis.





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## Data Harmonization and Standardization

### 3. Advanced regulatory analytics and reporting automation.

- In this approach, some KPI's can be defined and these pre-defined KPI's are used to receive the data, in addition to some relevant reports which can be gathered through standard templates.
- Pre-defined advanced quality control and quality assurance rules can be applied to satisfy automated validation. Again, the occurrences where these rules are violated are flagged automatically can be managed through deeper analysis, not the bulk data.
- Differently, in this approach the raw data are not audited, only the analytics processes should be audited.

### 4. Long -term CIM vision.

- Distribution companies can be enforced to apply CIM compatible data exchange definitions in the following 10 years period.
- Our recommendation is to use alternative 3 approach for the short and mid-term. For long term, moving towards alternative 4.





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# Data Requirements

## • WACC-Tail Implementation:

- Required Data: Network value older than economic life (i.e. 30 years)
- This value should be obtained to apply WACC-tail. Certain percentage of the asset value shall be added to the RAB, to encourage DSOs to maintain through overhaul and repair the grid rather than replacement. Sample table will be as follows:

Network Asset Category	Age Group 1	Age Group 2	Age Group 3	Age Group 4	Age Group 5
Transformers by power					
Poles by types					
(Unit Price Breakdown) ...					

These data can be required in the table “Distribution Region Data”.

For example, as a QC&QA rule, the total of these assets should be equal to the data gathered in “Distribution Region Data” table. Also, some upper and lower limits can be defined for each network assets.





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## Data Requirements

### • Network Asset Replacement Costs Realization:

- Required Data: Replaced network assets by category

Network Asset Category	Piece/Length
Transformers by power	
Poles by types	
(Unit Price Breakdown) ...	

These data can be gathered in a similar table to “Information on Previous Year's Investments” (Ek-6)

For example, as a QC&QA rule, the total of assets replaced cannot be bigger than whole assets of the company. Also, these replacements cannot be bigger than pre-defined cap by the maintenance model.





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## Data Requirements

- **Realizations of budgets included as TOTEX:**

- Required Data: Budget realization of items included in TOTEX, such as IT/OT hardware and software, vehicle, acquisition of new buildings.

❖ DSOs provide Capitalization Rates: Fast Money and Slow Money Ratio Proposals.





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# Data Requirements

## • Refurbishment Cost Estimation:

- Required Data: Age and condition of the network assets
- Since the refurbishment requirement will be higher for older assets and it changes based on the current age of the network, this data should be taken to estimate the refurbishment costs. To estimate the cost, firstly a network assessment methodology should be prepared.
- Health Index of an equipment is calculated by the economical life, current age and situation,
- Criticality Group is the importance of the asset for supply continuity indicators,

Network Assets (i.e. Transformer, Poles)	Health Index Group 1	Health Index Group 2	Health Index Group 3	Health Index Group 4	Health Index Group 5
Criticality Group 1					
Criticality Group 2					
Criticality Group 3					
Criticality Group 4					





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# Data Requirements

## • Supply Continuity:

- ASIDI, ASIFI (average interruption time weighted by the rated power) and improvement for worst served customers might also be added as indicators. For this purpose, data requirement is as follows:

Outage Cases	(Current required data)	Disconnected Power (kW)
...	...	...

Outage Cases	SAIDI for worst served 5% Customer	SAIFI for worst served 5% Customer
...	...	...

Worst Days	Date	Reason/Effect
...	...	...

For example, as a QC&QA rule, the consistency between the previous years' reported statistics can be checked. Also, uniform national data can provide more reliable measurements.

These data can be gathered in Quality Indicators (Tablo-5).





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# Data Requirements

## • Supply Continuity:

- Instead of applying penalties for each case, there should be performance indicator for general lighting. Total reward/penalty of the DSO should be added/subtracted to/from its revenue cap.

Criticality Cases	Causes	Total Number of Outages	Number of Repairs within Time Limits
Low Criticality	i.e. single lamp in a line	...	...
Medium Criticality	i.e. several lamps in a line	...	...
High Criticality	i.e. feeder failure	...	...





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# Data Requirements

## • Customer Satisfaction Surveys:

By applying these surveys, customer satisfactions, complaints can be analyzed. Also, by adding some questions to measure customers' willingness to accept and willingness to pay in order to calculate value of loss load:

### Customer Survey Data

Satisfaction with the core service package	New connection, Response to failures, etc.
Satisfaction with the quality of customers' contact	Ease of reachability by the customer and getting satisfiable responses
Satisfaction with the communication of the DSO	Providing information to customers via various communication channels (like planned outages, etc.)





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# Data Requirements

## • Connection Fee:

- Regionally differentiated connection tariffs is recommended. Each DSO might prepare their own connection fees proposal and submit to EMRA for approval.

Line Length	Workmanship Costs	Material Costs





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# Data Requirements

- **Annual Action Plans:** Annual action plans and related CAPEX requirements are recommended to be used for ex-post evaluation. If the stated targets are not achieved, some portion of the used CAPEX may not be accepted in RAB calculations.
- By this way, relation between cost and benefit may be established more effectively.

Action Plan	Purpose	CAPEX Requirement	OPEX Requirement	Target Benefit	Cost / Benefit Analysis





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# Data Requirements

## • Network Tariffs (Peak Load):

- Peak-load charges may be introduced for small and large industrial customers.

	Commercial	Industry
Number of customers who have peak load less than 25% of the connection capacity		
Number of customers who have peak load between 25%-50% of the connection capacity		
Number of customers who have peak load more than 75% of connection capacity		





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# Data Requirements

- **Network Tariffs (Time of Use for Network Tariffs):**

Hours	Residential	Commercial	Industry	Lighting	Agricultural Irrigation





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# Data Risk Assessment Process

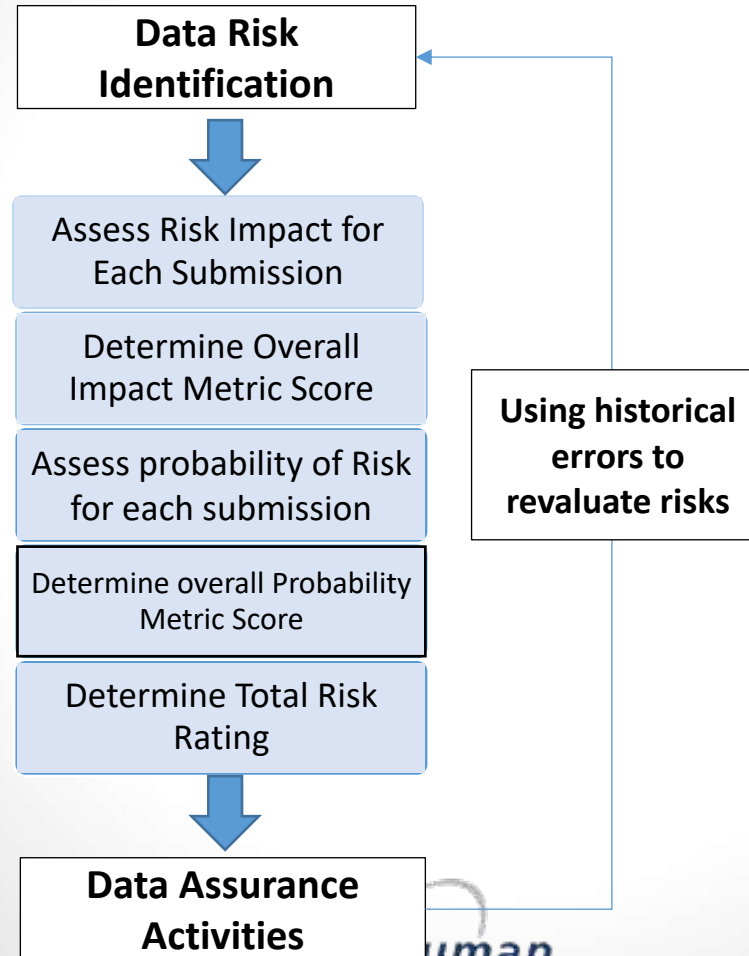




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# Risk Assessment Process





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# Risk Assessment Matrix

Impact Level \ Probability of Occurrence	Low	Medium	High
Low			
Medium			
High			





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# Risk Impact Metric





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# Impact Assessment Table

	Customers	Competition	Financial	Comparative efficiency
1	Has no or negligible service impact on all customers, other network operators, service providers, or shippers.	Negligible or no impact on the ability of third parties to compete in the market place.	No or negligible potential for financial impact on the level of incentives receivable from the Regulator as a result of an Error.	No or negligible comparative efficiency analysis impact from an Error.
2	Creates a breach that has a moderate service impact on any customers, other network operators, service providers, or shippers (and does not score 3 or 4) or Creates a moderate but low profile level of customer complaints, either directly or indirectly.	Low impact on the ability of third parties to compete in the market place.	An Error or omission that could potentially give rise to a low financial impact (assessed against a financial value equivalent to $<\pm 1\%$ Licensee's annual opex)	Comparative efficiency analysis impact from an Error of less than 1% of Licensee's annual opex.
3	Creates a breach in licence conditions that has a moderate impact on a large number of customers, other network operators, service providers, or shippers or Creates a breach that has a major impact on a small number customers, other network operators, service providers, or shippers or Creates a moderate but high profile number of legitimate customer complaints or dissatisfaction, either directly or indirectly	Moderate impact on the ability of third parties to compete in the market place.	An Error or omission that could potentially give rise to a significant financial impact (assessed against a financial value equivalent to $\geq \pm 1\%$ Licensee's annual opex but $\leq \pm 5\%$ )	Comparative efficiency analysis impact from an Error of $\geq 1\%$ and $\leq 5\%$ of Licensee's annual opex.
4	Creates a breach in licence conditions that has a major impact on a large number of customers, other network operators, service providers, or shippers <sup>11</sup> or Creates a significant number of legitimate customer complaints either directly or indirectly.	High impact on the ability of third parties to compete in the market place.	An Error or omission that could potentially give rise to a major financial impact (assessed against a financial value equivalent to $> \pm 5\%$ of Licensee's annual opex)	Comparative efficiency analysis impact from an Error $> 5\%$ of Licensee's annual opex.



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# Inherent Probability Assessment Table

11. Complexity of Data sources	12. Completeness of Data set	13. Extent of manual intervention	14. Complexity & maturity of reporting rules
<p><b>2</b> Single Data system used to populate submission.</p>	<p>Complete Data set routinely captured to populate this report for 2 years or more</p>	<p>Data collation and reporting are fully automated</p>	<p>The rule set is complete; the rules require no interpretation, judgement or assumptions; the rules have been in place for more than 12 months.</p>
<p><b>3</b> One numerical and one financial Data system used to populate submission.</p>	<p>Data routinely captured by DNO to populate this report but for less than 2 years or some elements of reporting based on extrapolation of sample Data rather than full Data set.</p>	<p>More than 0% but less than 60% of the Data is manually collated and reported.</p>	<p>The rule set is complete and has not changed for at least months but the rules require some interpretation, judgement or assumptions.</p>
<p><b>4</b> Two numerical systems or two financial systems or more than two Data systems used to populate submission.</p>	<p>Data not routinely captured by Licensee to populate this report. Reporting for a significant number of elements of the submission is based on extrapolation of sample Data rather than full Data set.</p>	<p>More than 60% of the Data is manually collated and reported.</p>	<p>The rule set is incomplete or the rules require significant interpretation, judgement or assumptions or the first issue of rules have been completed within the last 12 months.</p>



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# Control Framework Assessment Table

	<b>C1. Control Activities</b>	<b>C2. Experience of personnel</b>	<b>C3. Evidence of historical Errors with this Data</b>
<b>0</b>	<p>There are inadequate validation / preventative controls</p> <p>or</p> <p>controls have been in place for less than 12 months</p> <p>or</p> <p>systems and processes not documented and control points not assessed (ie any such material lacks substantial coverage)</p> <p>or</p> <p>Regulatory submissions not subject to effective review or supervision processes.</p>	<p>This submission being collated by employees with no prior experience of doing so</p> <p>and</p> <p>no method statement available to explain prior year approach to completing this report.</p>	<p>Material Errors identified for this report, or table level as appropriate, within the last two years; and the issues identified have not been eliminated</p> <p>or</p> <p>no audit undertaken on this submission in the last five years.</p>
<b>1</b>	<p>There are adequate validation / preventative controls</p> <p>And controls have been in place for more than 12 months but less than 2 years</p> <p>And systems and processes substantially documented and control points assessed</p> <p>And regulatory submissions subject to effective review or supervision processes.</p>	<p>This submission being collated by employees with no prior experience of completing this submission but using method statements for prior submissions to support them</p> <p>or</p> <p>this submission being collated by employees with prior experience of completing this submission – with no method statements for prior years available.</p>	<p>Material Errors for this submission have been identified within the last two years for which all issues have been remediated but not yet validated</p> <p>or</p> <p>no audits undertaken on this Data within the last two years, but audit has been undertaken within the last five years.</p>
<b>2</b>	<p>There are extensive validation / preventative controls.</p> <p>And controls have been in place for more than two years</p> <p>And systems and processes fully documented and control points fully evaluated and assessed</p> <p>And regulatory submissions subject to comprehensive and effective review and supervision processes.</p>	<p>This submission being collated by employees with prior experience of completing this submission – with method statements for prior years in place</p>	<p>Audit has been undertaken on this submission within the last two years and no Material Errors were identified</p> <p>And either</p> <p>there were no previously identified Errors in submissions.</p> <p>Or Audit confirmed that any previously identified issues have been properly addressed.</p>



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# Control Framework Assessment Table

Impact Metric Score	4	M	H	C	C
	3	M	M	H	C
	2	L	M	M	H
	1	L	L	L	L
		1	2	3	4
		Probability Metric Score			





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# Data Assurance Activities





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## Data Assurance Activities

**Data assurance activities are:**

- **Planning**
- **Review**
- **Sign-Off**





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## Data Assurance Activities

### Planning

Methodology Statement and Submission Plan should be prepared for the submitted forms. This plan explains the process of producing the submission and include the details of systems, responsibilities, timings, sign-off and additional methodologies to complete any calculations required.





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# Data Assurance Activities

## Review

- **Second Person Review**

All submissions are checked by a person other than the person who prepared the submission/tables. Second person is not necessarily be the chief or manager of the first person. Any person with reasonable understanding of the requirements is sufficient.

The role of the second person is to check whether the methodology is obeyed, confirming the accuracy of the data through checking inputs.

- **Internal Expert Review**

A regulatory specialist or someone who understands the return in detail (and may have been directly involved in its preparation) does the check. The role of this expert is to check whether the submission is compatible with any guidance of the regulator and ensure that the control activities have been performed and unusual data is resolved.

- **Internal Data Audit**

This check is performed by an Independent Internal Assurance Provider, e.g. a Group Internal Audit Function or Assurance Function (or equivalent) or a subject matter expert not directly involved in the return. This control ensures for providing the evidence of verification of data. Data verification is done by sampling approach and confidence level is determined through sample testing.





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# Data Assurance Activities

## Review

- **Internal Submission Process Audit**

This check is performed by an Independent Internal Assurance Provider, e.g. a Group Internal Audit Function or Assurance Function (or equivalent). These auditors are not responsible from the accuracy of the data but the control of the process to produce the submission. They review the adequacy and effectiveness of the internal control systems to ensure returns are timely, complete and accurate.

- **External Data Audit**

This audit is useful where specialist knowledge required and essential for financial accounts. Audit carried out by a third party outside the company or group. Independent registered audit organisations or independent experts with or without formal audit qualifications, may be assigned. This control ensures for providing the evidence of verification of data. Data verification is done by sampling approach and confidence level is determined through sample testing.

- **External Submission Process Audit**

Audit carried out by a third party outside the company or group. Independent registered audit organisations or independent experts with or without formal audit qualifications, where appropriate. These auditors are not responsible from the accuracy of the data but the control of the process to produce the submission. They review the adequacy and effectiveness of the internal control systems to ensure returns are timely, complete and accurate.





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# Data Assurance Activities

## Sign-Off

	When applies	Who is responsible	What: content/coverage
<b>Senior Manager Sign-off</b>	All submissions	Accountable senior manager.	<p>This review must be done in line with the minimum review criteria as established by each Licensee.</p> <p>Detailed review of table and the narrative.</p> <p>Complete and sign a record of evidence attesting to confidence in the accuracy of the submission.</p>
<b>Director Sign-off</b>	As identified through Risk Assessment.	A Director of a business function for example Director of Operations or Financial Director.	<p>Must complete a final review prior to submission to Ofgem.</p> <p>This review must be done in line with the minimum review criteria as established by each Licensee and include a challenge of the Senior Manager Sign-off.</p> <p>Must complete and sign a record of evidence attesting to accuracy of the submission.</p> <p>Drives an overall confidence assessment for the submission.</p>
<b>CEO Sign-off</b>	As identified through Risk Assessment.	Chief Executive Officer	<p>High-level oversight.</p> <p>Final layer of challenge to adequacy of submission in terms of completeness and accuracy.</p> <p>Must complete and sign a record of evidence attesting to accuracy of the submission.</p>
<b>Board Sign-off</b>	As identified through Risk Assessment.	Licensee Board	<p>High-level oversight.</p> <p>Board reviews summary of submission and assurance activities followed, as presented by a relevant Director.</p> <p>Detailed review of tables and assurance processes formally delegated to Director who approves with delegated authority on behalf of the Board.</p> <p>Approval of submission must be minuted to enable completion of a record of evidence attesting to accuracy, to be delegated to the CEO or other director identified by the board.</p>





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# Technical Assistance for Improvement of Performance-Based Tariff Regulation of EMRA For Turkish Energy Markets Through Introducing an Enhanced Monitoring System



## THANK YOU / Teşekkürler

12 December 2019, Wyndham Hotel, Ankara

