Demand resources as a possibility for a TSO

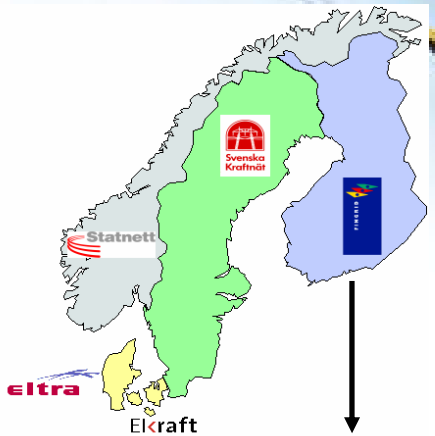
Jarno Sederlund
Fingrid Oyj
Operation Planning

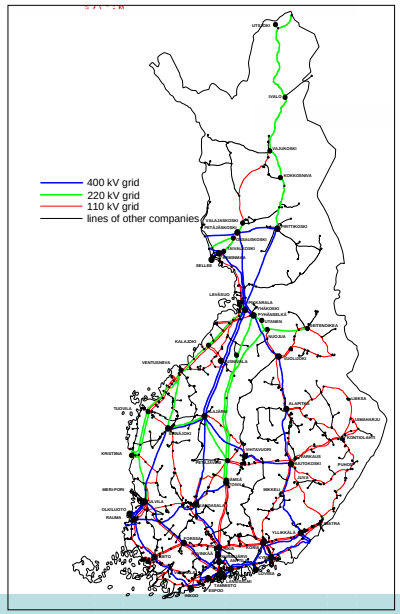
Demand Response Workshop in Crown Plaza Hotel, Helsinki,
April 19, 2005

Fingrid in the Nordic electricity market

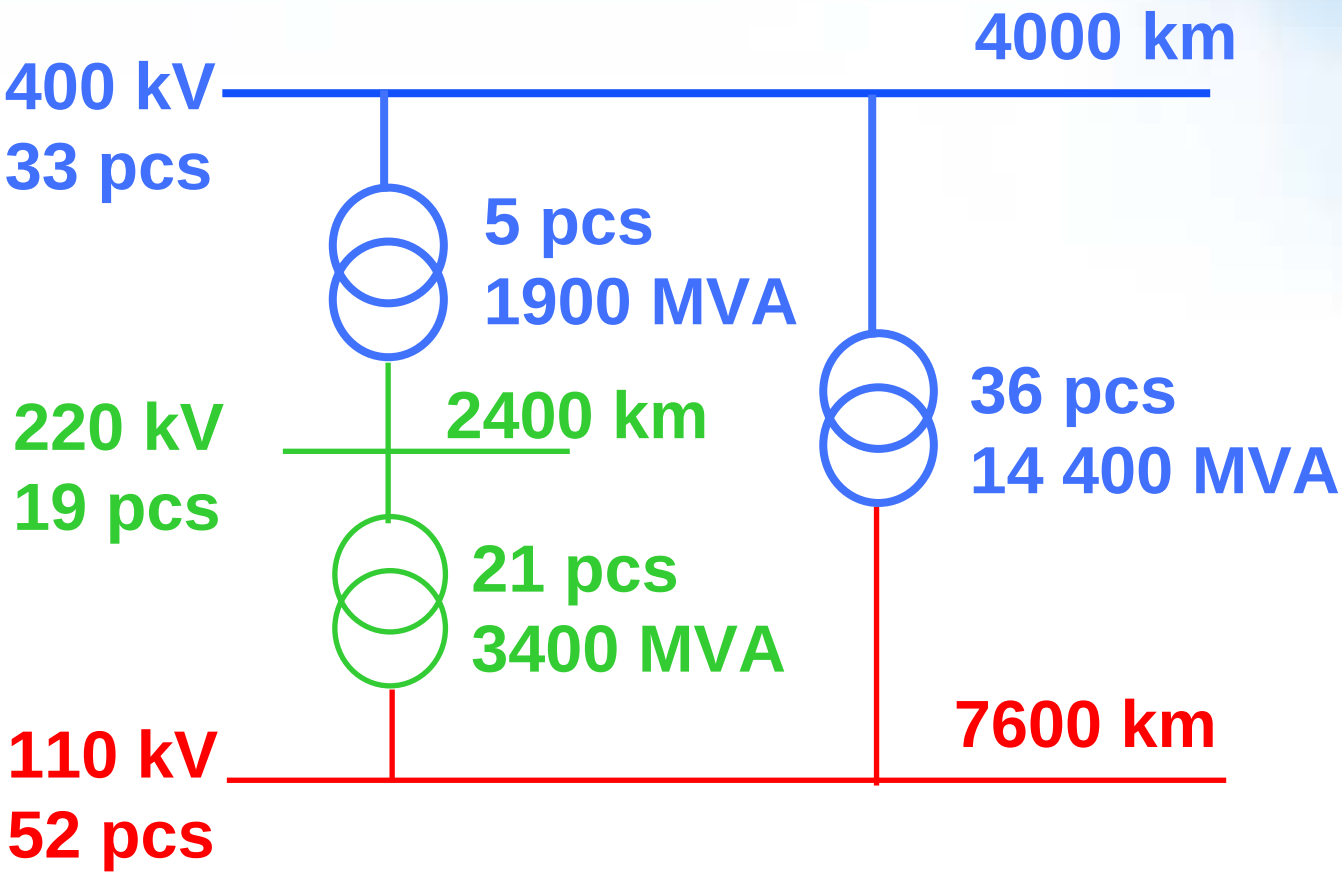
- Finnish Transmission System Operator in brief -

- Started operations on 1 September 1997
- Owns 99.5 per cent of the Finnish main grid and all the major interconnections
- Number of transmission customers: 98
- Number of personnel: 220 (31.12.2004)
- Turnover € 302 million
- Balance sheet € 1,400 million
- Consumption in Finland in 2004 87 TWh
- "All-time high" peak load hour (winter 2002/2003) 13 930 MW





Fingrid Oyj

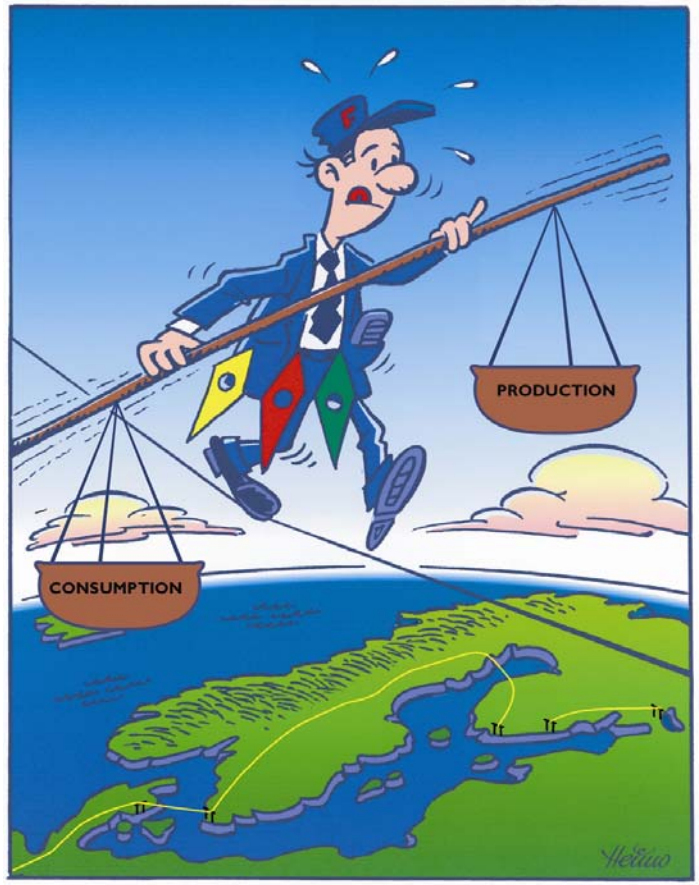


Substations 104 pcs
Transmission lines 13 900 km

Introduction

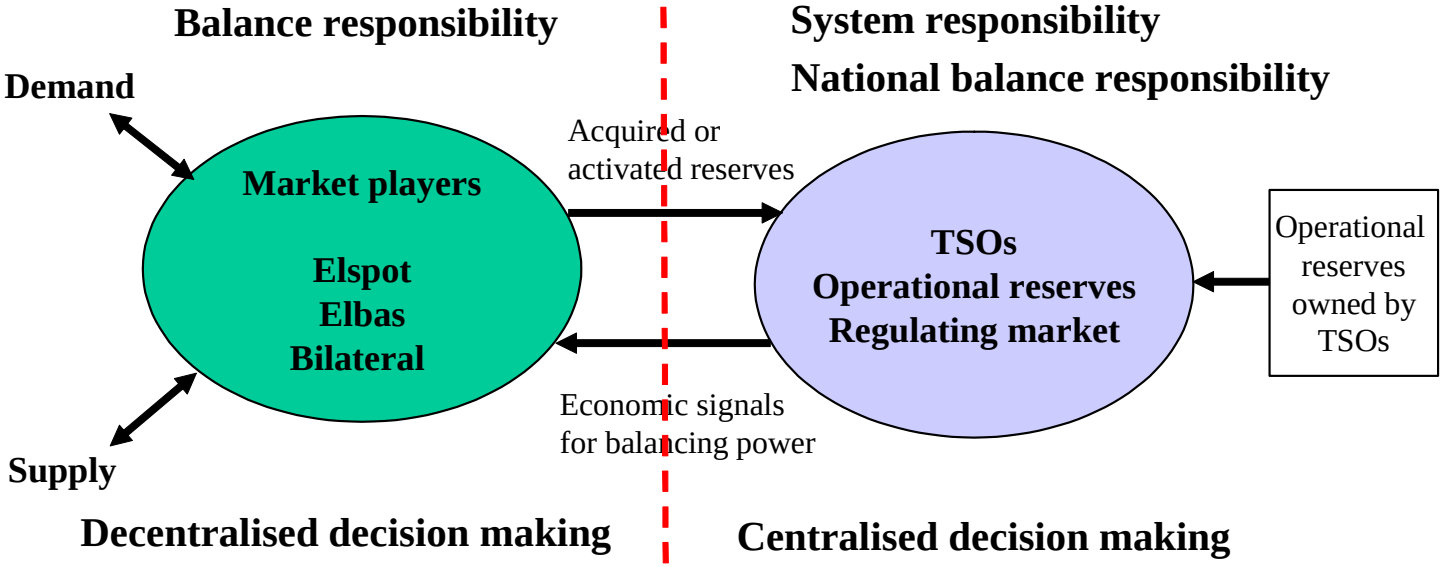
The Nordic power balance has been tightening in recent years

- more price spikes as a result of increased demand and few investments in new generation capacity
- increases risk of market clearing failure in extreme situations
- increases risk of using reserves in peak load situations for balancing the operation hour



Balance management

- **The market players are responsible for ensuring that their procurement meets their commercial commitments, even in peak-load situations**
- **TSO's have the national balance responsibility within the operating hour**

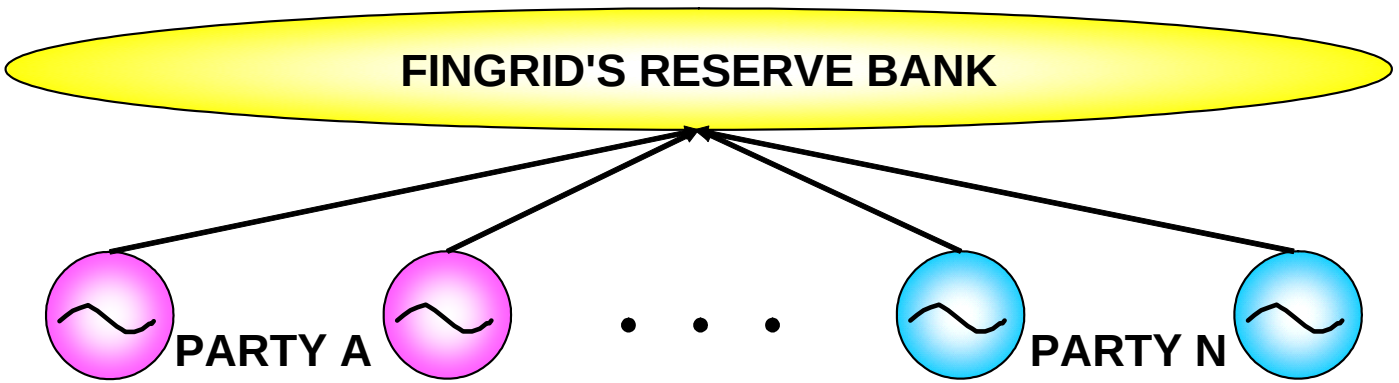


Balance management

- **TSO's tools for balance management are:**
  - automatic frequency control (primary regulation)
  - manual physical regulations (secondary regulation)
  - disturbance reserves (as a back-up solution)
- **TSO has no regulation capacity of its own in primary and secondary regulation**
  - frequency control is based on contracted resources
  - secondary regulation is based on the regulation power market
- **TSO can only produce part of the disturbance reserves itself**
  - resources are purchased from resource owners

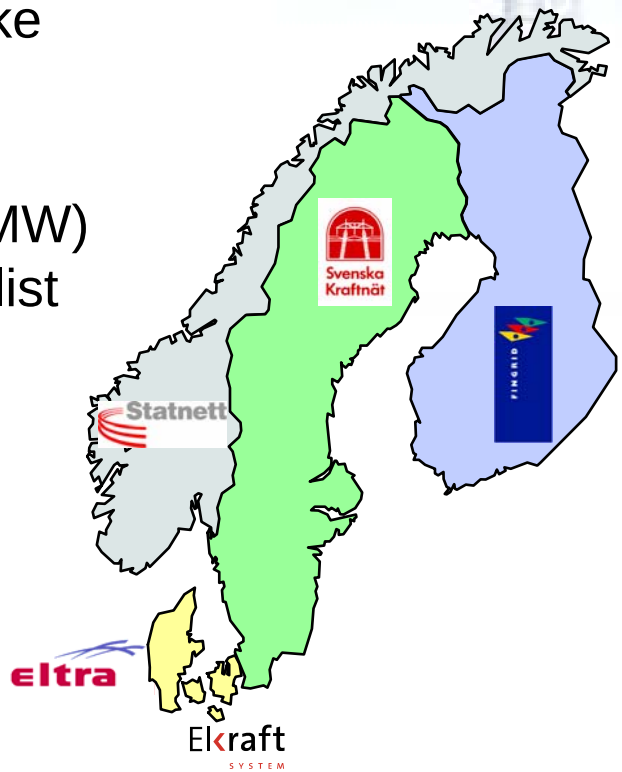
Primary regulation

- **Frequency shall be within the band 49,9...50,1 Hz**
- **Fingrid has established a so-called reserve bank where companies owning capacity which can be regulated can register their resources**
- **The resource owners maintain the measured regulation properties at their power plants in the agreed manner and receive a compensation for this from Fingrid**



Secondary regulation

- **Common nordic balance management => Nordic Regulation Power Market**
  - An electricity producer or consumer which has available regulation capacity can make regulation bids to the regulation power market
  - all Nordic regulating power bids (min 10 MW) are collected in one common merit order list
  - The synchronous area is regulated as a one system
  - cheapest available Nordic resources are applied for balancing
  - **there is a potential for increased DR participation in this market!!**



Nordic Regulation Power Market

Local TSOs pass bids on

Common Nordic merit order list

NOIS

Norwegian and Swedish TSOs maintain the frequency

Requesting up- or downregulation

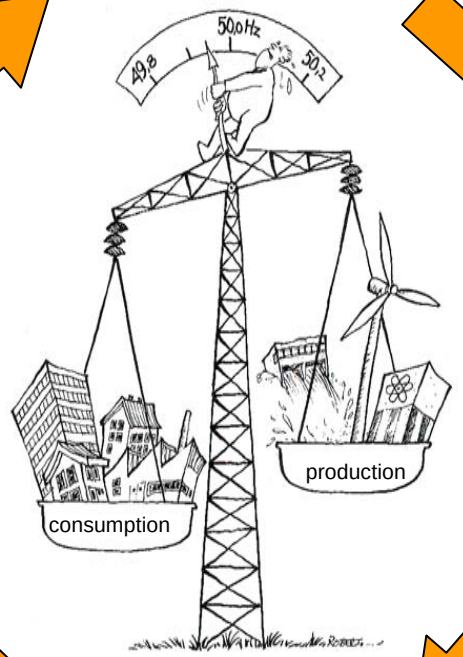
Local TSOs treat bids

Bids activated

Market players with regulating resources

Bids for up - or downregulation

local BMG software



Disconnectable loads

- as disturbance reserves -

- **Demand resources are used in Finland as disturbance reserve in the same way as power plants reserves**
- **Fingrid has signed contracts with large-scale process industry on disconnectable loads:**
  - Metal industry (steel works and furnaces)
  - Forest industry (groundwood plants and mechanical pulping plants)
  - Chemical industry (electrolyses)
  - The minimum unit size is 15 MW with at least 7000 hours availability per year
  - Availability to be disconnected at least 3 hours

Disconnectable loads

- agreements -

- **Totally around 1000 megawatts to be available from 2005 to 2015**
  - contracts are divided in two periods:
    - in the first period only half of the agreed power is in use
    - the other half is available on temporary use until the start of new nuclear power plant
- **To assure power system reliability requirements after the new (about 1 600 MW) nuclear power plant comes on-line**
  - new nuclear power plant will be the biggest dimensioining fault (unit size) in Finland
  - separate system protection scheme with disconnectable loads decreases unit size to 1300 MW
- **Contractual terms and payments are equal on voluntary basis to all participants**

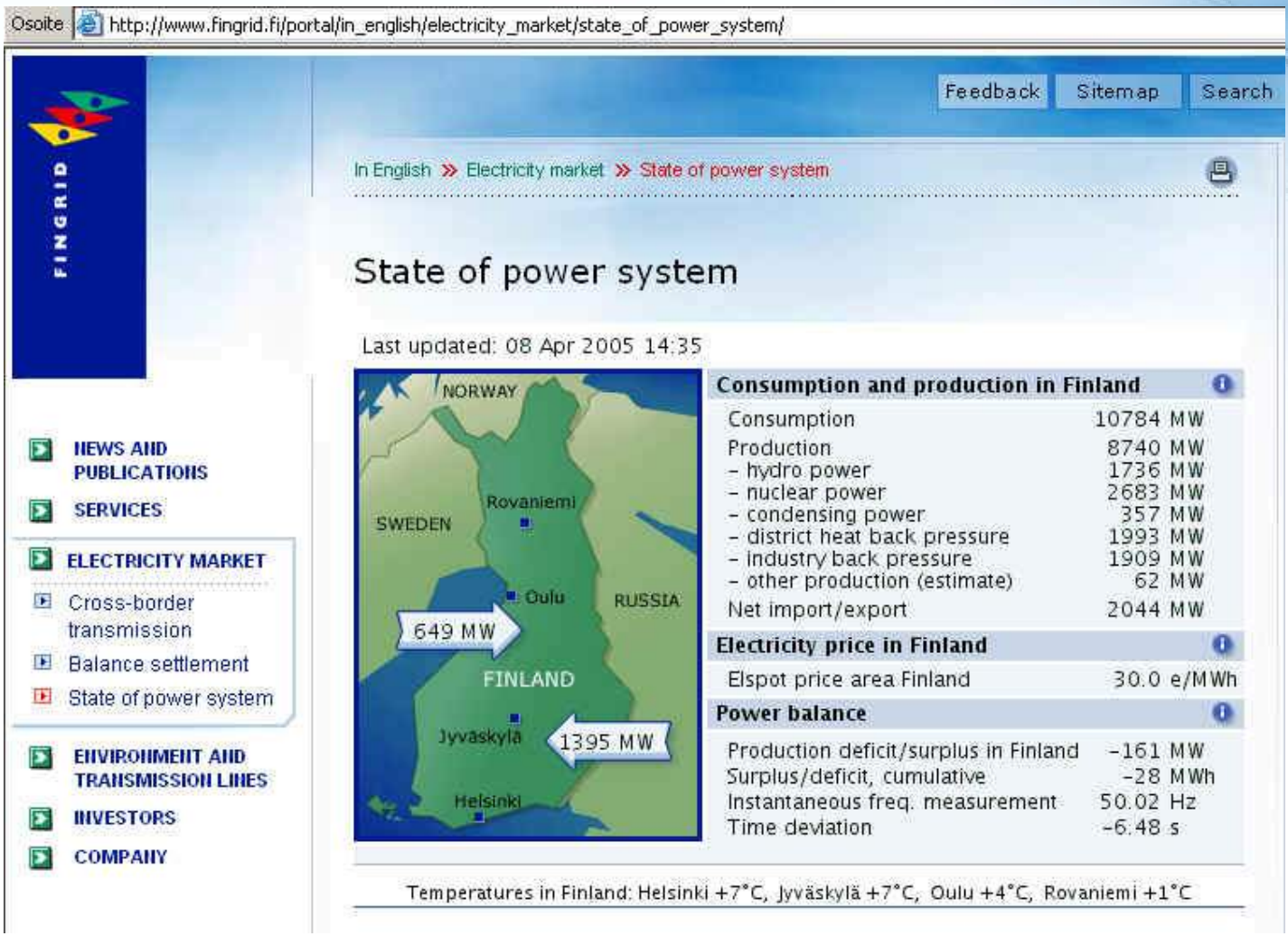
Disconnectable loads

- technical and functional terms -

- **Loads are disconnected from the grid by:**
  - frequency sensitive relays (frequency controlled disturbance reserve)
  - manually within 15 minutes, when asked by Fingrid (fast disturbance reserve)
  - separate system protection scheme that disconnects 300 - 400 MW load instantly if the new nuclear power plant is tripping
- **Loads can also be used as a part of disturbance reserve in extreme peak load situations, when no other resouces are available in regulation power market**
- **Participants have chosen loads so that disconnection does not interrupt significantly normal operation**

Demand resource benefits for TSO

- **It promotes competition and further capacity in regulating power market**
- **Market based resouces are a better way of maintaining the balance during extreme peak load situations than using**
  - disturbance reservers
  - or as a last resort forced load shedding
- **It creates additionally resources for disturbance reserves**



http://www.fingrid.fi