



San Diego County – Imperial County
Regional Communications System

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To: Regional Communications System Board of Directors

From: Donald Root, Assistant Manager

**PRELIMINARY REPORT: RCS PERFORMANCE DURING SEPTEMBER 8, 2011
REGIONAL POWER OUTAGE**

On Thursday, September 8, 2011 at approximately 3:35 PM, all commercially supplied electrical power in the San Diego and Imperial County region ceased as a sequence of events caused the shutdown of the power grid. Power remained out for a period of time ranging from 6 to 12 hours.

SITE POWER:

- Backup power systems immediately kicked in at 46 of the 48 RCS 800 MHz transmitting sites, maintaining 800 MHz operations on the RCS.
 - [REDACTED] Power Plant (North Simulcast Cell) has no backup power system. The loss of this site reduced the overall coverage of the 10-site North Simulcast Cell in the coastal areas of Encinitas, Carlsbad, and Oceanside. RCS staff responded with a portable generator. The plant was able to restore stable power about 6:30 PM, while the RCS technicians were hooking up the generator.
 - [REDACTED] (Northeast Simulcast Cell) has a landlord maintained generator that failed to start. The loss of this site reduced the overall coverage of the 5-site Northeast Simulcast Cell along the east grade of Palomar Mountain. A RCS technician responded and jump-started the generator at about 6:35 PM, restoring the site to service.
- Generators at three sites failed during the power outage.
 - [REDACTED] (South Simulcast leased site & generator in the El Cajon – Santee area) shut down after 20 minutes of operation. The loss of this site reduced the overall coverage of the 8-site South Simulcast Cell in the El Cajon-Santee-Lakeside area. A RCS technician responded and found the generator had overheated and would not support an electrical load. A rental generator was dispatched and put in place about 11:00 PM. The equipment provided only supplied power to maintain the microwave system to continue RCS connectivity for three dispatch centers.
 - [REDACTED] (I/R County site & generator outside of Valley Center) shut down after 21 minutes of operation. The loss of this site impacted Valley Center, parts of the Pala reservation, and the I-15 corridor between Bonsall and Escondido. A RCS technician responded and found the generator had overheated and was experiencing low oil pressure. The generator was successfully restarted about 5:50 PM, and was able to maintain load during hours of darkness. A portable

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- generator was placed at the site in case in the event the outage extended into daylight hours on 9/9.
- [REDACTED] (South Simulcast County site & generator) shut down at 8:43 PM due to a water pump failure. The loss of this site further reduced the overall coverage of the 8-site South Simulcast Cell in the Lakeside-Alpine-Crest area. A County generator technician responded and put a portable generator in place. Power was restored at about 11:20 PM.
 - Two additional sites have battery-only backup systems, which shut down after the designed battery run times.
 - [REDACTED] (North Simulcast) site shut down at about 8:35 PM, impacting North Simulcast coverage in downtown Encinitas. Technicians transported the portable generator no longer required at the [REDACTED] site to Encinitas and restored power about 9:00 PM.
 - [REDACTED] (South Simulcast) site shut down at about 6:30 PM. The loss of this site reduced the overall coverage of the 8-site South Simulcast Cell in the San Diego Airport-Downtown-coastal Imperial Beach areas. A decision was made early in the outage that this site was a lower priority than the other site outages, and to leave this site off until resources could be brought to bear. The site remained off until grid power was restored at about 1:30 AM on 9/9/2011.

RCS NETWORK:

Aside from the isolated site power failures, the two-county RCS 800 MHz network remained on the air and continued operating throughout the duration of the power outage. Three of the four Simulcast Cells remained in service. At the time the power outage occurred, the fourth (North) Simulcast Cell reverted to Fail Soft mode for approximately 30 minutes before returning to normal trunking operations (more on this below).

With a major public safety event impacting the Public Switched Telephone Network, along with the loss of many data communications methods and the overloading of the commercial wireless voice and data networks, radio traffic on the RCS network increased substantially above the normal levels. Along with the increase in overall traffic count there was a substantial increase in delayed transmissions ("busies"). The instances of busies ran through the late afternoon and evening hours, calmed down, and in the South Simulcast Cell re-peaked around midnight.

During the 16 hour period between 3:00 PM on 9/8/2011 and 7:00 AM on 9/9/2011, the RCS network processed 135,799 conversations system wide, with 8,486 busies (at an average wait time of 2.4 seconds)¹. An hour-by-hour breakdown of the loading is provided at the end of this report.

¹ For comparison, the average daily traffic during the May-August 2011 period was 111,578 conversations with 16 busies. The current system 24 hour traffic "high water mark" was on October 26, 2007 (during the 2007 Fires), when the system wide traffic load was 264,048 conversations, with 33,021 busies at an average wait time of 5.6 seconds.

At the time of the power outage some RCS agencies implemented their backup communications plans and shifted some or all of their operations to other resources such as conventional VHF or 800 MHz channels.

NORTH SIMULCAST CELL:

At the time power was lost throughout the network, the North Simulcast cell reverted to the "Fail Soft" redundancy mode for an unknown reason. Operations in this mode lasted for a period of time estimated by various Dispatch Centers to be 20-30 minutes. During a Fail Soft condition, agencies of like types (Law, Fire, EMS, Public Works) operating in the affected cell(s) are pooled onto working discrete radio channels, sharing the limited channel resources in an enhanced conventional mode. Dispatch Centers must shift to backup radios in order to be able to communicate with their units in the field.

Units and dispatch centers outside of the North Simulcast Cell were seeing normal trunking operations, but had to implement back-up radios in addition to their normal consoles to communicate with any units operating within the North Simulcast cell area.

Motorola has been brought in to work with RCS staff to analyze system-level data to determine the root cause(s) of this anomaly and identify corrective actions to be taken to avoid a repeat in the future. We expect to have this data within 1-2 weeks.

STAFF RESPONSE:

The full complement of RCS Network staff was engaged during the first six hours of the event, responding to the loss of backup power at sites, assisting with the deployment of portable generators, and monitoring the network. A smaller subset of staff remained on duty over night to monitor and respond to issues.

DISPATCH CENTERS:

Communications between the RCS Network Operations Center and the various RCS Dispatch Centers during the power outage was not coordinated. As a result, it was difficult to assess the operational impact of the various system issues in real time, and to convey the overall status of the network to the member agencies. We are looking at methods to increase the flow of information (both ways) while minimizing the operational impact on already stressed line personnel at communications and coordination points.

NEXT STEPS

This is the first time the entire RCS network has been stressed to this extent. There is a large amount of data yet to be gathered and numerous lessons to be learned. Some of the immediate actions RCS staff is taking are:

- Engage Motorola to work with us to identify the underlying conditions contributing to the North Simulcast Cell's loss of trunking at the onset of the power failure and identify measures to take to mitigate reoccurrences.
- Work with the Dispatch Centers to develop communications protocols to ensure coordination between the RCS Network Operations Center and member agency coordination points, and fault-tolerant pathways for those communications.
- Assess the number of portable generators available for emergency use and the locations these generators are normally pre-positioned. Determine if additional assets are required and where they should be positioned.
- Address power issues with our site owners.
 - Have already been working on taking over the generator at [REDACTED]
 - Will be discussing backup power options with the current owner of the [REDACTED]
- Complete project to add a 20th channel to the South Simulcast Cell. This project was already underway at the time of the outage. This will further reduce the busy count by adding an additional talk path to the cell, and should be in place and fully operational within 90 days.
- Continue to search for one or more frequencies that could be used to expand the North Simulcast Cell to further reduce the busy count.
- Task *Federal Engineering* with conducting a comprehensive review of the network's performance during the outage and provide updated recommendations that may impact planning for the replacement system.

NETWORK TRAFFIC COUNTS

For the 16 hour period, 3:00 PM 9/8/11 to 7:00 AM 9/9/11:

Date - Hour	RCS Network Wide				North Simulcast			South Simulcast		
	Air Time (hh:mm:ss)	Call Count	Busy Count	Avg. Busy Wait (sec)	Call Count	Busy Count	Avg. Busy Wait (sec)	Call Count	Busy Count	Avg. Busy Wait (sec)
9/8/11 3:00 PM	37:35:54	12,600	1,175	2.75	2,914	83	4.16	4,173	1,054	2.61
9/8/11 4:00 PM	49:53:59	18,402	2,379	1.51	5,150	1,050	1.48	5,177	1,222	1.55
9/8/11 5:00 PM	50:31:01	16,187	2,241	2.29	4,663	1,412	2.46	4,327	789	1.99
9/8/11 6:00 PM	43:24:36	13,270	1,400	2.16	4,140	900	2.32	3,619	499	1.86
9/8/11 7:00 PM	41:01:53	12,553	370	1.09	3,697	262	1.01	3,610	106	1.26
9/8/11 8:00 PM	36:13:50	10,984	476	1.37	3,687	298	1.40	3,524	169	1.26
9/8/11 9:00 PM	29:34:27	9,620	172	1.45	3,449	159	1.47	2,992	13	1.15
9/8/11 10:00 PM	27:46:55	8,814	5	0.60	3,071	5	0.60	2,545	0	0.00
9/8/11 11:00 PM	19:49:48	6,041	0	0.00	2,183	0	0.00	1,913	0	0.00
9/9/11 12:00 AM	19:00:01	6,254	177	2.10	1,814	0	0.00	2,080	177	2.10
9/9/11 1:00 AM	17:43:36	5,533	91	2.46	1,600	0	0.00	1,307	91	2.46
9/9/11 2:00 AM	12:35:47	3,864	0	0.00	1,328	0	0.00	992	0	0.00
9/9/11 3:00 AM	8:22:36	2,791	0	0.00	913	0	0.00	783	0	0.00
9/9/11 4:00 AM	6:22:22	1,990	0	0.00	613	0	0.00	709	0	0.00
9/9/11 5:00 AM	8:04:59	2,952	0	0.00	748	0	0.00	792	0	0.00
9/9/11 6:00 AM	12:31:02	3,944	0	0.00	1,206	0	0.00	792	0	0.00
TOTALS	420:32:46	135,799	8,486	2.37	41,176	4,169	2.01	39,335	4,120	1.97