Wind Energy Development
Current Status and Future Challenges

Hermann Oelsner
AFRICAN WIND ENERGY ASSOCIATION
The Conference Circus

Blah, blah, blah, blah...

Renewable Energy Sources - Harvesting the Wind
Darling WF First Phase 5,2 MW

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Global Wind Potential

World-Wind-Potentials TW
best sites >6,9 m/s

World Power Consumption TW

wind sites > 6,9m/s

US-Windfarm

existing world wide capacity

Source: Cristina Archer, Mark Jacobson/Stanford 2005

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Wind Resource Assessment

Example South Africa:
- Abundant wind - coastlines
- Wind Atlas: 4 m/s at 10 m
- West Coast: 8.5 m/s at 50 m
- Karoo
- 200 place names
- 39 “windhoeks”
South African Wind Energy
Status 2004

Wherever you go
you see them

Wherever you see them
they go

30 000 Windmills
Eskom Klipheuvel

- Eskom installed capacity ~ 40 000 MW
- Worldwide wind turbine capacity > 31000 MW 2002
- Eskom national peak demand ~ 31928 MW - 08 July 2003 evening peak
- Klipheuvel = 3.16 MW
- Capacity factor: 13.43 / 13.56 / 8.84 %
SA Wind Potential: 70 000 MW+

Statistics

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (est.2005)</th>
<th>Area Km²</th>
<th>GDP (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>82,438,000</td>
<td>357,050</td>
<td>30,579</td>
</tr>
<tr>
<td>South Africa</td>
<td>47,432,000</td>
<td>1,221,037</td>
<td>12,161</td>
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</tbody>
</table>

www.wikipedia.org

Information Day - Berlin January 2007
Compare Fossil Fuel with Renewable Energy Resources

- **Myth No. 1: Fossil fuels are inherently more economical**
  - This ignores what is economically relevant *prior* and *following* the generation process
  - Conventional energy subsidies currently amount to $300 billion/a

- **Myth No. 2: RE cannot supply all our energy needs**
  - Every year the sun delivers 15,000 times more energy to the earth than is consumed by the entire human population:
    - 35,000,000,000,000 kWh/a
Crude Oil Supply Chain

- 1. Extraction
- 2. Transport
- 3. Refineries
- 4. Waste Disposal
- 5. Storage
- 6. Shipping
- 7. Fuel combustion in engines, furnaces, power stations.

OIL PEAK
Texas oil fields 1975 – North Sea rigs peak 2004
Opec Spare Capacity 1970-2005

The Oil Bubble is Gone!

Average Excess OPEC Capacity

Sources: IEA, RJ&A, Bloomberg
IEA on Oil Price Increases

- “Oil prices will come down and renewables won’t make it.”
  - It is shortsighted.
  - It suggests wait-and-see attitude to consumers.

- “Wait a year or so and everything will be as ever”
  - we are told by the oil industry, with oil supply on the rise and renewables still called “too expensive”.

- Renewables barely exist in the official agenda of IEA: you will not find a serious preview for wind power in the new World Energy Outlook 2005, and you find no reliable data on other renewables.

Ref. „Parlamentarians and the Energy Conflict“ by Rudolf Rechsteiner
Natural Gas Supply Chain

1. Extraction
2. Liquidification
3. Transport
4. Storage tanks
5. Distribution
6. Fuel combustion in power stations

GAS CLIFF
40 % Price Increase

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Coal Supply Chain

• 1. Extraction,
• 2. Refining
• 3. Waste Disposal
• 4. Shipping
• 5. Fuel combustion in power stations

30 YEARS SUPPLY
in SA at today's mode of extraction

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Nuclear Supply Chain

1. Extraction
2. Transport
3. Refining
4. Transport
5. Process
6. Transport
7. Enrichment
8. Shipping
9. Power generation

INCOMPLETE BUSINESS PLAN
needs significant help to cover liability insurance
Uranium is not an unlimited resource
Wind & Wave Supply Chains

- Electricity chain begins at the power station.
- Only one link in the chain.
- No decommissioning costs
- No waste

SUSTAINABLE AND FUEL IS FREE OF CHARGE
Cost- and pay-back-structure of renewables

High initial capital cost, low fuel, O&M costs bring initial income shortfall and golden end

Finance Structure
Economic Benefits

- **Advantages over Centralised Generation:**
  - Lower transmission costs
  - Lower transforming and distribution costs

- **Pollution related external costs from fossil fuel power generation are avoided**
  - Higher health service costs
  - Increased cost of food and farm products

- **Energy Pay-back period**

- **Job Creation** 10w – 4c – 1n

- **Foreign Investment and Export Potential**

- **Clean Development Mechanism (CDM)**

- **Oil – GDP EFFECT (Shimon Awerbuch)**
  www.awerbuch.com
Strategic Benefits

- Prevent Power Cuts in Central System Faults
- Earth Quakes / Natural Disasters
- Less likely Target of War and Terror
- Short Lead Times to ease Western Cape crises
- Decreasing Cost in long term (0 fuel cost)
- Geopolitics: Security of Supply: **RISK!**
Opposition to use Wind Energy

- Multi Nationals loosing control of energy resources
- Monopoly of local Utility is loosing business to Independent Power Producers
- Loss of income to Municipalities from end users
- No room for corruption and fraud
Wrong and Misleading Advice

- **IEA International Energy Agency (IEA)**  
  - Intergovernmental organization for fossil fuels
- **EIA Energy Information Agency (EIA)**  
  - Part of the US-Department of Energy (DOE)
- **USGS U.S. Geological Survey**  
  - Scientific information on resources/geology
- **IAEA International Atomic Energy Agency**  
  - Founded in 1957 Promotion of Nuclear Power
IEA-Outlook and Reality

Windforce 10 (2020 10 % electricity share) [1999]

Reality 1999

IEA World Energy Outlook 1998

GW

100

150

200

250

1980 1990 2000 10 20
IEA-Outlook and Reality

GW

Windforce 10 (2020 10% electricity share) [1999]
IEA World Energy Outlook 2002
Reality 1999
IEA World Energy Outlook 1998

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Capacity in different market scenarios
1998-2030

Ref. „Parliamentarians and the Energy Conflict“ by Rudolf Rechsteiner

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"Reputable" publications (f.i. Engineering News, Business Day, Maverick) as well as learning institutions have even today not ceased to deny the existence and effect of global warming.
Conclusion

- Recognise and accept that nobody wants to sell or tax less electricity (wealth) or loose control of the market (power), but it is now happening (EE+DSM):
  - Significant increases in kWh costs are unavoidable

- World-wide, RE projects can only be implemented within a legal framework created by government to account for external costs and to care for the environment and its people
Recommendation

- **Introduce:**
  - Fair competition in electricity generation to encourage RE IPP
  - Feed in tariffs for RE generated electricity
  - Taxes on oil and gas, so that local producers can implement biomass, geothermal, solar and wind
  - Stop funding for nuclear and fossil research and non-renewable infrastructure
  - Net-metering for domestic applications
  - Mini-grids for rural off-grid applications
Wind and Wave: free, clean and save

Thank You

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