Flexibility -
New challenges in time and space

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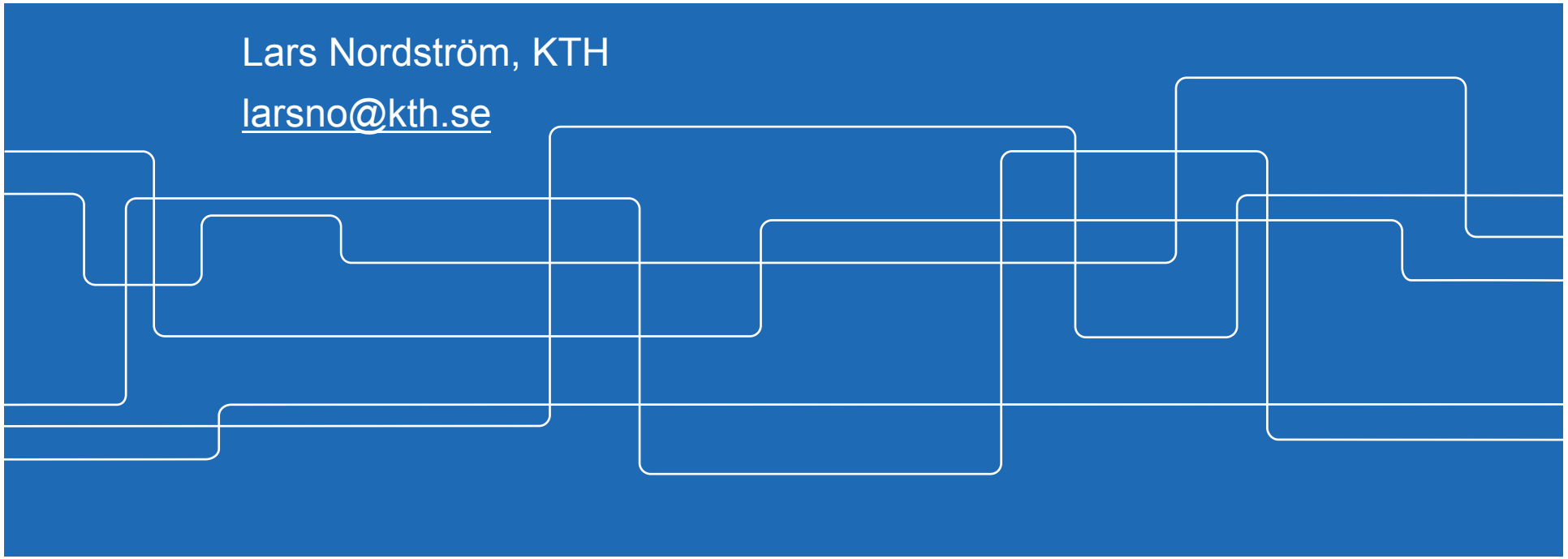


Outline of the talk

A bright future ahead

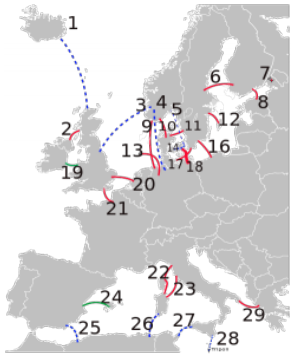
What can we learn from the past?

A closer look at flexibility

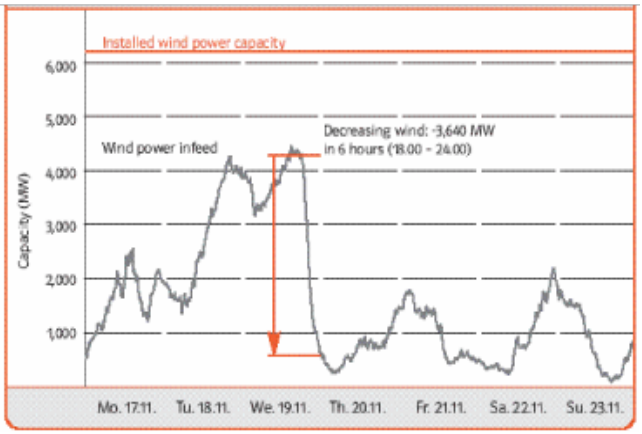
Which is the most important problem

At the Transmission level

Increased market coupling leads to larger variations in power flow.

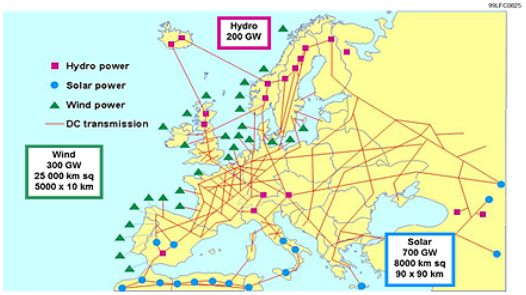


Source: Tintazul, Maix, J JMesserly;



E.On Netz (2004), *Wind Report 2004.*

Large amounts of renewables not in close proximity to load centers, new grids?



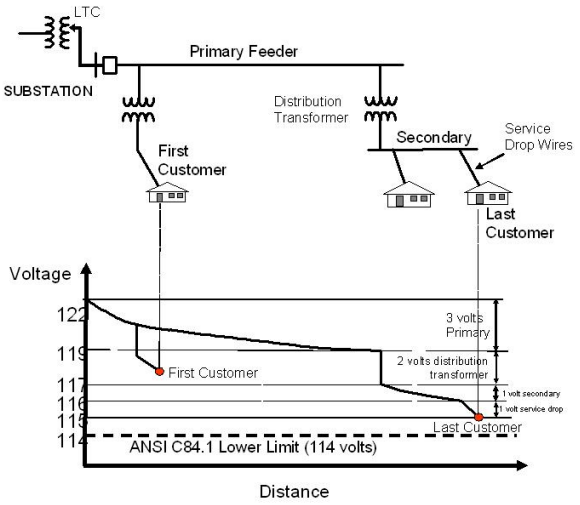
Source: Gunnar Asplund, Elways AB

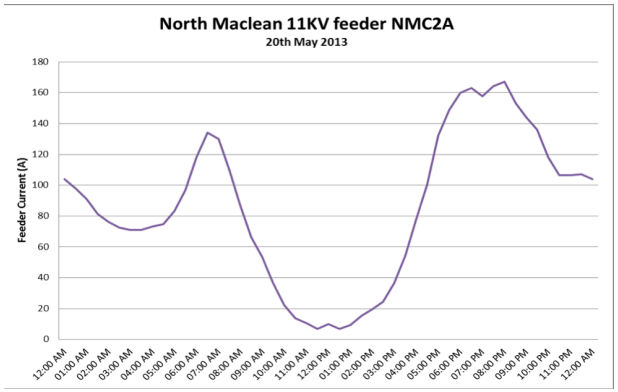
Inherent variability of supply increases stress to the system

At the Distribution level

Prosumers as market participants

Voltage control in active feeders





Source: Giles Parkinson RE Economy

Protection settings under varying load & production

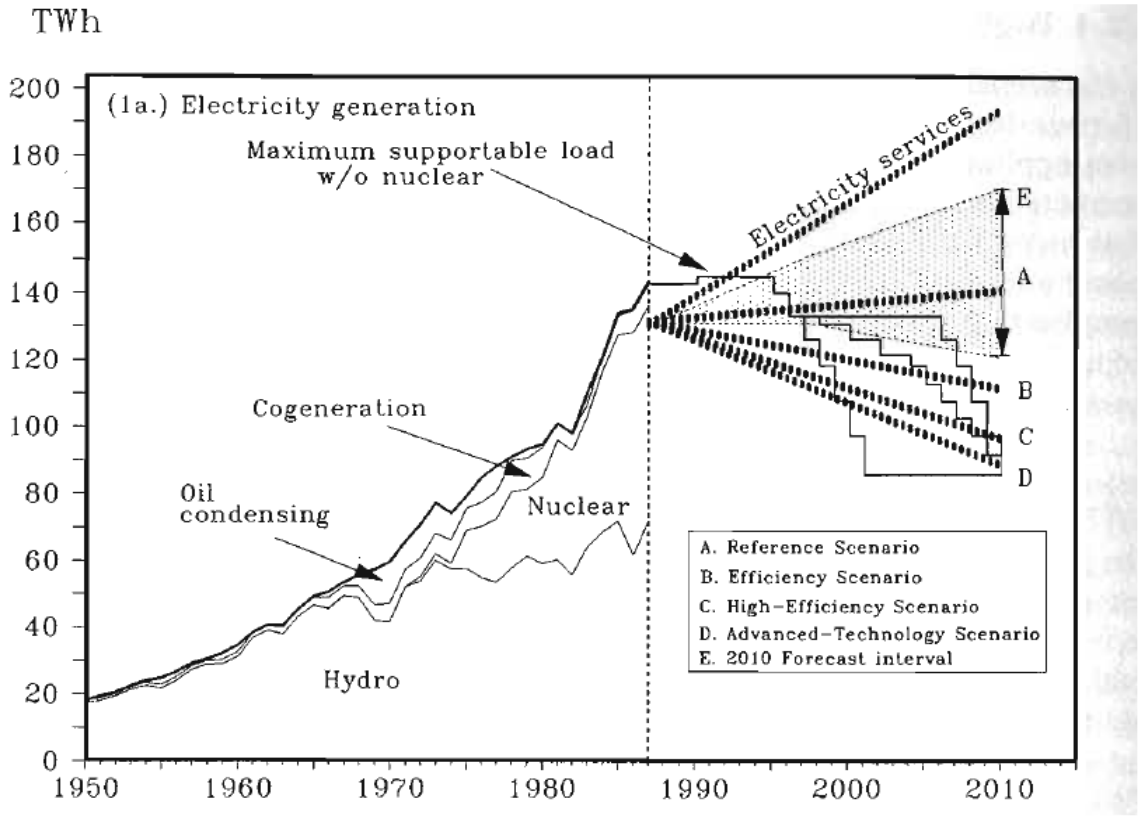
New types of load – ancillary services?

Demand response & Flexibility

Flexibility among end-user load activated in Demand Response schemes is often brought forward as a possible way to adress these challenges.

Is this a new idea?

Energiwende – Swedish style



Smart building services

BEA Systems, Inc. (Nasdaq: BEAS), the E-Commerce Transactions Company(TM), announced that [redacted] one of the largest energy companies in Europe, is using BEA's WebLogic product family of industry --leading e-commerce transaction servers, along with BEA components, to build an integrated network A network that supports both data and voice and/or different networking protocols for providing 'smart building' subscription services throughout Sweden. The services let customers remotely monitor their refrigerators, ovens, electricity consumption and power mains status, and control their burglar alarms and heating and air conditioning air conditioning, mechanical process for controlling the humidity, temperature, cleanliness, and circulation of air in buildings and rooms.. [redacted] estimates that, before the end of next year, 150,000 Swedish households will be using the new services, and hopes to add 200,000 new customers a year en route to a customer base of one million households within five years.

What can we learn from the past?

Rational plans vs Chaotic markets

Eric S. Raymond

Irrational Infrastructures

What we should learn from the past

Flexibility depends on devices & appliances and a user willingness to participate.

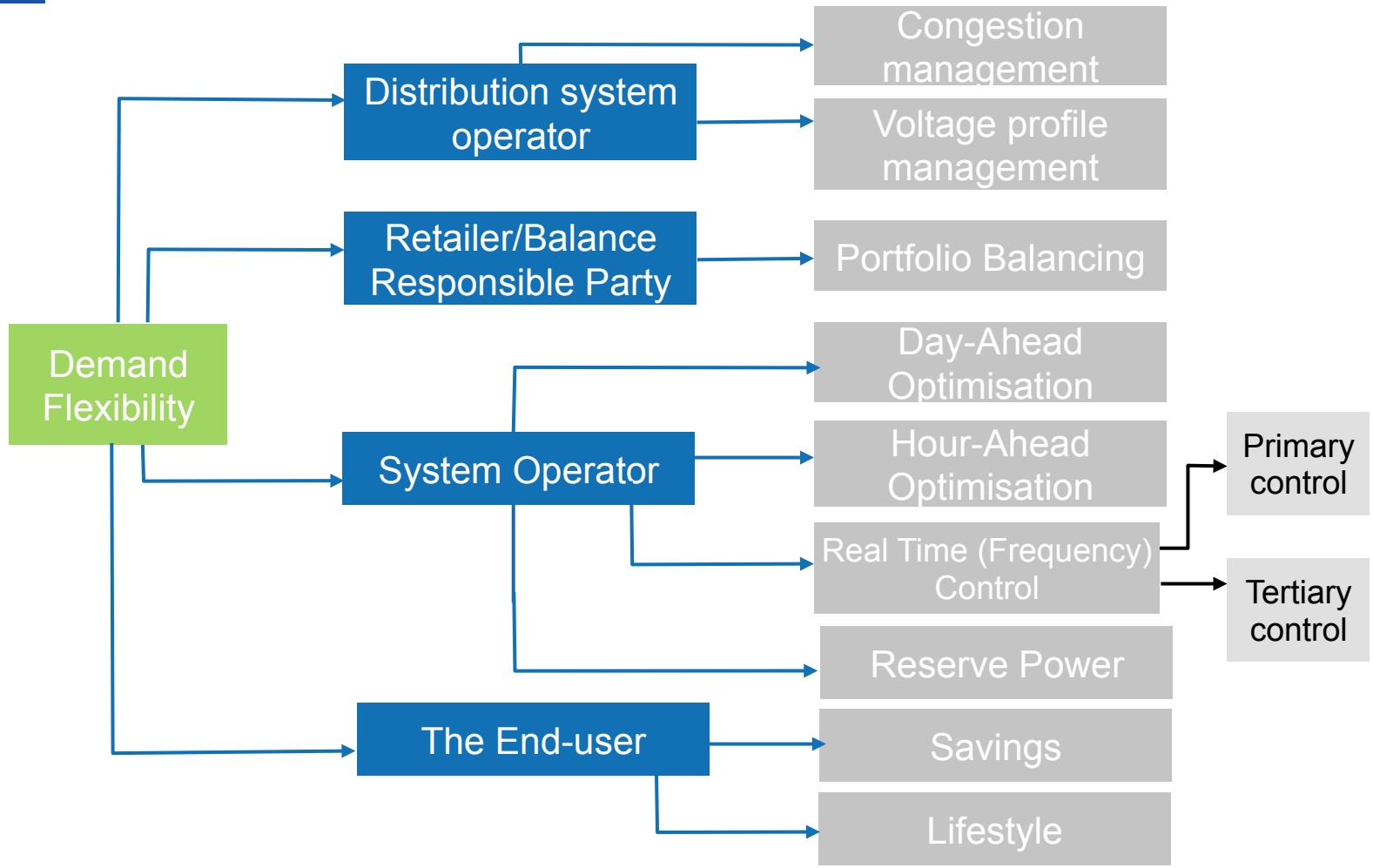
Large scale roll-out is cost effective only if helped by consumer pull

Rational planning vs. pushing for installation of devices and appliances

Consumer pull is stronger today – we should use it!

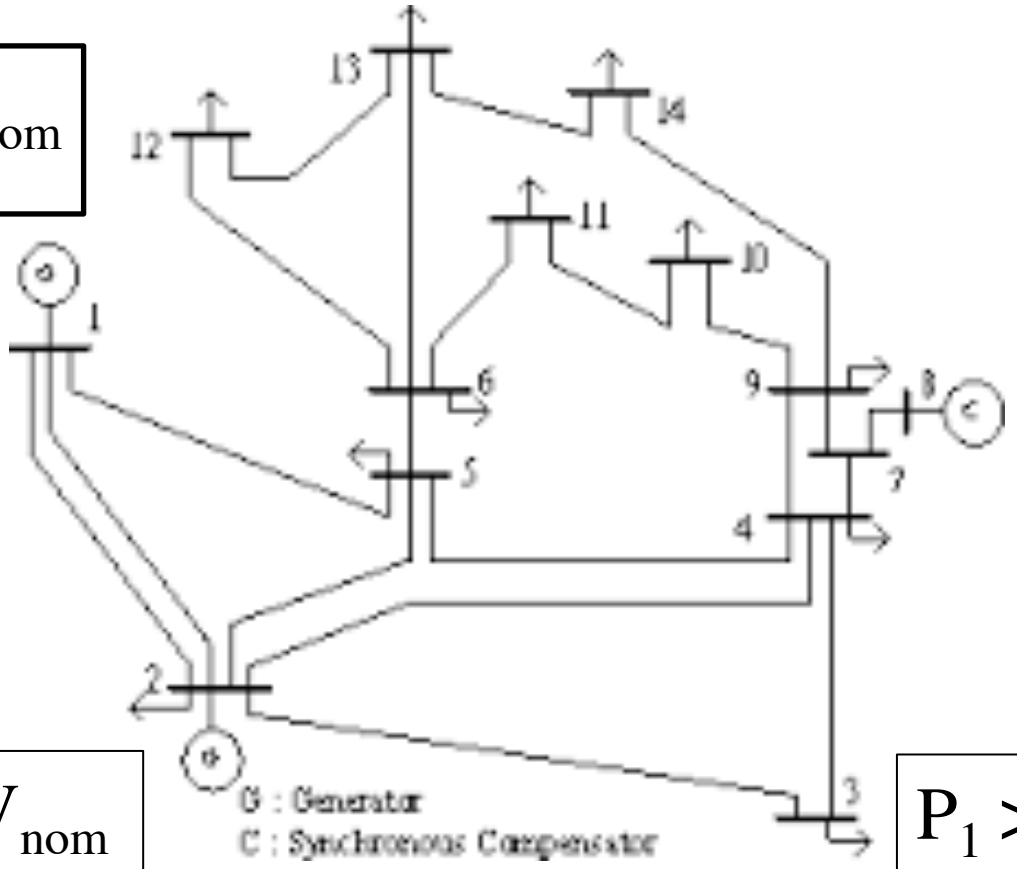
A closer look at Flexibility

Flexibility can help in many ways



Time and Space Challenges

$P_G < P_L \qquad f < f_{nom}$



$V_1 > V_{nom}$

$P_1 > P_{lim}$

So what problems can we expect?

Imbalances in real-time operation
Imbalances in day-ahead and hour-ahead markets

Time only challenge
Demand response competes with production

Voltage profile management
Line and transformer congestion
Distribution grid tariff management

Time and Space challenge
End-user group large enough to create a market?

Which problems have priority?

A balance responsible party activates demand response among its consumers to reduce imbalance

An end-user optimises its heating/AC comfort level and cost using intelligent heat-pump with online price information

An aggregator activates end-users with intelligent heat-pumps to reduce load in a grid segment avoiding congestion

Market Overlap - Interference

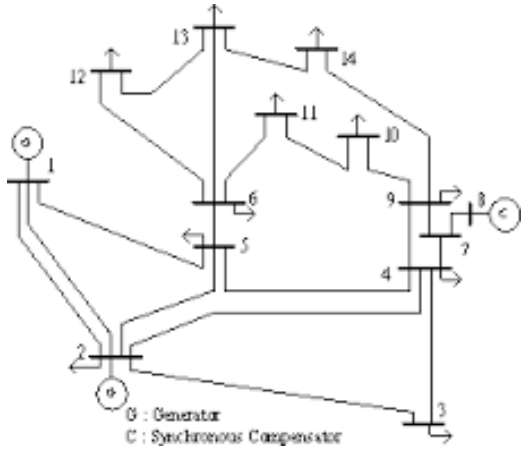
Controlling load to manage grid problem creates imbalances for BRP.

Can be managed via ”Market status” were grid problems have priority and set the rules.

Or is it really such a big problem?

Proportional to ratio of BRP portfolio to number of consumers controlled

Having built the Demand response bottoms up – the End-user has the right to chose not to buy



The challenges to sum up

Demand response should be built bottoms up, starting from end-user preferences & lifestyle.

Costs for equipment shared and user acceptance implicit

Demand Response that solve challenges with only a time component compete with price only.

Very challenging in presence of Hydro/CHP

Demand Response that can compete also with a space component have a competitive advantage

Too small group to form ”market”

Market interference between space and time problems

Priority for grid operations or laissez fare?

Questions?

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