**Part1: Energy stability and Market outrages**

Question 1.1: In the dataset **AEMR**, write a SQL statement to count the number of **valid (i.e. Status = Approved)** outage events grouped by and ordered by their respective outage reason type with the **Start Time** in 2016.

Question 1.2: Which outage type occurred most frequently in 2016?

SELECT

COUNT(\*) as Total\_Number\_Outage\_Events, Status, Reason

FROM

AEMR

WHERE

Status='Approved' and Year(Start\_Time) ='2016'

GROUP BY

Reason

ORDER BY

Reason**;**

Question 1.3: In the dataset **AEMR**, write a SQL statement to count the number of **valid** (i.e. Status = Approved) outage events **sorted by their respective reason type** (i.e. Forced, Consequential, Scheduled, Opportunistic) with the Start Time in **2017**. Order by **Reason**.

Question 1.4: Which outage type occurred the **least** in 2017?

SELECT

COUNT(\*) as Total\_Number\_Outage\_Events, Status,Reason

FROM

AEMR

WHERE

Status='Approved' and Year(Start\_Time) ='2017'

GROUP BY

Reason

ORDER BY

Reason**;**

Question 1.5: In the dataset **AEMR**, write a SQL statement that calculates the average duration **in days** for each valid outage type that compares the average durations for **Start Time** in 2016 and 2017. Order by **Reason** and **Year**.

SELECT

Status, Reason, COUNT(\*) as Total\_Number\_Outage\_Events,

Round(AVG((TIMESTAMPDIFF(MINUTE, Start\_Time, End\_Time)/60)/24),2) as

Average\_Outrage\_Duration\_Time\_Days, Year(Start\_Time) as Year

FROM

AEMR

WHERE

Year(Start\_Time) in ('2016','2017') and Status ='Approved'

GROUP BY

Status, Reason, YEAR(Start\_Time)

ORDER BY

YEAR(Start\_Time), Reason;

Question 2.1: Write a SQL statement showing the monthly COUNT of all approved outage types (Forced, Consequential, Scheduled, Opportunistic) that occurred for **2016**. Order by **Reason** and **Month.**

SELECT

Status, Reason, COUNT (\*) as Total\_Number\_Outrage\_Events,

MONTH(Start\_Time) as Month

FROM

AEMR

WHERE

YEAR(Start\_Time) = '2016' and Status = 'Approved'

GROUP BY

MONTH(Start\_Time), Reason

ORDER BY

Reason, MONTH(Start\_Time);

Question 2.2: Write a SQL Statement showing the **monthly COUNT** of all approved outage types (Forced, Consequential, Scheduled, Opportunistic) that occurred during **2017**. Order by **Reason** and **Month**.

SELECT

Status, Reason, COUNT (\*) as Total\_Number\_Outrage\_Events,

MONTH(Start\_Time) as Month

FROM

AEMR

WHERE

YEAR(Start\_Time) = '2017' and Status = 'Approved'

GROUP BY

MONTH(Start\_Time), Reason

ORDER BY

Reason, MONTH(Start\_Time);

Question 2.3: Write a SQL statement showing the total number of all valid outage types (Forced, Consequential, Scheduled, Opportunistic) that occurred for both 2016 and 2017 per month (i.e. 1 – 12). Order the year from **2016** to **2017**. Order by **Month** and **Year**.

SELECT

Status, COUNT (\*) as Total\_Number\_Outrage\_Events, MONTH(Start\_Time) as

Month, YEAR(Start\_Time) as Year

FROM

AEMR

WHERE

Status = 'Approved'

GROUP BY

YEAR(Start\_Time), MONTH(Start\_Time)

ORDER BY

YEAR(Start\_Time), MONTH(Start\_Time);

Question 3.1: Write a SQL statement showing the count of all approved outage types (Forced, Consequential, Scheduled, Opportunistic) for all participant codes for 2016 and 2017. Order by **Year** and **Participant\_Code**.

SELECT

COUNT (\*) as Total\_Number\_Outage\_Events, (Participant\_Code),

Status ,YEAR(Start\_Time) as Year

FROM

AEMR

WHERE

Status = 'Approved'

GROUP BY

(Participant\_Code) ,YEAR(Start\_Time)

ORDER BY

(Participant\_Code) ,YEAR(Start\_Time);

Question 3.2: Write a SQL statement showing the average duration of all valid (i.e. status = approved) outage types (Forced, Consequential, Scheduled, Opportunistic) for all participant codes from 2016 to 2017. Order the average duration in descending order.

SELECT

Participant\_Code, Status, Year(Start\_Time) as Year,

ROUND(AVG((TIMESTAMPDIFF(MINUTE, Start\_Time, End\_Time)/60)/24),2)

AS Average\_Outage\_Duration\_Time\_Days

FROM AEMR

WHERE

Status='Approved'

GROUP BY

Participant\_Code, Status, Year(Start\_Time)

ORDER BY

Year(Start\_Time)**,**

CAST(Avg(CAST(TIMESTAMPDIFF(DAY,Start\_Time,End\_Time)AS

DECIMAL(18,2))) AS DECIMAL(18,2)) DESC

**Part 2: Energy Losses and Market Reliability**

Question 1.1: Write a SQL Statement to COUNT the AGGREGATE number of valid forced outage events for 2016 and 2017. Order by **Reason** and **Year**.

SELECT

COUNT (\*) as Total\_Number\_Outrage\_Events, YEAR(Start\_Time) as Year

FROM

AEMR

WHERE

Reason = 'Forced'

GROUP BY

YEAR(Start\_Time)

ORDER BY

YEAR(Start\_Time);

Question 1.2: Building upon the query you completed in the previous question, calculate the proportion of outages that were **forced** for both 2016 and 2017. Order from **2016** to **2017**.

SELECT

SUM(CASE WHEN Reason = 'Forced' THEN 1 ELSE 0 END) as

Total\_Number\_Forced\_Outage\_Events, COUNT(\*) as

Total\_Number\_Outrage\_Events, ROUND((SUM(CASE WHEN Reason = 'Forced'

THEN 1 ELSE 0 END)/COUNT(\*))\*100,2) as Forced\_Outage\_Percentage

FROM

AEMR

WHERE

Status = 'Approved'

GROUP BY

YEAR(Start\_Time)

ORDER BY

YEAR(Start\_Time);

Question 2.1: Write a SQL statement to calculate the AVERAGE duration of forced outage events, as well as the AVERAGE amount of energy lost (MW) for both 2016 and 2017 due to forced outages. Order from **2016** to **2017**.

SELECT

Status, Reason, Year(Start\_Time) as Year, AVG(Outage\_MW) as

Avg\_Outage\_MW\_Loss, AVG (TIMESTAMPDIFF(minute, Start\_Time, End\_Time))

as Average\_Outage\_Duration\_Time\_Minutes, (ROUND(AVG(Outage\_MW),2) AS

Avg\_Outage\_MW\_Loss ,CAST(ROUND(AVG(Cast(TIMESTAMPDIFF(MINUTE,

Start\_Time, End\_Time) AS DECIMAL(18,2))),2) AS DECIMAL(18,2)) AS

Average\_Outage\_Duration\_Time\_Minutes)

FROM

AEMR

WHERE

Status = 'Approved' and Reason = 'Forced'

GROUP BY

YEAR(Start\_Time)

ORDER BY

YEAR(Start\_Time);

Question 2.2 Write a SQL statement to compare the AVERAGE duration of each **individual outage event** (Forced, Consequential, Planned and Opportunistic) for both 2016 and 2017. Order from **2016** to **2017**.

SELECT

Status, Reason, Year(Start\_Time) as Year, ROUND(AVG(Outage\_MW),2) as

AVG\_Outage\_MW\_Loss,

CAST(ROUND(AVG(CAST(TIMESTAMPDIFF(MINUTE,

Start\_Time, End\_Time) as decimal(18,2))),2) AS DECIMAL(18,2)) as

Average\_Outage\_Duration\_Time\_Minutes

FROM

AEMR

WHERE

Status = 'Approved'

GROUP BY

Reason, Year(Start\_Time)

ORDER BY

Year(Start\_Time), Reason;

Question 3.1: Write a SQL Statement to calculate the AVERAGE duration and AVERAGE energy lost (MW) for all **approved outages where the reason is equal to Forced** for each participant code, sorted by AVERAGE energy loss (Avg\_Outage\_MW\_Loss) in descending order and ordered by Year.

SELECT

Participant\_Code, Status, Year(Start\_Time) as Year,

ROUND(avg(Outage\_MW),2) as Avg\_Outage\_MW\_Loss,

CAST(ROUNd(AVG(cast(TIMESTAMPDIFF(MINUTE, Start\_Time, End\_Time) as

decimal(18,2))),2) AS DECIMAL(18,2))

as Average\_Outage\_Duration\_Time\_Minutes

FROM

AEMR

WHERE

Status = 'Approved' and Reason = 'Forced'

GROUP BY

Participant\_Code, Year(Start\_Time)

ORDER BY

Year(Start\_Time) ASC, Avg\_Outage\_MW\_Loss DESC ;

Question 3.2: Write a SQL statement to calculate the Average Outage (MW) Loss and Overall Summed Outage (MW) loss for each participant code where the Status is **Approved** and the Outage Reason is **Forced** across both 2016 and 2017.

SELECT

Participant\_Code, Facility\_Code, Status, Year(Start\_Time) AS Year, ROUND(AVG(Outage\_MW),2) as Avg\_Outage\_MW\_Loss,

ROUND(SUM(Outage\_MW),2) as Summed\_Outage\_MW\_Loss

FROM

AEMR

WHERE

Status='Approved'

AND Reason='Forced'

GROUP BY

Participant\_Code

,Facility\_Code

,Status

,Year(Start\_Time)

ORDER BY

Year(Start\_Time) ASC

,ROUND(SUM(Outage\_MW),2) DESC;