

Smart City Crisis Simulation - Prompt Engineering Exercise

Scenario Overview

Location: Novapolis (Fictional Smart City)

Crisis: Major Power Outage

Role: Crisis Response Assistant Consultant

Objective: Use prompt engineering to guide AI through crisis resolution

Challenge 1: Root Cause Analysis

Engineered Prompt

You are a Senior Technical Investigator specializing in smart city infrastructure and power grid systems.

CONTEXT:

Novapolis is a smart city with a population of 2.5 million people. The city operates on an integrated power grid.

- Residential zones (40% load)
- Commercial districts (30% load)
- Industrial sectors (20% load)
- Critical infrastructure including hospitals, data centers, and emergency services (10% load)

The city uses IoT sensors throughout the grid, automated distribution systems, and has implemented advanced load balancing algorithms.

INCIDENT:

At 14:37 local time, a complete citywide blackout occurred. All grid sectors went offline simultaneously.

TASK:

Conduct a root cause analysis and identify exactly 3 plausible causes for this blackout. For each cause, provide the following details:

1. **Cause Name**: A clear, specific title
2. **Likelihood Assessment**: Rate as High/Medium/Low with justification
3. **Technical Explanation**: Describe the failure mechanism (2-3 sentences)
4. **Supporting Evidence**: List 3 observable indicators that would confirm this cause
5. **Initial Response Actions**: Suggest 2-3 immediate investigation steps

Structure your analysis in a clear, prioritized format starting with the most likely cause.

Challenge 2: Impact Assessment

Engineered Prompt

You are the Chief City Planner for Novapolis with 20 years of experience in urban infrastructure.

CURRENT SITUATION:

The citywide power outage that began at 14:37 is now entering its third hour (17:45). While back-up generators are active, they are reaching capacity and cannot support all critical services.

CITY SECTORS:

1. **Healthcare Sector**: 8 hospitals, 45 clinics, 12 elderly care facilities
2. **Transportation**: Metro system (500K daily riders), traffic signals (2,000+ intersections)
3. **Business/Commercial**: Downtown financial district, 15 shopping centers, 200+ restaurants
4. **Residential**: 850K households across diverse income levels, high-rise apartments, suburban homes
5. **Other**: Water treatment plants, emergency services, telecommunications hubs

YOUR TASK:

Conduct a comprehensive impact assessment of this power outage. For each of the four main sectors, answer the following questions:

1. **Risk Level**: Classify as CRITICAL, HIGH, MODERATE, or LOW
2. **Immediate Impacts** (0-6 hours): Describe the most urgent consequences
3. **Cascading Effects** (6-24 hours): Explain how impacts will worsen or spread
4. **Vulnerable Populations**: Identify who is most at risk and why
5. **Time-Sensitivity Score** (1-10): Rate urgency where 10 = life-threatening within hours

Rank the sectors from highest to lowest priority for emergency response resources.

DELIVERABLE FORMAT:

Present as a prioritized action matrix that emergency managers can use for decision-making.

Challenge 3: Crisis Communication

Engineered Prompt

You are the Director of Public Communications for Novapolis with expertise in crisis messaging.

CRISIS CONTEXT:

- Citywide power outage began 3 hours ago (14:37)
- Cause still under investigation
- Estimated restoration time: 12-18 hours
- Backup power active at hospitals and emergency services
- No casualties reported so far
- Temperature is high (32°C/89°F), evening approaching

AUDIENCE DEMOGRAPHICS:

- 2.5 million residents with diverse backgrounds
- 15% elderly population (65+)
- 30% non-native speakers
- Mix of urban apartment dwellers and suburban homeowners
- High smartphone penetration but limited power for charging

YOUR TASK:

Write a public safety announcement that will be broadcast via:

- Emergency text alerts (160 characters)
- Radio broadcast (2-minute message)
- Social media (Twitter/X post, ~280 characters)
- Full press release (for news outlets)

REQUIREMENTS FOR EACH MESSAGE:

Emergency Text Alert:

- Maximum 160 characters
- Most critical information only
- Clear call to action

Radio Broadcast:

- 2 minutes when read aloud (approximately 250-300 words)
- Opening: Acknowledge the situation calmly
- Middle: Provide essential safety guidance (3-5 key points)
- Closing: Reassure and provide next update time
- Use simple language (8th-grade reading level)
- Avoid technical jargon

- Include specific actions citizens should take NOW

****Social Media Post:****

- ~280 characters for Twitter/X
- Shareable and clear
- Include relevant hashtag
- Link to more information

****Press Release:****

- Professional tone for media outlets
- Include: situation summary, current actions, public guidance, next update schedule
- Quote from city official
- Contact information for media inquiries

TONE GUIDELINES:

- ✓ Calm and authoritative (not alarming)
- ✓ Empathetic to citizen concerns
- ✓ Action-oriented with clear steps
- ✓ Transparent about what is known/unknown
- ✓ Reassuring but realistic

Avoid:

- X Panic-inducing language
- X Over-promising quick fixes
- X Minimizing legitimate concerns
- X Complex technical explanations

Some examples for Output Quality Standards

****Good Example** (Radio broadcast opening):**

> "Novapolis residents, this is an official message from your city emergency management. We are

****Poor Example** (avoid):**

> "Don't panic! We have a massive grid failure but everything is under control..."

Challenge 4: Optimization Strategy

Stage 1: Initial Allocation Prompt

You are a Senior Logistics and Operations Expert specializing in emergency resource allocation.

MISSION:

Allocate 50 portable emergency power generators across Novapolis's 5 districts to minimize disruption.

DISTRICT PROFILES:

District 1 - Central Business District

- Population: 50,000 (daytime: 200,000)
- Key facilities: Main hospital (600 beds), financial district, city hall, central police station
- Current status: Complete blackout, backup power at hospital only

District 2 - North Residential

- Population: 600,000
- Key facilities: 2 community hospitals (200 beds each), 15 schools, elderly care home (300 residents)
- Current status: Complete blackout, elderly care facility on limited backup (4 hours remaining)

District 3 - Industrial Zone

- Population: 80,000 (daytime: 150,000)
- Key facilities: Water treatment plant (serves 40% of city), food warehouses, manufacturing plants
- Current status: Blackout, water treatment on backup (6 hours remaining)

District 4 - East Suburbs

- Population: 900,000
- Key facilities: 3 hospitals (150 beds each), metro depot, telecommunication hub
- Current status: Complete blackout, hospitals on backup power (varying durations)

District 5 - South Mixed-Use

- Population: 400,000
- Key facilities: University (20,000 students), convention center (emergency shelter), fire stations
- Current status: Complete blackout, fire stations on backup

GENERATOR SPECIFICATIONS:

- Each generator can power: 1 critical facility OR 1 city block (\approx 100 homes) OR 1 transportation hub
- Fuel supply: 12 hours per generator (can be refueled)
- Deployment time: 30 minutes per generator

YOUR TASK:

Provide a generator allocation strategy. Present your allocation as:

- **District [Number] - [Name]: [X] generators**
- Primary allocation: [Specific facilities]
- Rationale: [One sentence]

Total must equal exactly 50 generators.

Stage 2: Justification and Trade-offs Prompt

Based on your allocation of 50 generators across the 5 districts, now provide a comprehensive justification for your decisions.

1. **Allocation Philosophy**: What overarching principle guided your decisions? (e.g., life-safety, resource efficiency)
2. **Prioritization Framework**: Explain the criteria you used to rank needs. Assign weights if applicable.
3. **Trade-off Analysis**: For each district, explicitly identify:
 - What you chose to support
 - What you chose NOT to support
 - Why the supported option outweighed alternatives
 - What risks you accepted by not allocating more resources there
4. **Vulnerable Groups**: How did your allocation address the needs of:
 - Elderly and medically dependent residents
 - Low-income areas without backup resources
 - Essential workers who keep the city functioning
5. **Temporal Reasoning**: Explain if your allocation considers:
 - Time-to-critical-failure for various systems
 - Whether resources could be redistributed after initial stabilization
 - Fuel resupply logistics
6. **Alternative Scenarios**: Briefly describe how your allocation would change if:
 - You had 30 generators (resource scarcity)
 - You had 80 generators (resource abundance)
 - The outage extended to 48+ hours
7. **Unintended Consequences**: What negative outcomes might result from your allocation strategy?

Present this as a decision memo that would be reviewed by the city's emergency management director.

Challenge 5: Post-Crisis Plan

Engineered Prompt

You are the Chief Policy Advisor to the Mayor of Novapolis, specializing in urban resilience and crisis management.

MISSION:

Develop a comprehensive Post-Crisis Prevention and Resilience Plan to ensure Novapolis never experiences another major outage.

CRISIS LESSONS:

Based on the recent blackout:

- Single point of failure caused citywide impact
- Limited distributed backup power capacity
- Insufficient real-time monitoring and early warning
- Unclear emergency communication protocols
- Resource allocation delays due to lack of pre-planning
- Vulnerable populations disproportionately affected

YOUR TASK:

Create a strategic policy framework with recommendations across five categories:

1. INFRASTRUCTURE RESILIENCE (Technical & Engineering)

Propose 3-5 concrete infrastructure improvements:

- Grid modernization measures
- Redundancy and failsafe systems
- Distributed energy resources (solar, battery storage)
- Physical security enhancements

For each recommendation:

- Description: What specifically should be built/implemented?
- Timeline: Short-term (1 year), Medium-term (1-3 years), Long-term (3-5 years)
- Estimated Cost: Rough budget category (\$ = <\$10M, \$\$ = \$10-50M, \$\$\$ = >\$50M)
- Risk Reduction: What specific failure mode does this prevent?

2. OPERATIONAL PREPAREDNESS (Planning & Response)

Recommend operational improvements:

- Emergency response protocols
- Resource pre-positioning strategies
- Training and drill requirements
- Inter-agency coordination mechanisms

3. TECHNOLOGY & MONITORING (Early Warning Systems)

Suggest technology investments:

- Predictive monitoring systems
- AI/ML for grid anomaly detection
- IoT sensor deployment
- Real-time dashboard for decision-makers

****4. POLICY & GOVERNANCE (Regulatory Framework)****

Propose policy changes:

- Building code updates (backup power requirements)
- Critical facility designation and standards
- Private sector resilience requirements
- Mutual aid agreements with neighboring cities
- Insurance and liability framework

****5. COMMUNITY RESILIENCE (Social & Equity Dimensions)****

Address societal vulnerabilities:

- Support programs for vulnerable populations
- Community energy hubs in each district
- Public education and preparedness campaigns
- Equity considerations in infrastructure investment

****6. FUNDING & IMPLEMENTATION ROADMAP****

- Identify funding sources (municipal budget, state/federal grants, public-private partnerships)
- Prioritize recommendations by impact and feasibility
- Define success metrics and accountability measures
- Establish governance structure for oversight

DELIVERABLE FORMAT:

Structure as a formal policy recommendation document with:

- Executive Summary (key recommendations)
- Detailed recommendations by category
- Implementation roadmap (quick wins vs. long-term investments)
- Risk assessment if recommendations are NOT implemented

CONSTRAINTS TO CONSIDER:

- City annual budget: \$2.5 billion (infrastructure is 15%)
- Political feasibility (must balance costs with public acceptance)
- Technical feasibility (existing infrastructure is 30+ years old)
- Timeline (mayor faces re-election in 18 months)