Institutions and crises, crises and institutions

Dr. Mark de Bruijne, Section POLG, Faculty TPM

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Institute for Transport Studies, University of Leeds, September 5
1. **What is a crises?**
2. **Institutions and crises**
3. **Electricity grid design issues**
4. **UCTE 2006 blackout**
5. **Case intro: the electric vehicle**
1. What is a crises?
What is a crisis?

• "Uncomfortable officials meet in unaccustomed surroundings to play unfamiliar roles making unpopular decisions based on inadequate information in much too little time."
Crisis

• What characterizes a crisis?
• How many dimensions of a crisis could we distinguish?
  • Scope of crises: local or global
  • Time: long/short (creeping/sudden)
  • Known problem: anticipated/unexpected
  • Type of crisis: simple/complex

So: what constitutes a crises in transportation?
Why study crises?

- High visibility events with large disruptive effect(s) on society

**Potential caveats**

- Crises: *post hoc ergo propter hoc* ("after this so because of this")?
- How unique is the crisis studied?
- Unit of analysis – what do you study, exactly?

**Potential benefits**

- Insight in key actors and interests in the policy field
- Insight in key interdependencies
- Insight in decision making and policy process
Crisis and decision making

- Like any other complex (policy) problem (many actors, coupled issues, conflicting interests, ‘wicked problems’, etc.)
- Bounded rationality, incrementalism (compromise, negotiation)
- 3 distinguishing characteristics:
  1. Threat and uncertainty
  2. Vital interests
  3. Time pressure/urgency !!!
- Mixed scanning, satisficing (intuition, expertise, experience)
Decision making performance under pressure

Cognitive functioning

Complex arguments

Routines

Average

High

Very high

Stress
2. Institutions and crises
How do crises affect institutions?
How do crises affect institutions?

- Crises as ‘window of opportunity’ for (policy) change
- Crises as focal point for previously unknown or unattended interdependencies

And vice versa?

- Allison (1972/1997): institutions shape crises and policy response
  (‘where you stand depends on where you sit’)
How do institutions affect crises?

• Crisis preparation/response as ‘rational’ policy?
• Eden (2004): Whole world on fire

• institutional knowledge often leaves out critical facts -- leading to disaster when incomplete information becomes the basis for action
• Cohen, March & Olsen (1972): garbage can model of decision making
  • Structural and accidental coupling
  • Role of policy entrepreneurs
Laatste voorstudie voor Deltaplan van Johan van Veen, getekend twee dagen voor de watersnoodramp van 1953.
3. 

*Electricity grid design issues*
A short primer on electricity grids

Some basic issues

- Kirchhoff's law = water
- Speed of light
- Continuous balance consumption and production
- Manageable but uncontrollable
- Reliability: > 99.999% (N-1)
- Designed for energy exchange, not trade
- Role of system operator changed
<table>
<thead>
<tr>
<th>Reliability</th>
<th>Disruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.00%</td>
<td>36 days</td>
</tr>
<tr>
<td>95.00%</td>
<td>18 days, 6 hours</td>
</tr>
<tr>
<td>99.00%</td>
<td>3 days, 15 hours, 40 min.</td>
</tr>
<tr>
<td>99.50%</td>
<td>1 day, 19 hours, 48 min.</td>
</tr>
<tr>
<td>99.90%</td>
<td>8 hours, 46 min.</td>
</tr>
<tr>
<td>99.95%</td>
<td>4 hours, 23 min.</td>
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<tr>
<td>99.99%</td>
<td>52 min., 36 sec.</td>
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<td>99.999%</td>
<td>5 min., 15 sec.</td>
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<td>99.9999%</td>
<td>32 sec.</td>
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<tr>
<td>99.99999%</td>
<td>3 sec.</td>
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</table>

Challenge the future
Reliability as a core public value

- reliability is difficult to define; many different meanings
- ‘reliability’ is a dynamic non-event (Weick, 1990)
- dynamic: permanent systemic condition
- but: reliability can only be assessed *momentarily*
- furthermore: non-event because result is almost always constant (reliable status)
- analogy: health
- this means: reliability is more visible and important when it fails
And some institutional context

Deregulation/liberalization/unbundling leads to increased institutional splintering/fragmentation.
Institutional fragmentation

Conventional paradigm

- Vertical integration
- Monopoly in each level
- One public enterprise
- Regulation of single agent

New paradigm

- Vertical unbundling
- Competition in each level (if possible)
- One public enterprise
- Multiple regulators of multiple agents and levels

Regulator

Production column

Consumers
4.

2006 UCTE blackout
UCTE

- 24 countries
- 29 system operators
- 450 mil. customers
- 610 GW installed capacity
- 2,500TWh/year elec. consumption
- 290 TWh/year interconnection exchanges
- 230,000 km of high voltage lines
21:38: double circuit line outage by E.ON Netz (ship crossing)

21:41 et 22:08: heavy loaded line between RWE TSO and E.ON Netz

22:10:11: manoeuvre by E.ON Netz
Area 1 under-frequency
Area 2 over-frequency
Area 3 under-frequency

49 Hz
9,260 MW

49,7 Hz
750 MW

50,60 Hz
‘Analysis’ of 2006 UCTE blackout

**UCTE**
- major unexpected blackout occurred
- voluntary coordination failed
- system ‘integrity’ was maintained
- dropped load restored within 2 hours
- the ‘system’ worked, there was no crisis

**European Union**
- major unexpected blackout occurred
- voluntary coordination failed (failures)
- 10 million households in 6 countries lost power
- islanding of control area in 3 zones
- vital interconnections exchanges were disrupted
- the ‘system’ failed, there is a crisis
Crisis and institutional repercussions

- Was the 2006 blackout a real crises?
- Was the 2006 blackout a ‘normal failure’ or…?
- Analysis: EU Lack of coordination, UCTE success of decentralization
- EU perspective dominated policy process
- Centralization and hierarchy (formation of ETSO-E)
- Binding rules and regulations (UCTE/ENTSO-E)
- New control technologies
- Appropriate/sufficient response?
5.

Case intro: the electric vehicle
Challenge the future
Mobility

Infrastructure

Crises?

Environment

Energy

Challenge the future
“Your institutional triangle”

Ministry of Energy

Grid operating companies

Ministry of transportation
Different styles & strategies may have different end results (?)
# Electricity system development

<table>
<thead>
<tr>
<th></th>
<th>1880-1920</th>
<th>1920-1970</th>
<th>1970-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technological development</strong></td>
<td>Take-off commercialization</td>
<td>Expansion</td>
<td>Interconnection</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>Local, distributed</td>
<td>Regional to national</td>
<td>International to ‘continental’</td>
</tr>
<tr>
<td><strong>Institutional design</strong></td>
<td>Private</td>
<td>Public</td>
<td>mixed private/public</td>
</tr>
<tr>
<td><strong>Organizational structure</strong></td>
<td>Vertically integrated</td>
<td>Vertically integrated</td>
<td>unbundled/fragmented</td>
</tr>
<tr>
<td><strong>Control technology</strong></td>
<td>Integrated in technology</td>
<td>Automated (central) control room</td>
<td>‘Seamless’ integration through IT</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Electro-mechanical</td>
<td>‘centrally ’ coordinated</td>
<td>?</td>
</tr>
</tbody>
</table>
Reliability of electricity supply

The challenge for reliability