

Experiences with Demand Response and Back-Up Generation as regulation power

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The “energy web” – a long term scenario

- Communication is abundant and free
 - Price signals “everywhere”
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- No minimum size
 - Many markets
 - Individual security of supply
 - All nodes can negotiate with all other nodes
- Equal possibilities for all technologies
 - Demand response
 - Back-up generation
 - ... and much more

Activating Back-Up Generation: Synergy

- New capacity to the market: Activating existing generation capacity
- Local security can be maintained or even improved
- Companies get an income
- Typical operation periods: 10-30 hours per year (~ before)
- Environmental problems limited

Demonstration project in few words

- **10 MW regulating power from BUG and demand**
 - End of year 2005: 25 MW
- **15 units online, 7 to come online soon**
- **Typical start up time: 1 minute**
- **Typical size: 0,5 MW per unit**
- **200.000 DKK/MW per year in reservation cost (US \$ 30.000)**
- **1 DKK/kWh produced (US \$ 0.15)**

Three types

- **BUG in island operation**
 - High degree of safety (important reason to participate)
 - Reduced and varying effect (depending on actual demand)
 - No extra meters
- **BUG in synchronous operation**
 - Security obtained with relays
 - Extra meters needed
- **Demand**
 - Measurement of reduced demand has been difficult (only total demand metered)
 - Effect varying with time
 - Demand will return at a later time

Typical owners of BUG

- Hospitals: 2
- Airport: 1
- Computer centre: 1
- Medical factory: 2
- Waste management: 2
- Tele communication and media: 2
- Electric utility (owner of BUG): 2
 - Including 5 mobile units and 8 stationary units







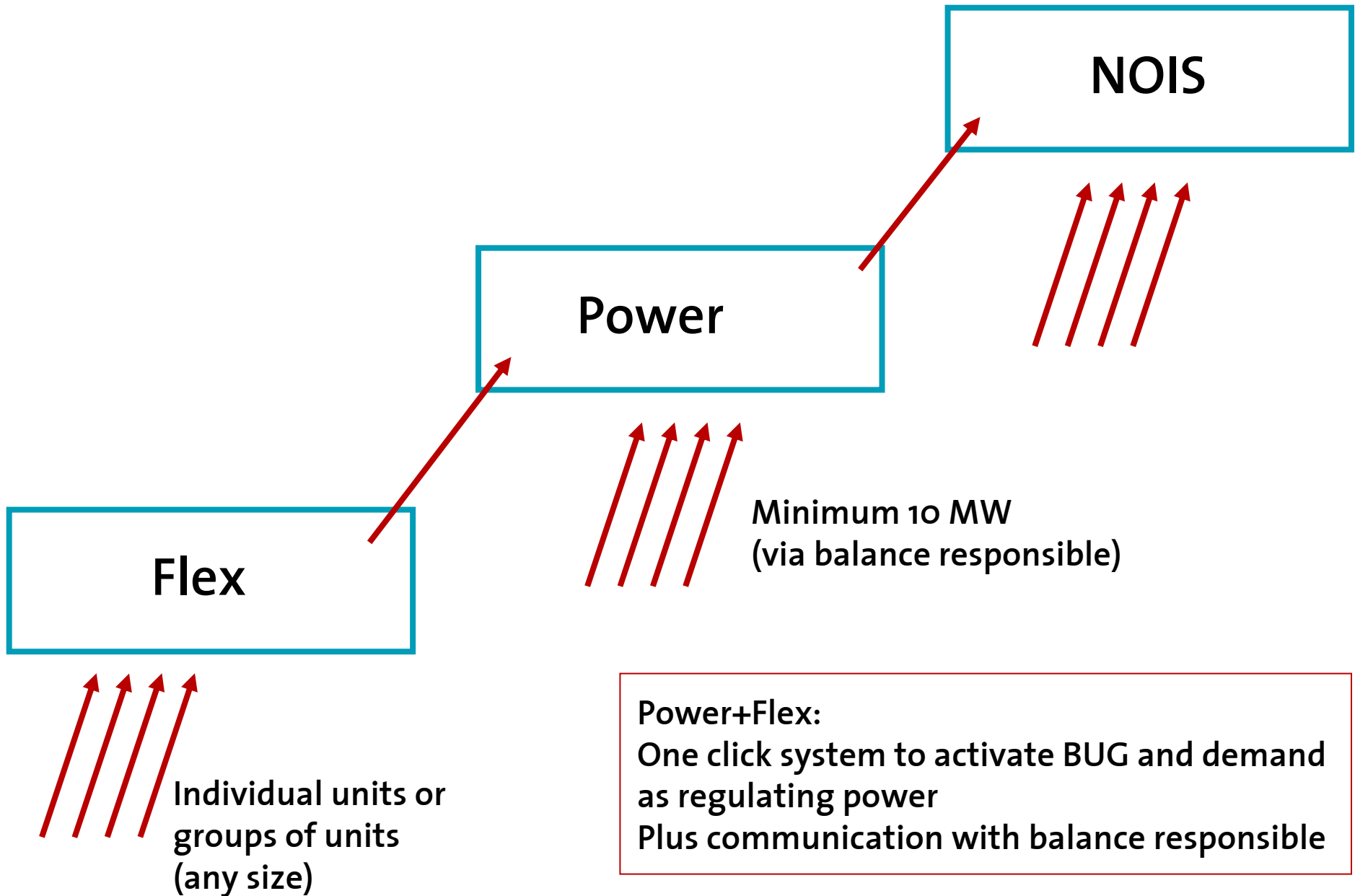


Demand as regulating power

- **Malting company (brewery): Cooling by ventilators**
- **Industrial cold store: Refrigeration compressors**
- **Ice skating ring: Refrigeration compressors**
- **Supermarkets: Ventilation and refrigeration**
- **Water supply: Pumping**







Results

- High interest to participate with BUG
- New application for aggregating bids and and communication to each units is working
 - GPRS-relay
 - Voice mail
- **Many delays (mainly administrative problems)**
 - Contracts with balance responsible
 - New meters (utility not used to this type of metering)
 - Allowance to deliver to grid
 - Tax questions

To be documented... (BUG)

- Fast resource (1 minute)
- Secure (many independent units)
- Reservation cost can be lowered

- Realistic with 75 MW regulating power from BUG in 2010
 - 50% of maximum need for regulating power in East Denmark