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COMMISSION

March 9, 2018

The Honorable Chairman and Members of the  
Hawaii Public Utilities Commission  
Kekuanaoa Building, First Floor  
465 South King Street  
Honolulu, HI 96813

Subject: KIUC 2017 Annual Service Reliability Report

Dear Mr. Iwase:

Attached for the Commission's information is a copy of KIUC's 2017 Annual Service Reliability Report. If you have any questions regarding the attached report please contact Tim Blume at (808) 246-8274.

Very truly yours,

A handwritten signature in black ink, appearing to read "Michael V. Yamane", with a long horizontal line extending to the right.

Michael V. Yamane, P.E.  
Chief of Operations & Technology

Enclosures

cc: Consumer Advocate  
Tom Lovas



**ANNUAL SERVICE RELIABILITY REPORT**

**2017**

Prepared  
March 1, 2018

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## INTRODUCTION

This is the 2017 Annual Service Reliability Report (“Report”) of the Kaua`i Island Utility Cooperative (“KIUC”). The Report contains a five-year history of standard industry reliability indices in order to depict the quality of electrical service provided to the cooperative consumer/member. These reliability indices are calculated using the data from all sustained (i.e. one minute or longer) system interruptions.

If data normalization is required, it is done using the guidelines specified in the report entitled, “Methodology for Determining Reliability Indices for HECO Utilities,” dated December 1990. That report indicates that normalization is allowed for “abnormal” situations such as hurricane, tsunami, earthquake, flood, catastrophic equipment failure, and single outages that cascade into a loss of load greater than 10% of the system peak. Such normalizations are made because good engineering design – while accounting for safety, reliability, utility industry standards, and economics – cannot and should not always account for catastrophic events.

The Report also contains a detailed breakdown of interruption causes, which is used to determine steps to be taken to prevent recurrence of such interruptions.



## DEFINITION OF TERMS

### CUSTOMER INTERRUPTION

One interruption of one customer. Interruptions to customers at their request (e.g. customer maintenance) are not considered.

### INTERRUPTION

The loss of service to one or more consumers and is a result of one or more component outages.

### INTERRUPTION DURATION

The period from the initiation of an interruption to a consumer until service has been restored to that consumer.

### MOMENTARY INTERRUPTION

An interruption that has duration limited to the period required to restore service by automatic or supervisory-controlled switching operations or by manual switching at locations where an operator is immediately available. Such switching operations must be completed in a specific time not to exceed one minute.

### SUSTAINED INTERRUPTION

Any interruption not classified as a momentary interruption (i.e. greater than one minute in duration). Only this type of interruption is included in the reliability indices within this report.

### RELIABILITY INDICES

Measurements used to indicate electrical service reliability. The indices used in this report conform to Institute of Electrical and Electronics Engineers (IEEE) standards. Four indices that convey a meaningful representation of the level of reliability were selected and are presented in this report. These reliability indices are as follows:

#### 1. AVERAGE SERVICE AVAILABILITY (ASA)

Total customer hours actually served as a percentage of total customer hours possible during the year. This indicates the extent to which electrical service was available to all customers. This index has been commonly referred to as the "Index of Reliability."

#### 2. CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (CAIDI)

The interruption duration per customer interrupted during the year. This index indicates the average duration of an interruption for those customers affected by a sustained interruption.

### 3. SYSTEM AVERAGE INTERRUPTION DURATION INDEX (SAIDI)

The interruption duration per customer served during the year. This index indicates the average interruption time experienced by all customers serviced on the system.

### 4. SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX (SAIFI)

The number of customer interruptions per customer served during the year. This index indicates the average number of sustained interruptions experienced by all customers serviced on the system.

The reliability indices are related to each other in a few ways. For example, the product of CAIDI and SAIFI is SAIDI. SAIDI can then be used to find ASA, since SAIDI represents the time during a period without service, while ASA represents the percent of time during that same period with service. The reliability indices can be thought of more simply as:

1. The percent of time electrical service is available (ASA)
2. The amount of time electrical service is NOT available (SAIDI)
3. How long an interruption lasts (CAIDI)
4. How often an interruption occurs (SAIFI)

**Table 1: 2013 – 2017 KIUC RELIABILITY INDICES**

	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
System Peak, MW	72.96	72.90	74.92	76.54	75.24
Customers, #	36,704	36,831	36,832	37,130	37,439
ASA, %	99.977	99.980	99.932	99.988	99.956
SAIFI, #	3.23	2.70	6.28	3.63	5.75
CAIDI, minutes	36.62	38.56	56.57	17.21	39.73
SAIDI, minutes	118.32	104.04	355.02	62.50	228.45

**Note:**

- None of the above data has been normalized.

**2017 Outages of Significant Magnitude:**

1. Interruption Report 2017-243, 8/7/17, 10:09 AM, 18,756 KWh – Scheduled work was in progress that necessitated taking the primary transmission out of service that feeds the Princeville substation, and thereby the entire North Shore. The backup path transmission experienced a fault. The location of this fault required a helicopter to locate and in the end the scheduled work had to be abandoned so as to get the primary line back in service. Total time out was about 2.75 hours.
2. Interruption Reports 2017-297 and 2017-298, 9/10/17, 10:31:10 AM, 49,224 KWh – Unit CT-1 located at the Kapaia Power Station was the only conventional dispatchable unit online. CT-1 tripped on reverse power due to a variety of factors resulting from grid fluctuations. The island went black within about three minutes. The island was fully restored and then went black again when an IPP closed their non-spinning synchronous unit to the grid. The island was fully restored in 75 minutes and 37 minutes respectively.
3. Interruption Report 2017-373, 11/1/17, 7:07:55 AM, 18,608 KWh – This outage was caused by a storm. Lightning took out the North Shore transmission twice within about 15 minutes. The transmission then went out a third time and failed to allow re-closure. Inspection by helicopter found a dead tree had fallen on lines but had then fallen away on its own. Breaker close was attempted and held. Total outage time was almost four and a half hours.



**Fig. 1: ASA (higher is better)**

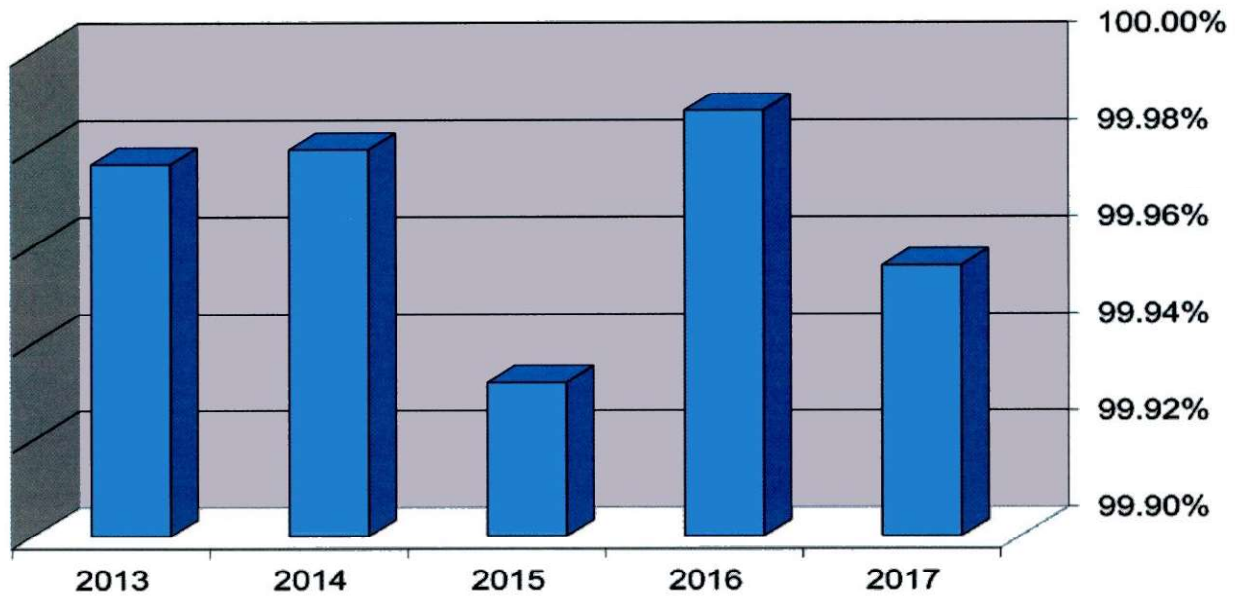


Figure 1 shows the Average System Availability (ASA) for the past five years. The 2017 ASA of 99.956% is lower than three of the previous four years of the five-year period and worse than the five-year average of 99.967%.

**Fig. 2: SAIFI (lower is better)**

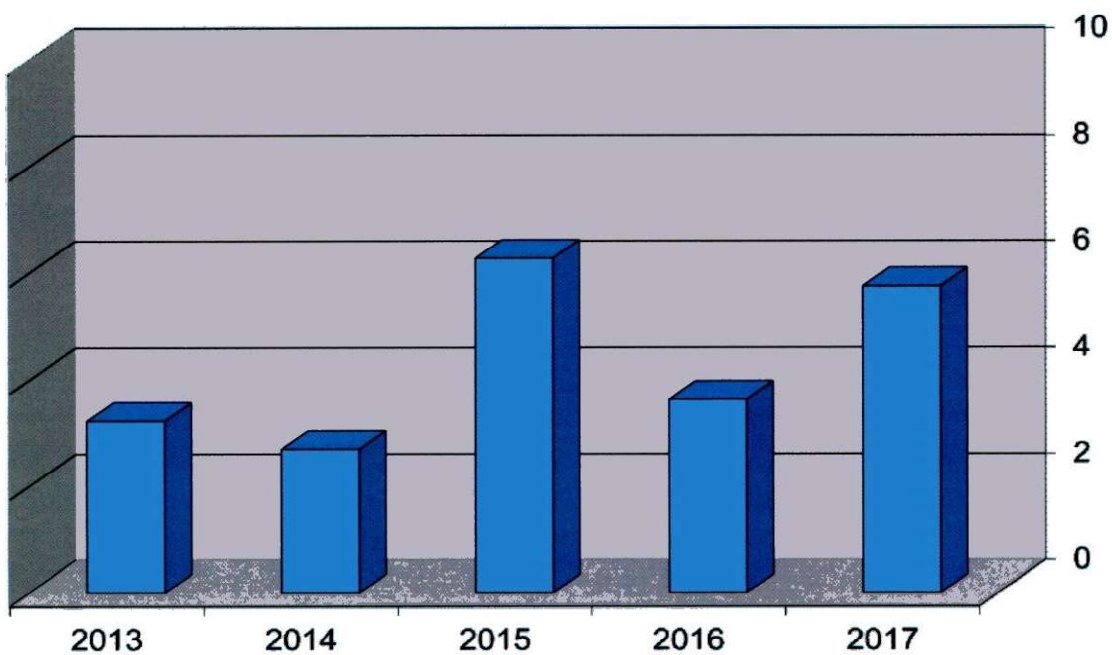


Figure 2 shows the System Average Interruption Frequency Index (SAIFI) for the past five years. The 2017 SAIFI of 5.75 was the second highest of the five-year period and worse than the five-year average of 4.32.

**Fig. 3: CAIDI (lower is better)**

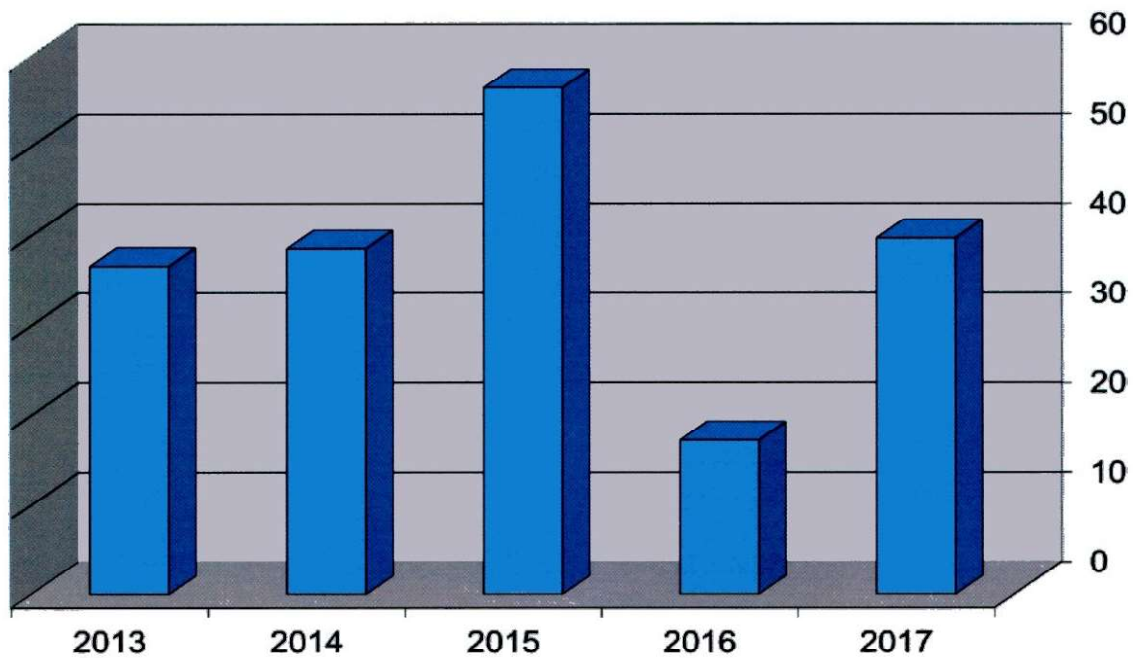


Figure 3 shows the Customer Average Interruption Duration Index (CAIDI) for the past five years. The 2017 CAIDI of 39.73 was the second highest of the five-year period and higher than the five-year average of 37.74.

**Fig. 4: SAIDI (lower is better)**

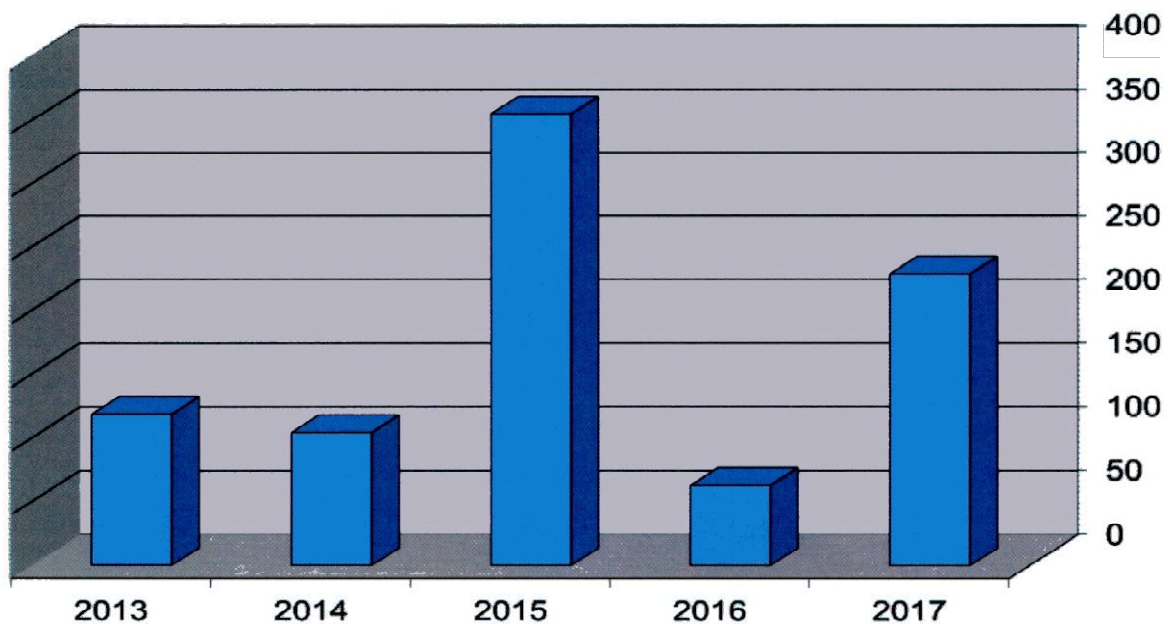


Figure 4 shows the System Average Interruption Duration Index (SAIDI) for the past five years. The 2017 SAIDI of 228.45 is higher than three of the previous four years of the five-year period and is also higher than the five-year average of 173.67.

## 2017 KIUC SUSTAINED INTERRUPTION CAUSES

In the following figures and tables, the most recent year's sustained interruption causes are examined. Interruptions can be broken down many ways, but we will focus on two areas: causes by frequency (what caused the most interruptions), and causes by magnitude (what caused the most severe interruptions).

Fig. 5: Sustained Interruptions by Frequency

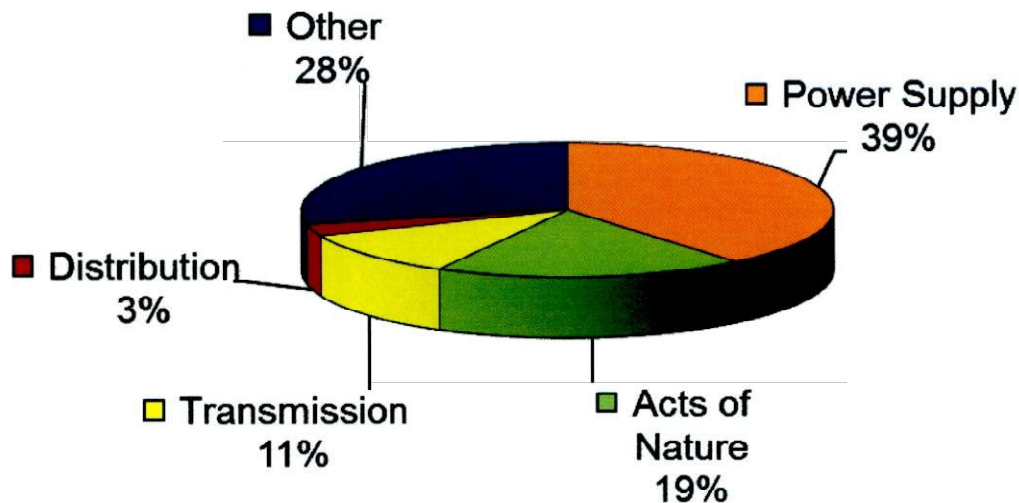


Figure 5 shows the breakdown by frequency. The leading cause of outages was “Power Supply” — interruptions caused by generating unit problems that result in a reduction of output, causing an under frequency load shed. The second most common cause was “Other” -- persons or equipment not related to or owned by KIUC. Examples include auto accidents that contact utility poles or wires, non-KIUC contractors such as construction crews that dig into underground cables or tree trimmers that contact overhead wires, and trees that contact wires due to overgrowth. The third leading cause of interruptions was “Acts of Nature” --- interruptions caused by high winds, floods, storms, etc. The fourth leading cause of interruptions was “Transmission” – failure or malfunction of transmission equipment including insulators, large transformers, lightning arrestors, and switches; and the fifth (or least) and final cause of interruptions was “Distribution” -- failure or malfunction of distribution equipment including cables, fuses, insulators, poles, and transformers.



Fig. 6: Sustained Interruptions by Magnitude

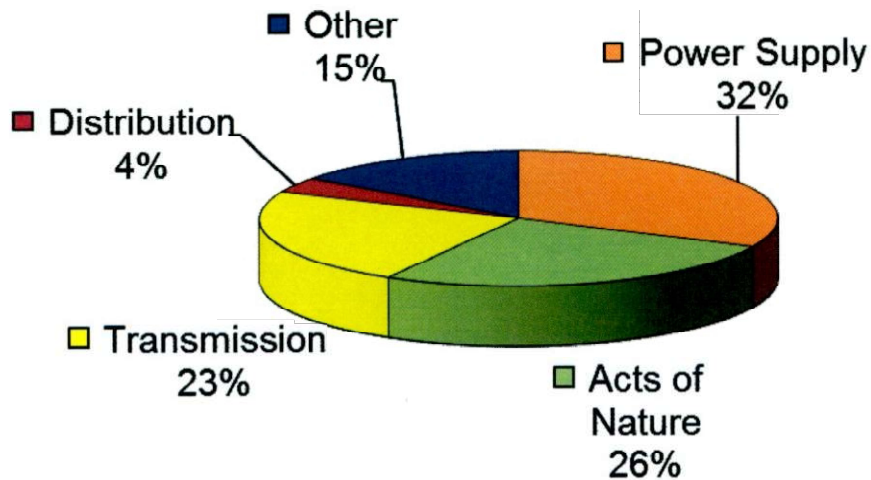


Figure 6 shows the breakdown by magnitude. The same descriptions and examples that were described following Figure 5 apply also for Figure 6. The causes of severe interruptions, in order from most to least, were "Power Supply", "Acts of Nature", "Transmission", "Other", and lastly "Distribution".



Outage Number	Circuit	Outage Start Time	Outage End Time	Duration	Class	Type	kW	Consumers
2017-035	2134	1/22/2017 4:59:34 AM	1/22/2017 8:15:00 AM	3:15:26	A	2	860	1528
2017-035	2133	1/22/2017 4:59:34 AM	1/22/2017 8:15:00 AM	3:15:26	A	2	140	406
2017-035	2132	1/22/2017 4:59:34 AM	1/22/2017 8:15:00 AM	3:15:26	A	2	360	718
2017-072	4123	2/22/2017 4:52:07 AM	2/22/2017 5:45:45 AM	0:53:38	A	4	610	225
2017-072	4122	2/22/2017 4:52:07 AM	2/22/2017 5:46:40 AM	0:54:33	A	4	630	1972
2017-072	4121	2/22/2017 4:52:07 AM	2/22/2017 5:47:27 AM	0:55:20	A	4	390	430
2017-072	4002	2/22/2017 4:52:07 AM	2/22/2017 5:44:04 AM	0:51:57	A	4	240	471
2017-074	2133	2/25/2017 6:17:25 PM	2/25/2017 6:26:53 PM	0:09:28	B	1	350	406
2017-074	4123	2/25/2017 6:17:23 PM	2/25/2017 6:31:13 PM	0:13:50	B	1	1050	225
2017-074	4122	2/25/2017 6:17:23 PM	2/25/2017 6:28:38 PM	0:11:15	B	1	340	1972
2017-074	3215	2/25/2017 6:17:23 PM	2/25/2017 6:30:47 PM	0:13:24	B	1	1680	1818
2017-074	2314	2/25/2017 6:17:23 PM	2/25/2017 6:25:47 PM	0:08:24	B	1	2050	768
2017-074	2311	2/25/2017 6:17:23 PM	2/25/2017 6:30:11 PM	0:12:48	B	1	1250	748
2017-074	3413	2/25/2017 6:17:22 PM	2/25/2017 6:26:15 PM	0:08:53	B	1	2860	2735
2017-074	5002	2/25/2017 6:17:21 PM	2/25/2017 6:29:55 PM	0:12:34	B	1	1460	1980
2017-074	3511	2/25/2017 6:17:21 PM	2/25/2017 6:31:44 PM	0:14:23	B	1	70	94
2017-074	3127	2/25/2017 6:17:20 PM	2/25/2017 6:24:37 PM	0:07:17	B	1	2700	1569
2017-074	3123	2/25/2017 6:17:20 PM	2/25/2017 6:30:24 PM	0:13:04	B	1	980	1187
2017-076	3127	2/28/2017 1:14:51 PM	2/28/2017 1:22:53 PM	0:08:02	B	2	3770	1569
2017-100	3125	3/29/2017 7:33:14 AM	3/29/2017 8:02:14 AM	0:29:00	B	5	2920	766
2017-102	3214	4/2/2017 8:08:27 PM	4/2/2017 8:40:37 PM	0:32:10	B	5	1900	120
2017-119	3127	4/22/2017 11:03:26 PM	4/22/2017 11:46:55 PM	0:43:29	B	6	2140	1569
2017-137	2314	5/3/2017 10:10:16 AM	5/3/2017 10:12:17 AM	0:02:01	A	6	1560	768
2017-137	2312	5/3/2017 10:10:16 AM	5/3/2017 10:14:17 AM	0:04:01	A	6	2690	754
2017-137	2311	5/3/2017 10:10:16 AM	5/3/2017 10:11:45 AM	0:01:29	A	6	860	748
2017-137	3215	5/3/2017 10:08:36 AM	5/3/2017 10:11:19 AM	0:02:43	A	6	650	1818
2017-137	3414	5/3/2017 10:08:34 AM	5/3/2017 10:18:25 AM	0:09:51	A	6	1800	859
2017-137	3413	5/3/2017 10:08:34 AM	5/3/2017 10:13:37 AM	0:05:03	A	6	1000	2735
2017-137	4123	5/3/2017 10:08:33 AM	5/3/2017 10:13:09 AM	0:04:36	A	6	730	225
2017-137	4122	5/3/2017 10:08:33 AM	5/3/2017 10:12:33 AM	0:04:00	A	6	690	1972
2017-137	4002	5/3/2017 10:08:33 AM	5/3/2017 10:13:48 AM	0:05:15	A	6	350	471
2017-137	5002	5/3/2017 10:08:32 AM	5/3/2017 10:11:53 AM	0:03:21	A	6	1020	1980
2017-137	3512	5/3/2017 10:08:32 AM	5/3/2017 10:14:37 AM	0:06:05	A	6	1600	2347
2017-137	3511	5/3/2017 10:08:32 AM	5/3/2017 10:13:23 AM	0:04:51	A	6	40	94
2017-137	3127	5/3/2017 10:08:32 AM	5/3/2017 10:12:51 AM	0:04:19	A	6	2720	1569
2017-137	2134	5/3/2017 10:08:32 AM	5/3/2017 11:17:00 AM	1:08:28	A	6	540	1528
2017-137	2133	5/3/2017 10:08:32 AM	5/3/2017 11:15:00 AM	1:06:28	A	6	110	406
2017-137	2132	5/3/2017 10:08:29 AM	5/3/2017 11:29:00 AM	1:20:31	A	6	310	718
2017-167	3125	5/26/2017 8:40:43 AM	5/26/2017 8:45:00 AM	0:04:17	B	5	2320	766
2017-190	4124	6/18/2017 2:02:28 PM	6/18/2017 2:15:51 PM	0:13:23	A	4	3760	1926
2017-190	4123	6/18/2017 2:02:28 PM	6/18/2017 2:16:27 PM	0:13:59	A	4	890	225
2017-190	4122	6/18/2017 2:02:28 PM	6/18/2017 2:16:54 PM	0:14:26	A	4	910	1972
2017-190	4121	6/18/2017 2:02:28 PM	6/18/2017 2:17:53 PM	0:15:25	A	4	870	430
2017-190	4124	6/18/2017 11:59:30 AM	6/18/2017 1:11:48 PM	1:12:18	A	4	3330	1926
2017-190	4123	6/18/2017 11:59:30 AM	6/18/2017 1:13:59 PM	1:14:29	A	4	890	225
2017-190	4122	6/18/2017 11:59:30 AM	6/18/2017 1:14:52 PM	1:15:22	A	4	810	1972
2017-190	4121	6/18/2017 11:59:30 AM	6/18/2017 1:15:35 PM	1:16:05	A	4	750	430
2017-190	4002	6/18/2017 11:59:30 AM	6/18/2017 4:07:01 PM	4:07:31	A	4	420	471
2017-234	4122	8/1/2017 5:45:18 PM	8/1/2017 7:01:49 PM	1:16:31	B	6	980	520
2017-237	2132	8/4/2017 2:39:34 AM	8/4/2017 4:35:00 AM	1:55:26	B	5	360	718
2017-237	2134	8/4/2017 2:39:30 AM	8/4/2017 4:33:00 AM	1:53:30	B	5	920	1528
2017-237	2133	8/4/2017 2:39:30 AM	8/4/2017 4:30:00 AM	1:50:30	B	5	190	406
2017-240	4121	8/6/2017 6:23:19 AM	8/6/2017 6:38:40 AM	0:15:21	B	1	610	430
2017-240	1432	8/6/2017 6:23:19 AM	8/6/2017 6:42:31 AM	0:19:12	B	1	210	300
2017-240	3313	8/6/2017 6:23:18 AM	8/6/2017 6:40:09 AM	0:16:51	B	1	1690	1396
2017-240	2134	8/6/2017 6:23:18 AM	8/6/2017 6:42:02 AM	0:18:44	B	1	980	1528
2017-240	3212	8/6/2017 6:23:16 AM	8/6/2017 6:40:41 AM	0:17:25	B	1	330	30
2017-240	2311	8/6/2017 6:23:05 AM	8/6/2017 6:43:26 AM	0:20:21	B	1	1080	748
2017-240	3215	8/6/2017 6:23:04 AM	8/6/2017 6:42:46 AM	0:19:42	B	1	1200	1818
2017-240	3123	8/6/2017 6:23:03 AM	8/6/2017 6:43:04 AM	0:20:01	B	1	720	1187



Outage Number	Circuit	Outage Start Time	Outage End Time	Duration	Class	Type	kW	Consumers
2017-240	3127	8/6/2017 6:21:26 AM	8/6/2017 6:45:18 AM	0:23:52	B	1	2070	1569
2017-240	2314	8/6/2017 6:21:25 AM	8/6/2017 6:44:21 AM	0:22:56	B	1	1660	768
2017-240	2312	8/6/2017 6:21:25 AM	8/6/2017 6:49:06 AM	0:27:41	B	1	2500	754
2017-240	4123	8/6/2017 6:21:24 AM	8/6/2017 6:46:49 AM	0:25:25	B	1	790	225
2017-240	4122	8/6/2017 6:21:24 AM	8/6/2017 6:45:42 AM	0:24:18	B	1	780	1972
2017-240	2133	8/6/2017 6:21:23 AM	8/6/2017 6:46:26 AM	0:25:03	B	1	230	406
2017-240	2132	8/6/2017 6:21:23 AM	8/6/2017 6:49:30 AM	0:28:07	B	1	570	718
2017-240	5002	8/6/2017 6:21:21 AM	8/6/2017 6:43:40 AM	0:22:19	B	1	950	1980
2017-240	4002	8/6/2017 6:21:21 AM	8/6/2017 6:48:38 AM	0:27:17	B	1	320	471
2017-240	3511	8/6/2017 6:21:21 AM	8/6/2017 6:48:01 AM	0:26:40	B	1	70	94
2017-240	3413	8/6/2017 6:21:21 AM	8/6/2017 6:48:01 AM	0:26:40	B	1	1820	2735
2017-240	3414	8/6/2017 6:18:44 AM	8/6/2017 6:51:36 AM	0:32:52	B	1	1510	859
2017-240	3512	8/6/2017 6:18:41 AM	8/6/2017 6:50:58 AM	0:32:17	B	1	2250	2347
2017-241	3414	8/6/2017 12:44:28 PM	8/6/2017 12:56:28 PM	0:12:00	B	1	1850	859
2017-241	3512	8/6/2017 12:44:25 PM	8/6/2017 12:53:01 PM	0:08:36	B	1	1920	2347
2017-243	3512	8/7/2017 11:18:41 AM	8/7/2017 11:20:57 AM	0:02:16	A	4	1580	2347
2017-243	3414	8/7/2017 11:18:41 AM	8/7/2017 11:20:33 AM	0:01:52	A	4	1840	859
2017-243	4124	8/7/2017 10:09:25 AM	8/7/2017 12:54:17 PM	2:44:52	A	4	3990	1926
2017-243	4123	8/7/2017 10:09:25 AM	8/7/2017 12:53:59 PM	2:44:34	A	4	750	225
2017-243	4122	8/7/2017 10:09:25 AM	8/7/2017 12:53:25 PM	2:44:00	A	4	820	1972
2017-243	4121	8/7/2017 10:09:25 AM	8/7/2017 12:52:59 PM	2:43:34	A	4	830	430
2017-243	4002	8/7/2017 10:09:25 AM	8/7/2017 12:52:26 PM	2:43:01	A	4	410	471
2017-257	4124	8/20/2017 10:46:16 PM	8/20/2017 10:53:56 PM	0:07:40	A	2	3100	2356
2017-257	4123	8/20/2017 10:46:16 PM	8/20/2017 10:53:41 PM	0:07:25	A	2	980	391
2017-257	4122	8/20/2017 10:46:16 PM	8/20/2017 10:53:20 PM	0:07:04	A	2	730	520
2017-257	4121	8/20/2017 10:46:16 PM	8/20/2017 10:52:43 PM	0:06:27	A	2	680	473
2017-257	4002	8/20/2017 10:46:16 PM	8/20/2017 10:52:10 PM	0:05:54	A	2	330	491
2017-262	4122	8/21/2017 2:13:13 PM	8/21/2017 3:19:24 PM	1:06:11	B	2	890	520
2017-267	2313	8/21/2017 5:07:23 PM	8/21/2017 6:01:00 PM	0:53:37	B	2	1805	931
2017-267	2313	8/21/2017 3:25:57 PM	8/21/2017 5:07:23 PM	1:41:26	B	2	2110	931
2017-268	4124	8/21/2017 3:24:04 PM	8/21/2017 3:40:19 PM	0:16:15	B	2	3800	2356
2017-268	4123	8/21/2017 3:24:04 PM	8/21/2017 3:39:41 PM	0:15:37	B	2	1310	391
2017-268	4122	8/21/2017 3:24:04 PM	8/21/2017 3:39:19 PM	0:15:15	B	2	1070	520
2017-268	4121	8/21/2017 3:24:04 PM	8/21/2017 3:39:05 PM	0:15:01	B	2	920	473
2017-268	4002	8/21/2017 3:24:04 PM	8/21/2017 3:37:57 PM	0:13:53	B	2	130	491
2017-297	5002	9/10/2017 10:31:10 AM	9/10/2017 11:22:04 AM	0:50:54	A	1	760	1880
2017-297	5001	9/10/2017 10:31:10 AM	9/10/2017 10:53:12 AM	0:22:02	A	1	1040	979
2017-297	4124	9/10/2017 10:31:10 AM	9/10/2017 11:18:53 AM	0:47:43	A	1	3300	2356
2017-297	4123	9/10/2017 10:31:10 AM	9/10/2017 11:30:49 AM	0:59:39	A	1	670	391
2017-297	4122	9/10/2017 10:31:10 AM	9/10/2017 11:29:59 AM	0:58:49	A	1	660	520
2017-297	4121	9/10/2017 10:31:10 AM	9/10/2017 11:42:25 AM	1:11:15	A	1	710	473
2017-297	4002	9/10/2017 10:31:10 AM	9/10/2017 11:17:31 AM	0:46:21	A	1	330	491
2017-297	3512	9/10/2017 10:31:10 AM	9/10/2017 11:25:06 AM	0:53:56	A	1	300	2334
2017-297	3511	9/10/2017 10:31:10 AM	9/10/2017 11:31:30 AM	1:00:20	A	1	60	95
2017-297	3415	9/10/2017 10:31:10 AM	9/10/2017 11:19:35 AM	0:48:25	A	1	180	1627
2017-297	3414	9/10/2017 10:31:10 AM	9/10/2017 11:39:26 AM	1:08:16	A	1	1520	713
2017-297	3413	9/10/2017 10:31:10 AM	9/10/2017 11:32:34 AM	1:01:24	A	1	1350	2786
2017-297	3412	9/10/2017 10:31:10 AM	9/10/2017 11:39:44 AM	1:08:34	A	1	130	221
2017-297	3411	9/10/2017 10:31:10 AM	9/10/2017 11:19:18 AM	0:48:08	A	1	890	542
2017-297	3314	9/10/2017 10:31:10 AM	9/10/2017 11:17:58 AM	0:46:48	A	1	290	103
2017-297	3313	9/10/2017 10:31:10 AM	9/10/2017 11:42:58 AM	1:11:48	A	1	830	1257
2017-297	3215	9/10/2017 10:31:10 AM	9/10/2017 11:19:49 AM	0:48:39	A	1	1080	1818
2017-297	3214	9/10/2017 10:31:10 AM	9/10/2017 11:40:33 AM	1:09:23	A	1	1600	598
2017-297	3212	9/10/2017 10:31:10 AM	9/10/2017 11:45:57 AM	1:14:47	A	1	360	79
2017-297	3211	9/10/2017 10:31:10 AM	9/10/2017 11:41:01 AM	1:09:51	A	1	500	170
2017-297	3127	9/10/2017 10:31:10 AM	9/10/2017 11:35:54 AM	1:04:44	A	1	920	1480
2017-297	3126	9/10/2017 10:31:10 AM	9/10/2017 11:41:20 AM	1:10:10	A	1	80	30
2017-297	3125	9/10/2017 10:31:10 AM	9/10/2017 11:16:01 AM	0:44:51	A	1	1790	1032
2017-297	3124	9/10/2017 10:31:10 AM	9/10/2017 11:16:20 AM	0:45:10	A	1	2970	183
2017-297	3123	9/10/2017 10:31:10 AM	9/10/2017 11:35:16 AM	1:04:06	A	1	520	829



Outage Number	Circuit	Outage Start Time	Outage End Time	Duration	Class	Type	kW	Consumers
2017-297	3122	9/10/2017 10:31:10 AM	9/10/2017 11:16:01 AM	0:44:51	A	1	1790	766
2017-297	3121	9/10/2017 10:31:10 AM	9/10/2017 11:16:01 AM	0:44:51	A	1	1090	1313
2017-297	2314	9/10/2017 10:31:10 AM	9/10/2017 11:29:21 AM	0:58:11	A	1	1350	1104
2017-297	2313	9/10/2017 10:31:10 AM	9/10/2017 11:18:13 AM	0:47:03	A	1	3060	931
2017-297	2312	9/10/2017 10:31:10 AM	9/10/2017 11:33:16 AM	1:02:06	A	1	2670	552
2017-297	2311	9/10/2017 10:31:10 AM	9/10/2017 11:31:24 AM	1:00:14	A	1	460	865
2017-297	2134	9/10/2017 10:31:10 AM	9/10/2017 11:46:08 AM	1:14:58	A	1	540	1676
2017-297	2133	9/10/2017 10:31:10 AM	9/10/2017 11:30:24 AM	0:59:14	A	1	150	400
2017-297	2132	9/10/2017 10:31:10 AM	9/10/2017 11:38:52 AM	1:07:42	A	1	160	647
2017-297	1432	9/10/2017 10:31:10 AM	9/10/2017 11:10:49 AM	0:39:39	A	1	190	337
2017-297	1325	9/10/2017 10:31:10 AM	9/10/2017 11:41:38 AM	1:10:28	A	1	510	171
2017-297	1324	9/10/2017 10:31:10 AM	9/10/2017 11:11:18 AM	0:40:08	A	1	390	0
2017-297	1323	9/10/2017 10:31:10 AM	9/10/2017 11:11:31 AM	0:40:21	A	1	660	1396
2017-297	1322	9/10/2017 10:31:10 AM	9/10/2017 11:41:54 AM	1:10:44	A	1	30	753
2017-297	1233	9/10/2017 10:31:10 AM	9/10/2017 11:18:27 AM	0:47:17	A	1	940	30
2017-297	1232	9/10/2017 10:31:10 AM	9/10/2017 11:11:50 AM	0:40:40	A	1	460	10
2017-297	1231	9/10/2017 10:31:10 AM	9/10/2017 11:18:38 AM	0:47:28	A	1	480	2
2017-298	5002	9/10/2017 12:46:37 PM	9/10/2017 12:56:28 PM	0:09:51	A	6	1480	1880
2017-298	5001	9/10/2017 12:46:37 PM	9/10/2017 12:56:08 PM	0:09:31	A	6	970	979
2017-298	4124	9/10/2017 12:46:37 PM	9/10/2017 1:05:41 PM	0:19:04	A	6	3510	2356
2017-298	4123	9/10/2017 12:46:37 PM	9/10/2017 1:10:10 PM	0:23:33	A	6	780	391
2017-298	4122	9/10/2017 12:46:37 PM	9/10/2017 1:09:00 PM	0:22:23	A	6	660	520
2017-298	4121	9/10/2017 12:46:37 PM	9/10/2017 1:21:29 PM	0:34:52	A	6	800	473
2017-298	4002	9/10/2017 12:46:37 PM	9/10/2017 1:11:45 PM	0:25:08	A	6	350	491
2017-298	3512	9/10/2017 12:46:37 PM	9/10/2017 1:13:58 PM	0:27:21	A	6	1900	2334
2017-298	3511	9/10/2017 12:46:37 PM	9/10/2017 1:10:42 PM	0:24:05	A	6	50	95
2017-298	3415	9/10/2017 12:46:37 PM	9/10/2017 1:06:33 PM	0:19:56	A	6	200	1627
2017-298	3414	9/10/2017 12:46:37 PM	9/10/2017 1:14:43 PM	0:28:06	A	6	1950	713
2017-298	3413	9/10/2017 12:46:37 PM	9/10/2017 1:10:54 PM	0:24:17	A	6	1390	2786
2017-298	3412	9/10/2017 12:46:37 PM	9/10/2017 1:15:14 PM	0:28:37	A	6	210	221
2017-298	3411	9/10/2017 12:46:37 PM	9/10/2017 1:06:09 PM	0:19:32	A	6	770	542
2017-298	3314	9/10/2017 12:46:37 PM	9/10/2017 1:02:15 PM	0:15:38	A	6	270	103
2017-298	3313	9/10/2017 12:46:37 PM	9/10/2017 1:22:14 PM	0:35:37	A	6	910	1257
2017-298	3215	9/10/2017 12:46:37 PM	9/10/2017 1:07:30 PM	0:20:53	A	6	1060	1818
2017-298	3214	9/10/2017 12:46:37 PM	9/10/2017 1:15:37 PM	0:29:00	A	6	1630	598
2017-298	3212	9/10/2017 12:46:37 PM	9/10/2017 1:22:37 PM	0:36:00	A	6	380	79
2017-298	3211	9/10/2017 12:46:37 PM	9/10/2017 1:15:42 PM	0:29:05	A	6	440	170
2017-298	3127	9/10/2017 12:46:37 PM	9/10/2017 1:09:34 PM	0:22:57	A	6	1290	1480
2017-298	3126	9/10/2017 12:46:37 PM	9/10/2017 1:16:10 PM	0:29:33	A	6	90	30
2017-298	3125	9/10/2017 12:46:37 PM	9/10/2017 1:01:31 PM	0:14:54	A	6	1510	1032
2017-298	3124	9/10/2017 12:46:37 PM	9/10/2017 1:06:48 PM	0:20:11	A	6	3280	183
2017-298	3123	9/10/2017 12:46:37 PM	9/10/2017 1:07:59 PM	0:21:22	A	6	560	829
2017-298	3122	9/10/2017 12:46:37 PM	9/10/2017 1:02:25 PM	0:15:48	A	6	1770	766
2017-298	3121	9/10/2017 12:46:37 PM	9/10/2017 1:07:11 PM	0:20:34	A	6	1240	1313
2017-298	2314	9/10/2017 12:46:37 PM	9/10/2017 1:08:23 PM	0:21:46	A	6	1350	1104
2017-298	2313	9/10/2017 12:46:37 PM	9/10/2017 1:04:27 PM	0:17:50	A	6	3550	931
2017-298	2312	9/10/2017 12:46:37 PM	9/10/2017 1:11:59 PM	0:25:22	A	6	2920	552
2017-298	2311	9/10/2017 12:46:37 PM	9/10/2017 1:08:12 PM	0:21:35	A	6	600	865
2017-298	2134	9/10/2017 12:46:37 PM	9/10/2017 1:22:51 PM	0:36:14	A	6	500	1676
2017-298	2133	9/10/2017 12:46:37 PM	9/10/2017 1:09:48 PM	0:23:11	A	6	180	400
2017-298	2132	9/10/2017 12:46:37 PM	9/10/2017 1:12:23 PM	0:25:46	A	6	410	647
2017-298	1432	9/10/2017 12:46:37 PM	9/10/2017 1:23:13 PM	0:36:36	A	6	260	337
2017-298	1325	9/10/2017 12:46:37 PM	9/10/2017 1:17:02 PM	0:30:25	A	6	470	171
2017-298	1323	9/10/2017 12:46:37 PM	9/10/2017 12:57:58 PM	0:11:21	A	6	1090	1396
2017-298	1322	9/10/2017 12:46:37 PM	9/10/2017 1:17:30 PM	0:30:53	A	6	540	753
2017-298	1233	9/10/2017 12:46:37 PM	9/10/2017 12:58:40 PM	0:12:03	A	6	410	30
2017-298	1232	9/10/2017 12:46:37 PM	9/10/2017 1:04:46 PM	0:18:09	A	6	390	10
2017-298	1231	9/10/2017 12:46:37 PM	9/10/2017 1:04:58 PM	0:18:21	A	6	460	2
2017-299	2134	9/10/2017 3:25:13 PM	9/10/2017 4:38:00 PM	1:12:47	A	4	1380	1676
2017-299	2133	9/10/2017 3:25:13 PM	9/10/2017 4:37:30 PM	1:12:17	A	4	280	400



Outage Number	Circuit	Outage Start Time	Outage End Time	Duration	Class	Type	kW	Consumers
2017-299	2132	9/10/2017 3:25:13 PM	9/10/2017 4:37:00 PM	1:11:47	A	4	900	647
2017-303	3313	9/14/2017 1:32:02 AM	9/14/2017 1:46:56 AM	0:14:54	B	1	940	1257
2017-303	1432	9/14/2017 1:32:01 AM	9/14/2017 1:50:57 AM	0:18:56	B	1	200	337
2017-303	3212	9/14/2017 1:32:00 AM	9/14/2017 1:47:53 AM	0:15:53	B	1	300	79
2017-303	4121	9/14/2017 1:31:57 AM	9/14/2017 1:46:12 AM	0:14:15	B	1	490	473
2017-303	2134	9/14/2017 1:31:57 AM	9/14/2017 1:49:25 AM	0:17:28	B	1	1000	1676
2017-335	2314	10/13/2017 8:52:48 PM	10/13/2017 11:00:41 PM	2:07:53	B	2	2170	1104
2017-336	4002	10/14/2017 7:54:00 PM	10/14/2017 9:29:20 PM	1:35:20	B	2	880	491
2017-348	4122	10/18/2017 12:46:46 PM	10/18/2017 1:46:43 PM	0:59:57	B	6	860	520
2017-373	4123	11/1/2017 11:34:09 AM	11/1/2017 11:49:53 AM	0:15:44	A	2	1570	391
2017-373	4122	11/1/2017 11:34:09 AM	11/1/2017 11:56:10 AM	0:22:01	A	2	670	520
2017-373	4121	11/1/2017 11:34:09 AM	11/1/2017 11:47:46 AM	0:13:37	A	2	650	473
2017-373	4124	11/1/2017 9:42:53 AM	11/1/2017 11:50:59 AM	2:08:06	A	2	2440	2356
2017-373	4123	11/1/2017 9:42:48 AM	11/1/2017 9:58:36 AM	0:15:48	A	2	780	391
2017-373	4124	11/1/2017 7:41:58 AM	11/1/2017 9:40:49 AM	1:58:51	A	2	3050	2356
2017-373	4123	11/1/2017 7:41:58 AM	11/1/2017 9:14:21 AM	1:32:23	A	2	990	391
2017-373	4122	11/1/2017 7:41:58 AM	11/1/2017 8:44:49 AM	1:02:51	A	2	610	520
2017-373	4121	11/1/2017 7:41:58 AM	11/1/2017 8:48:34 AM	1:06:36	A	2	900	473
2017-373	4002	11/1/2017 7:41:58 AM	11/1/2017 11:58:30 AM	4:16:32	A	2	420	491
2017-373	4123	11/1/2017 7:41:00 AM	11/1/2017 8:00:00 PM	12:19:00	A	2	12	391
2017-373	4124	11/1/2017 7:17:35 AM	11/1/2017 7:26:19 AM	0:08:44	A	2	3910	2356
2017-373	4123	11/1/2017 7:17:35 AM	11/1/2017 7:26:00 AM	0:08:25	A	2	900	391
2017-373	4122	11/1/2017 7:17:35 AM	11/1/2017 7:25:29 AM	0:07:54	A	2	730	520
2017-373	4121	11/1/2017 7:17:35 AM	11/1/2017 7:25:07 AM	0:07:32	A	2	680	473
2017-373	4002	11/1/2017 7:17:35 AM	11/1/2017 7:26:57 AM	0:09:22	A	2	470	491
2017-373	4124	11/1/2017 7:07:55 AM	11/1/2017 7:10:51 AM	0:02:56	A	2	3050	2356
2017-373	4123	11/1/2017 7:07:55 AM	11/1/2017 7:10:51 AM	0:02:56	A	2	990	391
2017-373	4122	11/1/2017 7:07:55 AM	11/1/2017 7:10:51 AM	0:02:56	A	2	880	520
2017-373	4121	11/1/2017 7:07:55 AM	11/1/2017 7:10:51 AM	0:02:56	A	2	610	473
2017-373	4002	11/1/2017 7:07:55 AM	11/1/2017 7:11:01 AM	0:03:06	A	2	400	491
2017-414	2314	12/13/2017 10:58:51 AM	12/13/2017 11:00:20 AM	0:01:29	B	1	1230	1104
2017-414	5002	12/13/2017 10:58:50 AM	12/13/2017 11:01:20 AM	0:02:30	B	1	1980	1880
2017-000	9999	1/1/2017 12:00:00 AM	1/1/2017 12:00:00 AM	0:00:00	C	3	0	0