



FINAL REPORT



Up-Gradation of Present Data Reporting System of Designated Consumers



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Background: Up-Gradation of Present Data Reporting System of Designated Consumers



1. Introduction

Energy Conservation (EC) Act, 2001 and EC Amendment Act, 2010, promote the efficient use of energy and its conservation. EC Act identified 15 sectors as energy intensive industries. Plants having energy consumption greater than a specified threshold are called Designated Consumers (DC). According to the section 14 (k) of EC Act each DC needs to submit its Annual Energy Return to Bureau of Energy Efficiency (BEE) and to the State Designated Agencies (SDA) every year in the data reporting formats as given in EC Act (Form 1). The format is common for all the sectors and captures macro level energy consumption information. Of the 15 energy intensive sectors, 8 have been covered in the first cycle of PAT.

In the present assignment, ICF has

- A. Developed the Draft Energy Data Reporting Formats for eight sectors and their sub-sectors:** Based on extensive research, review of selected baseline energy audit reports, discussions with industry experts, and discussion with Shakti Foundation, the data reporting formats are developed to capture various feasible energy input sources and their flow into the major processes. Process diagrams depicting the distribution of energy sources within the different processes of plant boundary are prepared. The total energy input in the plant boundary in the form of fuel, electricity and steam has been mapped and the various products coming out of the plant boundary have also been identified. Within the plant boundary several sub-processes have been identified and the energy flow to these sub-processes has been mapped.
- B. Prepared System Requirement for Energy Data Reporting System:** A System Requirement document has been prepared to describe the broad system architecture and requirements of the proposed energy data reporting system that are necessary for easy and convenient filing by the DC and provide greater analytic capability to BEE.

2. Approach

The approach adopted doing this assignment is illustrated as below:

Review of Existing Data Reporting System and related documents

- Existing Energy Reporting System given in Energy Conservation Act, 2001
- Review of PAT Consultation Document
- Study of the Baseline Audit Reports for all the eight sectors covered under PAT

Discussions with Industry Experts and Other Consultants working on Projects related to PAT

- Inputs were taken from various industry experts for sectoral insights
- Inputs were taken to develop sub-sector specific process-wise data reporting formats
- Discussions with Dalkia were held to identify common areas of study between the requirements of M&V project of Dalkia and Developing Data reporting formats project of ICF
- Identification of Major Processes within sub-sectors

Identification of sub-sectors based on the criteria used in PAT

- Process (Cement)
- Raw Materials (Pulp & Paper)
- Operation (Textile, Iron & Steel)
- Products (Aluminium)
- Fuel (Power)
- Technology (Chlor Alkali)
- Feedstock (Fertilizer)

Development of Energy Reporting Formats for each sub-sector within 8 Sectors. The formats capture:

- General Information of plant
- Production and Capacity Utilization Details
- Energy Consumption Details
 - Total Fuel Consumption in Plant Boundary
 - Total Electricity consumption in Plant Boundary
 - Process-wise Energy Consumption
- Measures for Upgration/Changes in Plant Boundary

Preparing Specification for System Requirements

- Architecture of energy data reporting system
- System requirements for easy and convenient filing by the user
- System requirements for providing greater analytic capability to BEE

3. Features of the New Data Reporting Formats

The Data Reporting Formats prepared under the project “Up-Gradation of Present Data Reporting System of Designated Consumers” have the following features:

1. The new formats will capture the process-wise energy (solid fuel, liquid fuel, gaseous fuel, steam and electricity) consumption information. Form 1 did not capture the energy consumption information on the gate-to-gate basis and the data for process-wise energy consumption was not captured in that form. The new formats will also capture the solid/liquid/gas waste or effluent generated in a process of the plant and consumed as fuel within the plant in any other processes.
2. The new formats intend to capture multiple products coming out of the plant boundary, broadening the earlier approach of capturing only the main product information. For e.g. in the Aluminium Sector in addition to the product Aluminium, two more products have been identified that are Alumina and Scrap. In this way, the DCs will be required to furnish information on all the products being transported or sold out of the plant.
3. Data on the raw materials used in the plant will be captured in the new formats. This will help in mapping the energy consumption of different plants on the basis of the raw material being used in the plant boundary.
4. In Form 1 of EC Act the actual production data was to be filled by the DCs. In the new format, the sales data is to be filled along with the opening and closing stock. This is done because the sales data is easily verifiable in comparison to the actual production data. Using the sales data and inventory information, it is easy to calculate actual production.
5. While capturing the fuel consumption details of DCs, the suggested formats captures the data on the total annual fuel purchase, and opening and closing inventory of fuel for that year. Earlier the inventory information was not captured in Form 1. This is done to correctly establish annual fuel consumption corresponding to the annual production.
6. Steam purchased and sold by the DCs to be used as fuel has been incorporated into the fuel sources.
7. Energy from electricity sources has been further elaborated into following:
 - a. Electricity purchased from and sold to grid/ open access/ third party/ exchange
 - b. Self generated electricity from various sources viz. through diesel generating sets, steam turbine/ generator, gas turbine, co-generation or through renewable sources.
 - c. Electricity purchased from and sold to CPP of sister plant
8. Flow of steam within various processes of the plant will be reflected through the new data reporting formats as these formats capture the data for steam going into and coming out of a process.
9. The new data reporting formats are designed to gather information on any major change that has happened in the plant recently. These formats will capture the changes for the following categories
 - a. Change in technology
 - b. Change in Operations
 - c. Change of Fuel
 - d. Change of Raw Material
 - e. Change of Feedstock
 - f. Energy Efficiency measures

10. The data reporting formats have been developed and submitted for 8 sectors and their 16 sub-sectors as shown in the following table:

S. No.	Sector	Sub-Sector
1	Thermal Power Plant	Coal
2		Gas
3	Cement	Dry/ Wet
4	Fertilizer	Natural Gas/ Naphtha
5	Iron & Steel	Integrated
6		Sponge Iron
7	Aluminium	Refinery
8		Smelter
9		Integrated
10	Pulp & Paper	Pulp
11		Paper
12		Pulp & Paper
13	Textile	Spinning
14		Processing
15		Composite
16	Chlor-Alkali	Membrane Cell/ Mercury

Annexure I: Energy Data Reporting Formats: Structure, Details and Instructions to Fill

1. Purpose of Format

The purpose of the energy data reporting format is to submit Annual Energy Return by a Designated Consumer (DC) to Bureau of Energy Efficiency (BEE) as per the EC Act. These formats will help BEE to determine the profile of energy use by a DC by providing breakup of different types of energy sources used, total quantity of energy used and vis-a-vis production. The format also requires breakup of total energy usage in different processes, based on which the necessary information to calculate overall plant energy intensity or SEC is obtained.

These formats are an extension of BEE's existing 'Form 1' which industries have been using till date to submit annual energy return to BEE. The proposed format will also assist industries to identify energy efficiency opportunities and focus on reducing overall Specific Energy Consumption (SEC).

2. Instructions for Data Entry

1. It is recommended that the data format be filled out by appropriate personnel such as an Energy Manager.
2. Provide data for *One* DC only. If there is more than one facility under the same management, then a separate form for each facility will need to be filled.
3. The form collects data on energy purchased and consumed during a financial year (12 consecutive months beginning from April up till March). All reported quantities should be annual figures for the financial year.
4. Many of the cells have dropdown menus to specify a finite number of answers. Please select one of the entries to answer the question.
5. It is mandatory to fill entries for the highlighted processes (section 3.3)

3. Structure of the Format

The Data Reporting format for each sub-sector has been divided into four sections:

Section 1: General Information of Plant:

In this section, a DC has to provide general information about their facility such as location, the sector and the sub-sector which the DC represents and the main product from the plant.

Section 1	
1.1	Name of Plant/ Unit
1.2	Location
1.3	Year of Establishment
1.4	Year of Filing Energy Return
1.5	Sector
1.6	Sub-Sector
1.7	Main Product

Section 2: Raw Material Input and Production Output:

This section is divided into two sub-sections given as follows:

Sub-Section 2.1: Raw Material Input Details: This sub-section takes the inputs regarding the raw materials used in the plant. The information is required for the raw material purchased during the year as well as opening and closing stock for the given year for which the energy return is being filed. The information has to be provided separately for different raw materials used.

Section 2.1	
2.1.1	Purchase in Current Year
2.1.2	Opening Stock of Raw Material
2.1.3	Closing Stock of Raw Material

Sub-Section 2.2: Capacity and Production Details: This sub-section captured information regarding the installed capacity of plant, annual sales, and opening and closing stock for the year, in which energy return is being filed. This information will help BEE to determine actual production by the plant in the given year.

Section 2.2	
2.2.1	Annual Installed Capacity
2.2.2	Product Sales in Current Year
2.2.3	Opening Stock of Product
2.2.4	Closing Stock of Product

Section 3: Energy Consumption Details:

This section captures information regarding the different sources of energy being used by the plants. The energy can be in the form of fuels or electricity. This section aims at taking inputs from the DCs at the plant level as well as based on the different processes within the plant boundary. This section is divided into three sub-sections which are described as follows:

Sub-Section 3.1: Total Fuel Consumption in Plant Boundary: This sub-section takes inputs regarding the fuel-consumption in the plant boundary. Fuels have been categorized as solid, liquid and gaseous. Consumption of steam as fuel also needs to be input by the DCs as several plants purchase steam in place of energy.

Waste in the form of solid, liquid or gas generated in the plant and being used as a fuel inside the plant boundary also needs to be furnished while filling the total fuel consumption in the plant boundary.

Section 3.1		Annual Fuel Consumption in Plant
		Fuel Sources
3.1.1	Solid Fuel	Coal (Indian)
		Petcoke
		Coal (Imported)
		Coal Lignite
		Other purchased solid fuels (biomass, bagasse, rice husk, etc.)
		Solid waste generated in the plant and used as fuel
3.1.2	Liquid Fuel	Furnace Oil
		Low Sulphur Heavy Stock (LSHS)
		High Sulphur Heavy Stock (HSHS)
		High Speed Diesel (HSD)
		Light Diesel Oil (LDO)
		Liquid effluent/waste generated in the plant and used as fuel
3.1.3	Gaseous Fuel	Compressed Natural Gas (CNG)
		Liquefied Petroleum Gas (LPG)
		Gas generated as by-product/waste in the plant and used as fuel
3.1.4	Steam*	Steam coming into the plant
		Steam going out of the plant
3.1.5	Other Fuel Sources (if any)	Solid/Liquid/Gas Waste Purchased to be used as fuel

Sub-Section 3.2: Total Electricity Consumption in Plant Boundary: Energy in the form of electricity being used in the plant boundary needs to be filled in this sub-section. Electricity could be purchased from grid, or through open access, from third parties or through power exchange. Self generated electricity from captive units or electricity from captive unit of a sister plant also needs to be recorded in this format appropriately.

Section 3.2		Annual Electricity Consumption in Plant Boundary	
		Electricity Sources	
3.2.1	Electricity from Grid/ Open Access/ Third Party/ Power Exchange	Total Purchased Electricity	Total Electricity Supplied
3.2.2	Self Generated Electricity From	Diesel Generating sets	Steam turbine/generator
		Gas turbine generator	Co-generation unit
		Renewable source of energy (wind, solar, small hydro etc.)	
3.2.3	Captive Power Plant of sister plant	Total Purchased Electricity	Total Electricity Supplied to sister plant

Sub-Section 3.3: Process wise Energy Consumption: This sub-section records process-wise energy consumption information. The information about usage of various sources of energy viz. fuels and electricity, in the different processes is required to be provided in this sub-section.

E.g. In case of Aluminium Refinery energy consumption for the processes given in following table are recorded.

In a plant there are stages where steam and waste energy may be generated in one process and is used in another process. The information about steam or waste energy going into and coming out of a process, wherever applicable, needs to be captured.

Section 3.3		Process Wise Annual Energy Consumption										
		Fuel Sources	Unit	Crusher & Grinder	Digester System**	Cleaning & Refining/ Filter System	Precipitation System	Evaporation System	Calcination/ Rotary Kiln System**	Co-Gen System	CPP	OPSS
3.3.1	Solid Fuel	Coal (Indian)	Tonne									
		Petcoke	Tonne									
		Coal (Imported)	Tonne									
		Coal Lignite	Tonne									
		Other purchased solid fuels (biomass, bagasse, rice husk, etc.	Tonne									
		Solid waste generated in the process to be used as fuel	Tonne									
		Solid waste consumed in the process as fuel										
3.3.2	Liquid Fuel	Furnace Oil	Kilo Litre									
		Low Sulphur Heavy Stock (LSHS)	Kilo Litre									
		High Sulphur Heavy Stock (HSHS)	Kilo Litre									
		High Speed Diesel (HSD)	Kilo Litre									
		Light Diesel Oil (LDO)	Kilo Litre									
		Liquid effluent/waste generated in the process to be used as fuel	Kilo Litre									
		Liquid effluent/waste consumed in the process as fuel	Kilo Litre									
3.3.3	Gaseous Fuel	Compressed Natural Gas (CNG)	SCM									
		Liquefied Petroleum Gas (LPG)	SCM									
		Gas generated as by-product/waste in the process to be used as fuel	SCM									
		Gas generated as by-product/waste consumed in the process as fuel	SCM									
3.3.4	Steam	Steam coming into the process	kcal									
		Steam going out of the process	kcal									
3.3.5	Other Fuel Sources (if any)	Solid/Liquid/Gas Waste Purchased to be used as fuel	Tonne/ Kilo Litre/ SCM									
3.3.6	Electricity Consumption		kWh									

Section 4: Up-gradation Measures /Changes inside Plant Boundary:

This section records the changes or the up-gradation measures within the plant boundary taken by the DCs in the year for which energy return is being filed. The changes could be in the technology, operations, fuel, raw material and feedstock etc. and can affect the overall energy consumption and production in the plant. Hence, this information needs to be provided while filing the energy return.



Section 4	Upgradation Measures /Changes inside Plant		Description
Measures Taken in the reporting period (the year of filing energy return) (Kindly select whichever applicable)	Change in Technology	Yes/No	
	Change in Operations	Yes/No	
	Change of Fuel	Yes/No	
	Change of Raw Material	Yes/No	
	Change of Feedstock	Yes/No	
	Energy Efficiency Measures	Yes/No	
	Other Measures	Yes/No	

Annexure II: System Requirements Specification

1. Purpose

The energy data reporting system is designed to collect information from Designated Consumers (DCs) regarding their energy usage as part of the energy return filing process. It is targeted for eight industrial sectors covered in the first phase of PAT scheme. Instead of asking industries to furnish annual fuel and electricity consumption via Form1 which is common for all the sectors, BEE may use the proposed the proposed sub-sector specific formats for DCs to report their energy consumption and replace the existing energy return filing system.

The purpose of this document is to describe the system requirements of the proposed energy data reporting system that are necessary for easy and convenient filing by the user and provide greater analytic capability to BEE.

2. Broad features of the Energy Data Capturing and Reporting System

The system requirements cover following aspects:

For Designated Consumers:

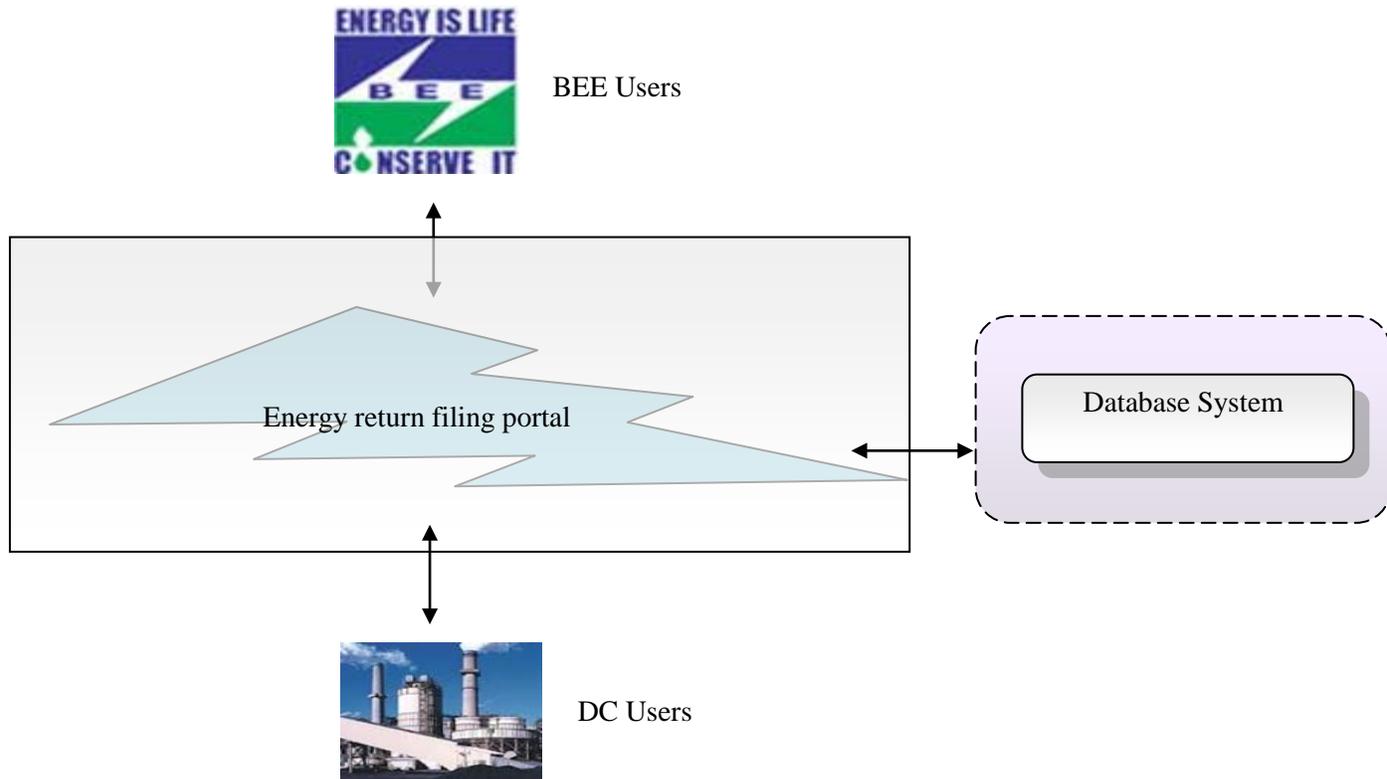
- Web based portal for filing annual energy consumption by authorized personnel in a DC
- Dashboard to show summarized annual energy consumption for each DC

For BEE:

- Database system for BEE to hold the information in safe and secured manner
- Tool to perform calculations to summarize energy consumption for each DC
- Web based portal to generate reports on energy consumption – sector wise, sub-sector wise, plant wise, process wise, fuel wise, geographical region wise, and combination of parameters, etc.

3. System Architecture

Energy Data Reporting System Overview



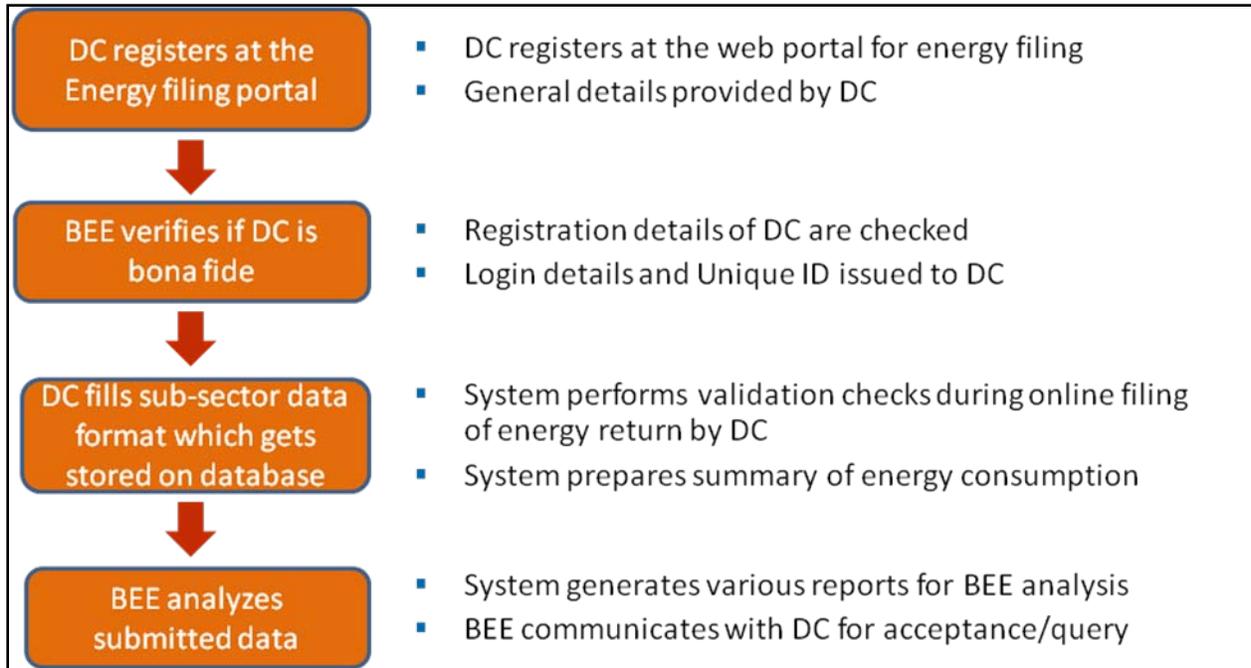
There will be two main components of the system

1. A web-portal for filing of energy return by DC and analysis of data by BEE
2. A database for storage of information filed by DC

4. Process Flow

The energy return filing is done every year. There is an online E-filing portal on BEE's website through which DCs submit details of their annual energy consumption by providing information in Form 1. Once approved, the DCs will have to provide annual energy consumption information as per the new suggested format. The logical sequence of energy return filing process is depicted in the chart below:

Suggested sequence of Energy return filing process



Both web-portal and database system will be operating from BEE's Data Center and will be operating on Windows Server.

5. System Functional Requirements

Registration by Designated Consumer

- DC will provide general details about the industry through Energy filing portal. An online form will be developed to capture general information. The form will contain general details about the plant, sector and sub-sector information.
- Wherever possible, drop down options will be provided in the form which DC can select to furnish information.
- There will be a provision to upload supporting documents such as certificate of incorporation, service tax registration, PAN number, etc.
- Validation checks will be provided in the form for filling mandatory fields in the form.
- Upon completion of form and upload of supporting documents, a reference number will be generated automatically. This will be unique for a DC.
- System will generate an e-mail to BEE regarding registration of new user.

Registration Approval by BEE

- BEE user will receive an email that a DC has applied for online registration.
- BEE user will login in the portal and review the general details and supporting documents provided by DC for completeness of information. A profile for DC will get created in the database.
- BEE user will issue login details to DC that will be used for annual filing of energy returns. System will send an email to the DC confirming the registration.
- If a DC gets registered with BEE, same DC will not be allowed to apply for registration again. System will perform validation checks to ensure that multiple accounts don't get created by the same DC. PAN number, Service tax registration number can be used as a criteria to establish uniqueness.

Filing of energy return by DC

- System will send an information notification before the scheduled period of filing energy return. For example if energy e-filing of FY 2011-12 is due in April 2012, system should send an email in the first week of April. Along with the email, system can also send sub-sector specific formats that are to be filled by the DC.
- Appointed person in DC will use the BEE provided login credentials for filing energy return.
- Depending on the sub-sector category of DC, respective data reporting formats will appear in the profile of DC. The format has to be filled by the user and provide supporting documents wherever applicable.
- Wherever possible, drop down options will be provided in the form which DC can select to provide information.
- System will have provision for upload of supporting documents – annual energy bills, certification of calorific value of fuels etc.
- In the side pane, unit conversion calculator can be provided to convert fuel calorific value from one unit to the desired unit.
- System will perform validation checks for filling mandatory fields.
- All entries will get stored in BEE database.
- An acknowledgment notification of successful submission will get generated upon completion of format and upload of documents.
- System will display a provisional summary of annual energy consumption to the DC.
- System will generate an e-mail to BEE informing that energy return has been submitted by the DC.

BEE analysis of energy return

- BEE user will login in the portal and review the details submitted by DC.
- System will run a query to compare the energy consumption details provided for the latest year vis-a-vis previous years.

- Energy consumption data earlier submitted by DCs (till the new system comes into place) will have to be transferred to the new system.
- System will also generate a summary of the major upgrades/activities undertaken last year by the DC. This will help BEE to understand reasons for change in SEC of a DC and also during M&V activities.
- In order to review and summarize sector and sub-sector level information, system will generate different source wise energy consumption reports for sector, sub-sectors, processes, geographic region, etc.
- Wherever required, system will be able to plot graphs/charts for pictorial depiction of energy consumption trends.
- Data for subsequent years will get added as time series in the respective DC profile in the database.

Requirements for web-portal

- Work on different internet browsers
- Uploading and downloading of files shall be faster
- Different forms shall be available on the portal depending on the type of DC

Requirements for Database system

- Usage restricted to BEE users only
- Every authorized user in BEE will get login details and access to database can be restricted depending on the type of user
- Database shall be able to handle multiyear data for existing set of DCs (about 480)
- Sufficient storage capacity to accommodate new category (sector) additions and new users (increase in number of DC)
- The database has to be smoothly accessible even if multiple BEE users are accessing simultaneously.
- Speedier report generation even if complex queries are run.



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