

Turbine Integration and Applications

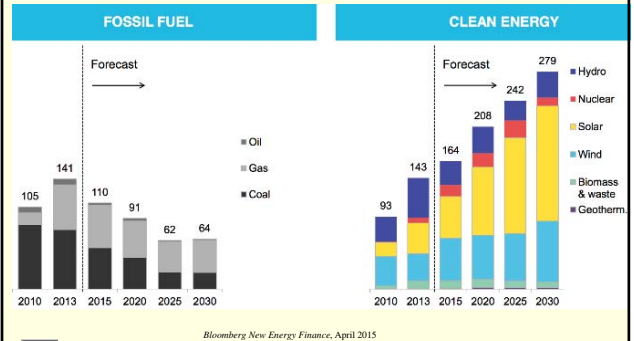
Andrew Kusiak
 Intelligent Systems Laboratory
 2139 Seamans Center
 The University of Iowa
 Iowa City, Iowa 52242 - 1527
 andrew-kusiak@uiowa.edu
 Tel: 319-335-5934 Fax: 319-335-5669
<http://user.engineering.uiowa.edu/~ankusiak/>



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New (added) Worldwide Capacity in GWs



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Can We Get to 100% Renewable Energy?

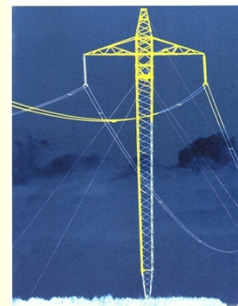
- ✓ 200 years ago 95% of energy came from wood
- ✓ By 1900 it was 50% coal
- ✓ By 2000 it was a mix of coal, nuclear, oil, and gas
- ✓ The Union of Concerned Scientists has published a plan for renewable energy to provide 80% of electricity by 2050
- ✓ Why stop there? Solar enthusiasts want to go for 100%



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High Voltage Direct Current Transmission



Introduction



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Transmission Cost

HVDC lines are more compact, and less costly than HVAC lines of the same capacity

Direct vs alternate current argument

Typical RCM Via 200 feet
500 kV ac

Typical RCM Via 100 to 150 feet
450 kV dc

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Time Scales in System Planning and Operations

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NYSERDA Report (2005)

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Autonomous Power Supply System

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Hau (2006), p. 567

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Irrigation System

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Hau (2006), p. 573

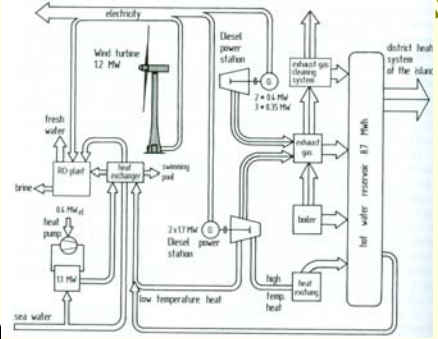
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Desalination Plant



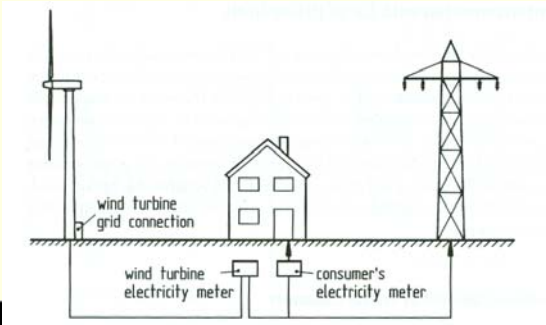
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Energy and Water Supplying System



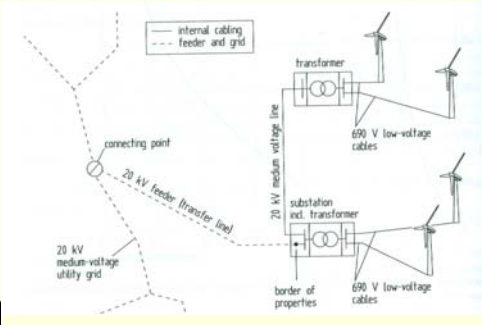
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Household WT Interconnected with a Grid



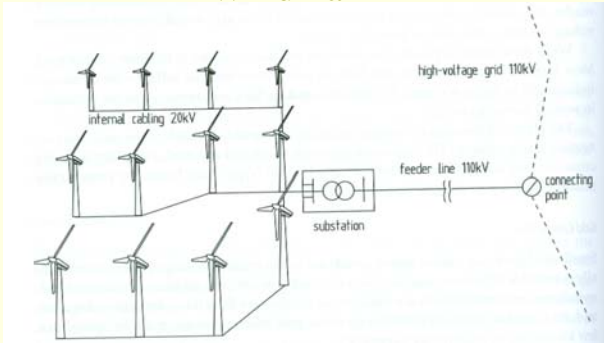
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Grid Connection of a Small Wind Farm



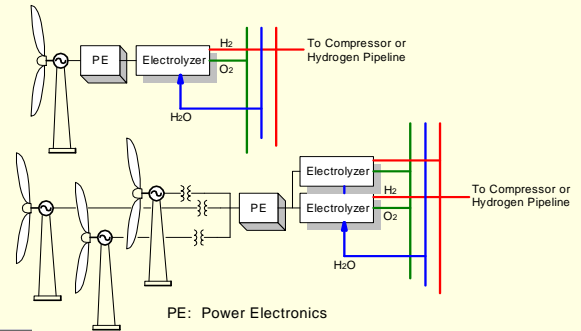
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Internal Cabling of a Large Wind Farm



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Hydrogen Transmission Scenario



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Offshore Developments



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Offshore Developments



Offshore Wind Magazine, Feb 2010
The University of Iowa Intelligent Systems Laboratory

Offshore Developments



WT shuttle
concept



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Offshore Wind Magazine, Feb 2010

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