



Sustainable Energy Planning
Aalborg University




Danish experience with large-scale integration of non-dispatched power generation

Poul Alberg Østergaard
Aalborg University
Denmark




Sustainable Energy Planning
Aalborg University

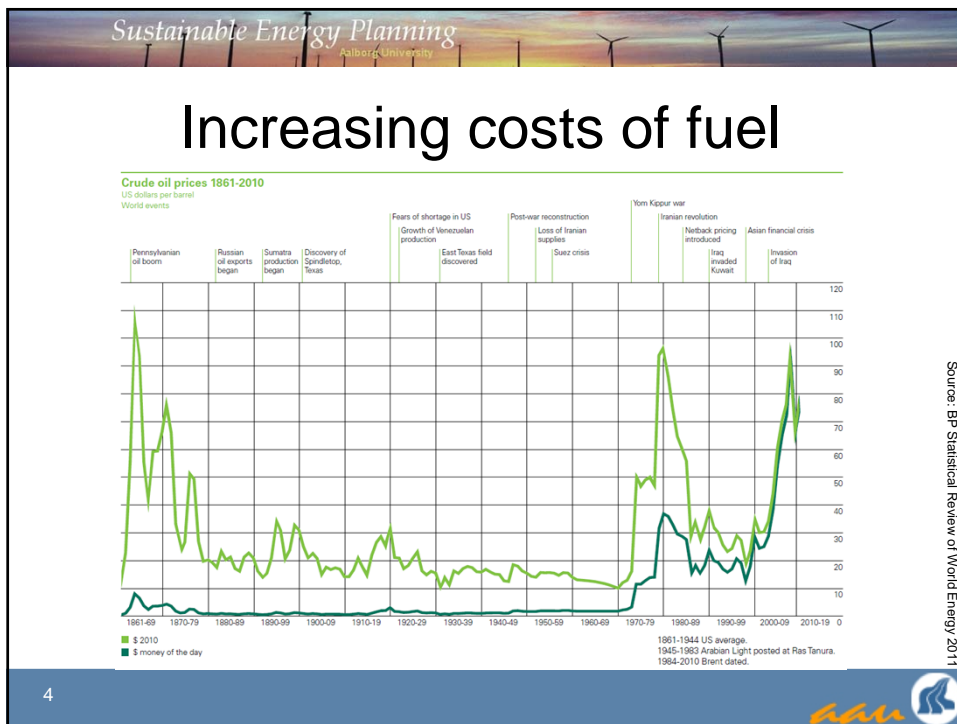
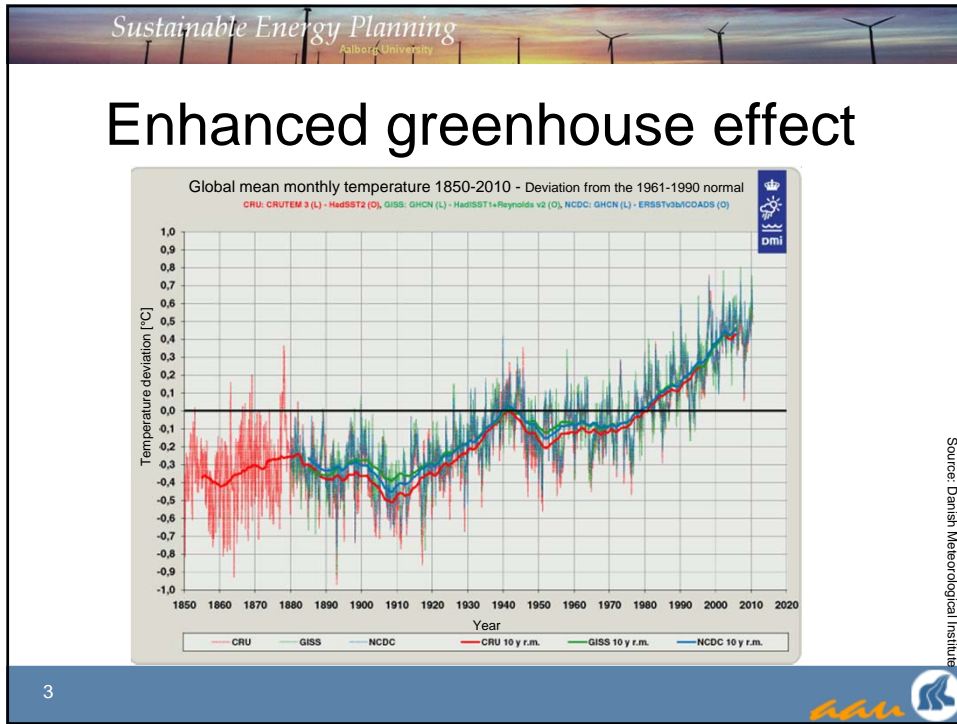


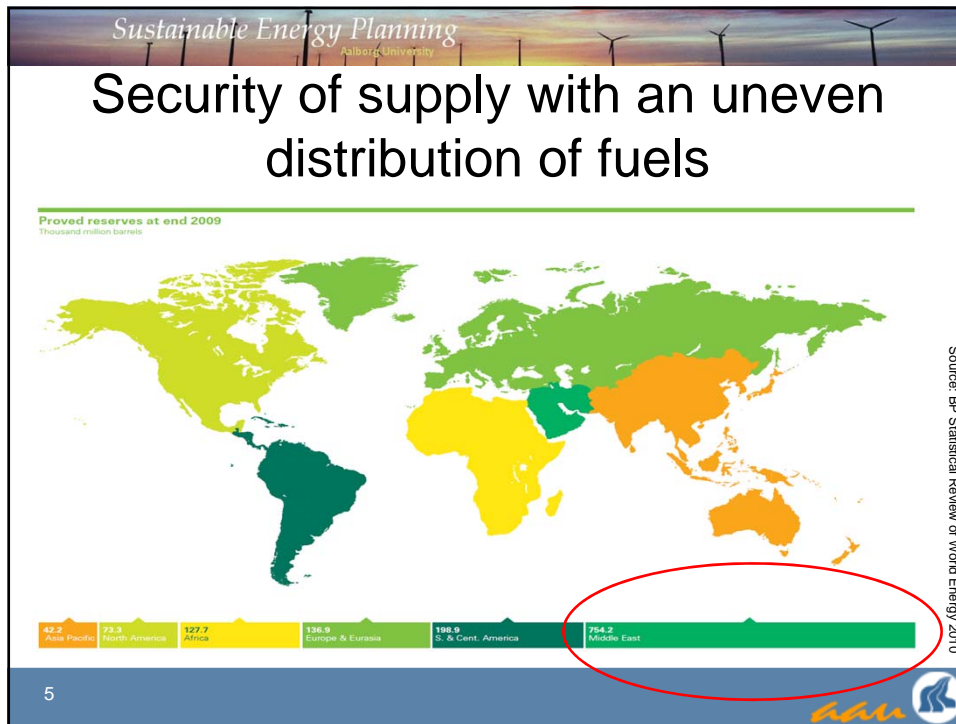
Programme of the presentation

- Global motivation for energy planning and a shift towards non-dispatched power generation
- The Danish energy situation
- Matching electricity consumption and demand

2





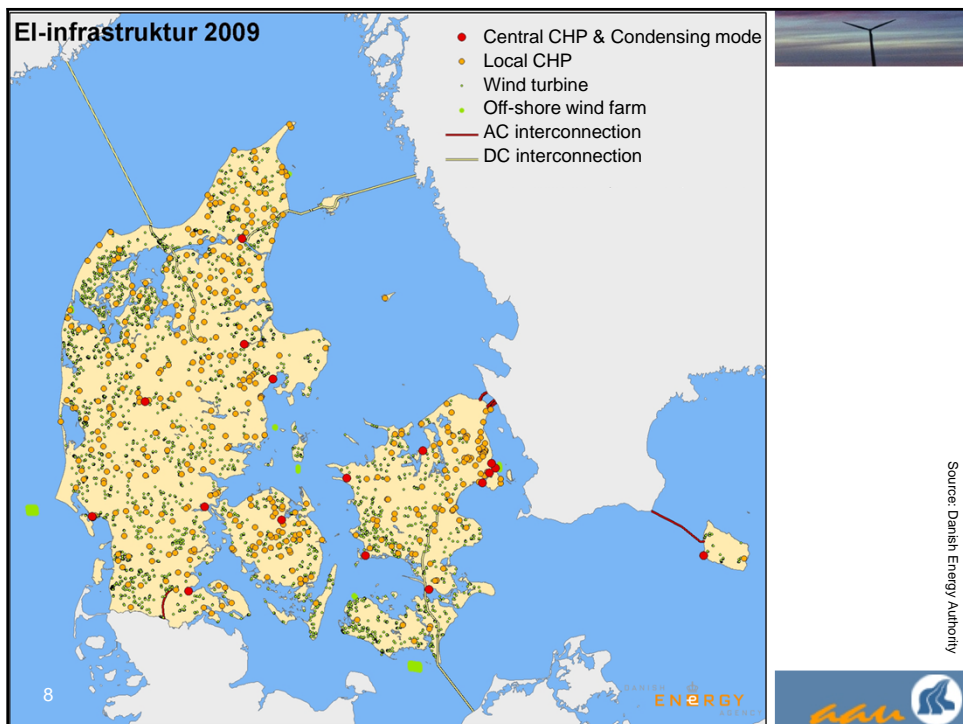
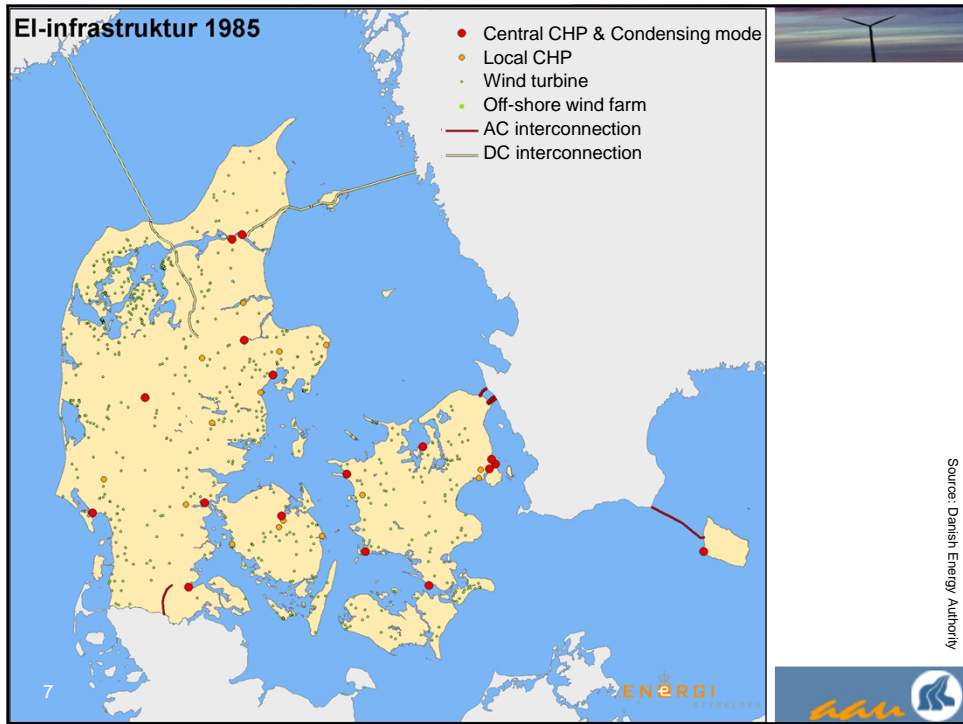


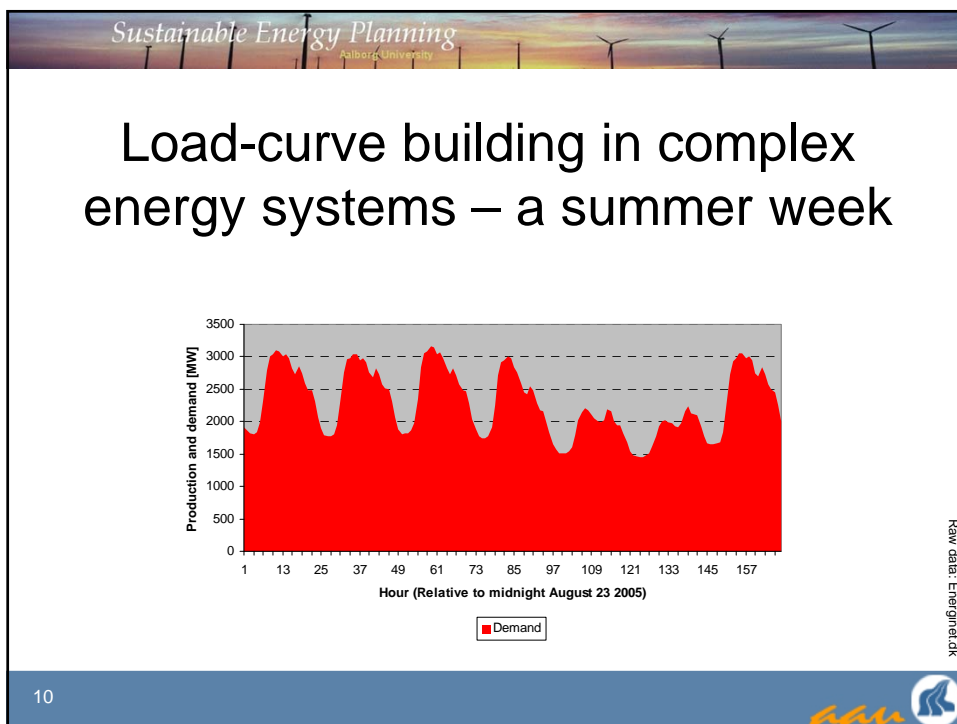
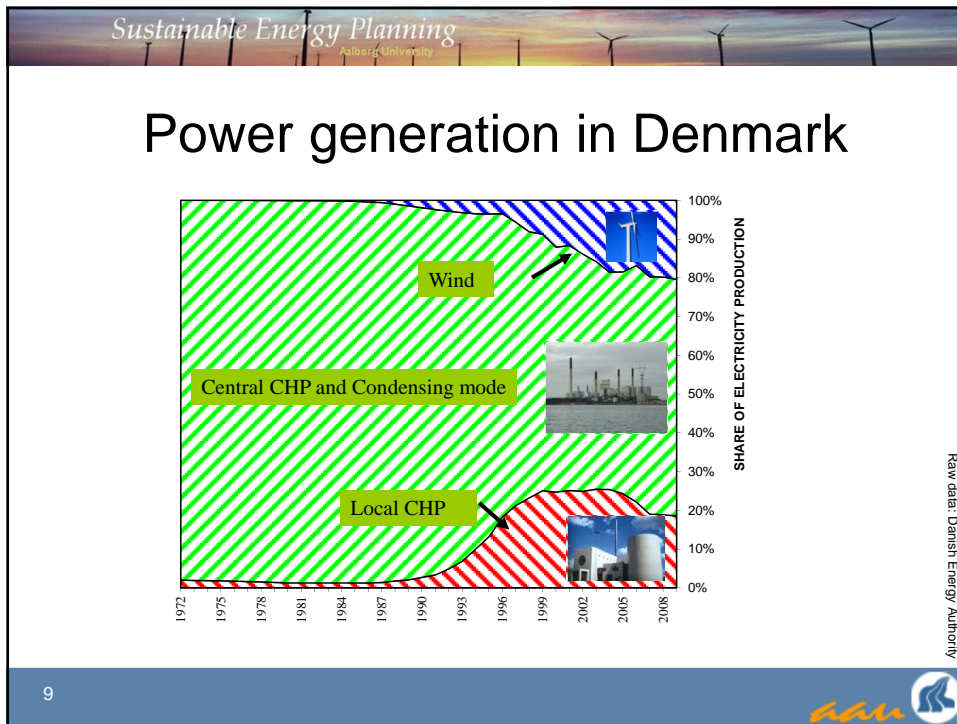
Sustainable Energy Planning
Aalborg University

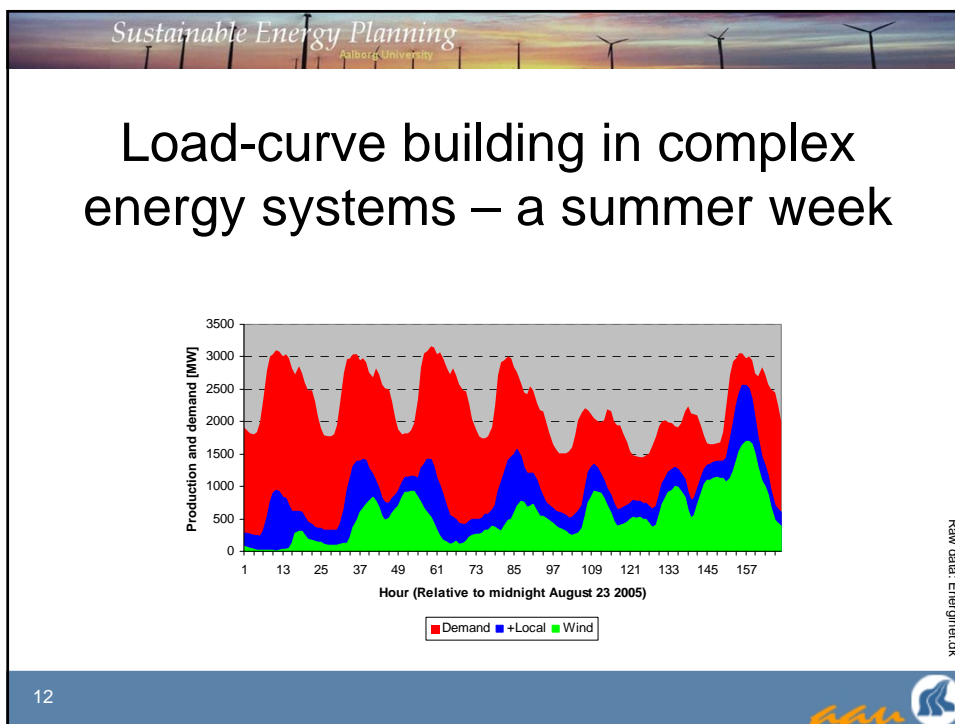
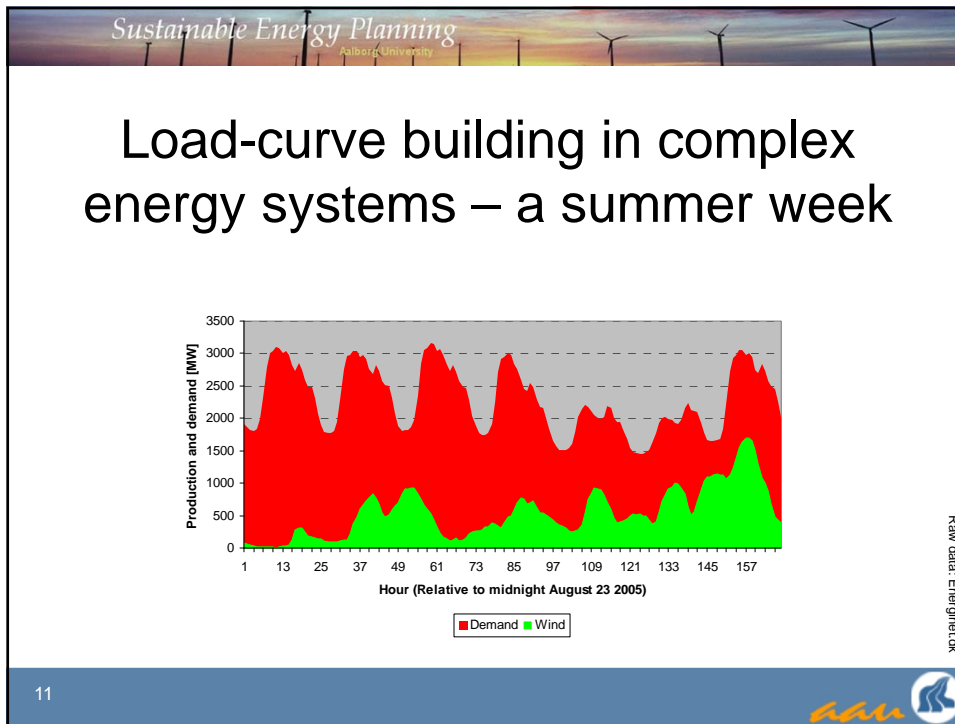
The Danish energy situation

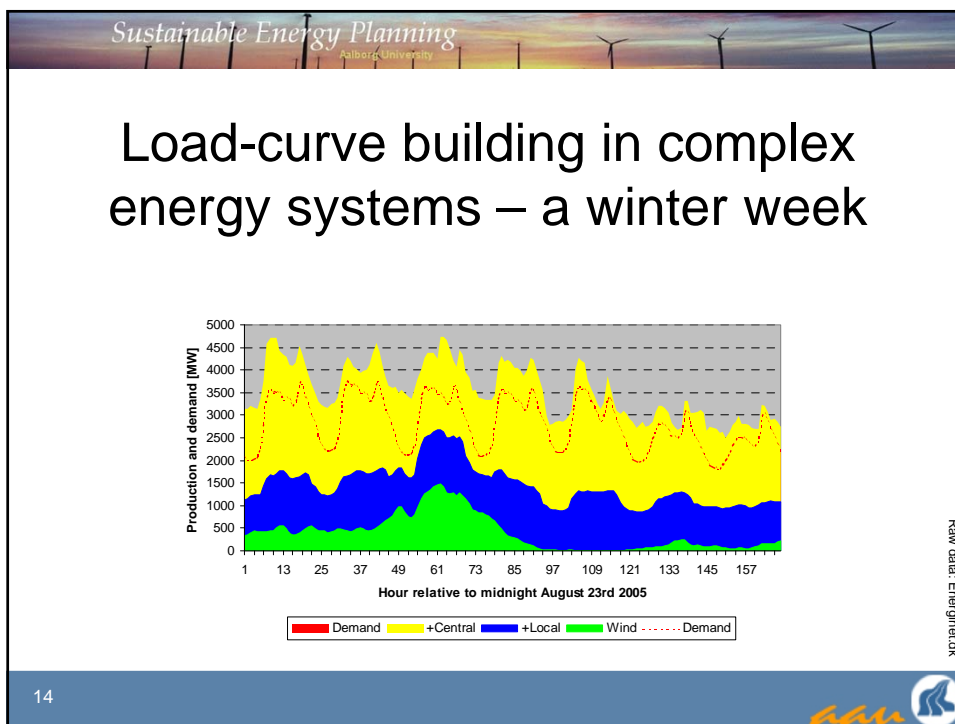
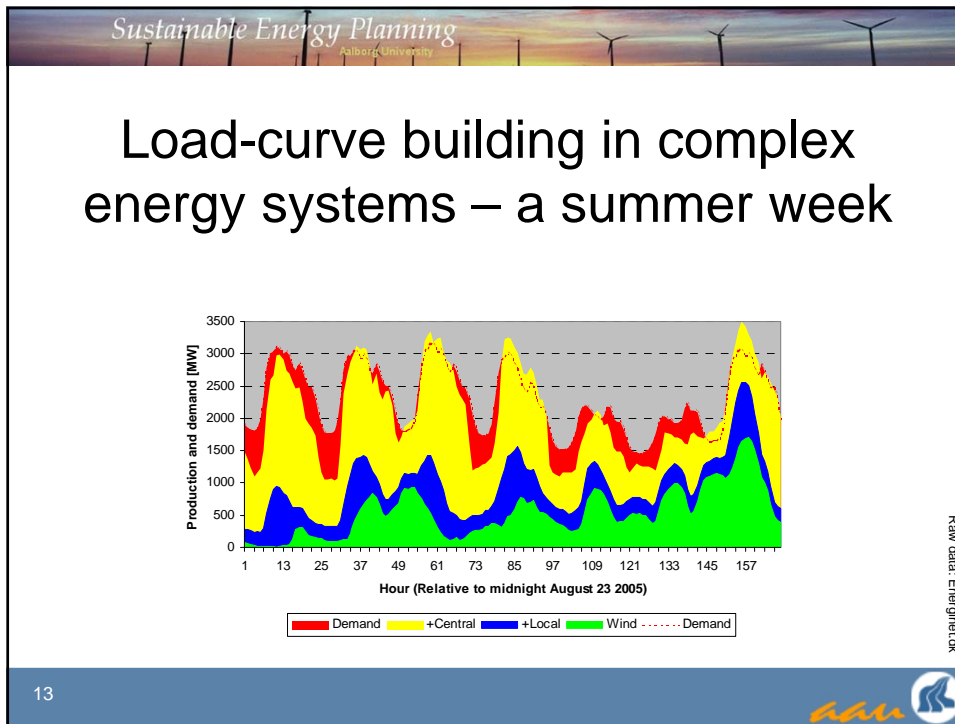
- Relatively strict CO₂-emission reduction target
- The only energy self-sufficient EU member country
- Increasing share of wind power
- Increasing share of local CHP power
- Decreasing share of central production
- Reduced manoeuvrability of the power system

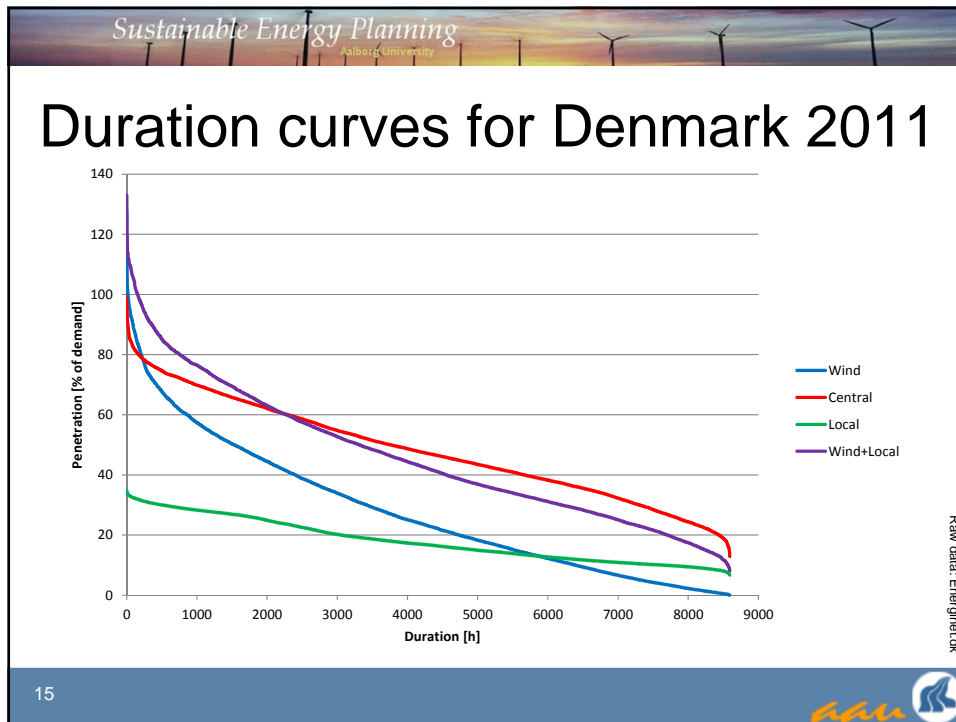
6











- Sustainable Energy Planning*
Aalborg University
- ## Measures for wind integration
- (Improving fuel efficiency by using CHP)
 - Improving CHP flexibility through heat storage
 - All thermal plants made controllable irrespective of size
 - Controllable heat pumps / immersion heaters for district heating production
 - Controllable heat pumps for individually heated dwellings
 - Smart charging electric vehicles & Vehicles to Grid (V2G)
 - Flexible electricity demand
 - (Electricity storage required for 100% renewable energy systems)
- Raw data: Energinet.dk
- 16

