

# BLACKOUT AHEAD?

Perspectives on energy supply and disturbances

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# WHAT EVENTS MAY HAPPEN?

- Extreme weather
- Ageing of components
- Human error
- Malicious damage
- Cyber attacks



# WHAT CONSEQUENCES MAY EMERGE?

- Loss of lightning and water supply
- Loss of heating or cooling
- Loss of communication
- Loss of sales
- Loss of transportation
- Loss of health care
- Loss of production
- Loss of ...

# WHAT MITIGATION STRATEGIES DO EXIST?

## Technical Level

Regular maintenance  
Monitoring & analysis  
Reserve capacity  
Load shedding:

- Automatic
- Manual

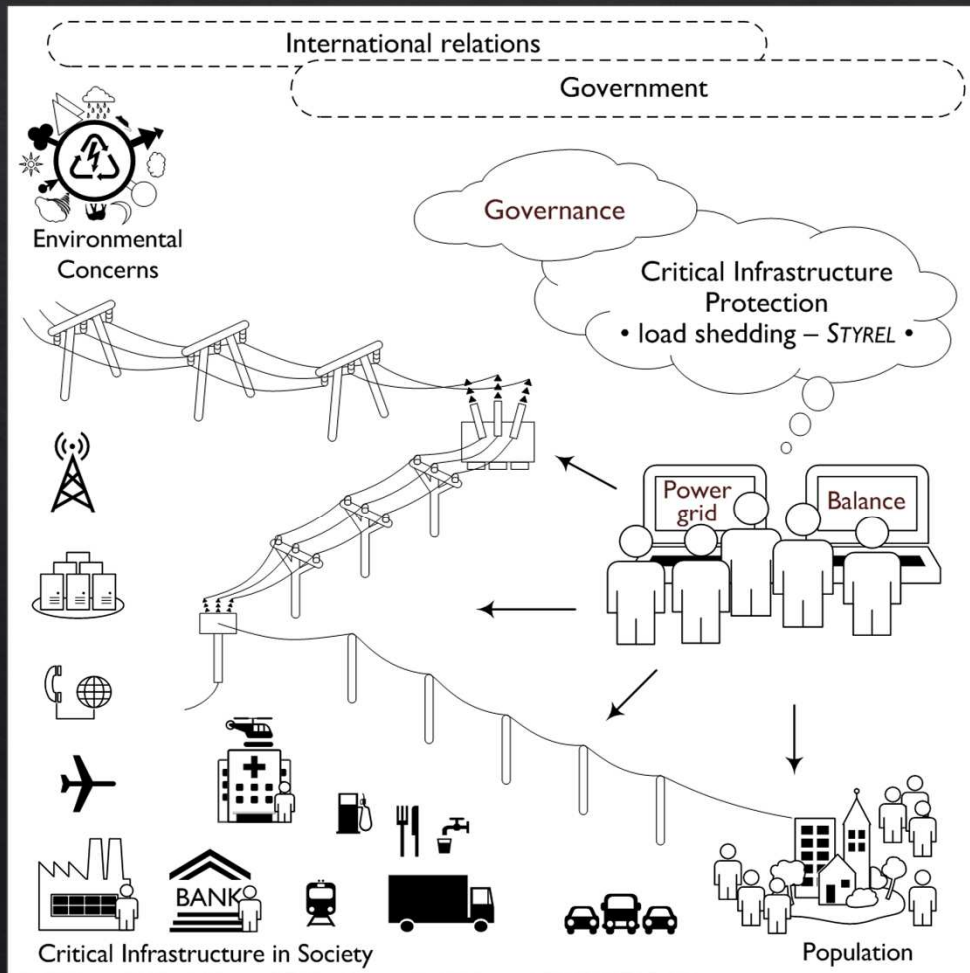
## Policy Level

ENTSO-E  
Nordel  
NIS  
GDPR  
Risk analysis  
*STYREL*  
Crisis management

## Society level

Reserve power (e.g. hospitals /companies responsible for living animals)  
Households are responsible to ensure preparedness up to 72 hours in Sweden

# CIP against Disturbances in Power Supply



*STYREL – steering electricity to prioritised power consumers*

- Swedish governance approach for critical infrastructure protection (CIP) against power shortages in Sweden
- Novel and unexplored type of policymaking for CIP
- Developed from 2004 to 2011
- Involves a large number of actors from all levels in society

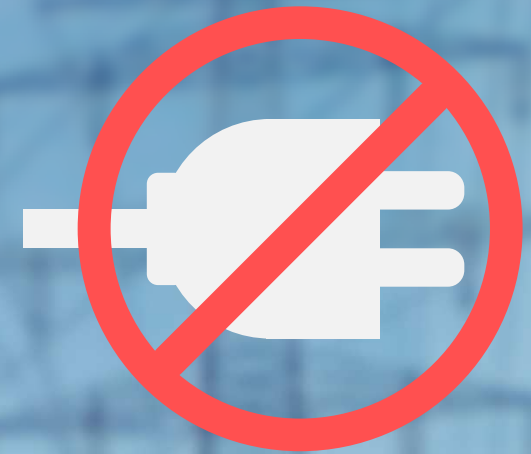
# WHO IS INVOLVED IN *STYREL*?

Main responsibility  
Swedish Energy Agency  
Swedish Civil Contingencies Agency,  
Svenska Kraftnät,  
Swedish Energy Market Inspectorate

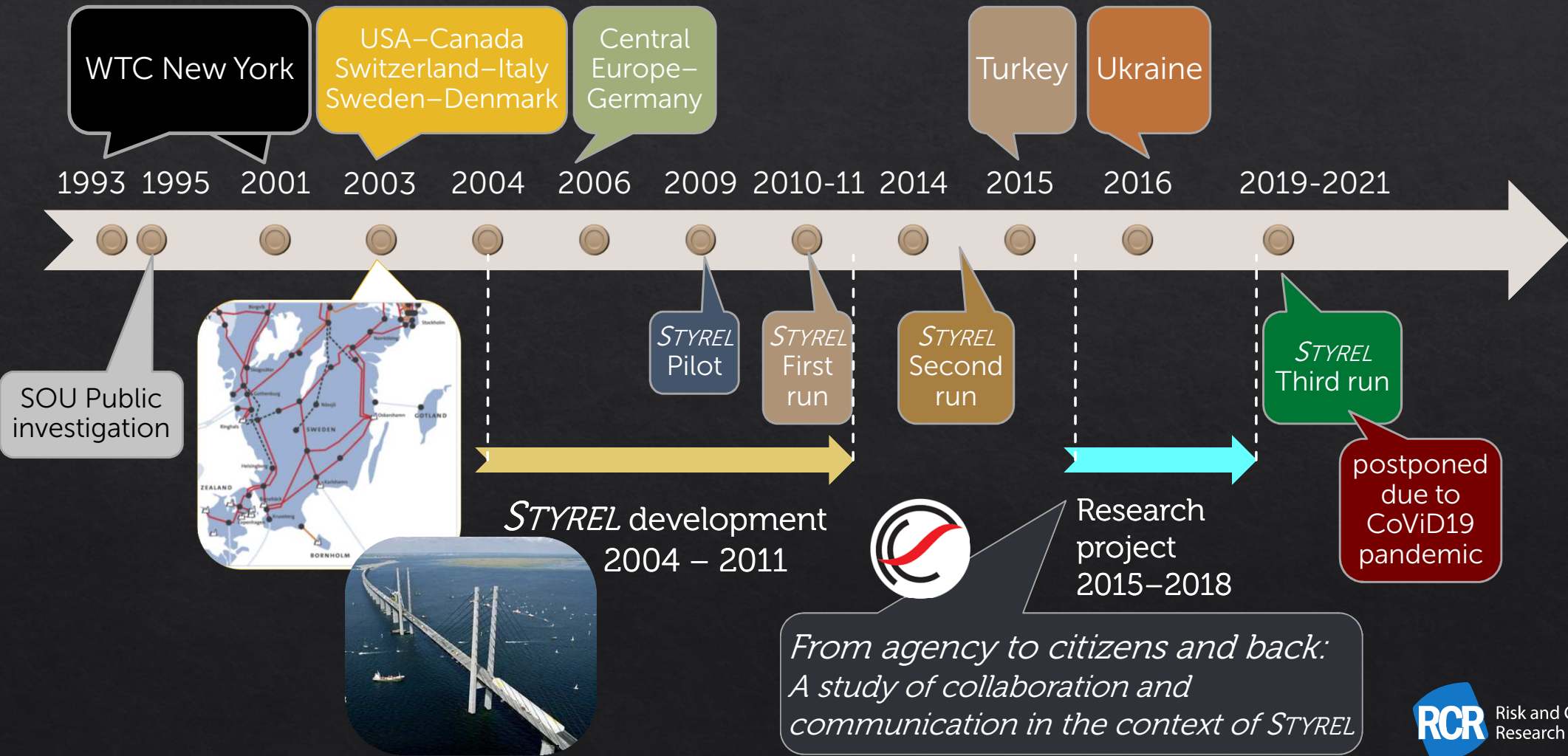
National level  
Ca 100 Agencies  
Svenska Kraftnät

Regional level  
21 County Admin. Boards  
A few regional PGOs

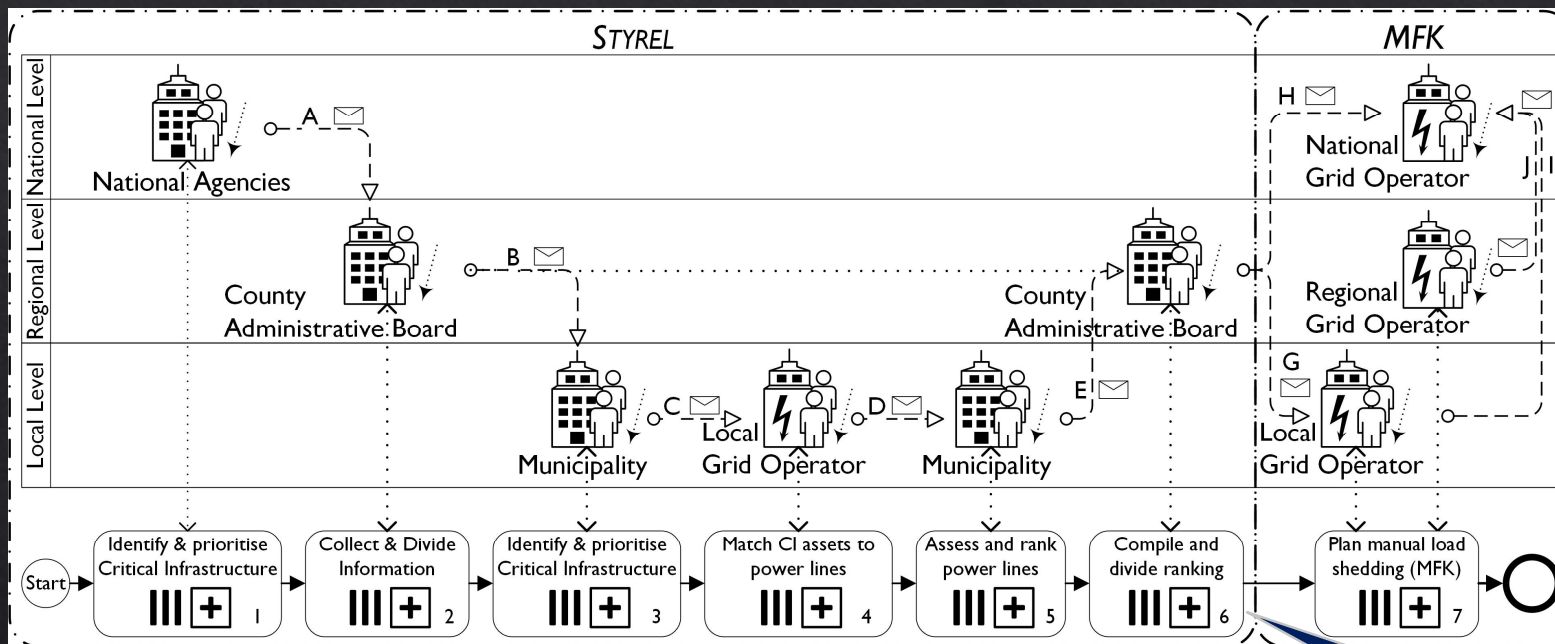
Local level  
290 municipalities  
Ca 160 PGOs



# WHEN AND HOW HAS *STYREL* DEVELOPED?



# WHAT ARE THE MAIN STEPS DURING *STYREL*?



Große & Olausson (2019). *Blind Spots in Interaction between Actors in Swedish Planning for Critical Infrastructure Protection*. Safety Science.

## Class Significant impact

Class	Significant impact
1	On life and health (within hours)
2	On vital societal functions (within hours)
3	On life and health (within days)
4	On vital societal functions (within days)
5	On economic values
6	On the environment
7	On societal & cultural values
8	Others

- Identification and prioritization of electricity-dependent critical infrastructure
- Decision-making on a local ranking of power lines
- Decision-making on a regional ranking of power lines
- Decision-making on a policy for manual load shedding at PGOs

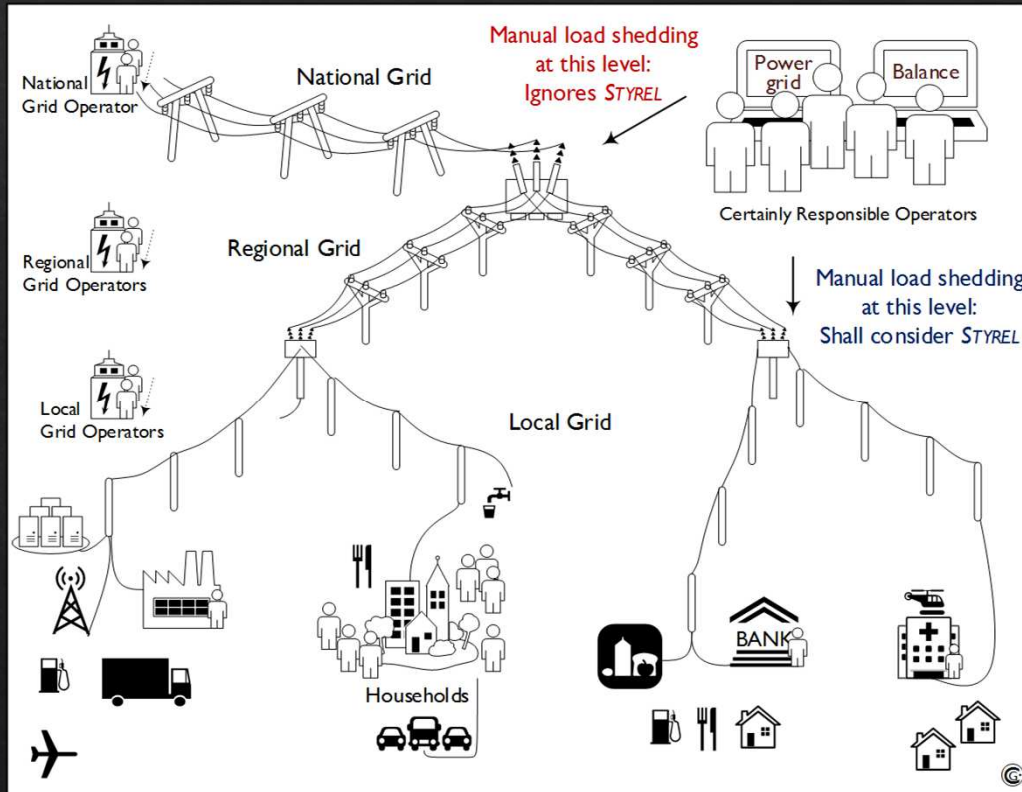
*Everybody thought "Well, what else could we do? It's just a damn long list, so we tried to get it as equally distributed as possible."*



# Emergency Response: Manual Load Shedding



Power shortage: Consumption (Load) > Production (available effect)



National PGO requires certainly responsible PGOs to reduce load within 15 minutes after order



- Currently 9 out of 160 PGOs
- 3 PGOs operate both local grids and regional grids that supply electricity to 40-60 sub-grids (locally operated by other PGOs)

Effects on society depends on the grid level that effectuates the load shedding  
Local level is preferred to follow the *STYREL*-MFK plan

*Exactly, it's thrilling. The third most important power line in the county, we don't know which one it is. We know it's important but not which one it is.*



# STYREL – Benefits and Challenges

## Well-established basis

- executed in full scale in Sweden on two occasions: in 2010/2011 and 2014/15, the third one is halted

## Blueprint for other contexts

- natural gas
- water

## Enhanced awareness concerning

- vulnerabilities at the local level
- the importance of established networks for emergency response
- the complexity of CIP

## Hardly possible to estimate the intended benefit for both:

- the actors in the multi-level system that performs the planning and
- the society that *STYREL* affects

## Difficulty to coalesce forces for CIP

- a subsequent actor in the process must rely on the expertise and dedication of the preceding actor

## Lack of measures to evaluate the quality of information

- variety in understandings and a lack of consensus

**servitris, Jönköping:**

Nej, jag är personligen inte särskilt elberoende eftersom jag jobbar och bor mitt i stan.

*No, I do not depend so much on power supply, because I live and work in the city.*

# WHAT IMPLICATIONS DO FOLLOW?

Technical Level

What policies concern critical infrastructure protection at which level in society in your country?

Policy Level

What societal functions would you prioritise in a power outage lasting:

- 10 hours
- 2 days
- 1 week ?

Society level

# Discussion

# WHAT COMES NEXT?

- Enhancing cross-European co-operation
- Developing knowledge exchange
- Aligning innovation and risk governance
- Synchronising local, regional and national efforts
- Improving integration of policy approaches
- Providing greater clarity about responsibilities
- Ameliorating planning and decision-making processes
- Considering information security and open data
- Boosting crowdsourcing and collaboration
- Upgrading societal preparedness and resilience
- Researching dynamics and uncertainties

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# WHAT CONCERNS DO THE ACTORS EXPRESS?

*For the final results... since we've only got a bundle of power lines, without knowing what's on them, it's extremely difficult. In theory, you could devalue the hospital in favor of a couple of superstores, or some water pumps. I don't see that because I only have scores and line IDs.*

*We must first experience such an event for starting approaching it. It's typical. So, one gets fed up.*

*When Styrel comes, we must create resources. I don't have knowledge. We don't have time, hence, no ability. We need help with this.*

*I think we have a lack of knowledge of each other's daily business, that's why this conflict emerged.*

*Yes, education and training are definitely important, and here, we fail.*

*Perhaps we need to consider a more holistic perspective in the crisis management system rather than to see STYREL as an isolated process since everyone is aware of this pay-off, which is very positive. It also implies how we integrate it as a visual result in our crisis management.*

*I feel like a traveler in shit. And therefore, I'm working alone with the questions. It's crazy! It is not a priority. It's not priority one, not two, not priority three; I do not think they have an understanding of that in the municipality.*

*The feeling I have is that we put down a lot of work on something that eventually becomes some kind of shrug.*

*Staff drops; thus, nobody is present to hand over the task. So it will continue.*

*No, there was no cooperation. They were unbelievable curt with us.*

# WHERE IS THE WAY TO MOVE?

