# SOUTH AFRICAN NEET WORKSHOP

**19 – 26 February 2007 Sandton Convention Centre**

# Wind Energy Development

## Current Status and Future Challenges

Hermann Oelsner

**AFRICAN WIND ENERGY ASSOCIATION**

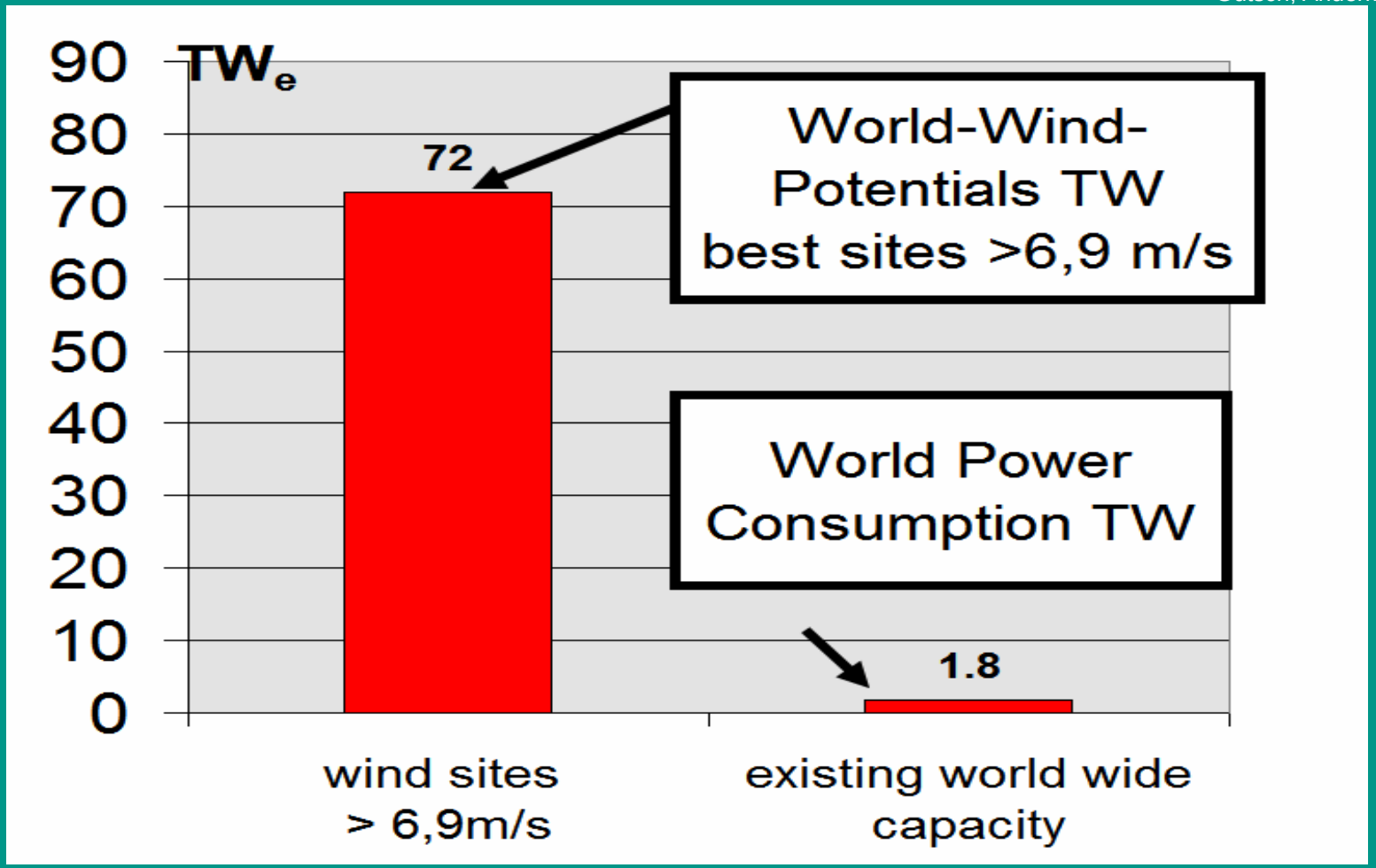


# The Conference Circus

# Darling WF First Phase 5,2 MW

# Global Wind Potential

Gütsch, Andermatt

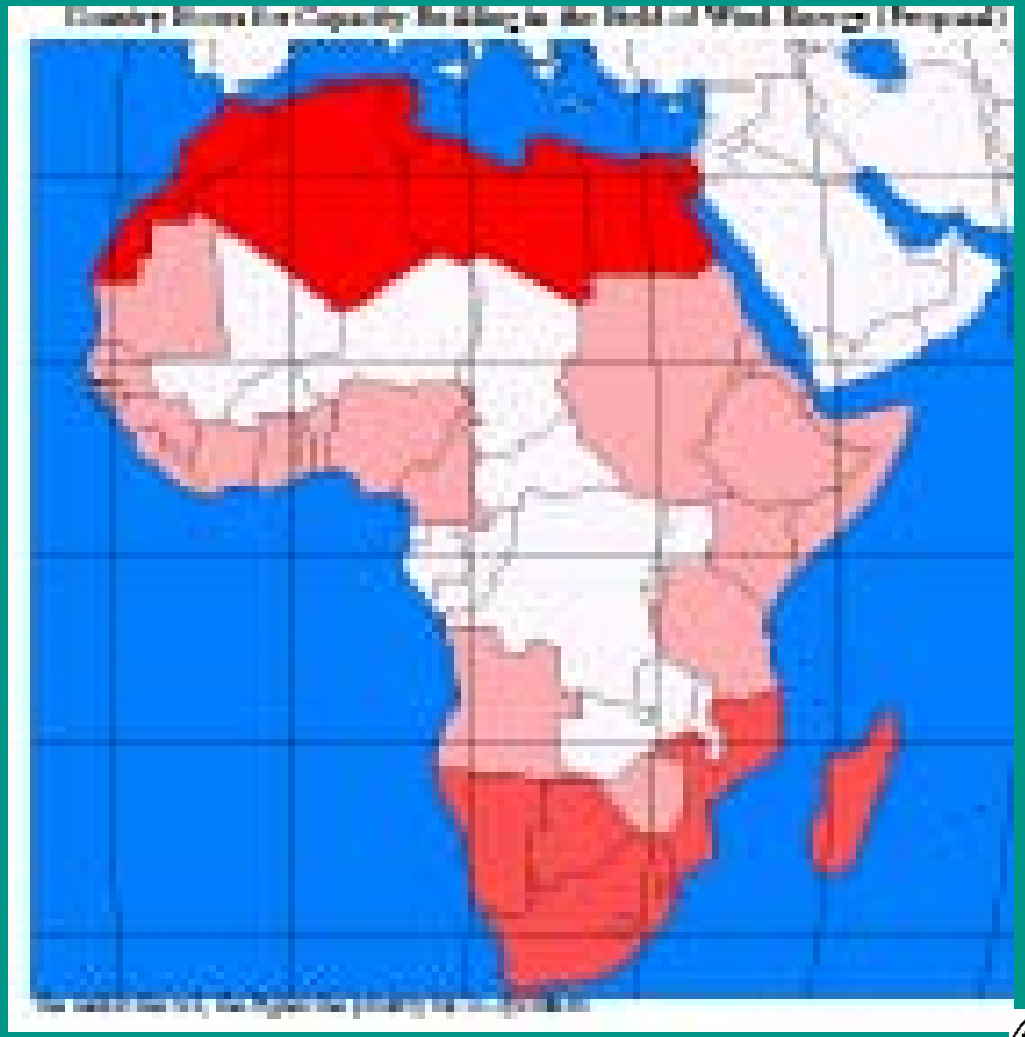



US-Windfarm

*Source: Cristina Archer, Mark Jacobson/Stanford 2005*

# Wind Regimes of Africa

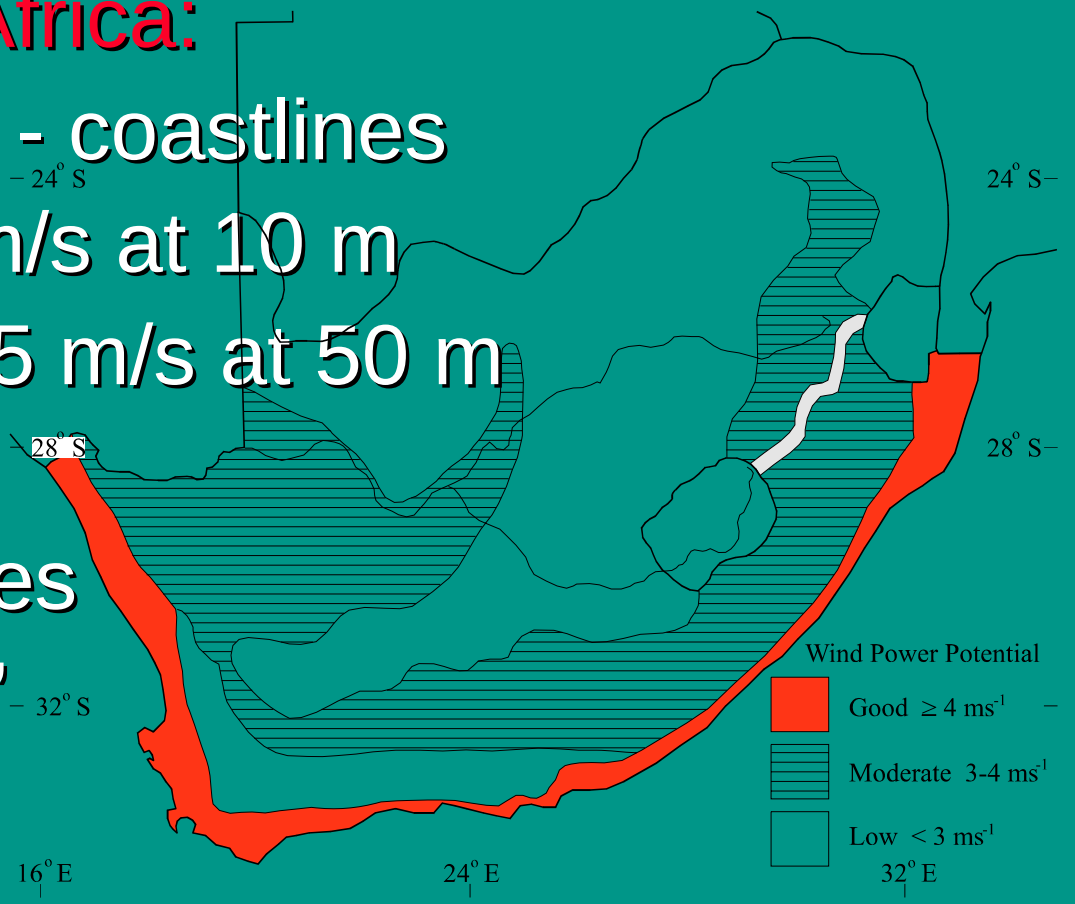
- *UNEP GEF Solar and Wind Resource Assessment SWERA*



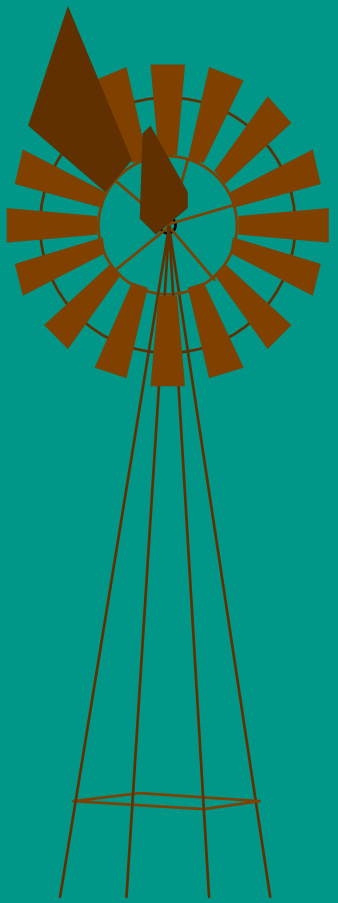
# Wind Resource Assessment

## 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***

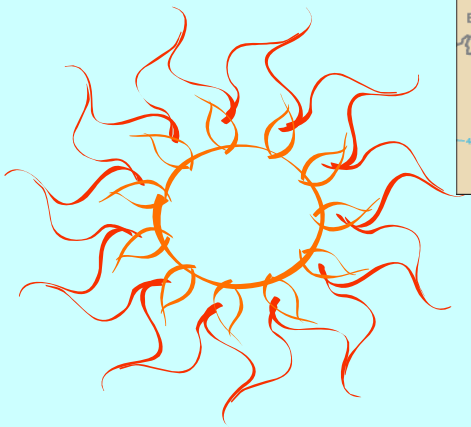
***Wherever you see them they go***

- 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**
- Klipheuwel = 3.16 MW
- **Capacity factor: 13.43 / 13.56 / 8.84 %**

# SA Wind Potential: 70 000 MW+


## Statistics

| | Germany |
|---|---|
| Population (est.2005) | 82,438,000 |
| Area Km² | 357,050 |
| GDP (US$) | 30,579 |
| | **South Africa** |
| Population (est.2005) | 47,432,000 |
| Area Km² | 1,221,037 |
| GDP (US$) | 12,161 |

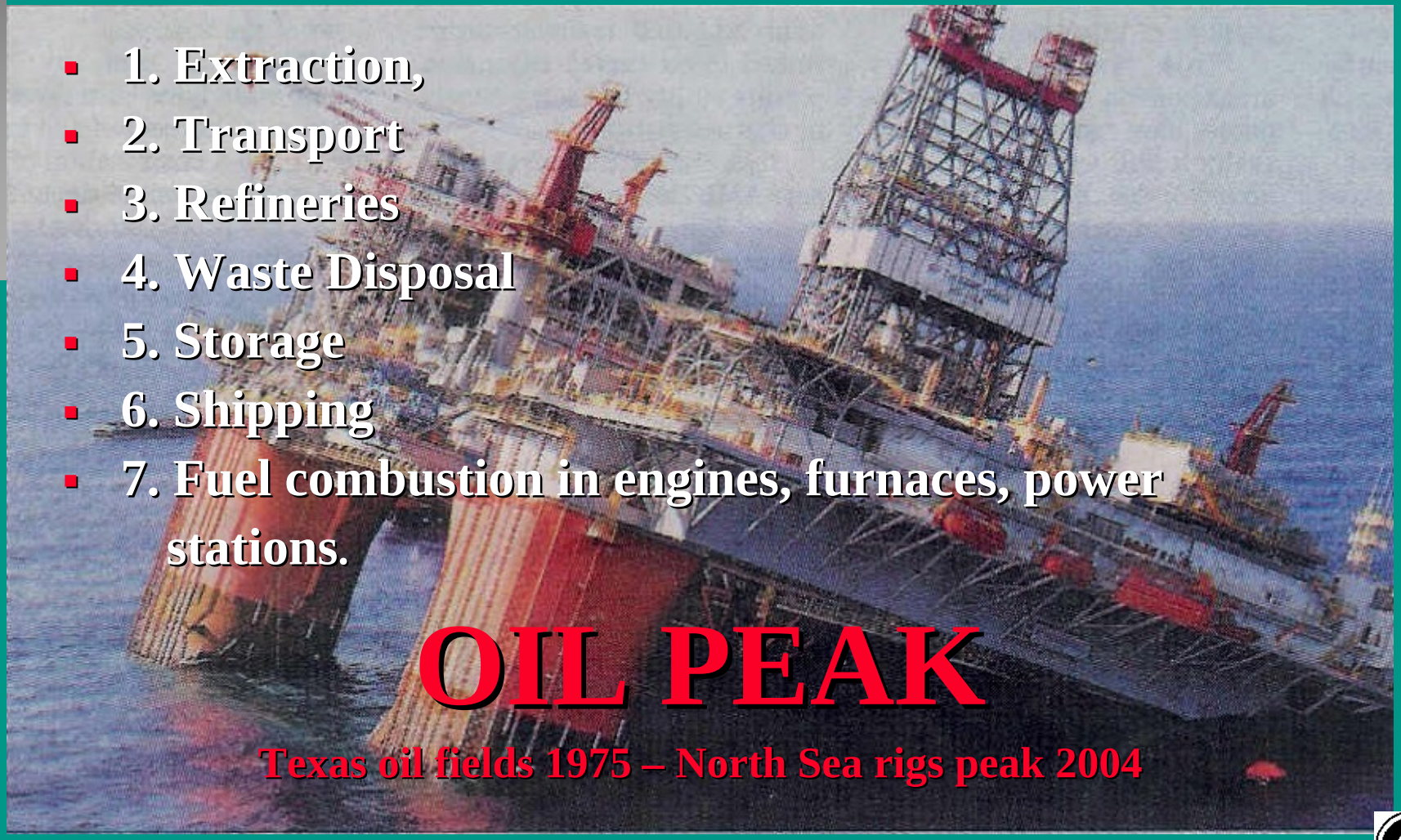
*www.wikipedia.org*

# 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 time more energy to the earth than is consumed by the entire human population:

    35 000 000 000 000 000 kWh/a

# Crude Oil Supply Chain



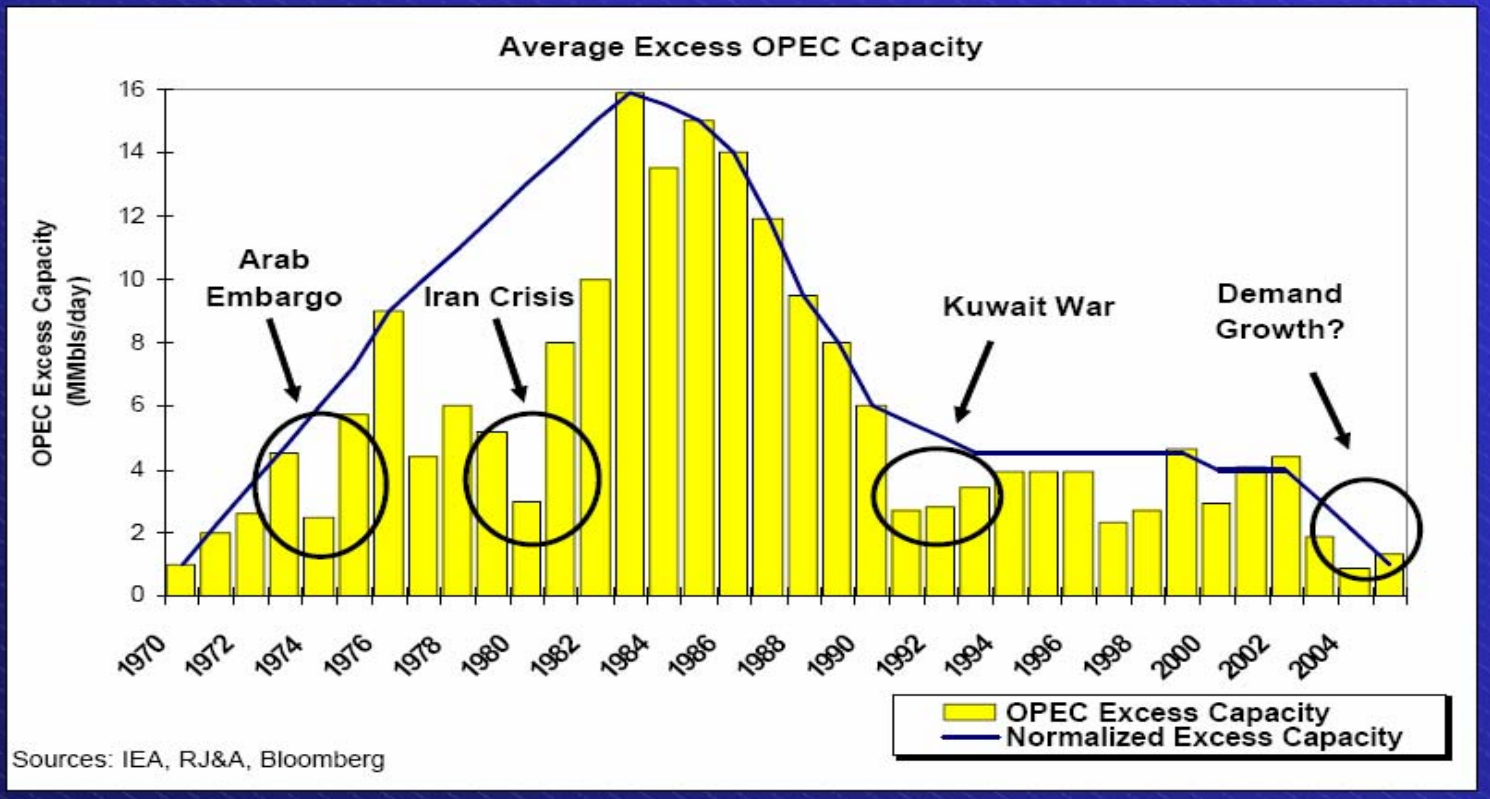
- 1. Extraction,
- 2. Transport
- 3. Refineries
- 4. Waste Disposal
- 5. Storage
- 6. Shipping
- 7. Fuel combustion in engines, furnaces, power stations.

## OIL PEAK

**Texas oil fields 1975 – North Sea rigs peak 2004**

# Opec Spare Capacity 1970-2005

## The Oil Bubble is Gone!



# 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**

# Coal Supply Chain

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

**30 YEARS SUPPLY**

**in SA at todays mode of extraction**

# 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

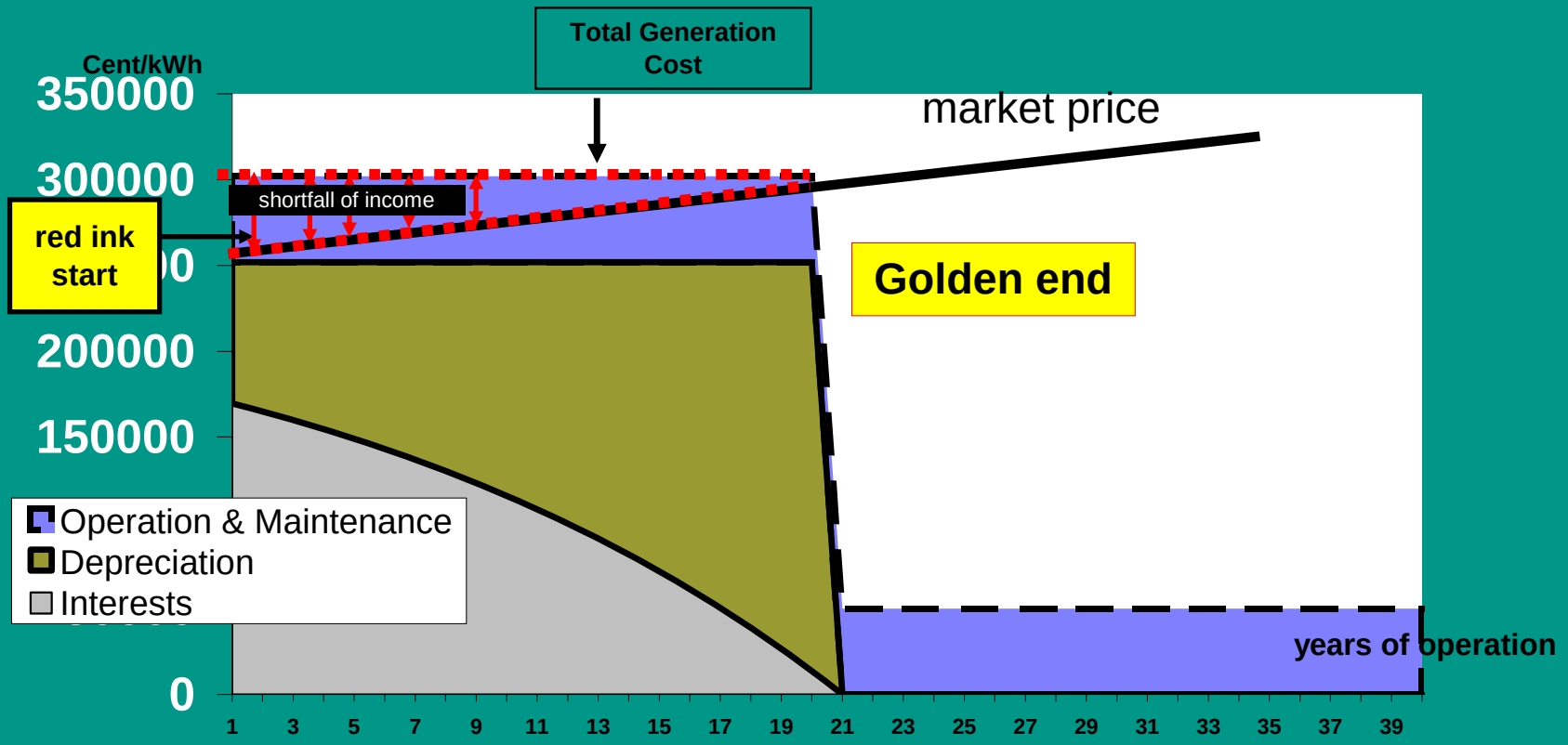
**SUSTAINABLE AND FUEL IS FREE OF CHARGE**



# Finance Structure

**Cost- and pay-back-structure of renewables**

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



# 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

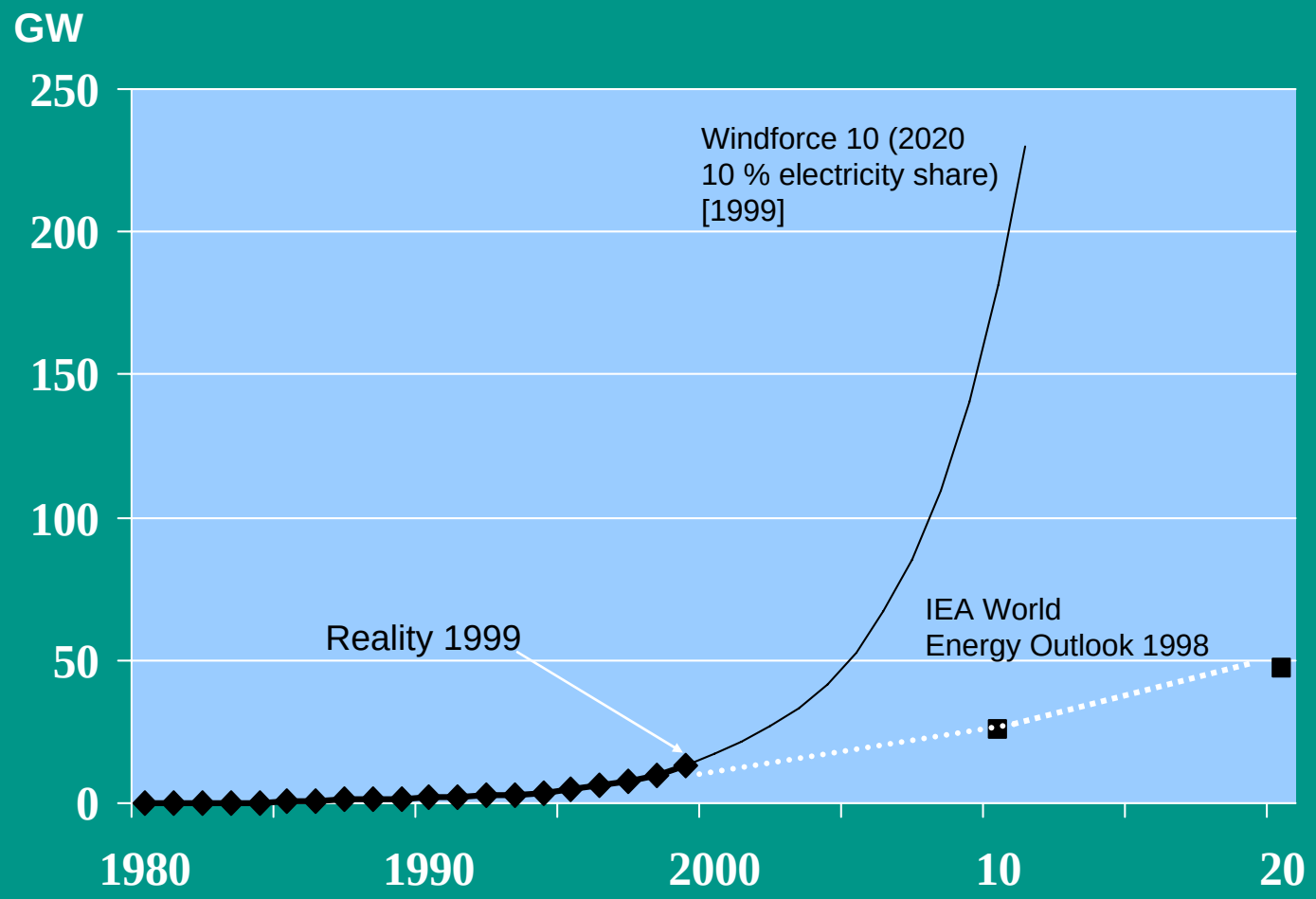
- Multi Nationals loosing control of energy resources
- Monopoly of local Utility is loosing business to Independent Power Producers
- Loss of income to Municipalities from end users
- No room for corruption and fraud

# Wrong and Misleading Advice

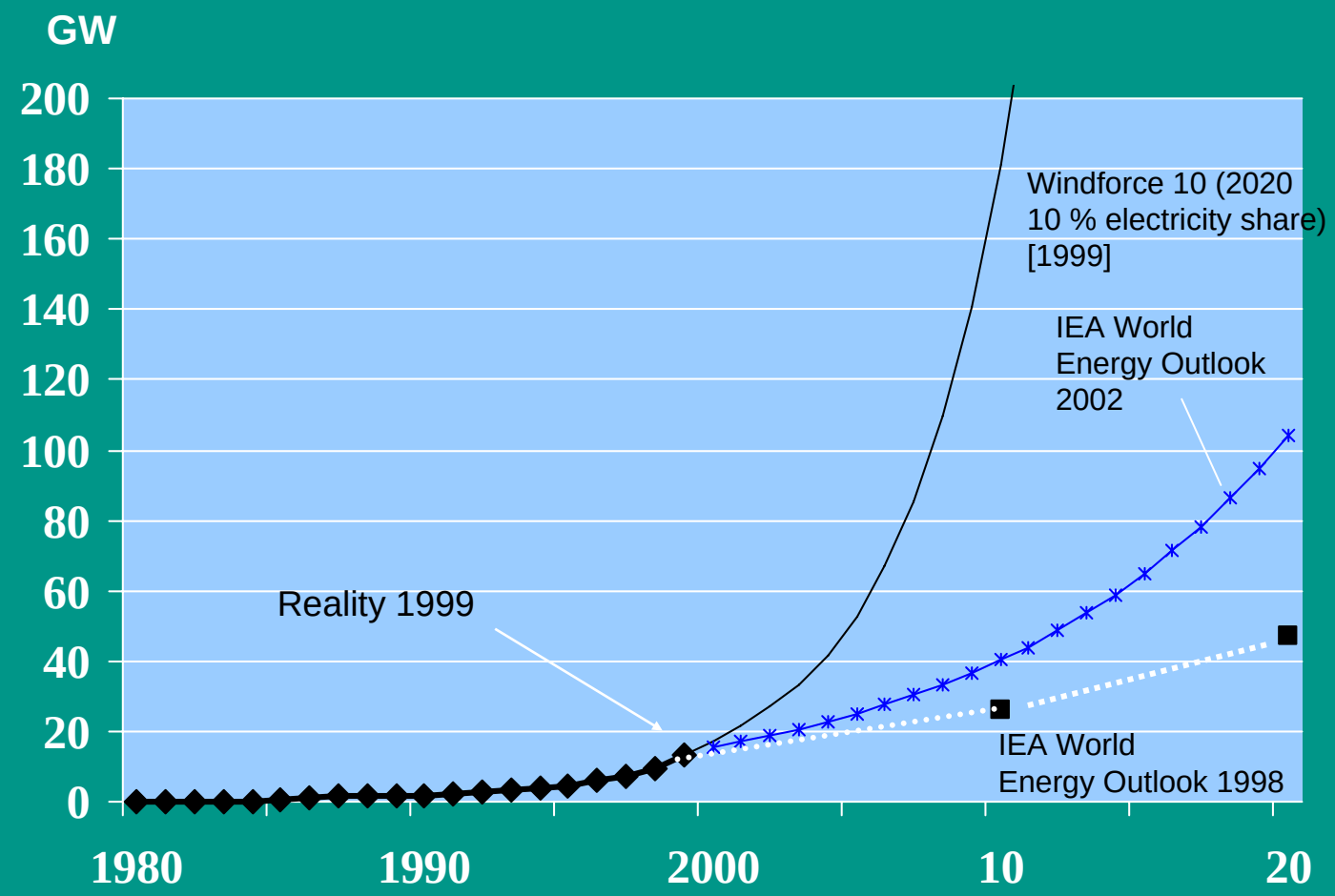
- **IEA International Energy Agency (IEA)**
  - Intergovernmental organization for fossil fuels
- **EIA Energy Information Agency (EIA)**
  - Part of the US-Department of Energy (DOE)
- **USGS U.S. Geological Survey**
  - Scientific information on resources/geology
- **IAEA International Atomic Energy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



# IEA-Outlook and Reality

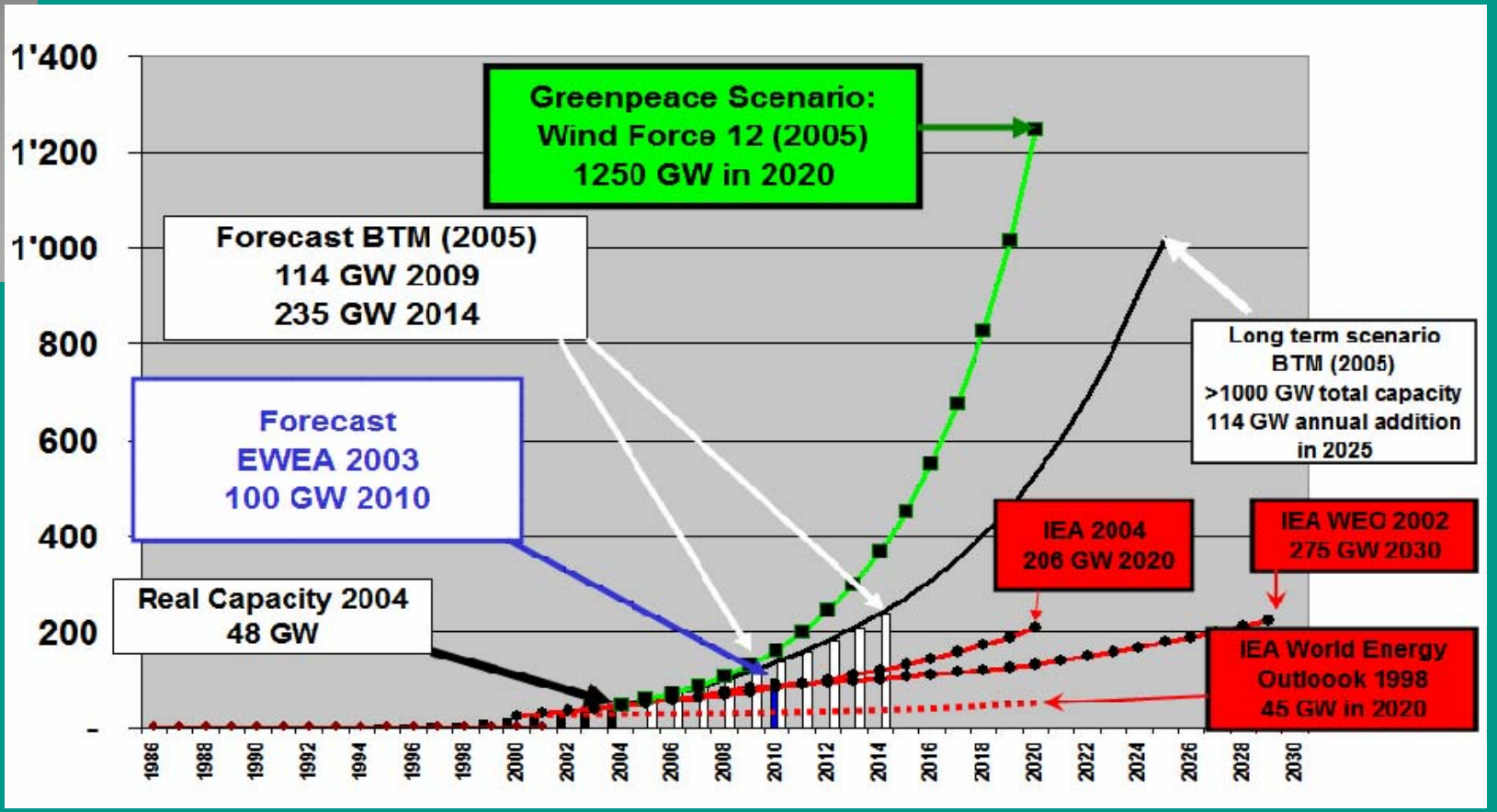


# IEA-Outlook and Reality



# Capacity in different market scenarios

## 1998-2030

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# Denial of Global Warming

"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