

October 30, 2017

To: The UrgentLink Disaster Communications System

From: MB Public Affairs, Inc.

Re: Communications and Electrical Service Outages Caused by Hurricane Maria

This memo presents data on the impact of Hurricane Maria on communications and power infrastructure in Puerto Rico. Hurricane Maria made landfall in Puerto Rico on September 20, 2017, and the data presented in this memo covers the period from this date through October 30 (40 days after landfall). This memo primarily relies on data from two Federal government sources:

- The Federal Communication Commission’s (FCC) “Hurricane Maria Communications Status Reports,” published daily since September 21, 2017 (one day after landfall). These reports present daily data on communications outages in Puerto Rico. The data in these reports is derived from FCC Disaster Information Reporting System (DIRS) data. DIRS is activated in serious disasters as a way for communications companies to self-report outages to the federal government.¹
- The U.S. Department of Energy’s (DOE) “Event Summary Reports,” published several times per week since September 20, 2017 (the day of landfall). These reports provide estimates of the number of electricity customers without power in Puerto Rico.

Where possible, this memo provides data at the local level. Note that Puerto Rico does not have counties – it has 78 administrative divisions called *municipios*. The U.S. Census Bureau recognizes *municipios* as “county-equivalents,” so the term “county-equivalents” is used throughout this memo.

TABLE OF CONTENTS

Key Findings 2

 Findings from Federal Government Data – Puerto Rico Territory-Wide 2

 Findings from Federal Government Data – San Juan, Puerto Rico 2

Cellular Telephone Service Outages 3

 Territory-Wide Outage Data 3

 Specific Data for San Juan, Puerto Rico 4

 Puerto Rico County-Equivalents Where 100% of Cellular Sites Went Out of Service 6

Landline Telephone Service Outages 7

Electrical Service Outages 8

Key News Coverage 9

Notes on Methodology 13

¹ <https://www.fcc.gov/general/disaster-information-reporting-system-dirs-0>

Key Findings

Findings from Federal Government Data – Puerto Rico Territory-Wide

- **Maria Devastated Cellular Communications in Puerto Rico:** According to FCC data, up to 96% of cellular sites in Puerto Rico were out of service in the three days after Hurricane Maria made landfall.
- **As of October 30, 2017, 58% of Cell Sites throughout Puerto Rico Remained Out of Service:** According to FCC data, as of October 30 (40 days after Hurricane Maria made landfall), 58% of cellular sites throughout Puerto Rico were still out of service.
- **For Three Days after Maria Made Landfall, over Half of All County-Equivalents in Puerto Rico Lacked any Functioning Cell Sites:** According to FCC data, over half (48 out of 78) of Puerto Rico’s county-equivalents had zero functioning cellular sites for three days after Hurricane Maria made landfall. It was not until October 29 (39 days after Hurricane Maria made landfall) that every county-equivalent in Puerto Rico had at least one functioning cellular site.
- **According to the U.S. Department of Energy Estimates, all of Puerto Rico Was without Power for Eight Days Following Maria:** According to DOE estimates, 100% of Puerto Rico residents were without power for eight days after Hurricane Maria made landfall.
- **As of October 30, 2017, the U.S. Department of Energy Estimated that 70% of Puerto Ricans Remained without Power:** According to DOE estimates, as of October 30 (40 days after Hurricane Maria made landfall), an estimated 70% of Puerto Ricans remained without power.

Findings from Federal Government Data – San Juan, Puerto Rico

- **Over 80% of Cellular Sites in Puerto Rico’s Largest County-Equivalent, San Juan, Were Out of Service for Four Days after Maria Made Landfall:** In San Juan, the capital and largest county-equivalent of Puerto Rico (pop. 395,326), over 80% of cellular sites were out of service for four days after Hurricane Maria made landfall.
- **As of October 30, 2017, 31% of Cell Sites in San Juan Remained Out of Service:** Widespread cellular outages have persisted for weeks in San Juan. According to the FCC daily reports, as of October 30 (40 days after Hurricane Maria made landfall), 31% of cellular sites in San Juan were still out of service.

Cellular Telephone Service Outages

The FCC has released cellular site (i.e. cellular tower) outage data for areas affected by Hurricane Maria. This data is found in the FCC’s “Hurricane Maria Communications Status Reports,” published daily since September 21, 2017 – these FCC reports are derived from outage data reported by communications companies through the FCC Disaster Information Reporting System (DIRS).

The FCC’s data shows the total number of cellular sites and the subtotal of out of service cellular sites in Puerto Rico, by county-equivalent, on a daily basis. (As noted earlier in this document, Puerto Rico does not have counties – it has 78 administrative divisions called *municipios*, which the U.S. Census Bureau describes as “county equivalents.”)

Territory-Wide Outage Data

The following table aggregates the FCC’s cellular site outage data for Puerto Rico in the 40 days after Hurricane Maria made landfall.

This table shows that, in the three days after Hurricane Maria made landfall, up to 96% of cellular sites in Puerto Rico were out of service (see highlighted rows).

This table also shows that, as of October 30 (40 days after Hurricane Maria made landfall), 58% of cellular sites in Puerto Rico remain out of service.

CELLULAR SITE OUTAGES IN AREAS AFFECTED BY HURRICANE MARIA

Date	Days after Hurricane Maria Made Landfall	Number of County-Equivalents in Disaster Area	Number of Cell Sites in Disaster Area	Number of Cell Sites Out-of-Service in Disaster Area	Percentage of Cell Sites Out-of-Service in Disaster Area
10/30/2017	40 days after landfall	78	2,648	1,540	58%
10/29/2017	39 days after landfall	78	2,648	1,521*	57%
10/28/2017	38 days after landfall	78	2,648	1,547	58%
10/27/2017	37 days after landfall	78	2,648	1,573	59%
10/26/2017	36 days after landfall	78	2,648	1,611	61%
10/25/2017	35 days after landfall	78	2,682	1,780	66%
10/24/2017	34 days after landfall	78	2,739	1,781	65%
10/23/2017	33 days after landfall	78	2,648	1,750	66%
10/22/2017	32 days after landfall	78	2,648	1,764	67%
10/21/2017	31 days after landfall	78	2,648	1,785	67%
10/20/2017	30 days after landfall	78	2,648	1,806	68%
10/19/2017	29 days after landfall	78	2,723	1,901	70%
10/18/2017	28 days after landfall	78	2,680	1,909	71%
10/17/2017	27 days after landfall	78	2,680	2,019	75%
10/16/2017	26 days after landfall	78	2,679	1,986	74%
10/15/2017	25 days after landfall	78	2,680	1,995	74%
10/14/2017	24 days after landfall	78	2,680	2,008	75%
10/13/2017	23 days after landfall	78	2,680	2,033	76%
10/12/2017	22 days after landfall	78	2,680	2,040	76%
10/11/2017	21 days after landfall	78	2,680	2,080	78%
10/10/2017	20 days after landfall	78	2,680	2,114	79%
10/9/2017	19 days after landfall	78	2,680	2,174	81%
10/8/2017	18 days after landfall	78	2,646	2,161	82%

Date	Days after Hurricane Maria Made Landfall	Number of County-Equivalents in Disaster Area	Number of Cell Sites in Disaster Area	Number of Cell Sites Out-of-Service in Disaster Area	Percentage of Cell Sites Out-of-Service in Disaster Area
10/7/2017	17 days after landfall	78	2,646	2,166	82%
10/6/2017	16 days after landfall	78	2,644	2,195	83%
10/5/2017	15 days after landfall	78	2,644	2,238	85%
10/4/2017	14 days after landfall	78	2,644	2,282	86%
10/3/2017	13 days after landfall	78	2,644	2,324	88%
10/2/2017	12 days after landfall	78	2,671	2,359	88%
10/1/2017	11 days after landfall	78	2,671	2,371	89%
9/30/2017	10 days after landfall	78	2,671	2,369	89%
9/29/2017	9 days after landfall	78	2,671	2,385	89%
9/28/2017	8 days after landfall	78	2,671	2,411	90%
9/27/2017	7 days after landfall	78	2,671	2,432	91%
9/26/2017	6 days after landfall	78	2,671	2,429	91%
9/25/2017	5 days after landfall	78	2,671	2,437	91%
9/24/2017	4 days after landfall	78	2,671	2,470	92%
9/23/2017	3 days after landfall	78	1,789	1,711	96%
9/22/2017	2 days after landfall	78	1,789	1,707	95%
9/21/2017	1 day after landfall	78	1,789	1,703	95%

Source: FCC “Communications Status Report for Areas Impacted by Hurricane Maria,” 9/21/17-10/30/17

*NOTE: The FCC’s data for this day appears to include an error – one county-equivalent appears in the FCC’s data for this day twice, with different outage figures. The higher figure was used for the aggregate in this table, but the difference between the two figures was insignificant.

Note that the number of cell sites described in the FCC’s daily reports has fluctuated over time – and the reason for these fluctuations is unclear. Nonetheless, this data is presented exactly as provided by the FCC daily reports. Further research, including FOIA requests and conversations with the FCC, is being undertaken to determine why the number of cell sites changed.

The FCC also reported that four major wireless providers have taken emergency measures to help expand service. These providers have opened up roaming in Puerto Rico in an effort to provide as much cell service as possible to Puerto Ricans. Additionally, these providers deployed Satellite Cells on Light Trucks (COLTs) and Terrestrial Cells on Wheels (COWs) into certain county-equivalents.²

Specific Data for San Juan, Puerto Rico

The table below shows cellular outage data for Puerto Rico’s largest *municipio*/county equivalent, San Juan (population 395,326) in the 40 days after Hurricane Maria made landfall.

This table shows that, in the three days after Hurricane Maria made landfall, up to 91% of cellular sites in San Juan were out of service (see highlighted rows).

This table also shows that, as of October 30 (40 days after Hurricane Maria made landfall), 31% of cellular sites in San Juan remain out of service.

² FCC “Communications Status Report for Areas Impacted by Hurricane Maria,” 9/21/17-10/15/17

**CELLULAR SITE OUTAGES IN AREAS AFFECTED BY HURRICANE MARIA –
THE COUNTY-EQUIVALENT OF SAN JUAN, PUERTO RICO**

Date	Days After Hurricane Maria Made Landfall	Number of Cell Sites in Disaster Area	Number of Cell Sites Out-of-Service in Disaster Area	Percentage of Cell Sites Out-of-Service in Disaster Area
10/30/2017	40 days after landfall	358	112	31%
10/29/2017	39 days after landfall	358	125	35%
10/28/2017	38 days after landfall	358	127	35%
10/27/2017	37 days after landfall	358	134	37%
10/26/2017	36 days after landfall	358	136	38%
10/25/2017	35 days after landfall	367	144	39%
10/24/2017	34 days after landfall	358	171	48%
10/23/2017	33 days after landfall	358	156	44%
10/22/2017	32 days after landfall	358	168	47%
10/21/2017	31 days after landfall	358	166	46%
10/20/2017	30 days after landfall	358	162	45%
10/19/2017	29 days after landfall	358	172	48%
10/18/2017	28 days after landfall	367	166	45%
10/17/2017	27 days after landfall	367	181	49%
10/16/2017	26 days after landfall	367	176	48%
10/15/2017	25 days after landfall	367	187	51%
10/14/2017	24 days after landfall	367	188	51%
10/13/2017	23 days after landfall	367	199	54%
10/12/2017	22 days after landfall	367	187	51%
10/11/2017	21 days after landfall	367	204	56%
10/10/2017	20 days after landfall	318	167	53%
10/9/2017	19 days after landfall	367	209	56%
10/8/2017	18 days after landfall	358	215	60%
10/7/2017	17 days after landfall	309	174	56%
10/6/2017	16 days after landfall	358	208	58%
10/5/2017	15 days after landfall	358	224	63%
10/4/2017	14 days after landfall	358	232	65%
10/3/2017	13 days after landfall	358	239	67%
10/2/2017	12 days after landfall	364	254	70%
10/1/2017	11 days after landfall	364	260	71%
9/30/2017	10 days after landfall	364	259	71%
9/29/2017	9 days after landfall	364	263	72%
9/28/2017	8 days after landfall	364	278	76%
9/27/2017	7 days after landfall	364	286	79%
9/26/2017	6 days after landfall	364	285	78%
9/25/2017	5 days after landfall	364	283	78%
9/24/2017	4 days after landfall	364	298	82%
9/23/2017	3 days after landfall	253	231	91%
9/22/2017	2 days after landfall	253	225	89%
9/21/2017	1 day after landfall	253	222	88%

Source: FCC “Communications Status Report for Areas Impacted by Hurricane Maria,” 9/21/17-10/30/17

Note that the number of cell sites described in the FCC’s daily reports has fluctuated over time – and the reason for these fluctuations is unclear. Nonetheless, this data is presented exactly as provided by the FCC daily reports. Further research, including FOIA requests and conversations with the FCC, is being undertaken to determine why the number of cell sites changed.

Puerto Rico County-Equivalents Where 100% of Cellular Sites Went Out of Service

As noted above, cellular outages were widespread in Puerto Rico, with up to 96% of all cellular sites out of service in the three days after Hurricane Maria made landfall. While nearly all cellular sites in San Juan certainly went out of service, San Juan still retained 9% of its functioning cellular sites as of September 23 (three days after Hurricane Maria made landfall). Most other county-equivalents in Puerto Rico fared far worse than San Juan – losing 100% of their functional cellular sites.

To wit, the FCC data shows that a majority of county-equivalents (48 out of 78) were without a single functioning cellular site in the three days after Hurricane Maria made landfall (see highlighted rows). The largest county-equivalent to suffer a 100% cellular site outage was the county-equivalent of Ponce (population 166,327), which did not have any functioning cellular sites in the three days after Hurricane Maria made landfall.

October 29 (39 days after Hurricane Maria made landfall) was the first day since landfall when every county-equivalent had at least one functioning cellular site.

PUERTO RICO COUNTY-EQUIVALENTS WITH 100% OUTAGE OF CELLULAR SITES

Date	Days after Hurricane Maria Made Landfall	Number of County-Equivalents with 100% Outage of Cell Sites (out of 78 County-Equivalents total)	Total population of County-Equivalents with 100% Outage of Cell Sites	Largest population County-Equivalents with a 100% Outage of Cell Sites
10/30/2017	40 days after landfall	0	n/a	n/a
10/29/2017	39 days after landfall	0	n/a	n/a
10/28/2017	38 days after landfall	1	26,720	Naguabo (Pop. 26,720)
10/27/2017	37 days after landfall	4	115,561	Las Piedras (Pop. 38,675)
10/26/2017	36 days after landfall	4	101,521	Las Piedras (Pop. 38,675)
10/25/2017	35 days after landfall	4	101,521	Las Piedras (Pop. 38,675)
10/24/2017	34 days after landfall	4	83,162	Yabucoa (Pop. 37,941)
10/23/2017	33 days after landfall	4	115,561	Las Piedras (Pop. 38,675)
10/22/2017	32 days after landfall	4	115,561	Las Piedras (Pop. 38,675)
10/21/2017	31 days after landfall	4	115,561	Las Piedras (Pop. 38,675)
10/20/2017	30 days after landfall	5	145,621	Las Piedras (Pop. 38,675)
10/19/2017	29 days after landfall	8	203,529	San Lorenzo (Pop. 41,058)
10/18/2017	28 days after landfall	8	232,673	San Lorenzo (Pop. 41,058)
10/17/2017	27 days after landfall	12	319,000	San Lorenzo (Pop. 41,058)
10/16/2017	26 days after landfall	11	301,750	San Lorenzo (Pop. 41,058)
10/15/2017	25 days after landfall	11	301,750	San Lorenzo (Pop. 41,058)
10/14/2017	24 days after landfall	11	334,899	San Lorenzo (Pop. 41,058)
10/13/2017	23 days after landfall	12	334,899	San Lorenzo (Pop. 41,058)
10/12/2017	22 days after landfall	14	408,781	Cidra (Pop. 43,480)
10/11/2017	21 days after landfall	15	431,767	Cidra (Pop. 43,480)
10/10/2017	20 days after landfall	18	496,957	Cidra (Pop. 43,480)
10/9/2017	19 days after landfall	23	596,385	Cidra (Pop. 43,480)
10/8/2017	18 days after landfall	22	595,252	Cidra (Pop. 43,480)
10/7/2017	17 days after landfall	22	576,010	Cidra (Pop. 43,480)
10/6/2017	16 days after landfall	22	587,039	Cidra (Pop. 43,480)
10/5/2017	15 days after landfall	24	631,731	Cidra (Pop. 43,480)
10/4/2017	14 days after landfall	27	694,499	Cidra (Pop. 43,480)
10/3/2017	13 days after landfall	33	878,871	Aguadilla (Pop. 60,949)
10/2/2017	12 days after landfall	27	702,367	Cidra (Pop. 43,480)
10/1/2017	11 days after landfall	27	786,086	Arecibo (Pop. 96,440)

Date	Days after Hurricane Maria Made Landfall	Number of County-Equivalents with 100% Outage of Cell Sites (out of 78 County-Equivalents total)	Total population of County-Equivalents with 100% Outage of Cell Sites	Largest population County-Equivalents with a 100% Outage of Cell Sites
9/30/2017	10 days after landfall	29	788,949	Guayama (Pop. 45,362)
9/29/2017	9 days after landfall	29	788,949	Guayama (Pop. 45,362)
9/28/2017	8 days after landfall	29	820,533	Vega Baja (Pop. 59,662)
9/27/2017	7 days after landfall	31	847,176	Vega Baja (Pop. 59,662)
9/26/2017	6 days after landfall	29	802,321	Vega Baja (Pop. 59,662)
9/25/2017	5 days after landfall	34	984,733	Aguadilla (Pop. 60,949)
9/24/2017	4 days after landfall	37	1,088,655	Aguadilla (Pop. 60,949)
9/23/2017	3 days after landfall	48	1,691,350	Ponce (Pop 166,327)
9/22/2017	2 days after landfall	47	1,670,572	Ponce (Pop 166,327)
9/21/2017	1 day after landfall	48	1,691,350	Ponce (Pop 166,327)

Source: FCC "Communications Status Report for Areas Impacted by Hurricane Maria," 9/21/17-10/30/17

Landline Telephone Service Outages

The FCC has released minimal data about landline telephone outages caused by Hurricane Maria. The FCC's daily reports do not provide specific numbers of landline customers without service.

However, the FCC does provide data about how many landline switches were not operational in Puerto Rico following Hurricane Maria's landfall. It is unclear how these landline switch outages affected communications – but nonetheless this data shows that landline-related infrastructure was affected by Hurricane Maria.

This data covers September 21 to October 30, the 40 days after Hurricane Maria made landfall.

LANDLINE SWITCHES DOWN IN PUERTO RICO FOLLOWING HURRICANE MARIA

FCC Report Date	Days after Hurricane Maria Made Landfall	No. of Landline Switches Down
10/30/2017	40 days after landfall	0
10/29/2017	39 days after landfall	0
10/28/2017	38 days after landfall	1
10/27/2017	37 days after landfall	1
10/26/2017	36 days after landfall	2
10/25/2017	35 days after landfall	7
10/24/2017	34 days after landfall	0
10/23/2017	33 days after landfall	1
10/22/2017	32 days after landfall	2
10/21/2017	31 days after landfall	2
10/20/2017	30 days after landfall	2
10/19/2017	29 days after landfall	2
10/18/2017	28 days after landfall	2
10/17/2017	27 days after landfall	6
10/16/2017	26 days after landfall	6
10/15/2017	25 days after landfall	6
10/14/2017	24 days after landfall	6
10/13/2017	23 days after landfall	6
10/12/2017	22 days after landfall	6
10/11/2017	21 days after landfall	6

FCC Report Date	Days after Hurricane Maria Made Landfall	No. of Landline Switches Down
10/10/2017	20 days after landfall	4
10/9/2017	19 days after landfall	4
10/8/2017	18 days after landfall	13
10/7/2017	17 days after landfall	13
10/6/2017	16 days after landfall	13
10/5/2017	15 days after landfall	13
10/4/2017	14 days after landfall	10
10/3/2017	13 days after landfall	10
10/2/2017	12 days after landfall	10
10/1/2017	11 days after landfall	11
9/30/2017	10 days after landfall	12
9/29/2017	9 days after landfall	12
9/28/2017	8 days after landfall	14
9/27/2017	7 days after landfall	18
9/26/2017	6 days after landfall	18
9/25/2017	5 days after landfall	18
9/24/2017	4 days after landfall	18
9/23/2017	3 days after landfall	9
9/22/2017	2 days after landfall	10
9/21/2017	1 day after landfall	Not provided

Source: FCC “Communications Status Report for Areas Impacted by Hurricane Maria,” 9/21/17-10/30/17

While the FCC does not make landline data available, the *Associated Press* reported that 85% of phone and internet cables were not operational on September 23, 2017 (two days after Hurricane Maria made landfall).³

On September 30, 2017 (10 days after Hurricane Maria made landfall), Puerto Rico Governor Ricardo Rosselló and FEMA announced that all landlines were operational again.⁴

Electrical Service Outages

Several times per week, the U.S. Department of Energy (DOE) has released “Event Summary Reports” with estimates of electrical outages in Puerto Rico resulting from Hurricane Maria. The table below shows these DOE estimates from September 20 (the day Hurricane Maria made landfall) through October 30 (40 days after landfall).

The DOE estimated that 100% of customer accounts (an estimated 1,569,796 accounts) in Puerto Rico lost electricity from September 21 (the day after Hurricane Maria made landfall) through September 28 (eight days after Hurricane Maria made landfall) – i.e. 100% of Puerto Ricans lost power for eight days. These days are highlighted in the table below.

The DOE estimates that, as of October 30 (40 days after Hurricane Maria made landfall), 70% of Puerto Rico customer accounts are still without power.

³ [“Crisis grows in Puerto Rico as towns without water, power and phone service.” Associated Press, September 23, 2017](#)

⁴ [“Puerto Rico gov: More needed, but feds have answered our calls.” CNN, September 30, 2017](#)

DOE DATA FOR ELECTRICAL OUTAGES IN PUERTO RICO FROM HURRICANE MARIA

Date	Days After Hurricane Maria Made Landfall	Estimated Customer Outages	Estimated Percent of Customer Accounts without Power
10/30/2017	40 days after landfall	1,091,009	70%
10/26/2017	36 days after landfall	1,158,510	74%
10/23/2017	33 days after landfall	1,287,233	82%
10/20/2017	30 days after landfall	1,279,384	82%
10/19/2017	29 days after landfall	1,230,721	78%
10/18/2017	28 days after landfall	1,269,965	81%
10/17/2017	27 days after landfall	1,291,943	82%
10/16/2017	26 days after landfall	1,354,734	86%
10/13/2017	23 days after landfall	1,412,817	91%
10/12/2017	22 days after landfall	1,302,931	83%
10/11/2017	21 days after landfall	1,403,398	89%
10/10/2017	20 days after landfall	1,318,629	84%
10/9/2017	19 days after landfall	1,334,327	85%
10/8/2017	18 days after landfall	1,386,130	88%
10/7/2017	17 days after landfall	1,386,130	88%
10/6/2017	16 days after landfall	1,401,828	89%
10/5/2017	15 days after landfall	1,425,375	91%
10/4/2017	14 days after landfall	1,434,794	91%
10/3/2017	13 days after landfall	1,485,028	95%
10/2/2017	12 days after landfall	1,485,028	95%
10/1/2017	11 days after landfall	1,491,307	95%
9/30/2017	10 days after landfall	1,491,307	95%
9/29/2017	9 days after landfall	1,491,307	95%
9/28/2017	8 days after landfall	1,569,796	100%
9/27/2017	7 days after landfall	1,569,796	100%
9/26/2017	6 days after landfall	1,569,796	100%
9/25/2017	5 days after landfall	1,569,796	100%
9/24/2017	4 days after landfall	1,569,796	100%
9/23/2017	3 days after landfall	1,569,796	100%
9/22/2017	2 days after landfall	1,569,796	100%
9/21/2017	1 day after landfall	1,569,796	100%
9/20/2017	Landfall	884,000	56%

Source: DOE "Situation Reports," 9/20/17-10/30/17

Key News Coverage

The following table provides key news coverage about power and communications infrastructure in the areas of Puerto Rico affected by Hurricane Maria. Numerous news outlets report that Puerto Rico is still struggling to recover its communication and power infrastructure three weeks after Hurricane Maria made landfall on September 20.

Note that this news coverage is only sourced from English-language news outlets.

**KEY NEWS COVERAGE ABOUT POWER AND COMMUNICATION INFRASTRUCTURE IN PUERTO RICO AFTER
HURRICANE MARIA**

Storm	Location Discussed	Source	Date	Title	MB Summary of Article
Irma	San Juan	<i>Caribbean Business</i>	9/16/2017	Power-generation system survived, but not high-voltage lines	Prior to Hurricane Maria, Hurricane Irma left 970,000 Puerto Ricans without power. Puerto Rico was still repairing power lines damaged by Hurricane Irma in mid-September.
Maria	San Juan	<i>New York Times</i>	9/20/2017	Puerto Rico Loses Power and Sets a Curfew	After Hurricane Maria made landfall, Puerto Rico's governor stated that he lost all communication with the southeast region of the island, which was hit the earliest and hardest.
Maria	Puerto Rico	<i>New York Times</i>	9/21/2017	For Puerto Ricans Off the Island, a Struggle to Make Contact After Maria	The day after Hurricane Maria made landfall, 95% of cellular sites throughout Puerto Rico went out of service. Puerto Ricans turned to phone messaging apps to communicate due to the difficulty of placing phone calls.
Maria	San Juan	<i>New York Times</i>	9/21/2017	Puerto Rico Faces Mountain of Obstacles on the Road to Recovery	With most cellular sites, radio, and TV stations down, the governor of Puerto Rico announced that the government had lost communication with local officials, which prevented the administration from knowing the true extent of damage in the island.
Maria	San Juan	<i>Caribbean Business</i>	9/21/2017	Powerless: Puerto Rico faces weeks without electricity	Hurricane Maria knocked out Puerto Rico's electrical grid leaving 3.4 million residents without power. The Puerto Rican government hired 56 private contractors to clear debris and rebuild power lines.
Maria	Puerto Rico	<i>The Guardian</i>	9/23/2017	Crisis grows in Puerto Rico as towns without water, power and phone service	Hurricane Maria destroyed 85% of above-ground and underground phone and internet cables. The governor distributed 250 satellite phones to Puerto Rican mayors to reestablish communication across the island.
Maria	Puerto Rico	<i>Caribbean Business</i>	9/24/2017	Power transmission, distribution systems devastated in Puerto Rico	The governor reported that the government had successfully repaired a submarine fiber optic cable to improve internet connectivity and long distance calls. Additionally, the governor stated that repairs to power grids were expected to take several months.
Maria	San Juan	<i>Miami Herald</i>	9/24/2017	No cell service in Puerto Rico? Drive to a highway in San Juan and pull over	After Hurricane Maria hit Puerto Rico, most of the island lost cellular service. Many Puerto Ricans resorted to driving around the island looking for areas with functioning cell towers in order to communicate with family and friends.
Maria	Puerto Rico	<i>The Verge</i>	9/25/2017	After Hurricane Maria, what will it take to turn Puerto Rico's power back on?	Puerto Rico's electricity transmission lines suffered catastrophic damage from Hurricane Maria, which left nearly the entire island without power.
Maria	San Juan	<i>Caribbean Business</i>	9/25/2017	Puerto Rico power authority restoring service to 'priority areas'	The Puerto Rico Electric Power Authority returned power to high priority buildings such as the Río Piedras Medical Center, Hato Rey's Police headquarters, and San Pablo Hospital.
Maria	Puerto Rico	<i>The Washington Post</i>	9/28/2017	U.S. response in Puerto Rico pales next to actions after Haiti quake	FEMA stated that the main reason why it was able to deliver aid faster to a foreign country than a U.S. territory stemmed from "a near-complete collapse of cellphone service on the island, as well as years of neglect to power lines and other utility systems."
Maria	San Juan	<i>Caribbean Business</i>	9/29/2017	Puerto Rico electric utility sets up generators to power island quickly	The governor of Puerto Rico promised swift installations of power generators and expected the island to have full power in six months despite having 4,500 fewer workers managing repairs.

Storm	Location Discussed	Source	Date	Title	MB Summary of Article
Maria	Puerto Rico	NBC	9/30/2017	Puerto Rico gov: More needed, but feds have answered our calls	Ten days after Hurricane Maria made landfall, the FCC reported that all landlines were operational.
Maria	San Juan	<i>Caribbean Business</i>	10/2/2017	Puerto Rico's power utility: Goal is 25% restoration within the month	The majority of power plants in Puerto Rico are located on the southern side of the island, but most of the demand for power comes from the northern side of the island where most of the population lives. The power lines are difficult to repair as they run through the remote, mountainous central part of the island.
Maria	Puerto Rico	<i>The Washington Post</i>	10/4/2017	The Energy 202: Why it will take so long to bring power back to Puerto Rico	Puerto Rico's public electric utility suggested it may take four to six months for the entire electrical grid to be fully operational. One of the issues causing a delay was that repairmen needed to be flown in to sites to make repairs. Additionally the repair crew needed to "communicate with each other across the island. But to communicate, they need cell or landline service that depends on power from the electric grid."
Maria	Puerto Rico	<i>Caribbean Business</i>	10/5/2017	FCC Approved Funding to Fix Island's Telecommunications	The government deployed 10 "Cell on Wheels" mobile cellular sites to bridge the communication gaps in parts of the island.
Maria	Puerto Rico	<i>Caribbean Business</i>	10/6/2017	Setback in Telecommunications Recovery Efforts	Many cellular towers were physically damaged by Hurricane Maria.
Maria	Puerto Rico	<i>The Guardian</i>	10/6/2017	Puerto Rico cell phone service to be restored by Google balloons	The FCC approved the use of solar-powered, high-altitude balloons to provide internet service to Puerto Ricans. Additionally, entrepreneur Elon Musk pledged to send battery installers to the island.
Maria	Puerto Rico	<i>Caribbean Business</i>	10/7/2017	Big Tech has big plans to help reconnect Puerto Rico	Several large tech companies offered to assist Puerto Rico's energy and communication needs. However, many of their promises have been vague or delayed with government bureaucracy.
Maria	San Juan	<i>New York Times</i>	10/7/2017	Minus Electrical Grid, Puerto Rico Becomes Generator Island	With most of Puerto Rico without power, many residents resorted to buying portable generators.
Maria	Puerto Rico	<i>USA Today</i>	10/8/12	Alphabet's Project Loon gets OK to use balloons to revive Puerto Rico cell service	While the FCC approved Google's Project Loon to restore internet connectivity via solar powered balloons in Puerto Rico, no scheduled deployment data was set. Officials also stated that the balloons need to be integrated into a telecommunication network before being able to deliver a signal.
Maria	Orocovis, Canóvanas, and Vieques	<i>San Juan Star</i>	10/9/2017	In Puerto Rico, Lives Depend on Volunteer Doctors and Diesel Generators	Emergency communications were so impacted by Hurricane Maria that doctors and medical personnel were forced to roam the countryside to looking for victims of the storm to assist.
Maria	San Juan	<i>Caribbean Business</i>	10/9/2017	Army Corps of Engineers awards first major Puerto Rico power grid repair contract	The U.S. Army Corps of Engineers (USACE) awarded Puerto Rico a \$35.1 million contract to repair the Palo Seco Plant, one of the main power providers to the city of San Juan.

Storm	Location Discussed	Source	Date	Title	MB Summary of Article
Maria	San Juan	<i>Caribbean Business</i>	10/9/2017	Puerto Rico electric utility power innovation backfires	Puerto Rico Electric Power Authority overloaded one its power generators, causing a massive power outage to customers in San Juan. Additionally, years of austerity resulted in Puerto Rico having only a few workers with knowledge of the electrical grid to manage repair efforts.
Maria	Puerto Rico	NPR	10/10/2017	Weeks After Hurricane Maria, Puerto Rico Struggles To Turn On The Lights	Two weeks after Hurricane Maria, nearly 90% of Puerto Rico was without power. Puerto Rico's government-owned utility, PREPA, had filed for bankruptcy earlier in 2017 in an effort to restructure its \$9 billion debt. PREPA's systematic failure to maintain its power infrastructure only exacerbated the power outage on the island following Hurricane Maria.
Maria	Puerto Rico	<i>Caribbean Business</i>	10/10/2017	USACE says over 270 power generators installed in Puerto Rico	Puerto Rico received 270 emergency power generators through relief efforts, but Puerto Rico's government was slow to install them. Only 12 to 15 of the power generators sent to Puerto Rico Aqueduct and Sewer Authority have been installed out of the 150 received.
Maria	Yabucoa	<i>The Washington Post</i>	10/11/2017	Three weeks since Hurricane Maria, much of Puerto Rico still dark, dry, frustrated	The municipal government of Yabucoa (population 37,941) was completely without communication infrastructure and government officials were forced to communicate via courier.
Maria	Trujillo alto & Cordillera Central	<i>San Juan Star</i>	10/12/2017	In the mountains of Puerto Rico, Hurricane Recovery Is Slower	The mountainous rural regions of Puerto Rico have suffered greater levels of power outages following Hurricane Maria. The difference in recovery rates is largely due to limited access to these remote regions.
Maria	Puerto Rico	<i>The Washington Post</i>	10/18/2017	Most of Puerto Rico has been in the dark for 28 days, 7 hours and 33 minutes	Puerto Rico's power outage from Hurricane Maria has been the longest power outage since 2000. The island suffered a setback when a transmission line connecting San Juan and Palo "tripped." This caused one third of residents who had regained power to lose it again.
Maria	Puerto Rico	<i>The Wall Street Journal</i>	10/20/2017	Inside Puerto Rico's Struggle to Recover a Month After Hurricane	A continued lack of power in Puerto Rico has hampered recovery efforts on the island. Additionally, "Cellphone service remains out for swaths of the island, complicating communication and coordination in recovery efforts."
Maria	Puerto Rico	NPR	10/20/2017	Why It's So Hard To Turn The Lights Back On In Puerto Rico	Hurricane Irma significantly weakened Puerto Rico's electrical infrastructure prior to Hurricane Maria's landfall – which has made it even more difficult for the electrical grid to recover from Hurricane Maria.
Maria	Puerto Rico	<i>New York Times</i>	10/20/2017	Puerto Ricans Ask: When Will the Lights Come Back On?	Roughly 80% of the island was without power, four weeks after Hurricane Maria made landfall. Some residents have not had power for 45 days
Maria	Puerto Rico	<i>USA Today</i>	10/30/2017	Puerto Rico power restoration: Why it is taking so long	Six weeks after Hurricane Maria made landfall, 70% of Puerto Rico residents were still without power.

Notes on Methodology

Government Data from the FCC: This memo uses the Federal Communication Commission’s (FCC) “Hurricane Maria Communications Status Reports,” published daily since September 21, 2017 (one day after Hurricane Maria made landfall). These status reports present daily data on communications outages in Puerto Rico and can be accessed at <https://www.fcc.gov/maria>.

These FCC reports provide data in the following categories:

- **“Wireless Services”** (i.e. cellular services) affected
- **“Cable Systems and Wireline”** (i.e. landline telephone services) affected
- **“Broadcast”** (i.e. television and radio stations) affected
- **“Public Safety Access Points”** (i.e. 911 call centers) affected

These FCC reports show that Puerto Rico was never without a functioning central “Public Safety Access Point” following Hurricane Maria’s landfall (though calls were routed through an emergency backup call center for the eight days).

The data in these daily FCC reports is derived from FCC Disaster Information Reporting System (DIRS) data. DIRS is activated in serious disasters as a way for communications companies to self-report outages to the federal government.

Department of Energy: This memo uses the U.S. Department of Energy’s (DOE) “Event Summary Reports,” published daily since September 20, 2017 (the day Hurricane Maria made landfall).

News Coverage and Other Sources: This memo includes news coverage of communication infrastructure failing during Hurricane Maria. This memo also includes population figures from the U.S. Census Bureau.