Step 1. Outline

What	Problem(s)	Power outage
When	Date	September 8, 2011
	Different, unusual, unique	Current reverse
Where	State, city	Southwest Regional Grid
	Facility, site	North Gila substation near Yuma, AZ
	Task being performed	Doing work on faulty capacitor

Impact to the Goals

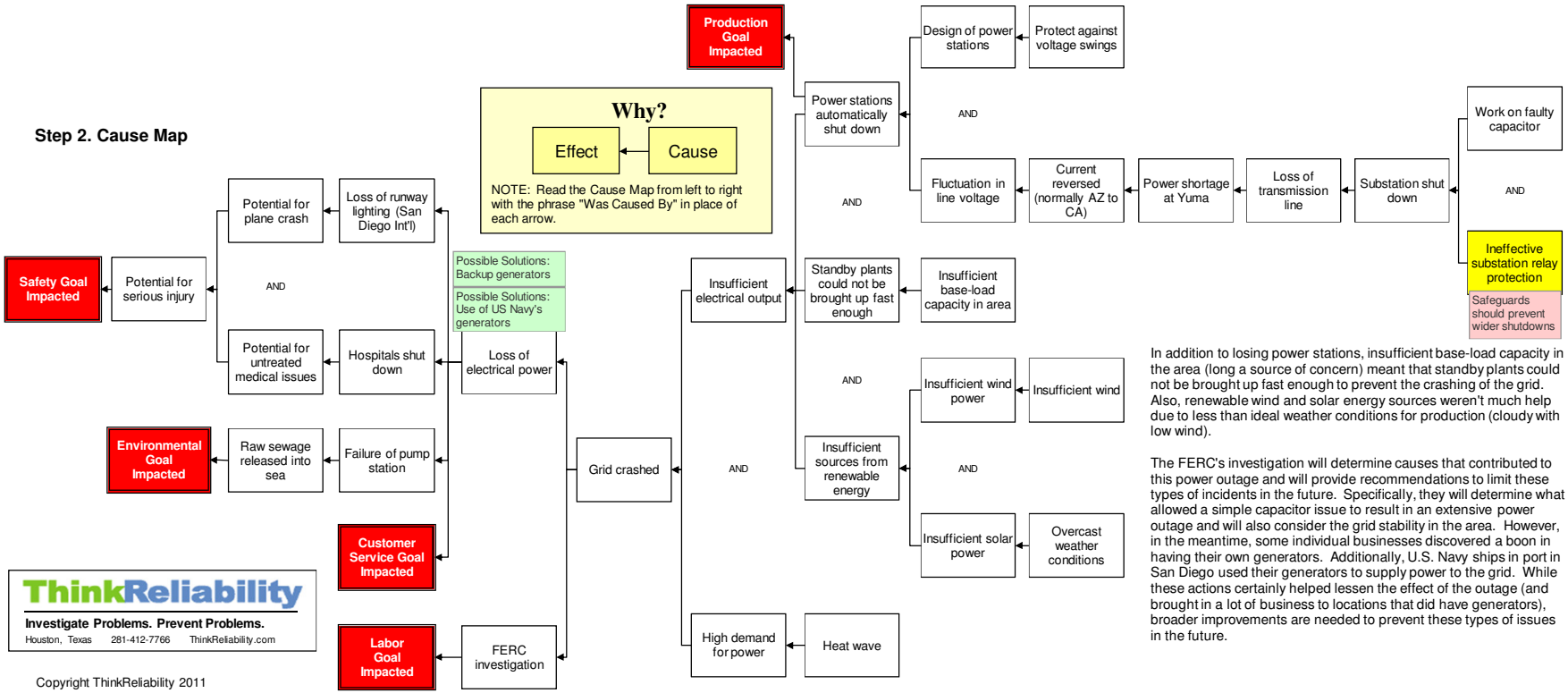
Safety	Potential for serious injury		
Environmental	Raw sewage released into sea		
Customer Service	Loss of electrical power to at least 6 million	Up to $118 M	Economic losse
Production-Schedule	15 power stations shut down for 1 day (assuming 10,000 MW *$40/hr MW loss of revenue)	$9.6 M	
Property, Equip, Mtls	Potential for damage to grid & power plants		
	Potential damage to customer equipment		
Labor, Time	FERC investigation		
		Over $100 M	
Frequency	Region's worst blackout in 15 years		
		Annualized Cost ?	

Power Outage Stretches from Arizona to California
September 8, 2011

On September 8, 2011, work on a fault capacitor in Arizona began a series of events that resulted in the worst power outage in the Southwest for 15 years. Although there were no injuries reported as a result of the power outage, there was a high potential for injuries and/or deaths, as hospitals shut down and at least one airport lost runway lighting. Raw sewage leaked onto beaches and millions found themselves without power. The economic losses from this incident are reported to be as high as $118 million. The Federal Energy Regulatory Commission (FERC) will be conducting an investigation to determine how simple capacitor work resulted in an incident with such extreme effects.

The issues related to this power outage are complicated, and can be more clearly understood in a visual format, such as a Cause Map. We can examine the cause-and-effect relationships that resulted in the impacted goals discussed above. The potential for injury was caused by a loss of electrical power to hospitals and airports. The loss of power was caused by a grid crash, resulting from insufficient power and high demand (at least partially due to a heat wave). Power stations that normally provide electricity were automatically shut down when a current reverse (normally the current runs from Arizona to California) resulted from the loss of a transmission line resulting from the capacitor work. Although "operator error" has been mentioned as a potential cause, it's undesirable that one operator's error could cause such an extreme power outage. The system should be designed to prevent this, and the investigation will hopefully address issues in the system that contributed to the extent of the outage.

Step 2. Cause Map



In addition to losing power stations, insufficient base-load capacity in the area (long a source of concern) meant that standby plants could not be brought up fast enough to prevent the crashing of the grid. Also, renewable wind and solar energy sources weren't much help due to less than ideal weather conditions for production (cloudy with low wind).

The FERC's investigation will determine causes that contributed to this power outage and will provide recommendations to limit these types of incidents in the future. Specifically, they will determine what allowed a simple capacitor issue to result in an extensive power outage and will also consider the grid stability in the area. However, in the meantime, some individual businesses discovered a boon in having their own generators. Additionally, U.S. Navy ships in port in San Diego used their generators to supply power to the grid. While these actions certainly helped lessen the effect of the outage (and brought in a lot of business to locations that did have generators), broader improvements are needed to prevent these types of issues in the future.

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