

**PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response**

PG&E Data Request No.:	CalAdvocates_054-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_CalAdvocates_054-Q01		
Request Date:	March 11, 2021	Requester DR No.:	CalAdvocates-PGE-2021WMP-20
Date Sent:	March 16, 2021	Requesting Party:	Public Advocates Office
PG&E Witness:		Requester:	Alan Wehrman

SUBJECT: PG&E's 2021 WILDFIRE MITIGATION PLAN (WMP) UPDATE

QUESTION 01

Per Table 7.1, in 2020, PG&E reported 3,195 distribution outages due to transformer damage or failure. This is an increase of 1,332 from 2019.

	2015	2016	2017	2018	2019	2020
Line 18n: Outages due to transformer damage or failure - Distribution	1,696	1,875	2,407	1,653	1,863	3,195

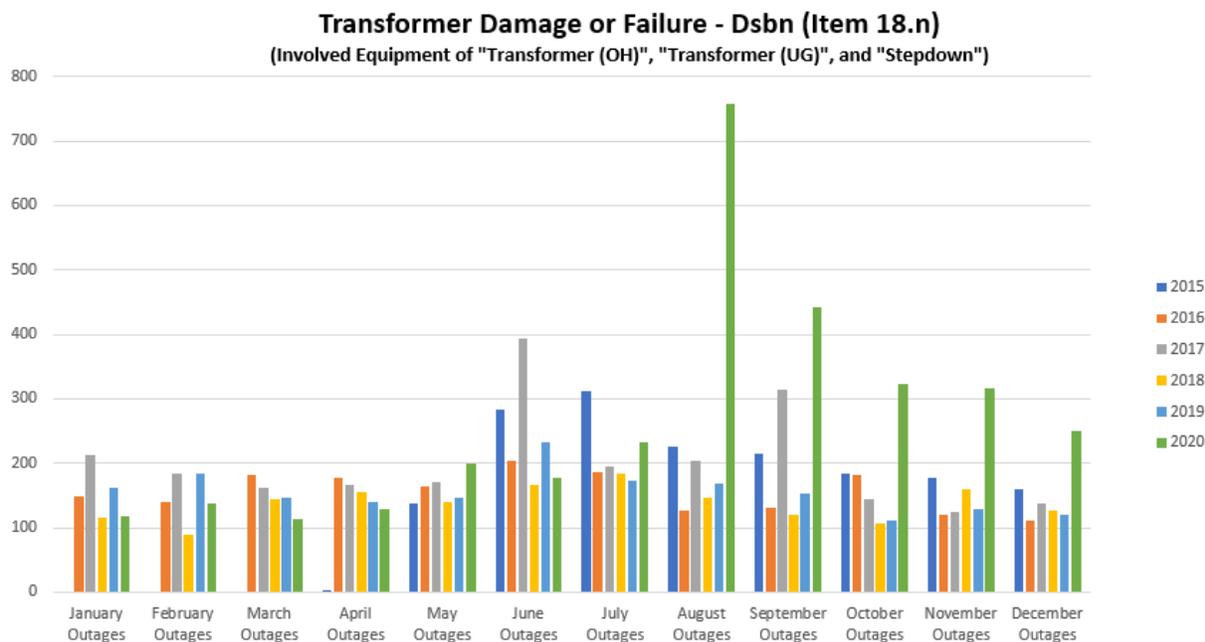
- a. What factors account for the increase in the number of outages due to transformer damage or failure from 2019 to 2020?
- b. What is the average age of the transformers involved in the 3,195 distribution outages in 2020 mentioned above?
- c. What is the minimum age of the transformers involved in the 3,195 distribution outages in 2020 mentioned above?
- d. What is the maximum age of the transformers involved in the 3,195 distribution outages in 2020 mentioned above?
- e. Has PG&E identified any common causes for the 3,195 distribution outages in 2020 mentioned above?
- f. If the answer to part (e) is yes, please list the top five common causes and the number of distribution outages associated with each cause, out of the 3,195 mentioned above.
- g. Has PG&E performed a root cause analysis of any of the 3,195 distribution outages in 2020 mentioned above?
- h. If the answer to part (g) is yes, please provide results of such root cause analyses.
- i. Of the 3,195 distribution outages mentioned above, how many were in HFTD Tier 2 and how many were in Tier 3?

ANSWER 01

To present outage data in the Table 7.1 format, PG&E downloads and summarizes various data fields from its outage data base. PG&E updated its outage data structure mid-2015, which included additional fields such as the Involved Equipment field. Upon review of this question, PG&E has determined that not all transformer related damage or failure was fully presented under Item 18n, which is explained below.

- a) The following table and graph below provide the current monthly outage data by month for Item 18n, which PG&E’s WMP utilized the Involved Equipment fields of “Transformer (OH)”, “Transformer (UG)” and “Stepdown”. As can be seen, the number of outages increased significantly in August 2020 and in subsequent months mostly likely due to the severe heat experienced in August.

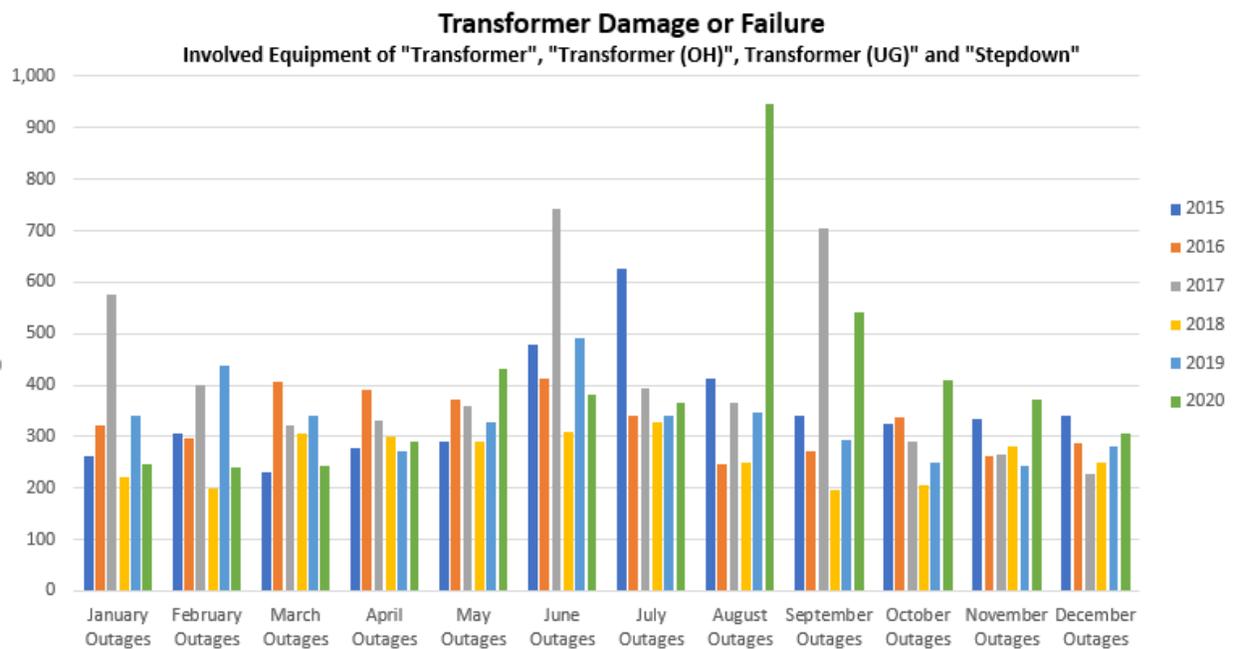
Year	January Outages	February Outages	March Outages	April Outages	May Outages	June Outages	July Outages	August Outages	September Outages	October Outages	November Outages	December Outages	Year Total
2015	.	.	.	3	138	283	311	225	215	184	178	159	1,696
2016	149	140	181	178	165	203	187	126	132	182	121	111	1,875
2017	212	185	162	166	171	394	194	204	313	145	124	137	2,407
2018	115	90	144	155	140	166	183	147	120	107	159	127	1,653
2019	162	183	147	139	146	233	173	168	154	111	128	119	1,863
2020	117	138	113	128	200	177	233	758	443	322	316	250	3,195



PG&E’s legacy outage data base utilized the Involved Equipment field of “Transformer”, which did not distinctly indicate if it was overhead (OH) or underground (UG) transformer. The outage data structure implemented in mid-2015 was set up to more accurately capture this detail and thus “Transformer” is used less often. When the outage data was summarized in Table 7.1, the outages with the Involved Equipment field of “Transformer” was inadvertently reported under “Item 18.n. Other – Distribution”. For completeness, the following table and graph below provide the current monthly outage data by month for all Transformer Damage or Failure with the Involved Equipment fields of “Transformer”, “Transformer (OH)”, “Transformer (UG)” and “Stepdown”.

Although the data presented in the following table and graph still shows the higher transformer failures that occurred in August 2020, the overall distribution transformer related failures/outages in 2020 was actually lower than in 2017 and do not significantly stand out compared to the other years.

Year	January Outages	February Outages	March Outages	April Outages	May Outages	June Outages	July Outages	August Outages	September Outages	October Outages	November Outages	December Outages	Year Total
2015	262	307	231	278	291	480	627	412	339	324	333	340	4,224
2016	322	296	408	391	372	414	339	247	273	336	261	288	3,947
2017	576	399	321	332	359	741	395	367	705	290	266	226	4,977
2018	221	199	305	301	290	310	327	251	196	205	281	250	3,136
2019	339	438	342	273	329	492	341	347	293	250	244	281	3,969
2020	246	240	242	289	433	382	365	948	543	410	373	305	4,776



- b) We do not currently have this level of detail for the failed list of transformers.
- c) We do not currently have this level of detail for the failed list of transformers
- d) We do not currently have this level of detail for the failed list of transformers
- e) Yes, PG&E continuously analyzes failed transformers for cause of failure when the failed equipment is collected through the MPR (Material Problem Report) process.
- f) There are two critical root causes for a transformer to fail:
 - 1) Physical damage due to:
 - i. Corrosion
 - ii. Fire

- iii. Car Poles
- iv. Animal Contacts (Bushing Damage)
- v. Construction and transport damage

2) Electrical failure due to:

- i. Age and normal usage – Breakdown of insulation of transformer winding wires due to age (Reference IEEE C57.91 for Loss of Insulation Life Calculations and Discussion)
 - ii. Manufacturing Process Gaps (Loose Connections, Water Intrusion, Transformer and Component Design)
 - iii. Breakdown of insulation materials of transformer due to other than normal usage (i.e. Shorting of secondary Leads, Reported and Unreported Electrical Load Increases exceeding the transformers design)
- g) PG&E, similar to the industry, does not perform root cause on all failed distribution overhead transformers. However, a root cause analysis is performed on a selected set of transformers that may be less than 5 years old and fail unexpectedly.
- h) The key findings from our causal analysis is summarized in (f)
- i) Of the noted 3,195 distribution outages (with the Involved Equipment fields of “Transformer (OH)”, “Transformer (UG)” and “Stepdown”), 248 were in the HFTD Tier 2 area and 134 in the HFTD Tier 3 area. Of the noted 4,776 distribution outages (with the Involved Equipment fields of “Transformer”, “Transformer (OH)”, “Transformer (UG)” and “Stepdown”), 473 were in the HFTD Tier 2 areas and 222 in the HFTD Tier 3 areas.