

*Presentation at a visit by Danida and IFU
at Risø National Laboratory on Thursday 16th June, 2005*

Wind Energy (Systems) Consulting Knowledge transfer, International Experience

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Risø WindConsult, Wind Energy Systems (VES) programme

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Overview

- Risø WindConsult
 - Types of Services
 - Examples on assignments
 - Experiences: Technical & non technical issues
- Wind Energy Technology Centre CWET India
 - WE Background in India
 - CWET project overview
 - Counterpart / Stakeholders / organisation (SC's)
- Summary of experiences
 - Keys to success: Implementation Guidelines & Strategy

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Types of Services

Wind Farms

Isolated Decentralised Power Systems

Wind Energy Technology Centres (Institution building)

Wind Measurements

Wind Resources

Wind Farm Siting and Layout

Technical Specifications

Wind Turbine Testing

Performance Verification

Power system modelling and power quality assessment

Feasibility Studies

Due diligence

Training and Courses



RISØ WINDCONSULT



Experience from projects in more than 50 countries

Consultant and Technical Assistance on contract

Partner in co-operation

consortium of consultants
technology centres and authorities
industry
developers

Special experience from emerging markets

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Examples on assignments

- Wind Energy Knowledge Centres
 - Wind Diesel test station, pilot project & training (1989, EU, Hangzhou & Dachen Island, Zejian Province, P.R.China)
 - Dabanchen Wind Farm & Technology Center, Consultancy all services. (1989-91, Danida, Urumqi, Xinjiang Province, P.R.China)
 - Hurghada Wind farm & Technology Center, Consultancy all services. (1989-91, Danida, Hurghada, Egypt)
 - C-WET Centre for Wind Energy Technology, Technical Consultant all services. (1999-2004, Chennai, tamil nadu, India)
 - Contacts with / assistance to the World Bank on project formulation for a possible WE Technology Centre in P.R,China (2004)



Examples on assignments

- Wind Energy, Institutional Capacity Building
 - Fact finding mission on decentralised WE application (1996, Danida, Inner Mongolia)
 - Wind Energy Training of 20 Chinese experts in Wind farm siting & layout and Wind turbine technology centers (1999, Danida, Denmark)
 - Requests for training of / knowledge transfer to WT industry in Xinjiang province (2003)
 - Courses in wind energy application for stakeholders (2003 ongoing) include:
 - ITRI,
 - Norway, Ireland, Baltics
 - P.R.China, India, Vietnam, Cambodia
 - Countries in the Pacifics



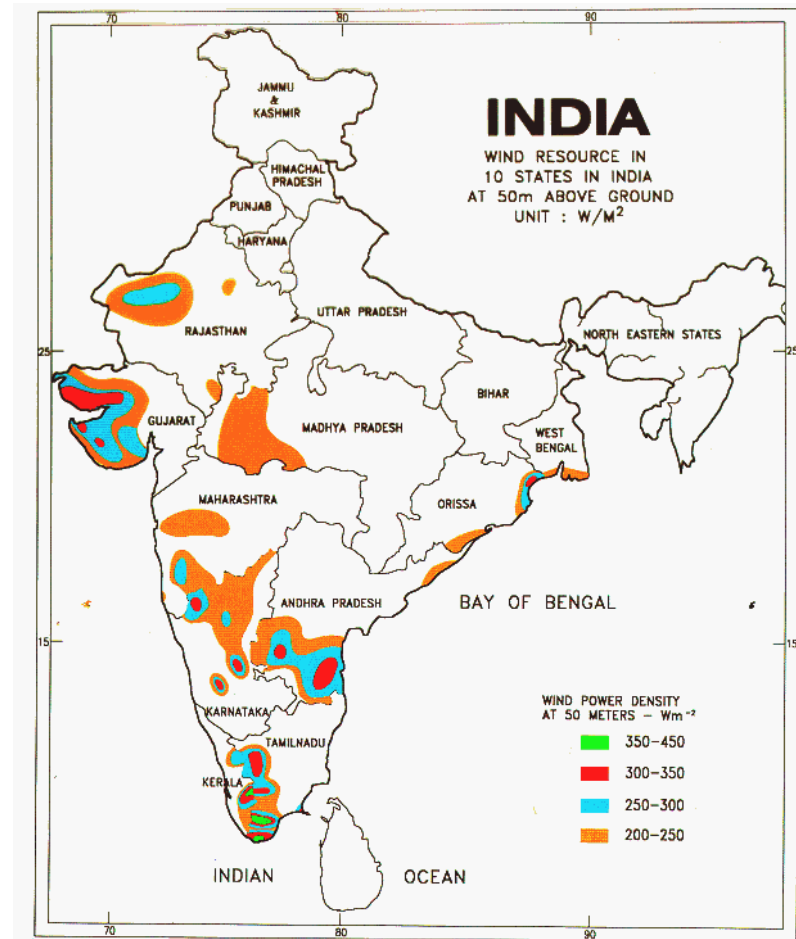
Summary of experiences

- Other examples on assignments
 - Isolated power systems (1984 – 2004, Danida/WB, Republic of Cape Verde)
 - Wind Atlas, Wind farms & WE technology Centre (1992 ongoing, Danida, Egypt)
 - Assistance on WE technology deployment, infrastructure development & decision making to international counterparts (1984 – present, various clients, North & South America, Europe, Russia, Africa, Asia)
- Overall experience
 - Successful project implementation requires equal attention to technical & non technical issues
 - Proposed Implementation Strategy & Guidelines




INDIA, DANIDA and RISØ

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Electricity from Wind Power

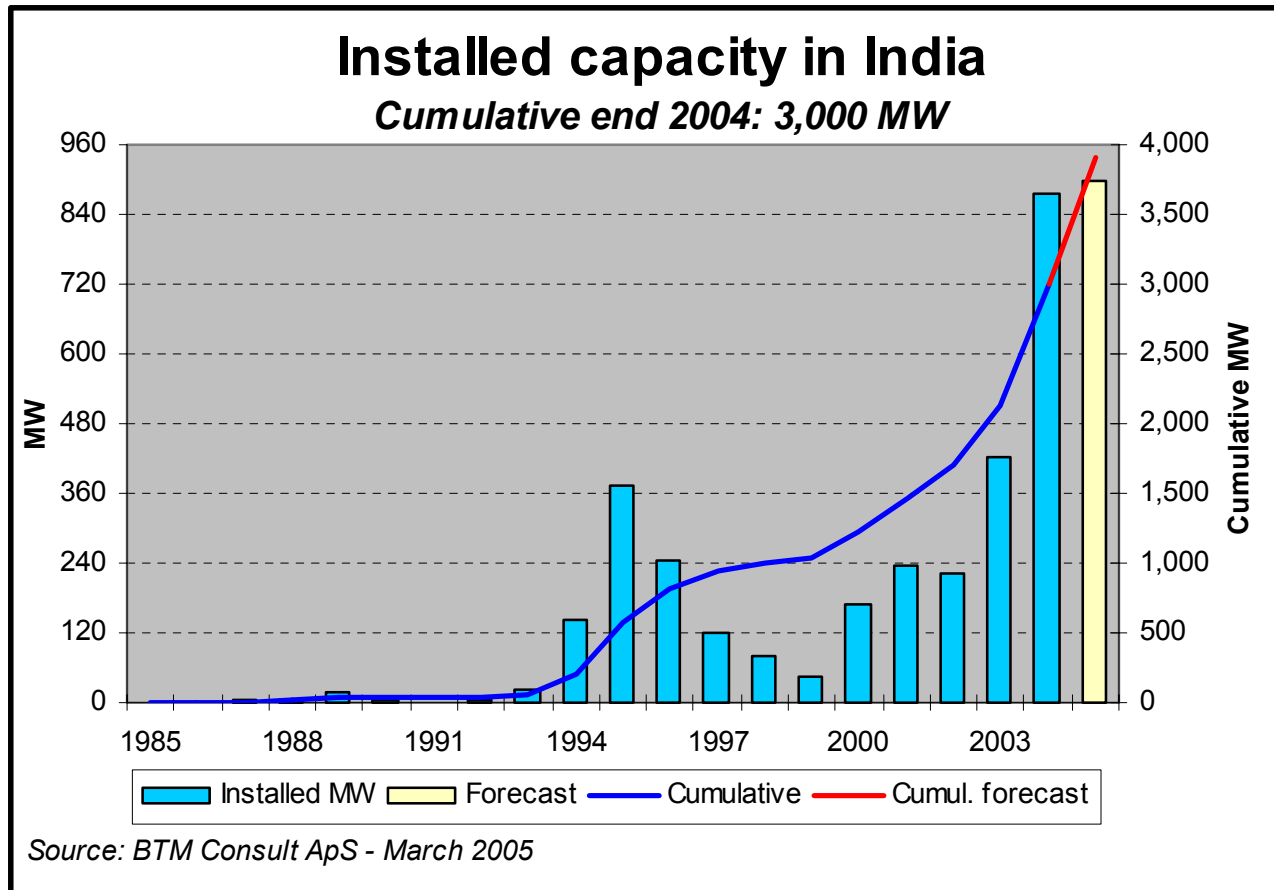
 Country/Region	Cumulative MW - end 2004	Est. average full load hours	Est. average capacity factor	Est. electricity production in 2004 TWh ²⁾
Germany ¹⁾	16,649	1,794	20.5%	29.87
Spain	8,263	2,100	24.0%	17.35
USA	6,750	2,300	26.3%	15.53
Denmark	3,083	2,250	25.7%	6.94
India	3,000	1,800	20.5%	5.40
The Netherlands	1,081	2,100	24.0%	2.27
Italy	1,261	2,000	22.8%	2.52
United Kingdom	889	2,628	30.0%	2.34
P.R. China	769	2,100	24.0%	1.61
Greece	587	2,500	28.5%	1.47
Sweden	478	2,100	24.0%	1.00
Rest of World	5,102	2,000	22.8%	10.20
Total	47,912	(avg. 2014)	(avg. 23%)	96.50

Source: BTM Consult ApS - March 2005

¹⁾ Germany - DEWI - February 2005

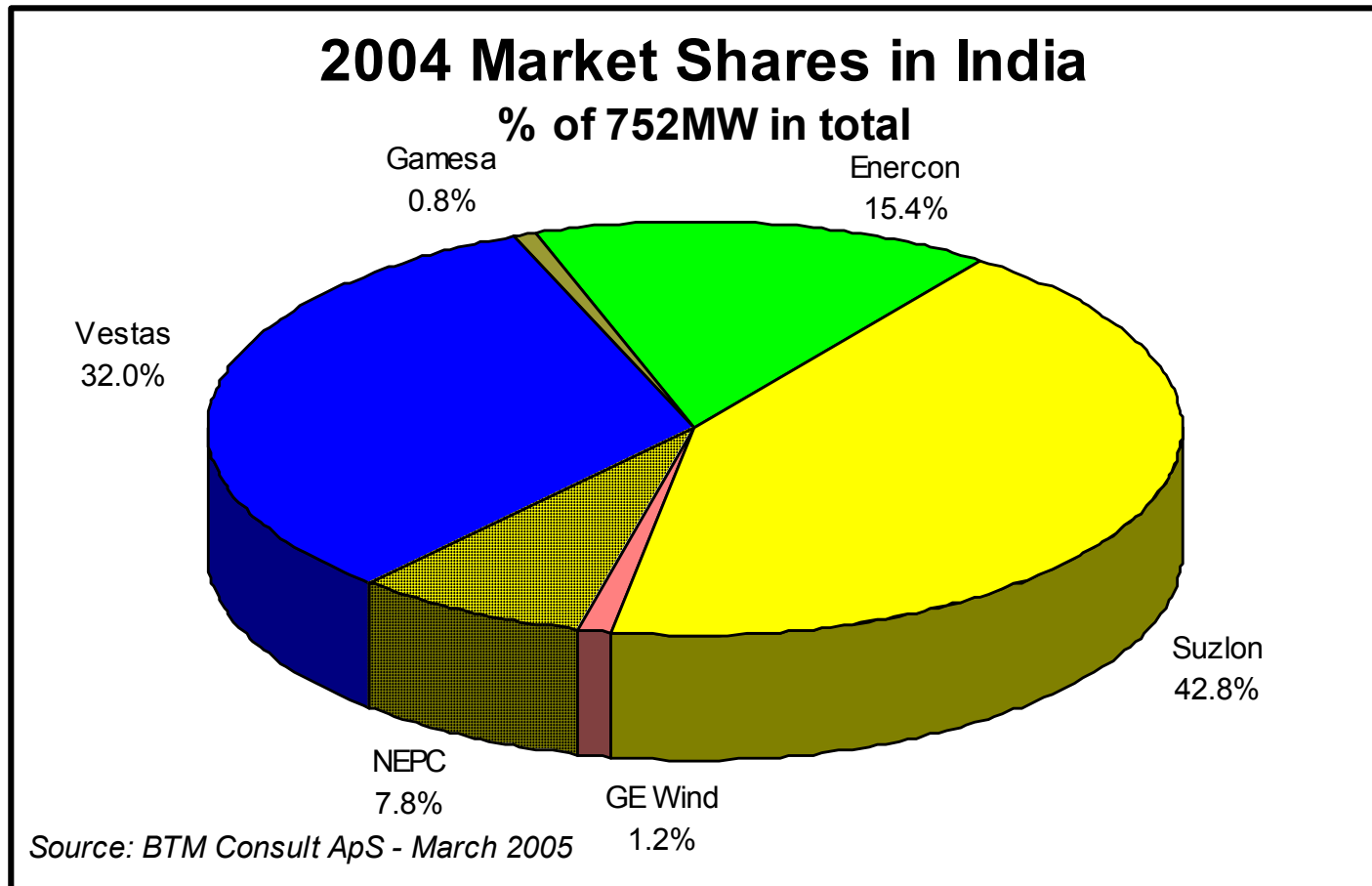
²⁾ Energy unit: 1 Tera Watt Hour (TWh) = 1 Billion kWh

Capacity development



- Gross Potential of 45,000 MW & Technical Potential of 13,000 MW

Indigenous Industry



Public initiatives

POLICY MEASURES & INITIATIVES

- Fiscal and Financial Incentives
- Wheeling, Banking, Third Party Sale and Buy-Back Facility by SEBs
- Capital Subsidies in certain States
- Soft Loans from IREDA
- 9 Potential States announced Policies for private sector wind power generation
- Guidelines issued for healthy and orderly Wind Power Development.

Department of Non-Conventional Energy Sources (DNES) in 1982.

Ministry of Non-Conventional Energy Sources (MNES) in 1992.



*Ministry of Non-Conventional Energy Sources
Headquarters at New Delhi*

Danida-supported wind activities

- 1989 and 1990 pre-feasibility studies and pre-appraisal missions for wind-diesel projects
- 1990 study tour to European test stations in, and in 1991 a study of grid conditions in Gujarat
- 1995 50 mill US\$ through a new mixed-credit scheme to the World Bank's 450 mill US\$ "Renewable Resources Development Projects", credit at a concessional rate for private sector wind farm projects
- 1999 Establishment of a National Wind Turbine Test Station (C-WET) for standardisation, certification and testing of wind turbine generators.



Building Wind Energy

Danida instruments

- Studies
- Knowledge transfer
- Grants for demonstration
- Technology transfer
- Credits
- Institutional development

Development items

- Feasibility (Resource assessment, grid studies)
- Small- and large-scale demonstration
- Policies and incentives (market development)
- Finance – soft loans
- Indigenous industry
- Training/Capacity building
- Wind Energy CoE
 - Technical services & R&D
 - QA, Standards, Certification, testing

The Core problem

- The core problem addressed by the project is formulated in the host country strategy as:
- *“Although the wind energy projects in general have been technically successful, there is a genuine and urgent need for a quality assurance system to serve the industry as well as investors, insurance companies and authorities”.*
- Thus the general development objective is to provide capabilities and facilities for verification and testing for safety, quality and performance of wind turbines.
- i.e. to establish a quality assurance system to provide a maximum of credibility for wind power to the stakeholders

Specific objectives

- To establish national facilities and capabilities for testing of wind turbines and for certification of wind turbines,
- The preparation of standards and certification rules as well as for monitoring of the technical performance, incidents and accidents of wind turbines in India,
- Dissemination of information,
- Training in procedures and methods to perform blade testing.

A National Wind Energy Technology Centre, India

Risø National Laboratory is providing all Technical Assistance

Rambøll is acting as Project Monitoring Consultant for Danida



Main Project Components:

- Institutional Development incl. Quality Management System
- Human Resource Development including a Training Needs Assessment and an extensive Training Programme
- Certification including a national Type Approval System
- Test and measurements including national System Testing procedures
- Supply of equipment for field power performance measurements and stationary WTG system testing

A National Wind Energy Technology Centre, India

Wind Turbine Testing:

Applies International Standards



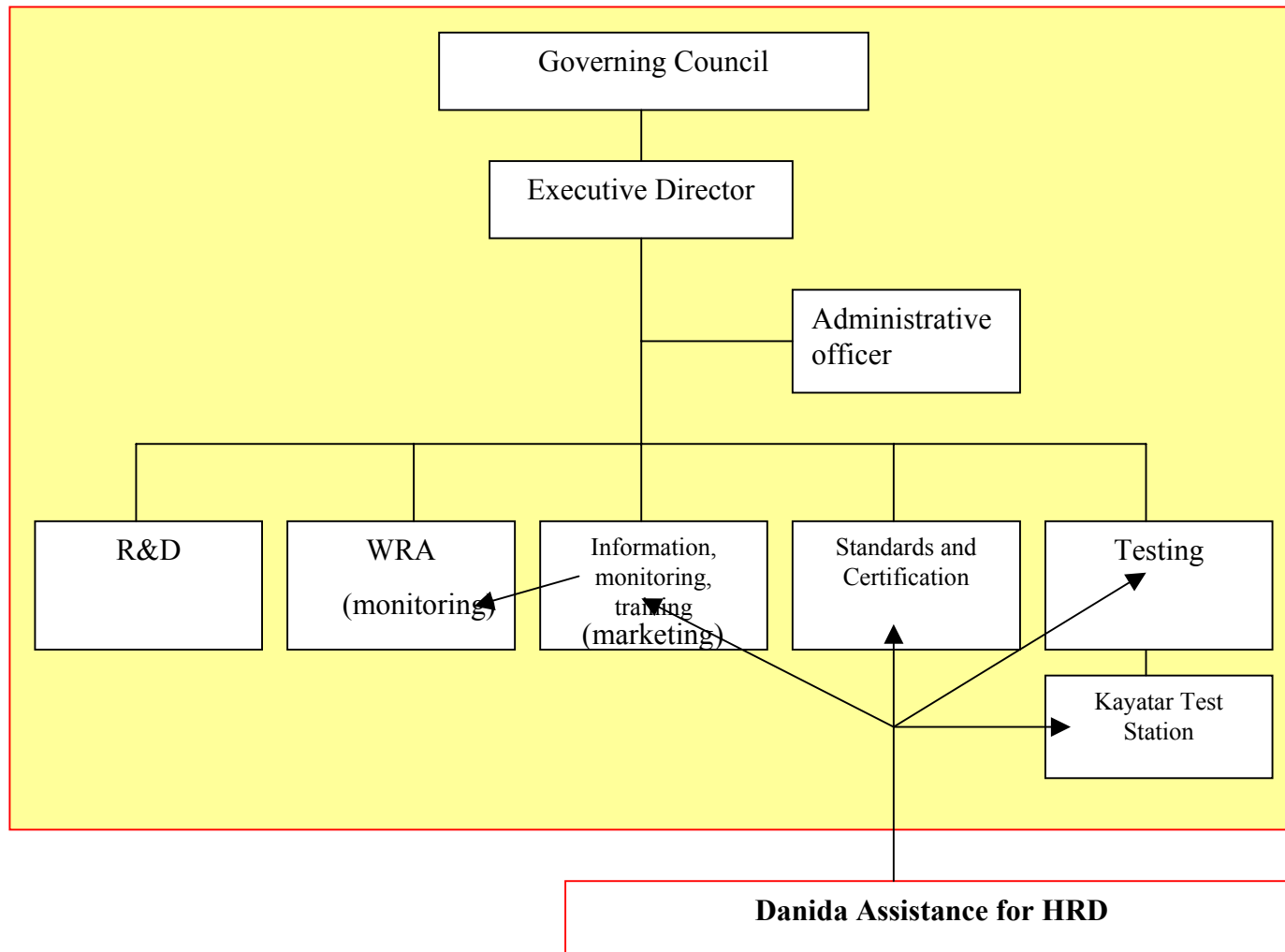
Field measurements:

- Power Performance
- Power Quality

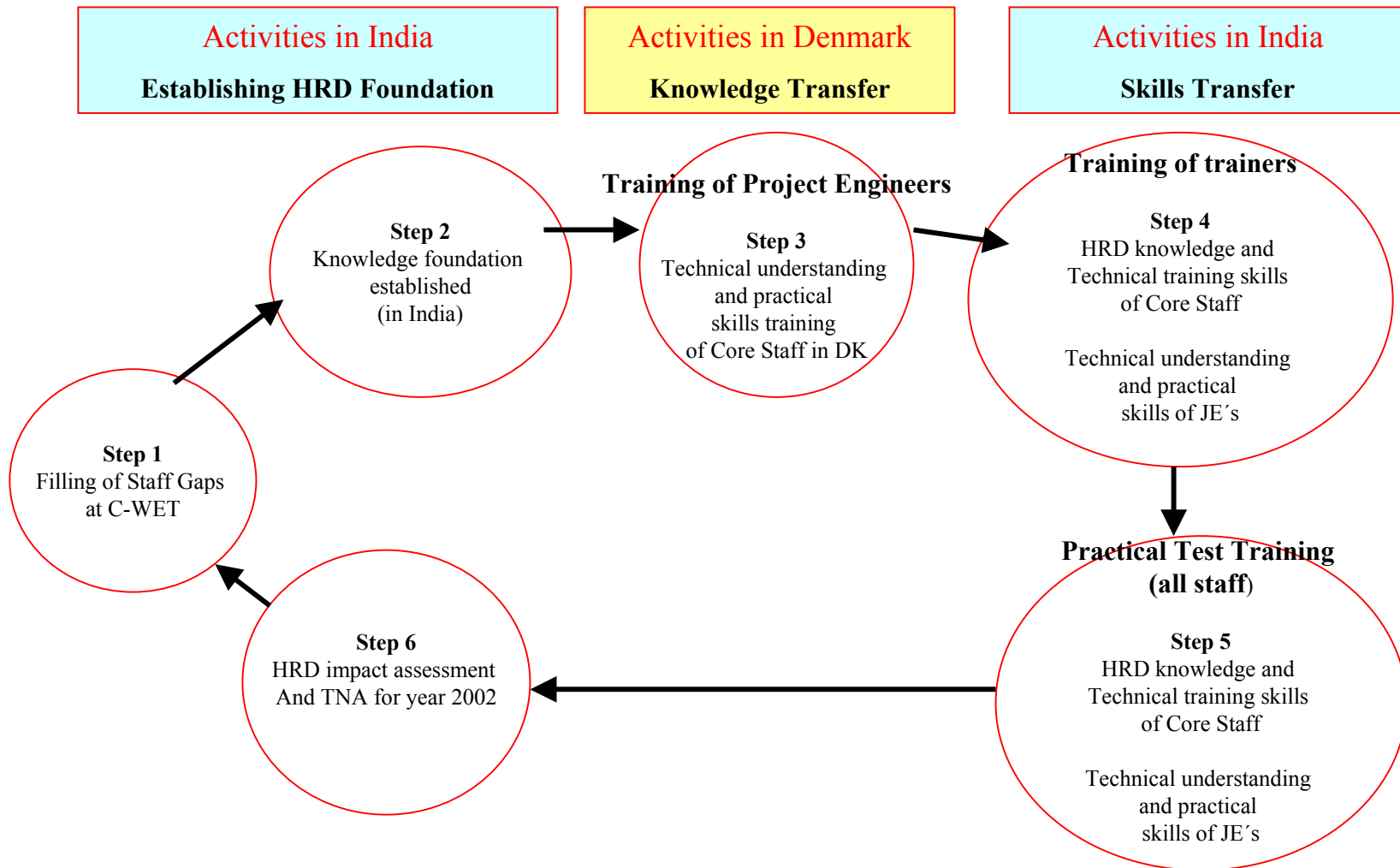
Measurements at Kayathar:

- Power Performance
- System Tests for certification
 - Verification of the WTG
 - Function tests including grid interface and cut-in/out
 - Loads measurements
 - Dynamic response
- Power Quality

C-WET units



Knowledge transfer strategy: Logical HRD CYCLE



Final project outputs

- Core organisation for WT testing and certification
- Institutional development plan
- Test station created with 3 units and test facility in Kayathar and centre complex in Chennai
- QMS system for testing and certification
- Indian standards for testing and certification developed
- Training of C-WET staff according to TNA study completed
- Testing capability at C-WET developed
- Type certification capability at C-WET developed
- Capability in monitoring, training and information on certification and testing

Indicators

- T(type)A(pproval)P(rovisional)S(ystem) was implemented by MNES in 2002, the final version TAS approved by MNES
- C-WET interaction with Indian Wind Turbine Manufacturers Association established and in force
- C-WET applications for accreditation submitted to NABL
- C-WET has been accepted as member of the IMTS institutions
- C-WET held a one week international wind turbine training programme in February 2004
- C-WET contracted in wind energy contexts on commercial conditions (Risø is one of the international clients, using C-WET as subcontractors on Risø contracts with international clients)
- C-WET managing international R&D cooperation of wind mapping India with funding from India

C-WET future

- Centre of Excellence for wind energy in India
- As government institute neutral and directed towards the industry, authorities, developers, electricity sector, investors and insurance
- Business culture – provider of services for payment
- Indian node in the international network of wind energy centres
- Testing and certification internationally recognized through accreditation
- Primary mover in the Indian wind energy science and technology network
- Contribution to education of engineers and researchers

Thank you for your attention

