



## Wind energy research and the industry

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# Wind energy research and the industry

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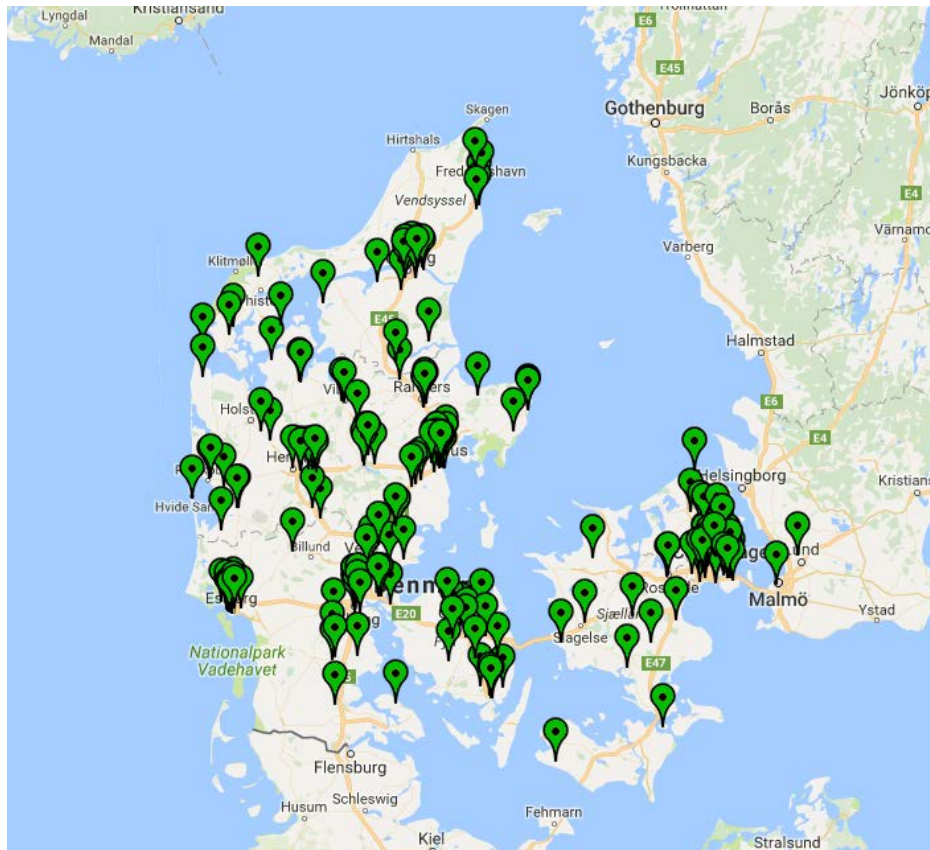
Wind Energy Denmark  
Annual Event 2016  
26. Oct.



What is the importance to the wind industry of having a strong Danish base?

What is the importance to Denmark of having a strong wind industry?

# The Wind Industry in Denmark



3M A/S AAG Aalborg Gummivarefabrik A/S A2SEA A/S Aalborg Port A/S Aalborg Universitet Aarhus Port ABB A/S  
 AB-Inventech A/S Advokat-aktieselskab Borch AH Industries A/S Aibel Denmark A/S Alfa Laval Nordic Aluwind AMU vest A/S Apro  
 Wind Aps Andersen Partners Advokatpartnerselskab AREFA Danmark A/S Atradius BACH Composite Industry Bachmann  
 electronic GmbH Batslev Rådgivende Ingeniører A/S BIC Electric Bech-Brøn Beck Rechtsanvælte Beckhoff Automation A/S Beredskabscenter  
 Aalborg Udarbejdescenter Best Energy A/S Betech A/S BIRR A/S Bjerregaard Consulting A/S Blade Repair Solutions Blade Test Centre A/S Bladena  
 Bladt Industries Blue Company A/S Blue Water Shipping A/S BMS Krangården Bostik A/S BBR  
 Industriautomatisering A/S Brt. Klee A/S Bruel & Kjaer Sound & Vibration Measurement A/S Bruun & Højle Bureau Ventas C.C. Jensen A/S  
 Certex Danmark A/S Connected Wind Services Danmark A/S Coles A/S Copenhagen Infrastructure Partners  
 COWI DAFA A/S Damatoch Danfoss A/S Dansk Gummi Industri A/S Dansk Metal DEIF A/S  
 DELACOUR DELPYRO A/S DELTA DESITEK A/S Deugro Danmark A/S DR-II (DTS Institut)  
 Dialight BTI A/S DHL Global Forwarding A/S Duma Industri A/S DNV GL  
 Group Dokka Fasteners A/S DONG Energy DSV DTU  
 VindenergiEast Metal Trade A/S Eiva A/S EKU Aps ELS Group A/S Eltronic A/S  
 EMD International A/S Energy Project Shipping Aps Envision Energy E:ON EP Tools A/S Esbjerg Port  
 ESP Consulting Nordic EUC Vest / KursusCenter Vest European Energy Eurowind Energy A/S EXACT RECRUITMENT  
 GROUP F. C. Rov Pibling Falck Safety Services A/S Fiberline Composites A/S Fibox A/S Fjero A/S Force Technology  
 Foga Aps Fritz Schur Energy Fritz Schur Technical Group A/S FT Technologies Aps Fyns Kran Udstyr A/S GARDIT A/S  
 Geo GK Energi Aps Global Lighting Protection Services GML Search & Selection A/S Grøntly A/S Grenaa Havn A/S Haco A/S Hans  
 Buch A/S HARTING Aps Hempel A/S HOFOR Horsens Energicenter Næst Aps Horten Advokatpartnerselskab JHR  
 IMPACT HSM Industri A/S HSWind Hvide Sande Port HYDAC A/S Hydratex A/S Hydra Grene A/S Hydratech Industries  
 Wind Power A/S Hyperbanc Consult Aps IED Greenpower IIm electronic a/s The Innovation Office Aps International Wind Academy Lolland A/S  
 Ingeniørhøjskolen Aarhus Universitet Inero Horsens ISC Rådgivende Ingeniører A/S IPS-Group A/S ITW Densit JSB Plast Jupiter  
 Group A/S Just Wind DK Aps Autronica Fire and Safety A/S Keel Solution KK Wind Solutions Klaus Hein Shipping EFTF Aps  
 Klingspor A/S Klüber Lubrication Skandinavien A/S Lemvig-Müller A/S Liftra Aps Lind Jensens Maskinfabrik  
 A/S Lindø Industripark A/S LM Wind Power Group Local Energy A/S L-tek A/S Kromann  
 Reumert Maersk Training MAKE Megatrade Beslag A/S Metalock Denmark A/S Mirade Q-Inspect A/S Mita-Teknik A/S  
 MHI Vestas MHI-Ø&Co Offshore Wind A/S MT Højgaard A/S N.C. Nielsen sss Nellemann Survey  
 NEAS Energy A/S Nibe Wind Components Niebuhr Gears A/S Niras Nissens A/S Nordex  
 Energy GmbH Nordic Offshore Marine Nord-lock Aps Nordmark Maskinfabrik A/S Novatech Aps Novenco A/S Ocean Team Windcare A/S  
 Oer Energy Oglænd System A/S Optica A/S Orbicon A/S Orbital A/S Orga Aviation BV Parker Hannifin Danmark A/S Per  
 Aarsleff A/S PHOENIX CONTACT A/S PlanEnergy PP Techniq Aps Primo Danmark Prodan A/S Quantec Signals GmbH Ramboll  
 Danmark A/S Reichhold Danmark A/S Resc. Revisionsfirmaet Ole Vestergaard A/S Roenne Havn A/S Romo Wind A/S Ross DK  
 A/S Resolux Aps Ruxtec Danmark Aps RT9 Abrasives A/S Salling Plast A/S Sauer Robklov Law Firm Scania Minds Scancon A/S Scanel  
 International A/S Scandioo Scantico Denmark A/S Schaeffler Danmark Aps Schneider Electric A/S Danmark  
 Seaproof Solutions SEGES P/S Semco Maritime Siemens A/S SIKK A/S Siemens Wind Power  
 A/S Skagen Sandblæseri & Skibs-Service Afd. Syd Aps Skovgaard Invest Aps Solar Danmark A/S SSP  
 Technology A/S Stego Norden AB Svendborg Brakes A/S Sweco Swire Blue Ocean A/S terms The Switch in  
 Elephants A/S Thomas A/S Thyborøn Port. Tibnor A/S Torben Rafn & Co. A/S Trelleborg Sealing Solutions Denmark A/S UN-FLY A/S  
 Universal Foundation A/S University of Southern Denmark Valmont SM Vattenfall A/S vb Enterprise A/S  
 Ventherm A/S Vento Energy Support Aps Vestas Wind Systems A/S VikarDanmark Virk Plast A/S Wissenborn  
 A/S Welcon A/S WILLBRANDT Gummiteknik Aps Wind1 A/S Wind Energy Denmark Wind Estate A/S wpt offshore  
 Denmark A/S Ymer Technology Zenith Advisory Zero-Max A/S Zelt-Abegg ZITON

CLOSE TO  
250 MEMBERS

# Good framework conditions for the sector

## Well-established sector

- Costs
- Operation
- Integration

## Focus on

- Industrialization
- Reliability
- Quality and validation
- Optimization
- Innovation

## Need for

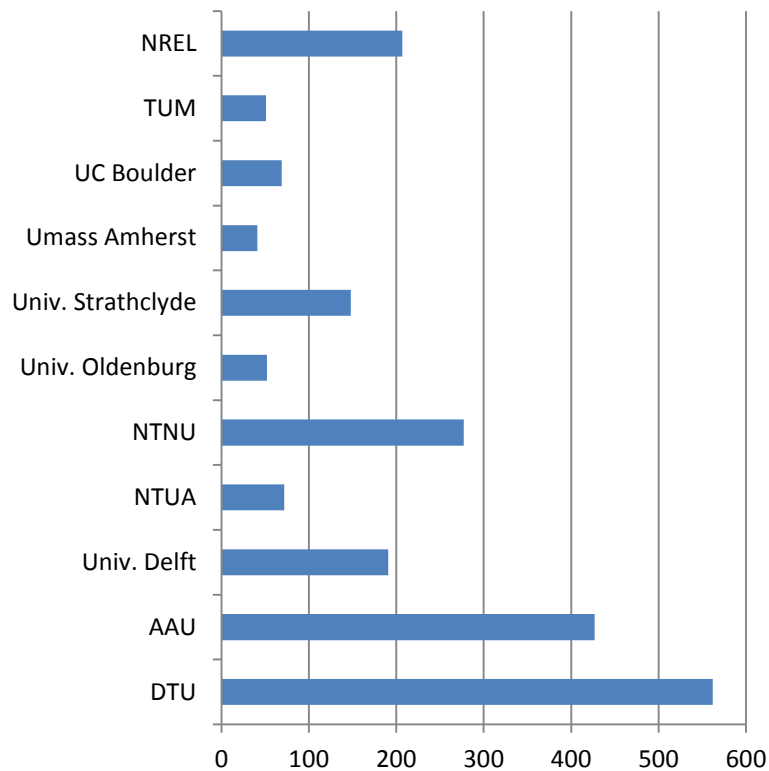
- Access to state-of-the-art knowledge
- Test and demonstration facilities
- Qualified staff
- Market for demonstration

## University role

- Research (knowledge generation)
  - Education and training
  - Contribution to innovation
  - Tests and consultancies

# Research and test facilities

**Public. 2010-15**



Web of Science 21-10-2016, topic: "wind energy" OR "wind power" OR wind turbine" OR "wind farm"

- Full-scale testing facilities (Østerild and Høvsøre)
- Blade tests (Blaest)
- LORC
  - Nacelle tests
  - Support structures
  - Climate chambers
- Windscanner
- Research turbines
- National Wind Tunnel
- Large scale structural test facility (Villum foundation)
- Lab facilities
- ....

# National Research Budgets

Nation	2015 Budget in mio EUR	Jobs X 1000
Denmark	14.3	31
Germany	91.1	150
Spain	86.4	20
Japan	117.2	4
USA	98.3	88
European Commission	91.9 (research) 197.6 (demonstr.)	330

Source: IEA Wind TCP, 2015 Annual Report



## Concluding remarks

- Together strengthen the strategic priority of public wind energy research in Denmark
- New models for industry-university cooperation
- Increased coordination of the Danish research, test and education efforts through MEGAVIND
- Plan the Danish effort in an European and global context

