

# **Sri Lanka Institute of Information Technology**



**IT3021- Data Warehousing and Business Intelligence**

## **Assignment 02**

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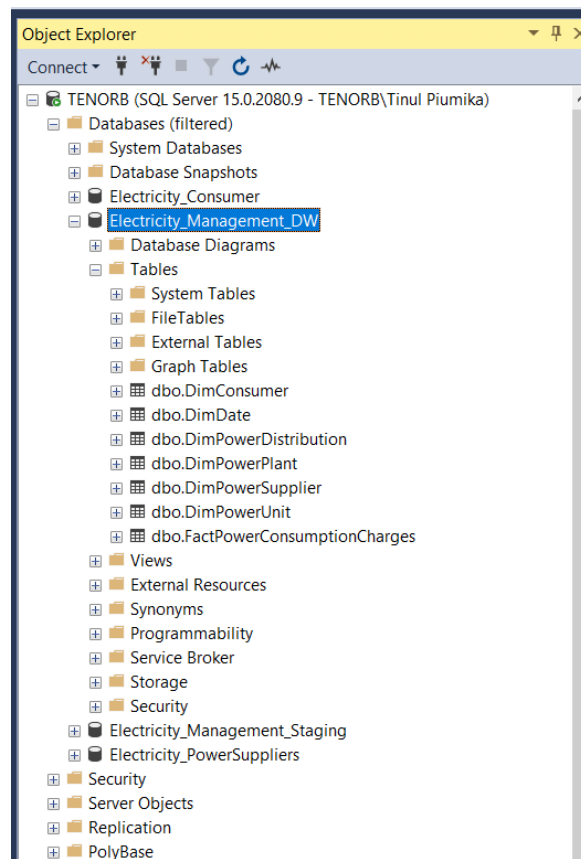
## Step 1 – Data Source for the Assignment

For the data source, the data warehouse database “Electricity\_Management\_DW” was selected which was previously created in Assignment 1.

The fact table and Dimension tables,

1. FactPowerConsumptionCharges – Fact Table
2. DimPowerDistribution
3. DimPowerPlant
4. DimPowerSupplier
5. DimPowerUnit
6. DimConsumer
7. DimDate

Also, the data warehouse follows the snowflake schema to integrate them. Those fact and dimension data were used to create OLAP cubes and generate OLAP operations in Excel and prepare reports in Report Builder.

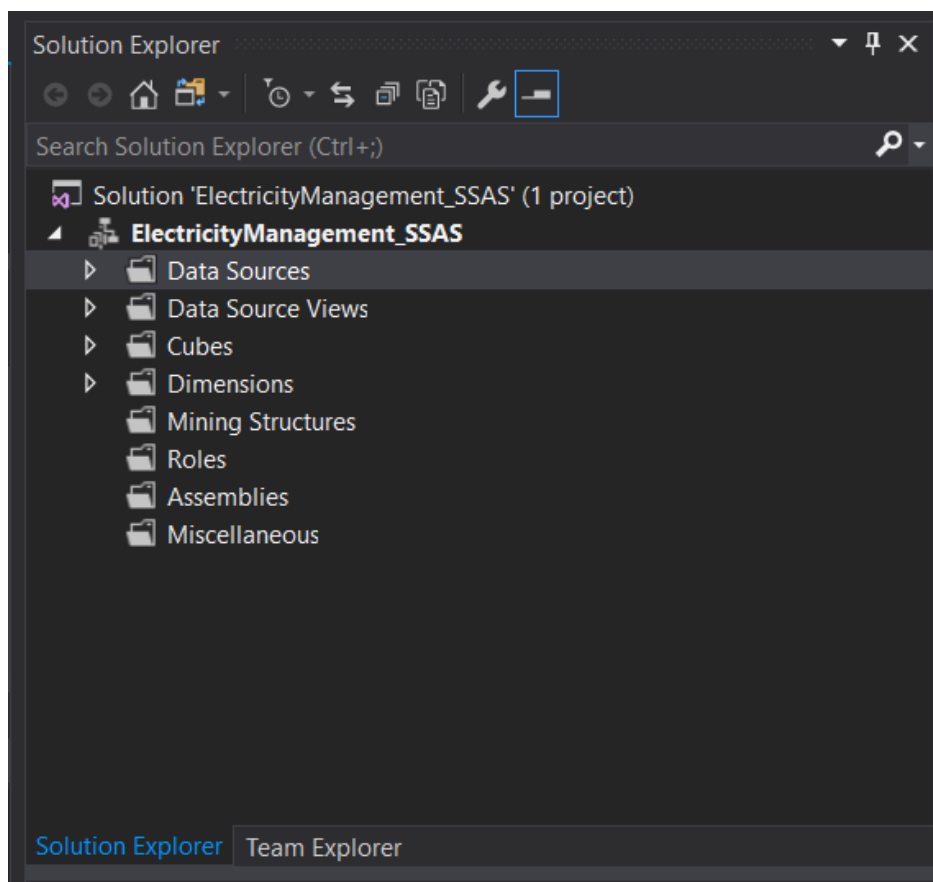


## Step 2 – SSAS Cube Implementation

- Used Tools: -  
SSAS  
SQL Server Management Studio  
SSDT

### 2.1 Create the SSAS Project

When creating the OLAP cubes first, created Analysis Services Multidimensional and Data Mining Project on SSDT. Then renamed it “*ElectricityManagement\_SSAS*”.



## 2.2 Create a Data source

Under the Data Sources folder in the above folder structure, a data source file was created.

In the data source file, a new connection was defined with the Data warehouse

“Electricity\_Management\_DW”. And as the authentication to the data warehouse new login is created in the data warehouse which connects to the data analysis service instance assigned to the windows authentication.

Login Properties - NT SERVICE\MSOLAP\$ROOT

Select a page: General, Server Roles, User Mapping, Securables, Status

Script Help

Login name: NT SERVICE\MSOLAP\$ROOT Search...

Windows authentication (selected)  
SQL Server authentication

Password:   
Confirm password:   
Specify old password   
Old password:   
Enforce password policy   
Enforce password expiration   
User must change password at next login

Mapped to certificate   
Mapped to asymmetric key   
Map to Credential   
Mapped Credentials

Credential Provider

Remove

Default database: master   
Default language: English - us\_english

Progress: Ready

OK Cancel

Data Source Designer

General Impersonation Information

Data source name: Electricity Management DW

Provider:

Connection string: Provider=SQLNCLI11.1;Data Source=TENORB;Integrated S Edit...

Data source references

Maintain a reference to another object in the solution

Create a data source based on an existing data source

Isolation: ReadCommitted

Query timeout (in seconds): 0

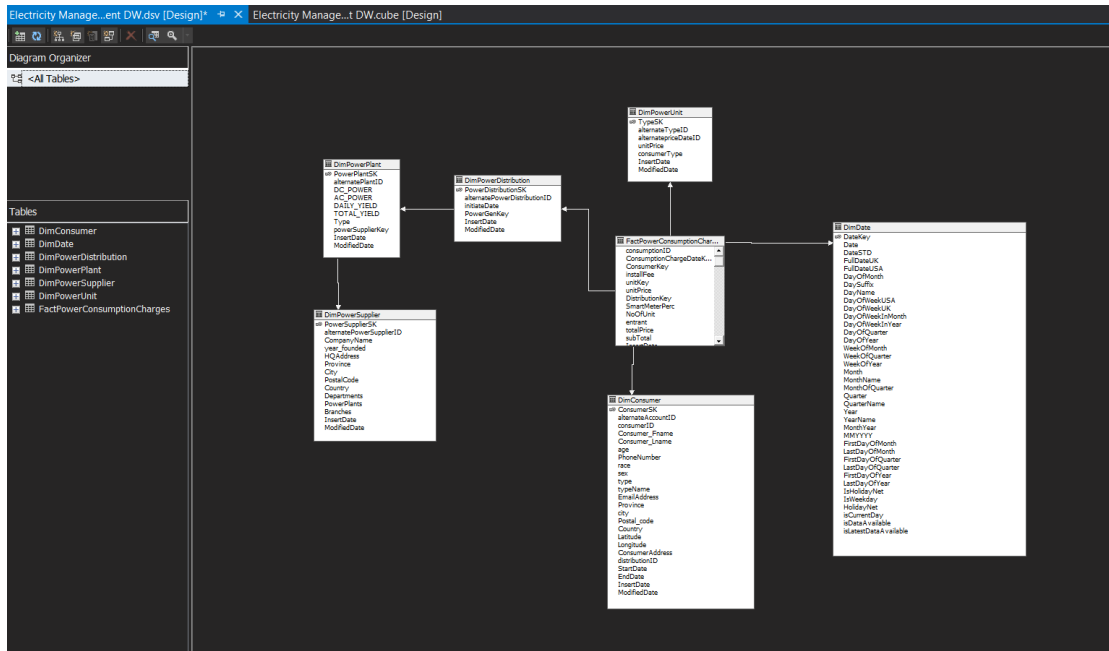
Maximum number of connections: 10

Data source description:

OK Cancel Help

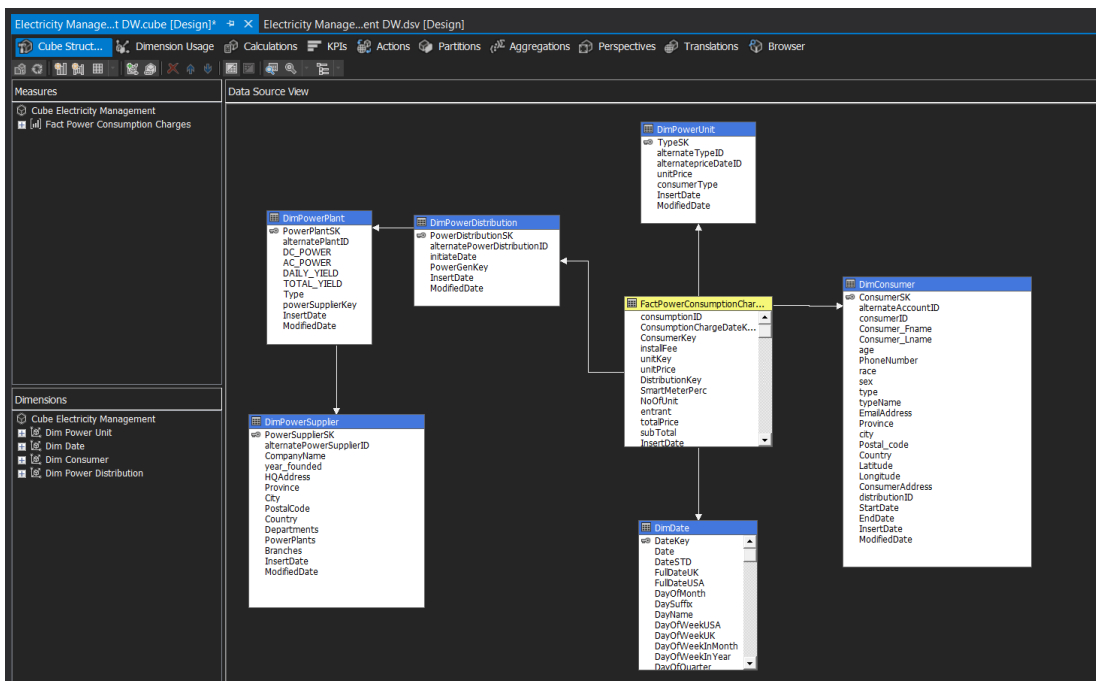
## 2.3 Create a Data Source View

Under the Data Source Views folder, Added a new data source view called DSV Electricity Management DW.

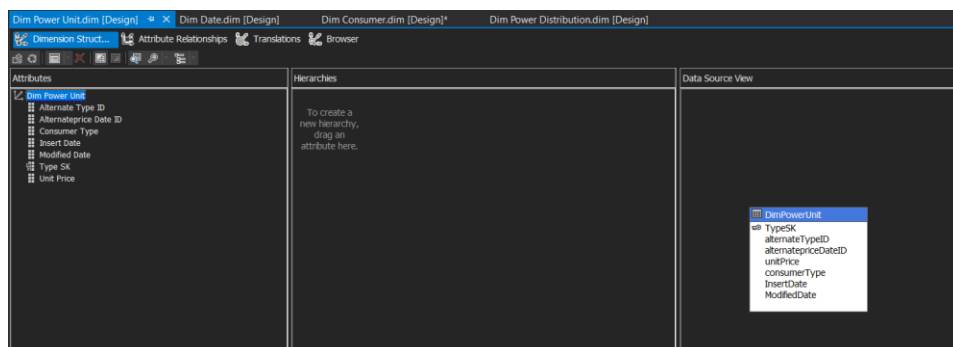
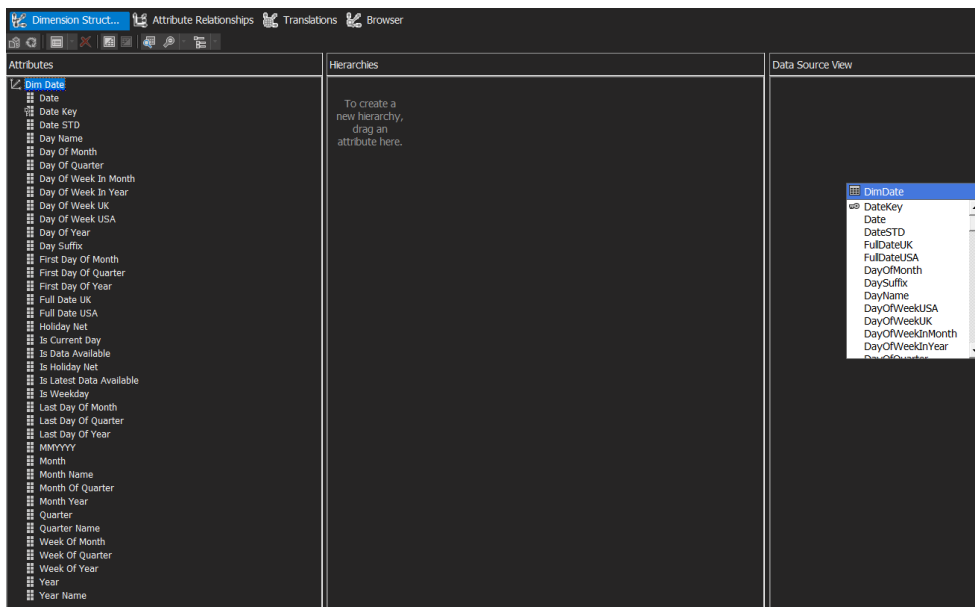
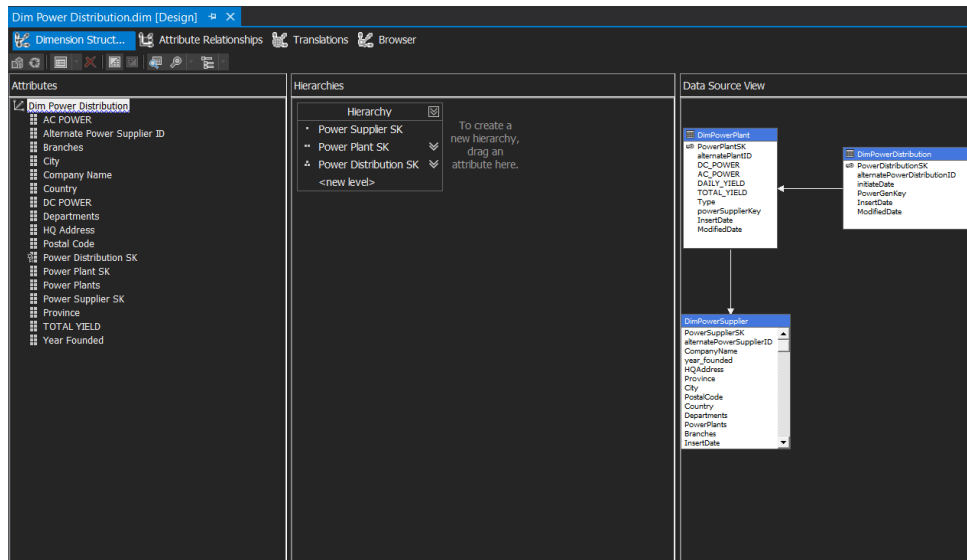


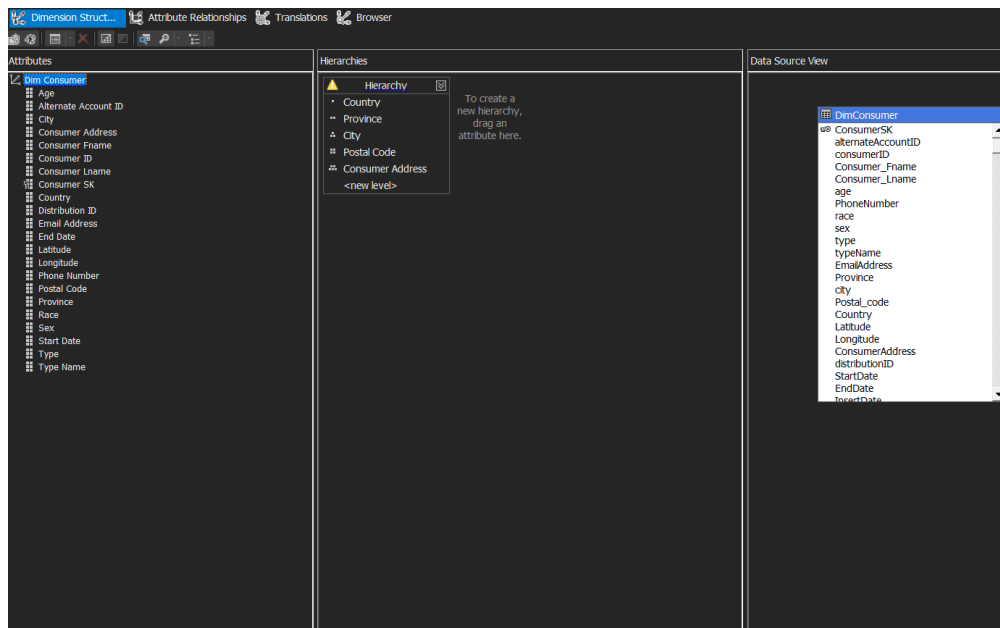
## 2.4 Create a Cube

Under the Cubes folder, created a new cube using the above data source.

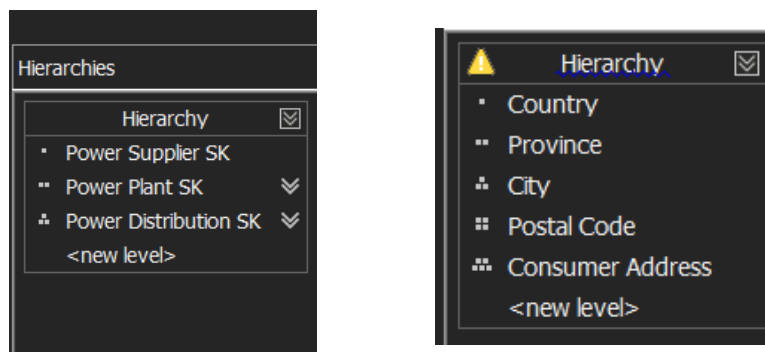


Then all the relevant attributes were selected from the dimensions and created a hierarchy in the cube of relevant dimensions

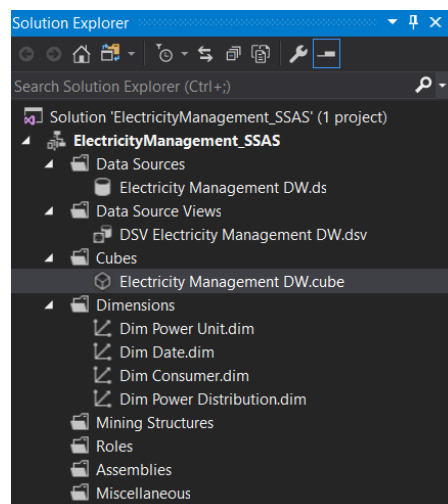




- These are the 2 hierarchies that were created,



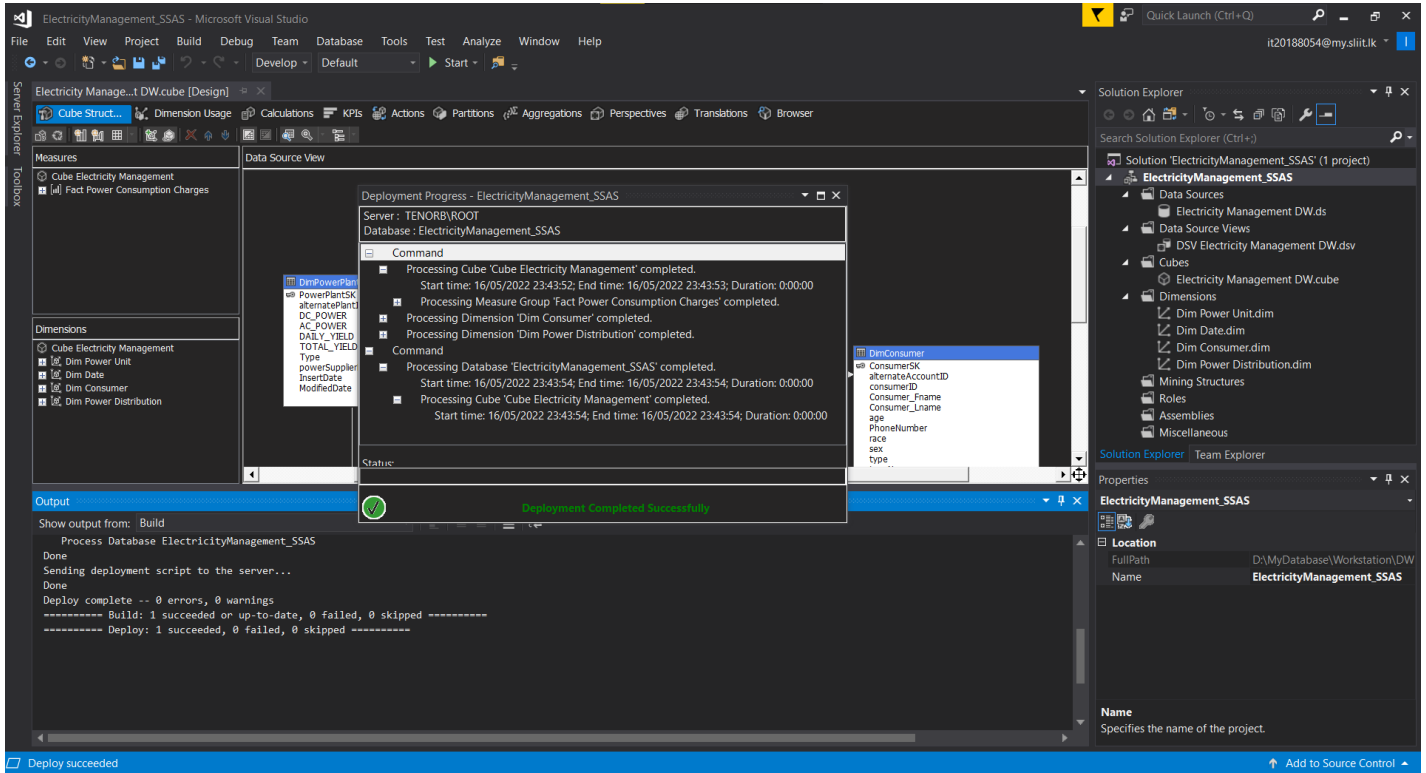
- the folder structure after the above structure,





## 2.5 Deploy the Cube

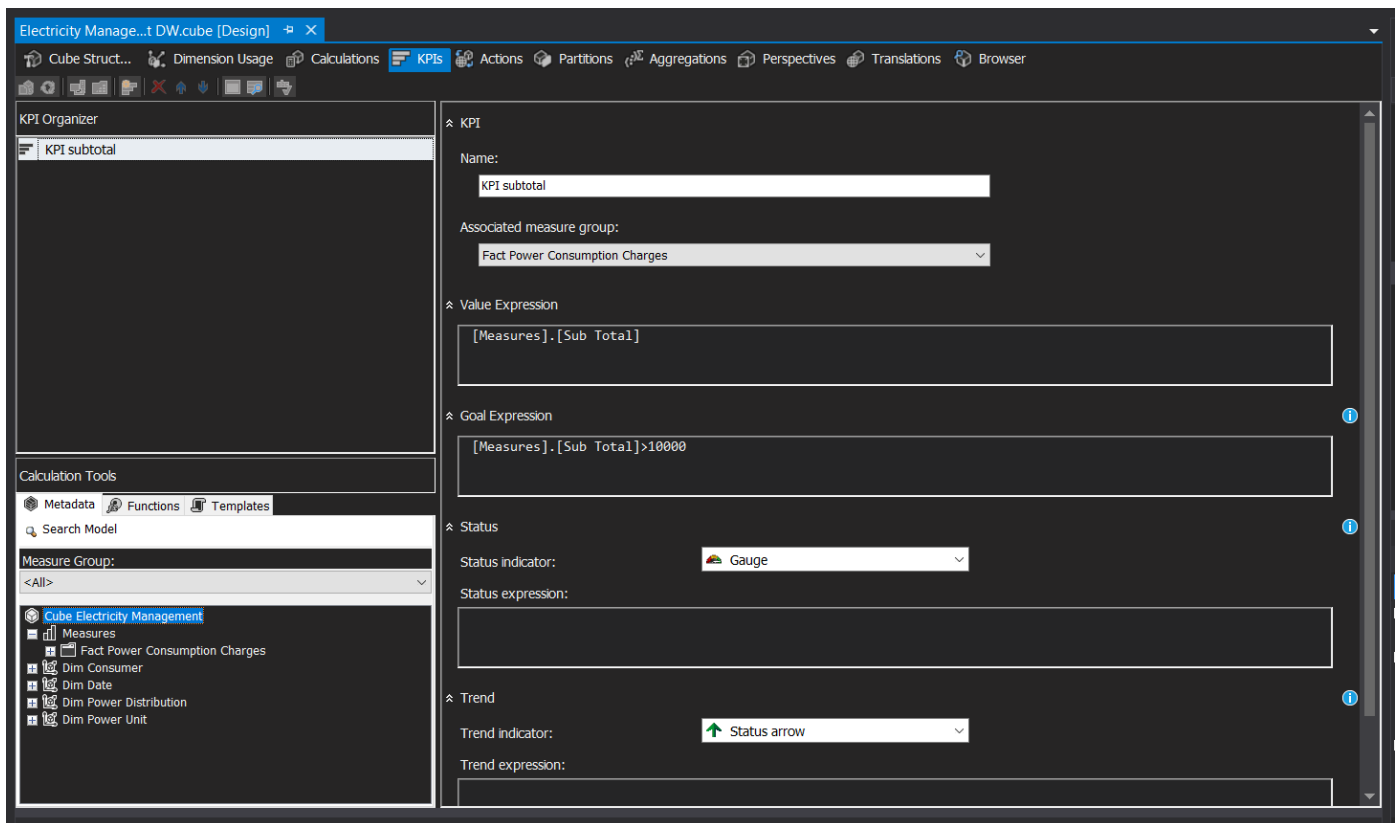
After finishing all the above steps, the cube is deployed. If it is successfully deployed a message is displayed signifying deployment's success as shown below.



## 2.6 Create KPI

KPIs are developed based on the needs of the company. It is a measurable value that shows how well a corporation accomplishes essential business objectives. KPIs are used by businesses to assess their progress toward achieving their objectives.

The following Figure shows the KPI which I created after the deploying cube. These are the KPI values created for power consumption. It can be used for determining how much consumers paid more than 10000



## 2.7 Browse Cube Data

Browsing data is done via using SSMS. By connecting SSAS to SSMS using instance and MDX queries can generate by selecting the relevant fields from the dimensions.

The below figure shows how to browse data in SSMS,

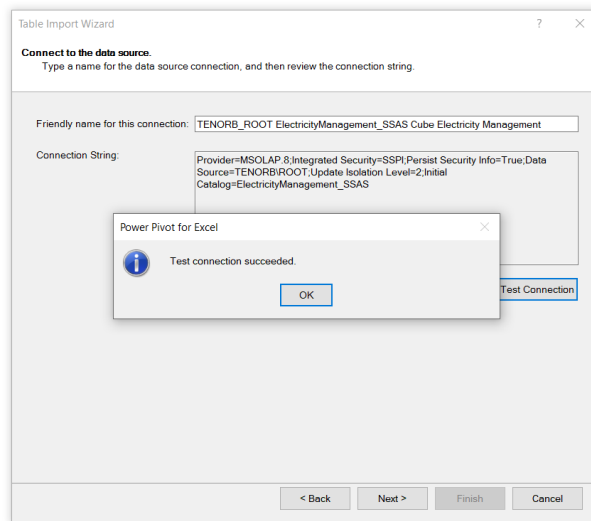
The screenshot shows the SQL Server Enterprise Manager interface. On the left, the 'Object Explorer' pane displays the 'TENORB\ROOT' tree structure, including 'Databases', 'ElectricityManagement\_SSAS', 'Data Sources', 'Data Source Views', 'Cubes', 'Cube Electricity Management', 'Dimensions', 'Mining Structures', 'Roles', 'Assemblies', and 'Management'. The 'Cube Electricity Management' cube is selected. The main pane shows the 'Cube Electricity Management [Browse]' window. The 'Measures' list on the left includes 'KPI subtotal Value' and 'KPI subtotal Goal'. The 'Dimensions' list includes 'Dim Consumer' with fields like 'Age', 'Alternate Account ID', 'City', 'Consumer Address', 'Consumer Fname', 'Consumer ID', 'Consumer Lname', 'Consumer SK', 'Country', 'Distribution ID', 'Email Address', 'End Date', 'Latitude', 'Longitude', and 'Phone Number'. The 'Calculated Members' section is empty. The main data table has the following columns: 'Dimension' (with a dropdown set to '<Select dimension>'), 'Hierarchy', 'Operator', 'Filter Expression', and 'Paramet...'. The table contains 20 rows of data, starting with 'Cally' and ending with 'Mary'.

Dimension	Hierarchy	Operator	Filter Expression	Paramet...
Consumer ID				
1	Cally			
10	Oprah			
100	Lauren			
1000	Jane			
1001	Karyn			
1002	Germaine			
1003	Male			
1004	Vivien			
1005	Mariam			
1006	Raven			
1007	Jaime			
1008	Charlotte			
1009	Zelda			
101	Mary			
1010	Isabella			
1011	Jayne			
1012	Sara			
1013	Carla			
1014	Aspen			
1015	Carolyn			
1016	Janna			
1017	Rachel			
1018	Xena			
1019	Ocean			
102	Mary			

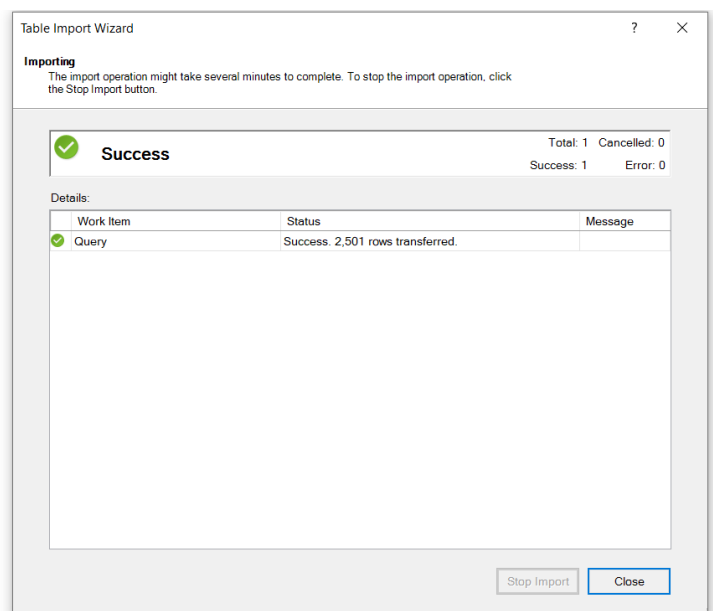
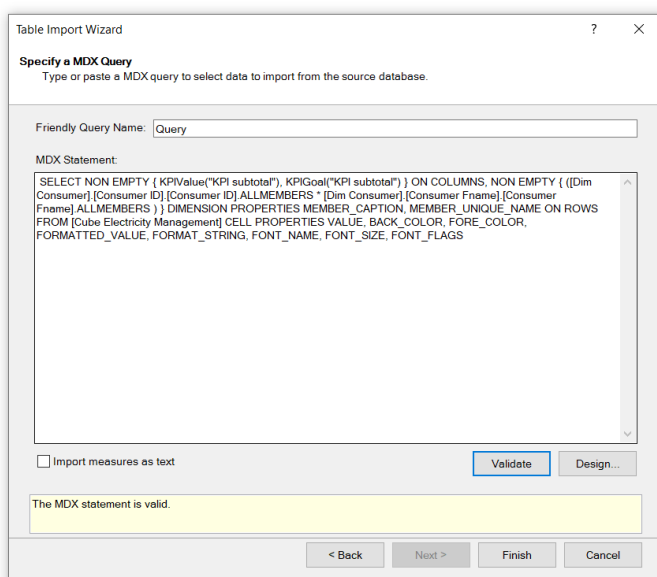
### Step 3: Demonstration of OLAP operations

- Used Tools:-  
Excel  
SQL Server Management Studio  
SSAS

To display the OLAP operation first, the Excel is connected to the SSAS cube using the MDX query. MDX query is created using the above process. And below picture shows how to connect the Excel to SSAS Cube successfully.

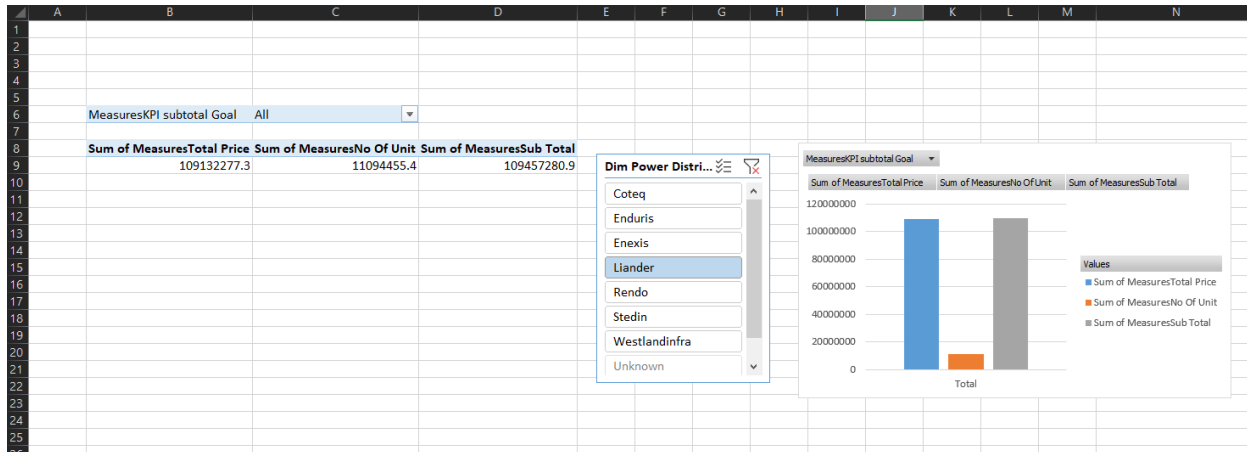


Then, this shows how to successfully insert a sample MDX query for generating data to create OLAP operations.



## Slice

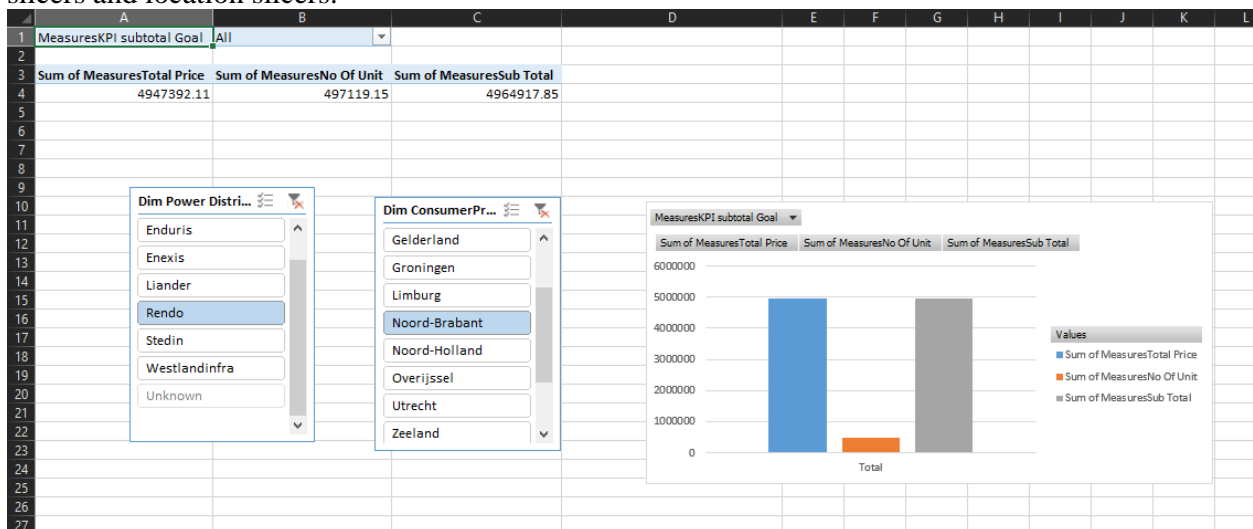
Slices are visual filters that can be used to filter data in a pivot table or chart. For the pivot table and pivot chart, I utilized two slices, one for each. The slices I used to filter my pivot table and pivot chart are shown in the diagram below.



## Dice

Selecting appropriate qualities to group the data by is referred to as dicing the data.

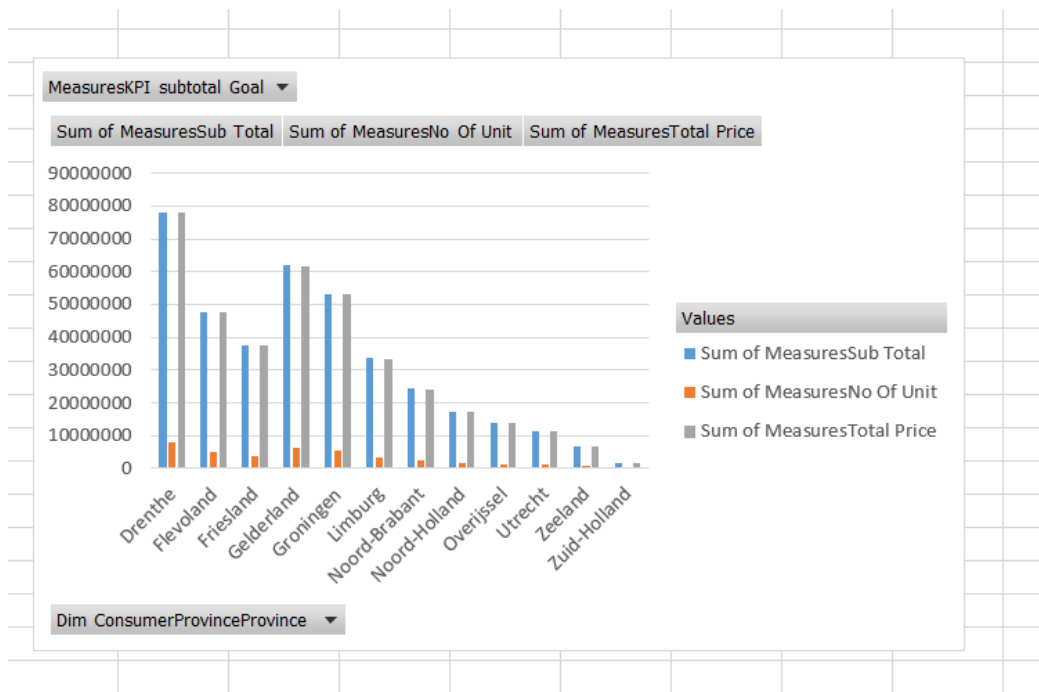
To analyze the data in the pivot table and pivot chart, I utilized two slicers. Those are power supplier slicers and location slicers.



## Roll-up

Climbing up a hierarchy of a dimension to aggregate data is what the Roll up OLAP function in cubes signifies.

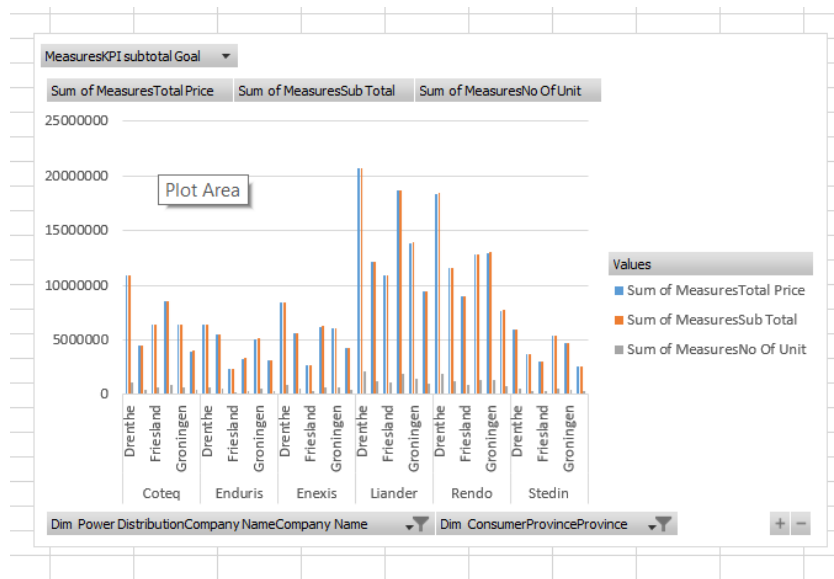
	B	C	D
1	All		
2			
3	Sum of MeasuresSub Total	Sum of MeasuresNo Of Unit	Sum of MeasuresTotal Price
4	78281790.75	7946475.44	78044420.09
5	47684792.12	4818624.97	47551901.48
6	37570572.33	3789486.01	37443813.59
7	61882749.45	6274260.5	61709044.5
8	53259613.81	5422042.93	53094206.2
9	33515647.3	3430338.6	33404178.05
10	24263287.89	2433563.17	24183214.97
11	17419480.61	1769922.15	17366925.87
12	13927293.75	1395262.19	13879807.21
13	11321711.31	1144715.77	11286153
14	6694412.77	678673.92	6670457.66
15	1661678.09	170583.42	1652011.39
16	<b>387483030.2</b>	<b>39273949.07</b>	<b>386286134</b>
17			
18			
19			



## Drill-Down

In cubes, the drill-down OLAP function entails navigating through details by moving down a hierarchy of a dimension.

	B	C	D
	All		
	Sum of MeasuresTotal Price	Sum of MeasuresSub Total	Sum of MeasuresNo Of Unit
1	10904340.98	10935276.01	1078912.69
2	4433635.5	4449963.89	449812.42
3	6382096.98	6403599.97	643888.89
4	8550270.95	8569833.15	862622.58
5	6417899.34	6433460.56	646199.74
6	3980614.98	3985356.71	412313.39
7			
8	6348298.08	6368440.04	653138.83
9	5484271.27	5489268.52	553141.99
10	2381098.01	2392217.71	238433.29
11	3302695.31	3313571.67	323848.69
12	5097751.94	5110528.27	524746.39
13	3122147.18	3141198.34	318434
14			
15	8401509.64	8428449.3	857362.75
16	5626097.29	5644199.26	561764.1
17	2710148.48	2719531.25	279109.93
18	6218418.83	6237145.45	622993.81
19	6092701.48	6117374.02	620749.47
20	4289512.88	4305580.03	446740.52
21			
22	20658726.64	20709375.87	2118100.39
23	12141491.29	12178055.11	1248472.12
24	10884490.71	10917696.18	1080494.03
25	18629800.07	18689115.91	1907334.05
26	13867697.29	13914235.4	1407135.01
27	9401942.13	9420595.76	954879.07
28			
29	18330521.99	18401224.63	1873089.8
30	11596492.46	11635654.43	1178058.01
31	8955021.28	8994996.08	916893.67
32	13840042.66	13850053.34	1393055.63



## Step 4: SSRS Reports

### Used Tools:-

Report server

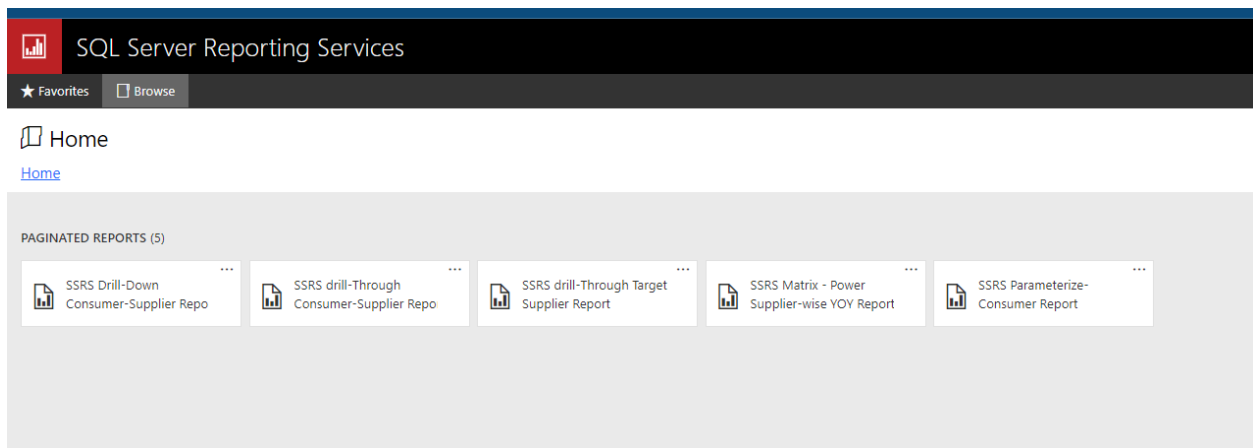
SSRS web portal

Report Server Configuration Manager

Report Server database

Microsoft Report Builder

The below figure shows the web portal view. In there, the created paginated reports and SSRS folder are displayed.





## Report 1: Report with a matrix

The below figure shows rows and columns designed according to the report

New Table or Matrix

Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functions such as Sum, Avg, and Count on the fields in the Values box.

Available fields

- CompanyName
- alternatePlantID
- Year
- totalPrice
- subTotal
- NoOfUnit
- alternatePowerDistributionID
- DateKey
- consumptionID

Column groups

- Year

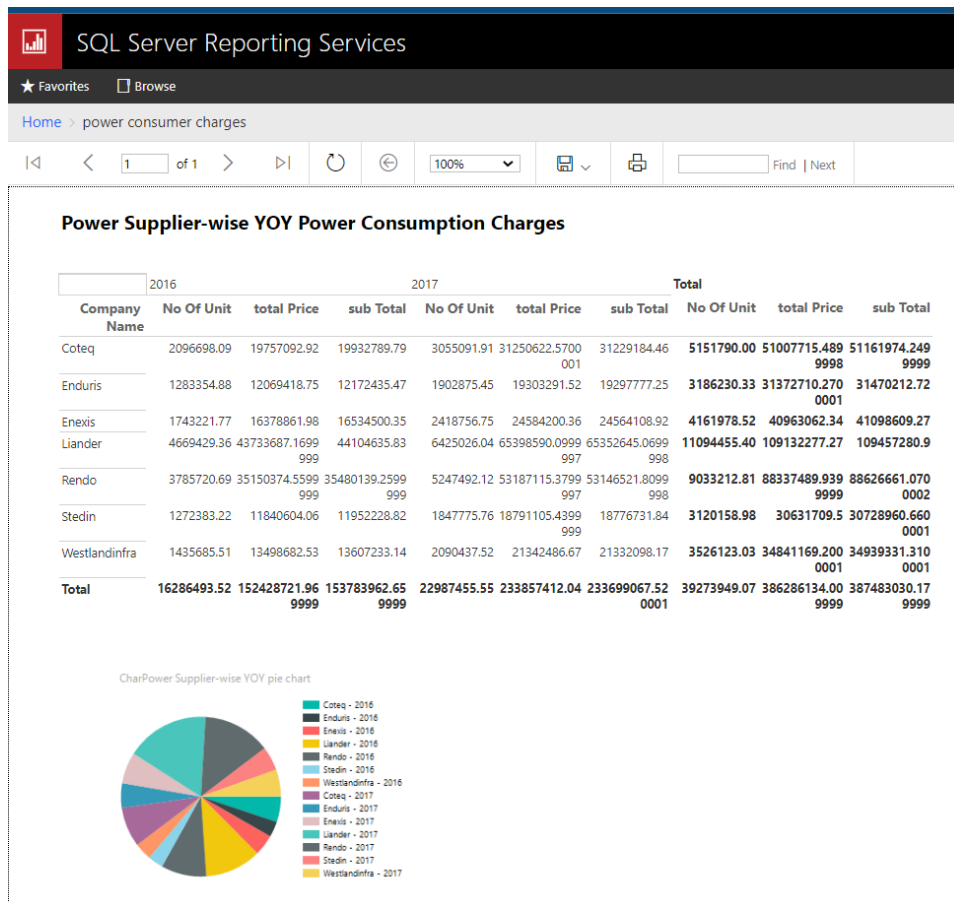
Row groups

- CompanyName

Σ Values

- Sum(NoOfUnit)
- Sum(totalPrice)
- Sum(subTotal)

Help < Back Next > Cancel



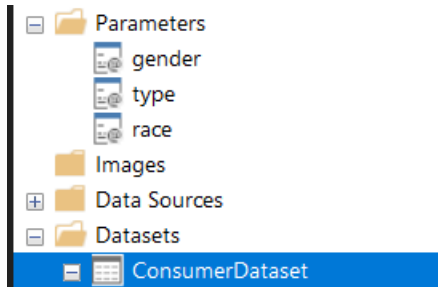
Report shows all the power supplier companies year wise sales price and sub total amounts according to power consumption market.

And the pie chart shows year-wise total amount prices percentages of power suppliers.

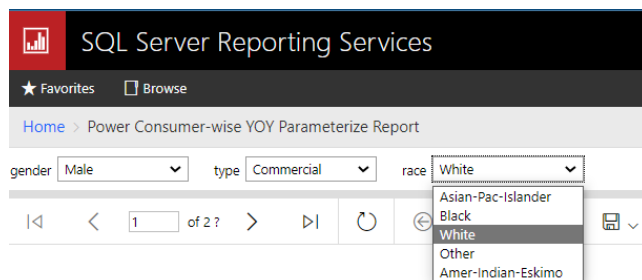
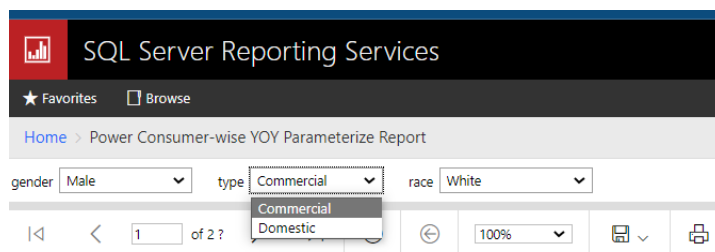
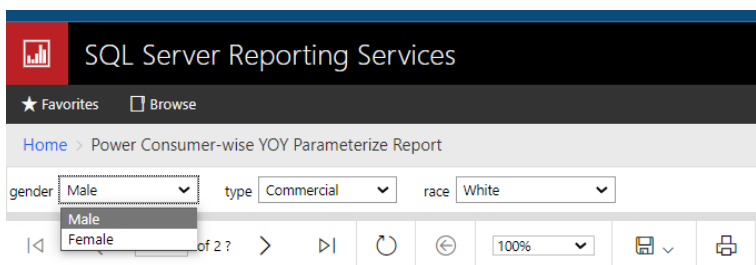
## Report 2: Report with more than one parameter.


This report used three parameters of Gender, Race, and Type of the consumer. And multiple options can be selected in the parameter.

Then, the selected value from the Gender, Race, and Type drop-down, relevant details related to those parameter values are displayed. Also inside the parameter default values are created for the efficiency of retrieval of the report



The below figures show three parameters and the result report.




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gender Male type Commercial race White

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Power Consumer-wise YOY Power Consumption Charges

consumer ID	Consumer Fname	Consumer Lname	age	Phone Number	race	sex	type	type Name	Email Address	2016	2017
12	Freya	Robbins	38	06-14372584	White	Male	1	Commercial	FreyaRobbins38@fen.nl	127923.35	124946.38
16	Sade	Lancaster	46	06-89328463	White	Male	1	Commercial	SadeLancaster46@gmx.com	109153.31	126288.07
18	Ciara	Bird	57	06-32034203	White	Male	1	Commercial	CiaraBird57@yahoo.com	115604.73	121927.01
29	Evelyn	Kelly	37	06-99658252	White	Male	1	Commercial	EvelynKelly37@fen.nl	103961.18	124503.45
33	Basia	Watts	52	06-38245091	White	Male	1	Commercial	BasiaWatts52@gmail.com	108887.42	121550.97
55	Mary	Hill	39	06-37905066	White	Male	1	Commercial	MaryHill39@row.nl	110655.84	135104.69
66	Mary	Nelson	60	06-66728586	White	Male	1	Commercial	MaryNelson60@so.nl	110267.7	128311.97
74	Megan	Todd	55	06-38930457	White	Male	1	Commercial	MeganTodd55@gmail.com	112771.28	125102.98
76	Mary	Smith	42	06-13273126	White	Male	1	Commercial	MarySmith42@hotmail.com	107804.04	118885.41
83	Mary	Vega	31	06-61164657	White	Male	1	Commercial	MaryVega31@yahoo.com	116628.03	121789.09
85	Mary	Mccormick	37	06-13253201	White	Male	1	Commercial	MaryMccormick37@fen.nl	105734.58	118041.14
99	Mary	Harris	39	06-19981426	White	Male	1	Commercial	MaryHarris39@so.nl	107381.04	125265.61
101	Mary	Hayes	50	06-89543762	White	Male	1	Commercial	MaryHayes50@un.nl	108632.77	126738.83
112	Maria	Evans	67	06-21507472	White	Male	1	Commercial	MariaEvans67@yahoo.com	118367.16	108226.36

### Report 3: Create an SSRS drill-down report.


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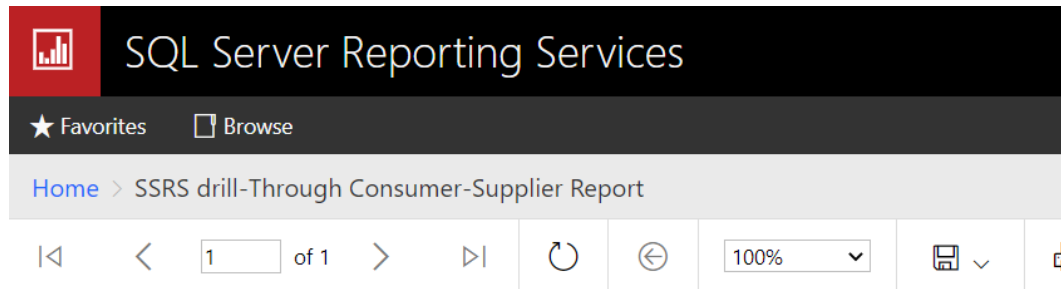
Home > SSRS Drill-Down Consumer-Supplier Report

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## Drill Down Monthly Company Power Consumption

Year	Month	Company Name	unit Price	total Price	sub Total
2016	1		10792.000000000001	8566404.93	8558824.03
	10		23578.500000000009	15019975.67	15038533.02
	11	Coteq	3096.6999999999999	2109431.14	2107609.6
		Enduris	1861.8500000000001	1270008.74	1268694.46
		Enexis	2554.65	1712778.86	1713692
		Liander	6769.5999999999999	4653297.15	4653567.94
		Rendo	5445.0499999999999	3733752.68	3732292.41
		Stedin	1848.4000000000001	1263403.86	1261511.33
		Westlandinfra	2106.7500000000001	1431847.81	1432329.56
	12		23998.050000000001	16691403.36	16697917.75
	2		10896.500000000001	8819517.14	8825018.669999999
	3		10948.750000000001	8131349.559999999	8127122.929999999
	4		11080.150000000001	8048008.16	8063593.690000001
	5		17362.950000000005	12385442.6	13152763.1
	6		22118.300000000008	15162454.15	15657876.45
	7		22254.150000000009	14669599.54	14669441.71
	8		23218.650000000000	14773745.53	14853599.72


#### Report 4: Create an SSRS drill-through report.



### Provincial Power Generation in the country

Province	No Of Unit	total Price	total Price
<a href="#">Drenthe</a>	7946475.44	78044420.0899	78044420.0899
		997	997
<a href="#">Flevoland</a>	4818624.97	47551901.4800	47551901.4800
		001	001
<a href="#">Friesland</a>	3789486.01	37443813.5899	37443813.5899
		999	999
<a href="#">Gelderland</a>	6274260.50	61709044.4999	61709044.4999
		997	997
<a href="#">Groningen</a>	5422042.93	53094206.1999	53094206.1999
		998	998
<a href="#">Limburg</a>	3430338.60	33404178.0500	33404178.0500
		001	001
<a href="#">Noord-Brabant</a>	2433563.17	24183214.97	24183214.97
<a href="#">Noord-Holland</a>	1769922.15	17366925.87	17366925.87
<a href="#">Overijssel</a>	1395262.19	13879807.21	13879807.21
<a href="#">Utrecht</a>	1144715.77	11286153	11286153
<a href="#">Zeeland</a>	678673.92	6670457.65999	6670457.65999

When you select the province, the system will redirect it to power suppliers who distribute under the selected province



# SQL Server Reporting Services



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Power Supplier Total Power Generation

Company Name	year founded	Branches	Departments	No Of Unit	sub Total	total Price
Coteq	1986	16	4	449812.42	4449963.89	4433635.5
Enduris	1998	13	3	553141.99	5489268.52	5484271.27
Enexis	2000	20	6	561764.10	5644199.26	5626097.29
Liander	2008	15	3	1248472.12	12178055.11	12141491.29
Rendo	2013	15	5	1178058.01	11635654.43	11596492.46
Stedin	1886	12	4	370115.47	3712823.96	3701758.93
Westlandinfra	1979	23	4	457260.86	4574826.95	4568154.74