Roadmap for Finnish Wind Power Industries

The Wind Power Technology Group

The Federation of Finnish Technology Industries

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Motivation

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The wind industry is one of the top Finnish Cleantech opportunities

The **wind industry** has been one of the **fastest growing** technology industries in the past decade, and provides excellent growth opportunities also in the future

Ongoing restructuring of **global manufacturing** affects the Finnish technology industry and the economy.

The **Wind Power Roadmap 2009** and actions taken provide a **good basis** for the **Finnish** wind power market

2014

*The **wind industry** faces the **same challenges** as any other **manufacturing industry***

Roadmap 2014 to 2017

***Actions are needed** on **several** fronts to ensure the **future success** of the Finnish wind industry and the **Cleantech industry** as a whole*

Target 2017

*A **competitive** Finnish wind industry brings **employment, economic**, and **environmental benefits***

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Finnish wind industry offers global opportunities

- Wind power technology is a 100 billion euro per year market opportunity
  - Renewable energy is key in moving towards low carbon energy systems and in climate change mitigation.
  - Wind power is among the fastest growing renewable energy technologies globally.
  - According to IEA, investments of over 2 000 billion dollars are required in wind power by 2035.
- The wind industry has become a mature global business
  - Supply chains that produce thousands of component parts.
  - Operation and maintenance that is increasingly advanced in its use of technology to design turbines, organise wind farms, and map wind potential.
  - Most of the industry is vertically integrated, but deep supply chains have emerged to provide technology and components for the largest turbine manufacturers.
- Finland benefits from a strong domestic wind industry
  - Wind power manufacturers are well positioned to face global competition.
  - The Finnish technology industry needs new growth areas.
  - Wind power is an integral part of Finland's energy mix: in 2013, wind energy made up 1% of the total energy consumption, and in 2020, that same category is set to be >6%.
  - Local manufacturing reduces the environmental impact of transport, creates jobs, and improves the economy at local and national levels.

Sources: IEA WEO (2013), IPCC AR5 (2014)

Despite progress, several bottlenecks hinder success

- The Wind Power Roadmap 2014–2017 builds on the Roadmap 2009
  - Actions made on the basis of the Roadmap 2009 include a wind power feed-in tariff and measures to reduce spatial planning problems
  - Companies and Finnish technology industries committed to further work for the Finnish wind industry
- Swift action is needed to ensure a competitive Finnish wind power industry
  - The global market is still growing rapidly, future market positions are now divided
  - The Finnish wind power industry is ready to compete in the global market
- Opportunities exist in wind power technologies and in the integration of wind power in electricity markets
  - Space exists for new innovations in several areas of wind power technology
  - Challenges remain in the large-scale integration of wind power in electricity markets, both near the populated areas and in favourable, but remote, geographical areas

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Sources: Finnish Confederation of Technology Industries (2009)

Wind Power Market

- Market trends

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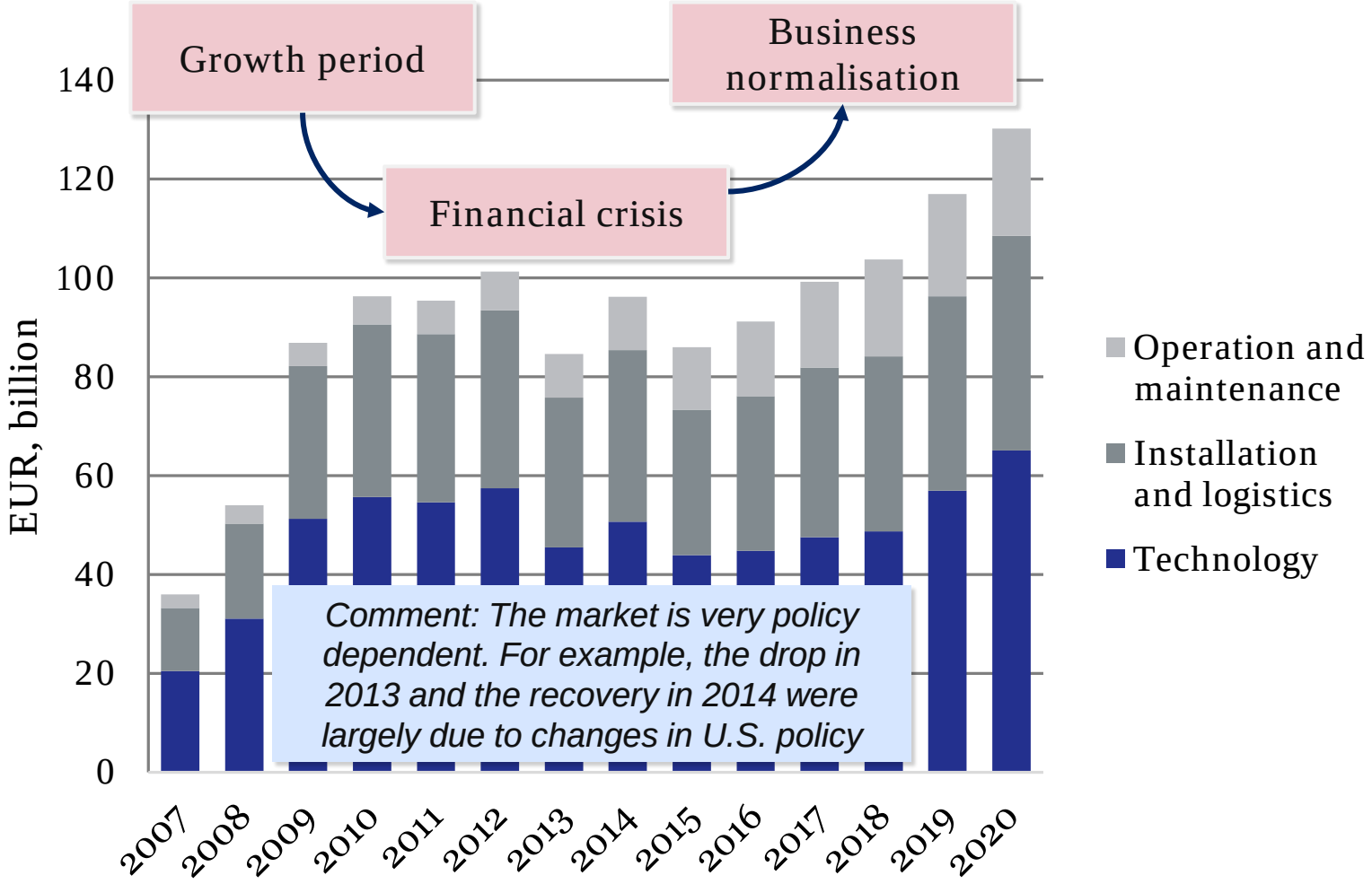
Global wind industry market: past growth and future prediction



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Sources: IEA MTMR (2014); IEA ETP (2014), 2 degrees scenario

Two main drivers of wind technology to date

Size

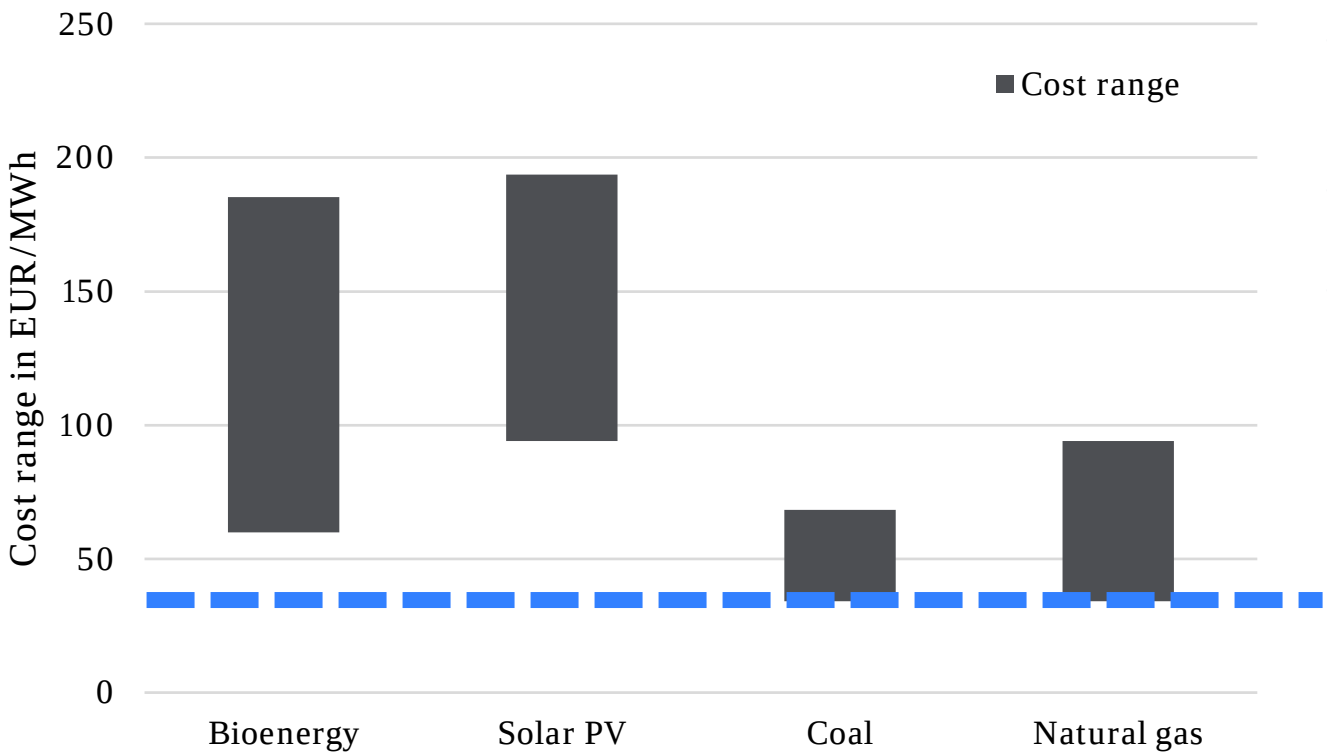
Levelized cost of energy (LCOE)

1970-80:s- 2014 2030

During the past decades, the focus has been on increasing wind-power turbine size and tower height.

Going forward, efficiency, maintenance, and operating expenses will become more central as increasing size becomes more challenging.

Wind power is already often the most competitive renewable energy



- In good locations, wind is already among the cheapest energy forms
- Development is still required in offshore wind
- For example, in Brazil, wind was the cheapest of all electricity forms in government auction in 2013

Wind cost level (Capex and Opex) in best locations

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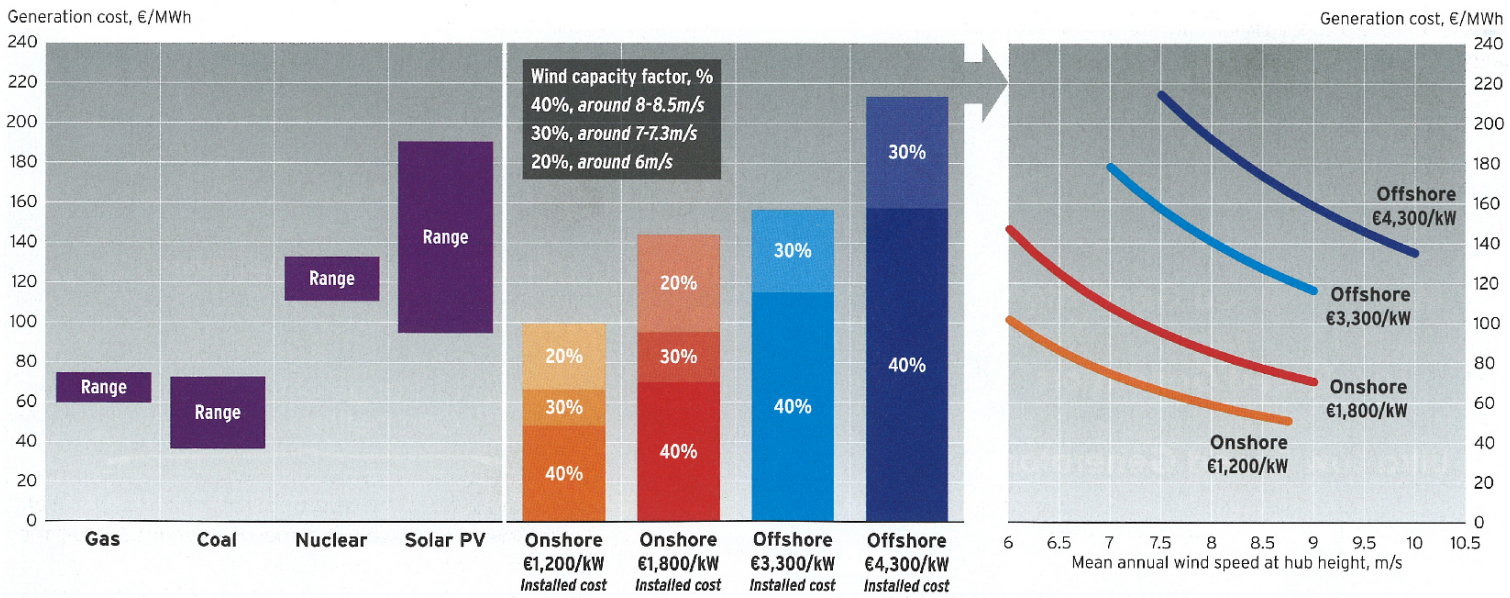
Sources: IEA ETP (2014)

Wind cost range

- Power generation costs for onshore wind are on the same level as nuclear, even in more costly installation sites and with lower wind speeds of c. 6.5 metres per second.

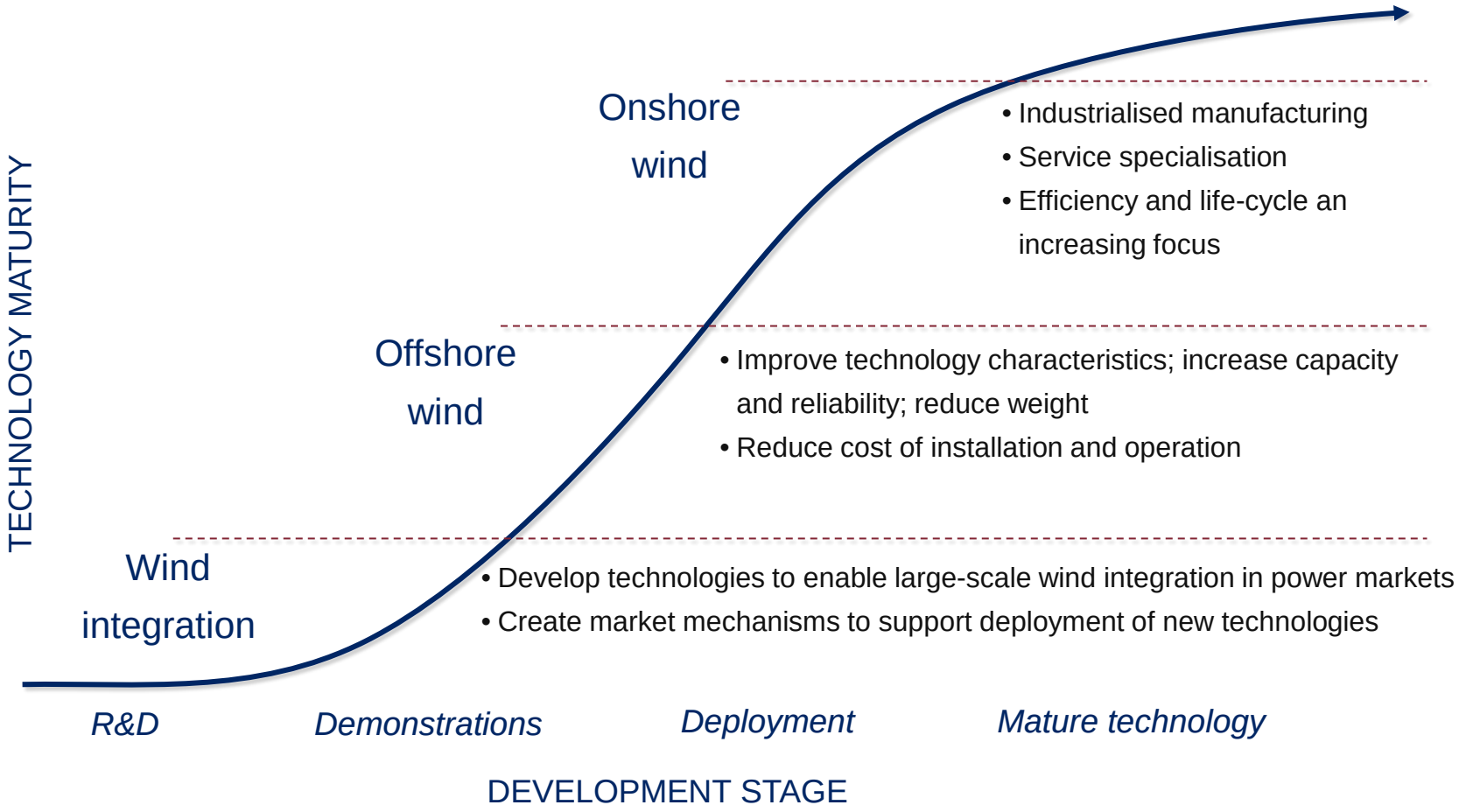


Generation cost at different levels of generation capacity usage

Generation cost depending on installation site price

Source: Windpower Monthly February 2014

Overview of wind power technology progress and key trends



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Wind Power Market

- Finnish Industry's Potential

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Wind power value network

Focus areas in this roadmap

MATERIALS

- Adhesives & sealants
- Aluminium
- Carbon fiber
- Ceramics
- Composite materials
- Concrete
- Copper
- Fibreglass
- Epoxy
- Hydraulic oils
- Iron & steel
- Permanent magnets
- Reinforced plastics
- Rubber
- Teflon

COMPONENTS

- Rotors & Blades
- Pitch, yaw and controls
- Mechanical Drivetrain
- Generator & Power Electronics
- Tower Components & Nacelles

MANUFACTURE

- Design & Product Development
- Turbine Manufacturing
- Monitoring & Control Systems

REALISATION

- Project Development
- Analytical and Planning Services
- Construction
- Transportation & Installation
- Financing, Insurance & Administration

OPERATION

- Power Generation
- Operation & Maintenance
- Smart grids
- Auxiliary Services

RESEARCH

- Basic Research
- Wind Power Technologies
- Wind Integration

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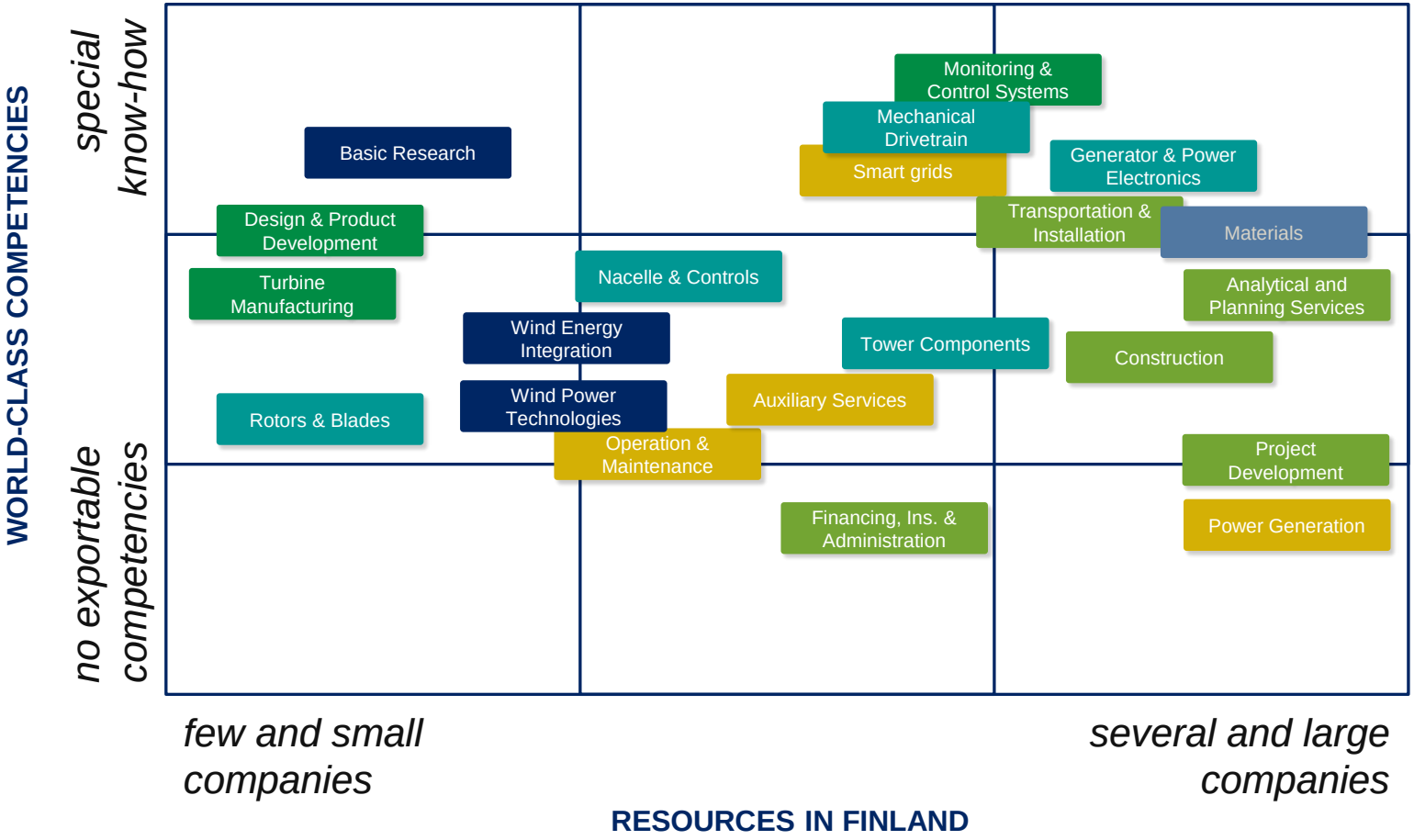
Sources: CGGC (2009)

Finnish wind power competencies and resources



- Some areas in wind turbine components have a leading position in the markets, especially in generators and power electronics
- Other Finnish strengths link to smart grids (ITC), monitoring and measurements (e.g. Vaisala), offshore industry, and strong research tradition

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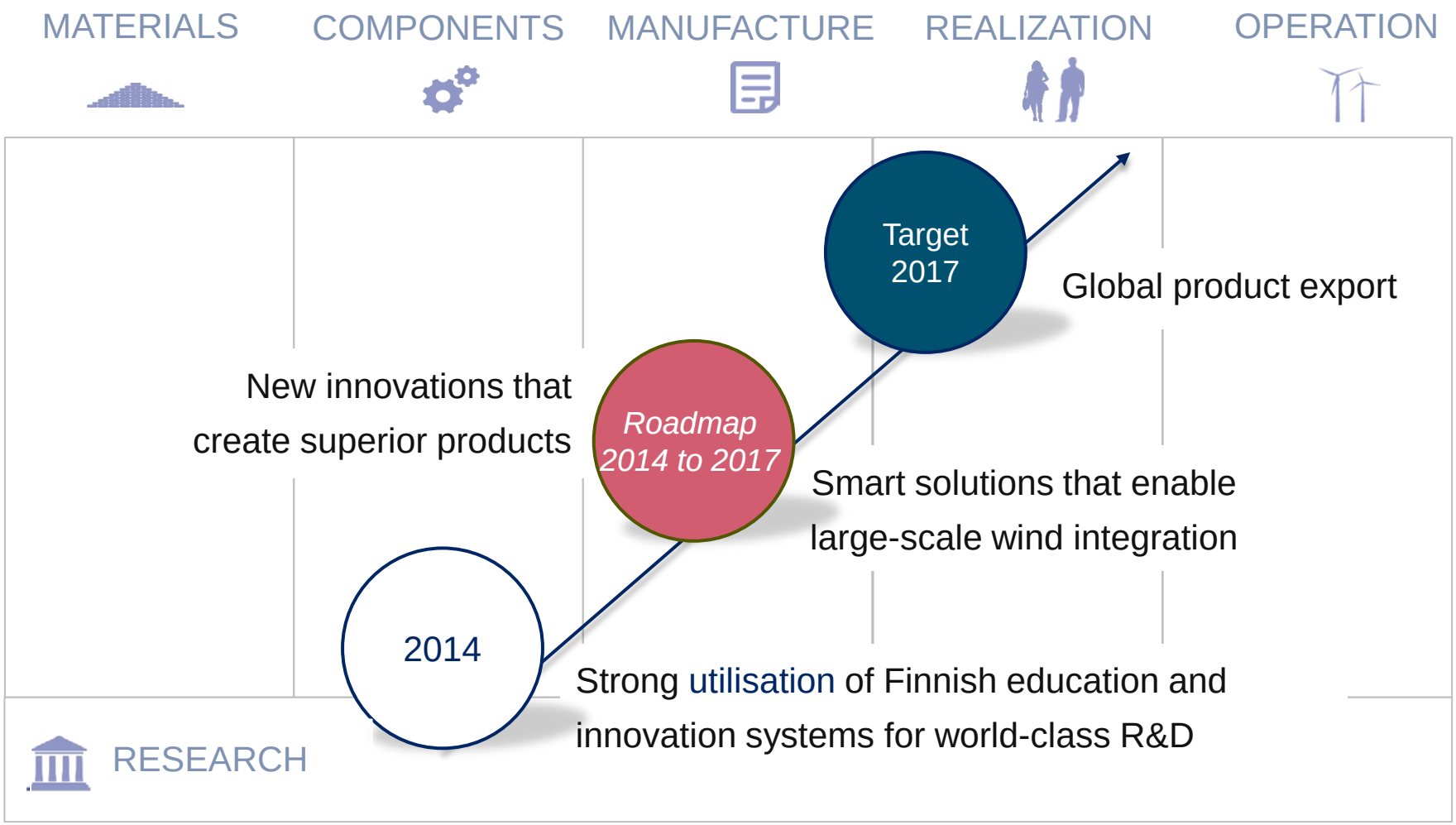
Benchmarking: Summary of keys to success

Denmark	Germany	Spain
• Early political ambition for renewables • Strategic decision to increase wind in national energy system • Innovative and persistent companies • Small country: one grid-owner, short distances, easy networking • National co-operation between R&D institutions and industry • Targeted education • Complete value network	• Stable political support for a long time, starting in 1989 (250 MW Programme) • Renewable Energy Act (EEG, since 2000) established clear feed-in tariff system • Teaming with Danish pioneers, acquiring companies (e.g. Siemens – Bonus) • Local involvement: community wind farms • Political will to create an industry; using strong engineering heritage in Germany	• Early mover (1990s); academic research started in the 1980s • Political support for many decades, though currently uncertain • Utilities among main developers • Deployment in a growing power market (1995-2008) • Own industry with R&D&I • A banking system that came to understand underlying risks and mechanisms
• About 28 000 employees in wind power sector as a whole • App. turnover €10 billion in 2013, of which app. 50% is exported • App. 250 members in the Danish Wind Industry Association	• About 118 000 employees in wind power • App. production volume (2012) €9,4 billion; export share well above 60% • 2100 operator companies, 1100 manufacturers, suppliers and service providers	• About 30 000 employees in wind power • Industry exports technology: app € 1.9 billion/year • Some 200+ companies in the industry
• R&D support 8.7 M€ (2012)	• R&D support 93.2 M€ (2012)	• R&D support 24 M€ (2011)

Sources: Interviews with Danish, German and Spanish Wind Associations; Pictures/flags: Microsoft Office.com

Key Finnish opportunities in the wind power value network



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Actions

- Roadmap 2014–2017

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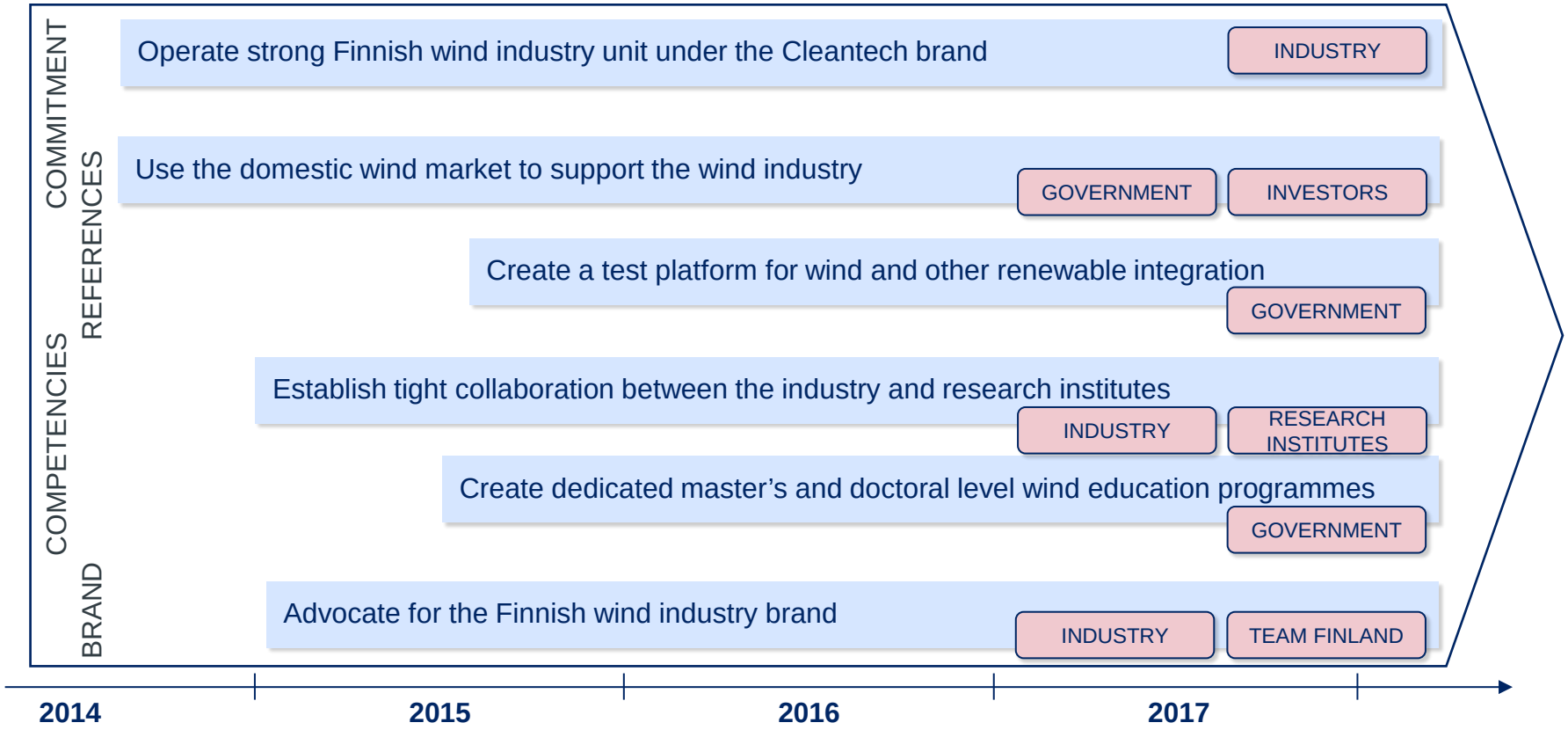
Enabling the success of the Finnish wind industry

Roadmap 2014 to 2017



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Industry, together, has the potential to create superior products

Roadmap
2014 to 2017

1 Operate a strong Finnish wind industry unit under the Cleantech brand

- Combined Finnish industry has stronger potential to develop world-class products than individual companies
- The government's Cleantech initiative is a suitable vehicle for the wind industry
- A strong cluster supports the development of SMEs and other new entrants

A domestic market boosts Finnish wind industry growth

Roadmap 2014 to 2017

- …and creates new possibilities

2 Use the domestic wind market to support the wind industry

- Government support for the market is useful for industry development
- The domestic market creates potential for local opportunities and supports a credible Finnish wind industry brand
- Finnish financiers could use their influence to increase the use of Finnish components in domestic projects
- Deepen the cooperation with the STY on national topics

3 Create a test platform for wind and other renewable integration

- Large-scale integration of wind in energy markets is not yet solved anywhere
- Finland is of the right size and has the right capabilities in wind and smart grids
- The government should create a test platform framework and support industry in building infrastructure
- A platform creates learning possibilities and reference opportunities

Competitiveness of Finnish industry is built on world-class R&D

Roadmap 2014 to 2017

4 Establish tight collaboration between the industry and research institutes

- The best experts in Finland need possibilities for active cooperation
- The Government should support R&D&I collaboration: Finnish successes have often been built around government sponsored programmes. Current R&D funding is low (1.9 M€ in 2012) compared to Denmark, where the funding is much larger due to the greater volumes of business
- Strengthening international R&D cooperation is essential for the industry to compete in global markets
- In Denmark, the private and public support is more integrated and focused, for example, through the Lindoe Offshore Renewables Center (LORC)

5 Increase the offering in wind-power-related education, especially at university level

- Finland's competitiveness requires highly skilled employees
- Investments in researchers and skilled engineers are bound to yield benefits
- There is a European level need for a competent workforce

Finnish Cleantech's success is built on real products for global markets

Roadmap 2014 to 2017

6 Advocate for and support the Finnish wind industry brand

- Combine the wind industry under the Finnish Cleantech brand
- Showcase successes through Team Finland and other means
- The government should support the industry through export and trade facilitation

Impacts

- Roadmap 2014–2017

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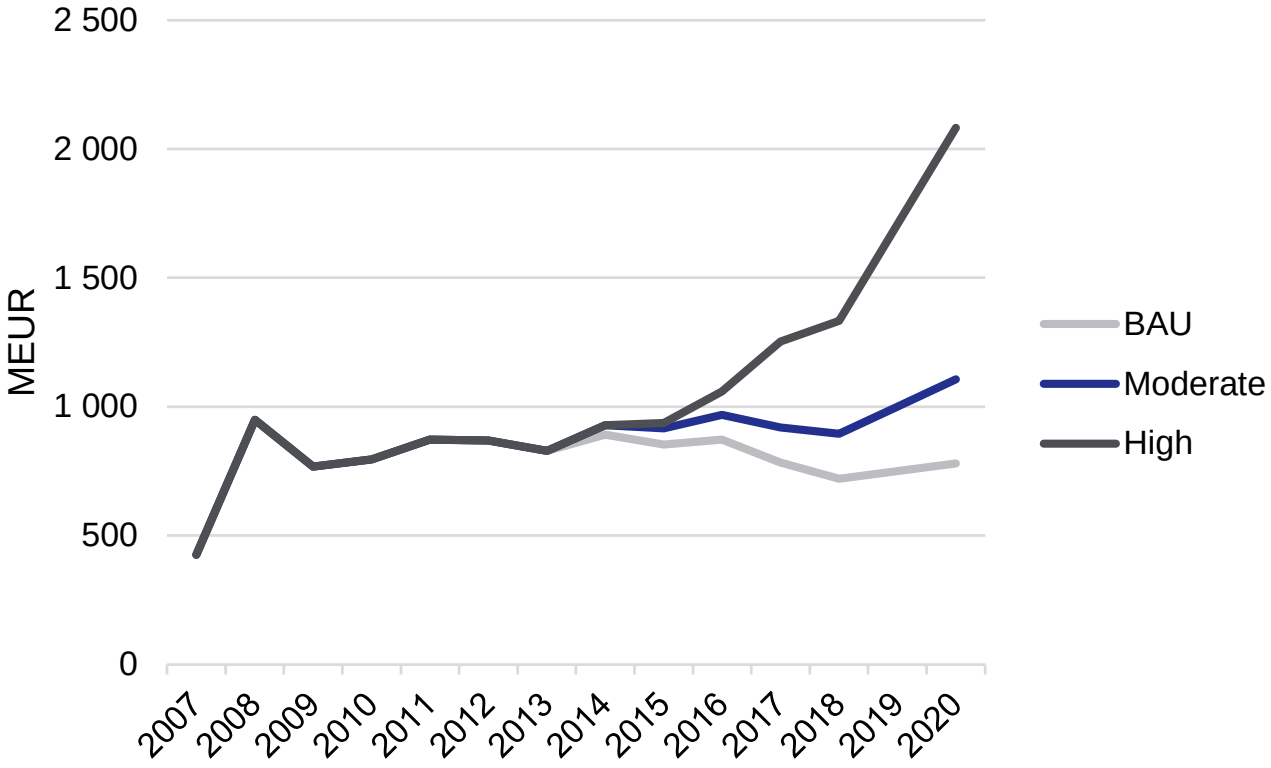
Revenue potential of the Finnish wind industry

Roadmap 2014 to 2017



- The wind power industry has delivered around 750 – 1 000 MEUR in revenue during the past five years, corresponding to a market share of 1.5–3.0% in the global equipment market
- Even keeping the market share a challenge in a business-as-usual scenario (BAU)
- Moderate actions could keep the market share until 2020 and help the industry grow
- Roadmap implementation could lead to doubling of the market share and 2 000 MEUR in revenues

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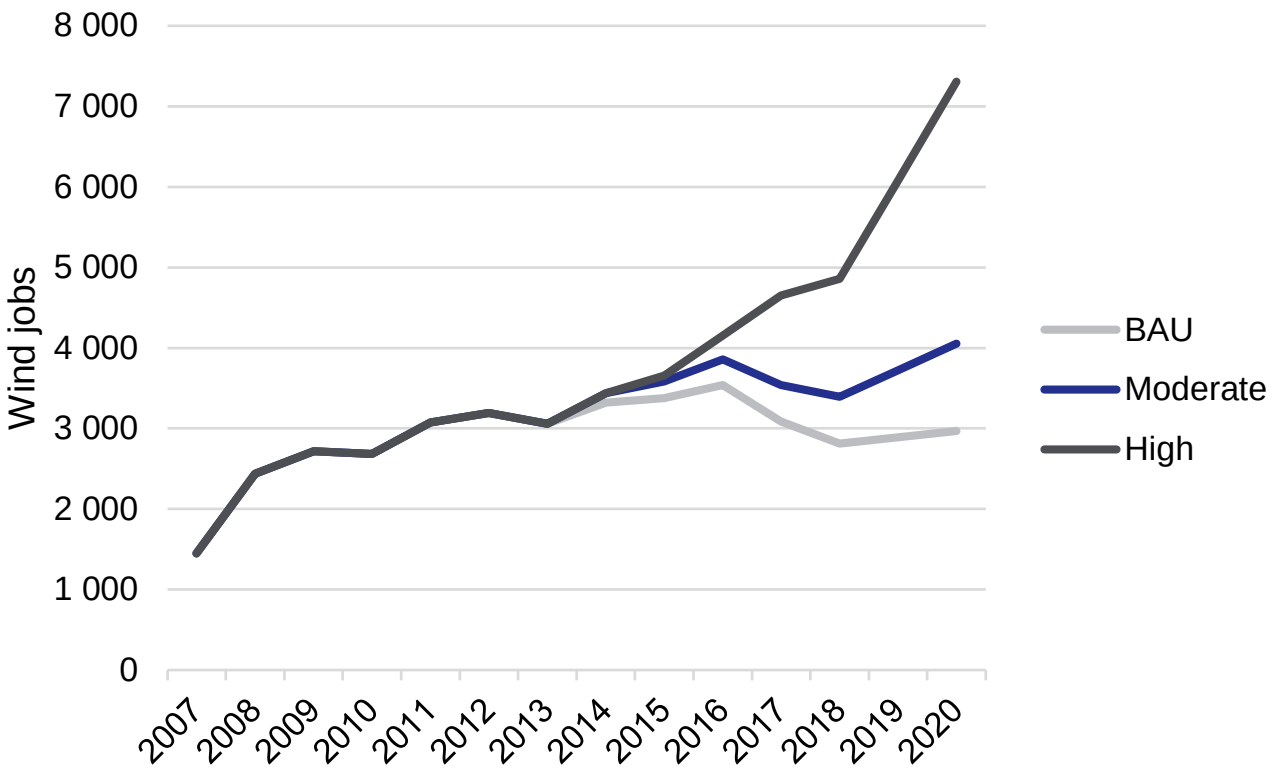
Analyzed Finnish wind industry component manufacturers assumed to cover 90 % of the Finnish wind industry
Sources: Data from 30 Finnish wind industry component manufacturers, IRENA (2014)

Jobs creation in the Finnish wind industry

Roadmap 2014 to 2017



- Employment by the wind power industry has varied between 2 000 – 3 000 in the past years
- An increased industry market share to 3% and a growing domestic market by 2020 can bring the total number of jobs to 7 000
- Most of the jobs are in component manufacturing

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Analyzed Finnish wind industry component manufacturers assumed to cover 90 % of the Finnish wind industry
Sources: Data from 30 Finnish wind industry component manufacturers, IRENA (2014)

Summary

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Enabling the success of Finnish wind industry

Roadmap 2014 to 2017

- Wind power technology is a **100 billion euro** per year market opportunity
- The best potential for Finland lies in **high tech**, both in wind components and in the way wind is integrated in the energy markets
- **Swift action** is needed to ensure a competitive Finnish wind power industry as part of the Finnish Cleantech story:
  - Create a test platform for wind and other renewable energy integration with smart grids
  - Establish tight cooperation between wind industry R&D and our research institutes
  - Educate sufficient resources in competent master's and doctoral level job takers
  - Advocate for the Finnish wind industry both at home and especially abroad
- With realistic estimates, the wind industry can bring in **double** the current **revenue** and create **double** the number of **new skilled jobs**
  - With the right actions, the revenue of Finnish wind companies could exceed 2 000 million euros and the workforce over 7 000 people by 2020

Global wind power market

- Appendix 1

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Wind power technology trends

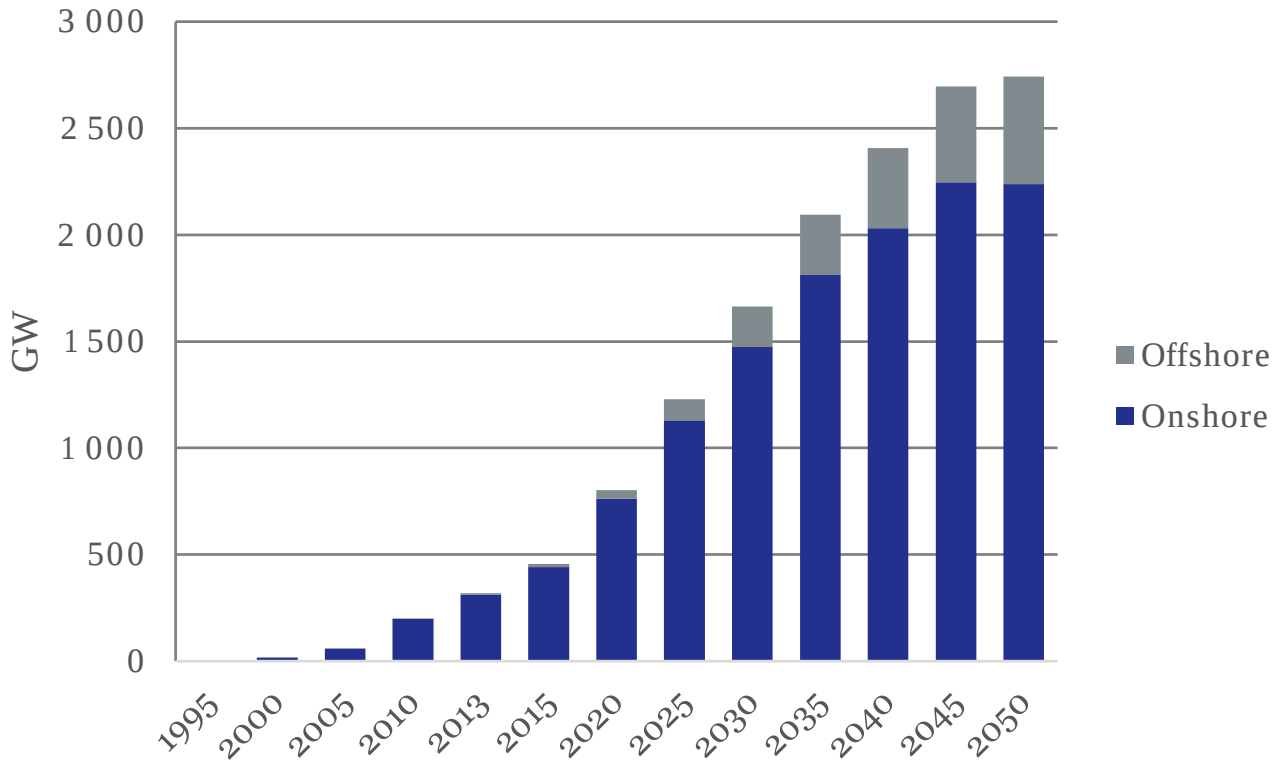
- Industrialised manufacturing
  - Some estimates see a change in the current business model, where a vertically integrated wind turbine manufacturer dominates the value chain.
  - The new business model could resemble more the aircraft industry type structure, where subcontracting chains become longer and more specialised
- Service specialisation
  - There are specialised services throughout the life-cycle, from project development to construction to installation and operation and maintenance.
- Efficiency and life-cycle an increasing focus
  - The size race starts to reach a limit, in terms of both hub weight and manufacturing capacity
  - Installation and operation and maintenance costs are becoming more important
- Large-scale wind integration in power markets is also a technology challenge
  - Energy storage options and grid development are the most active paths studied

Benchmarking: Main technology trends in Denmark, Germany, and Spain

Denmark	Germany	Spain
• R&D focuses on LCOE reduction, e.g. through value chain optimisation • Offshore technology development: foundations, installations, and accessibility • New functionalities and fewer components (e.g. direct drive concept, two bladed concept) • Lighter materials and more flexible constructions (e.g. towers, generators, blades, foundations) • Smart grid • Wind turbine development (capacity in MW and rotor diameter) • Modularisation and system supply, reducing the number of models and the number of suppliers	• Energy storage: power-to-gas (wind power to hydrogen and methane) • Virtual power plant R&D • Wind technology, several areas, e.g. greater performance through intelligent rotor blades • New materials (carbon-based) • Wind-turbine for low-wind-speed areas, larger rotor diameter, smaller generator • Grid integration for wind energy – especially feed-in-management	• Durable cement for offshore floating platforms through nanotechnology • Wind-wave power open-sea platform equipped for hydrogen generation • Floating, modular, multi-use platform system for use in deep waters • Lightweight 10-MW class offshore wind turbine based on a superconducting generator • Electrical transmission systems for large offshore wind power plants • Wind-flow modelling in complex terrain • Integration of wind energy in islands

Sources: Megawind 2013; Vestas; Danish, German and Spanish Wind Energy Associations, IEA Spain (2012)

Global wind power capacity



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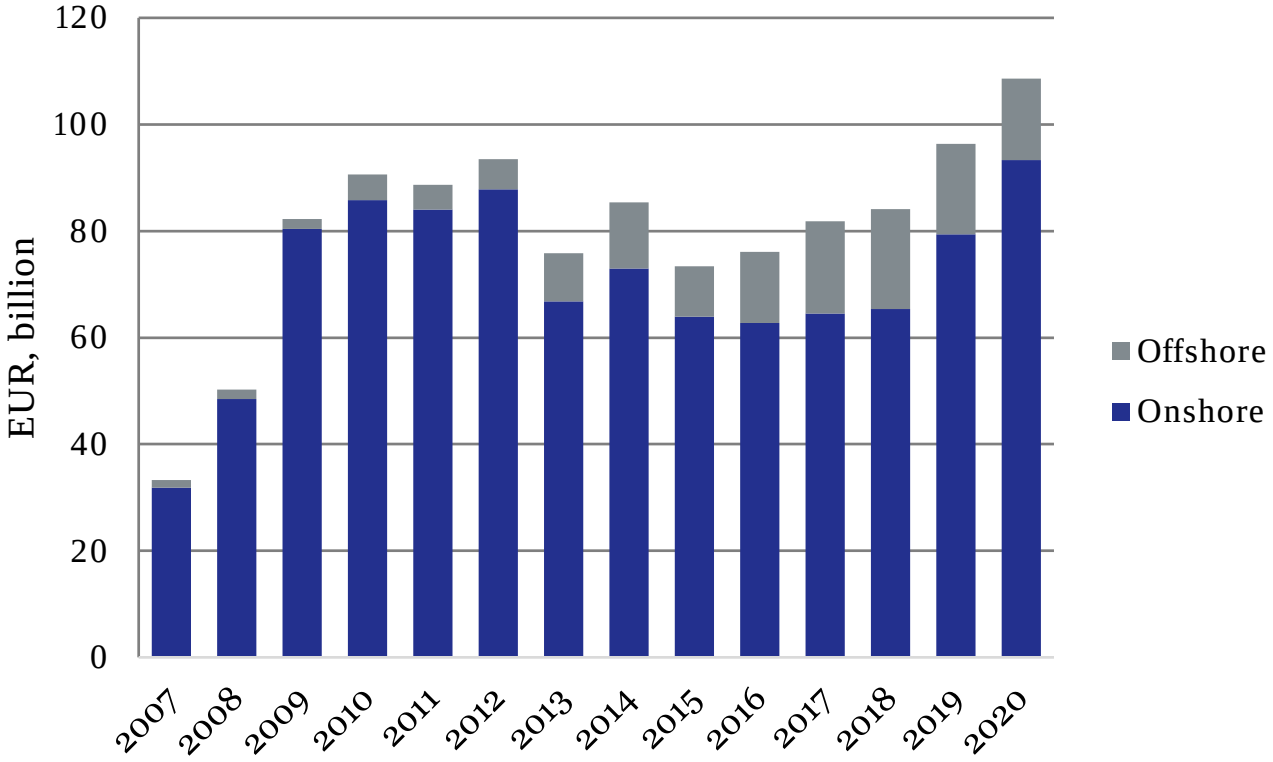
Sources: IEA ETP (2014)

Investments in wind power by sector



Calculated on the basis of installed GW and assumed cost development in EUR/kW

Sources: IEA ETP (2014), IEA MTMR (2014)

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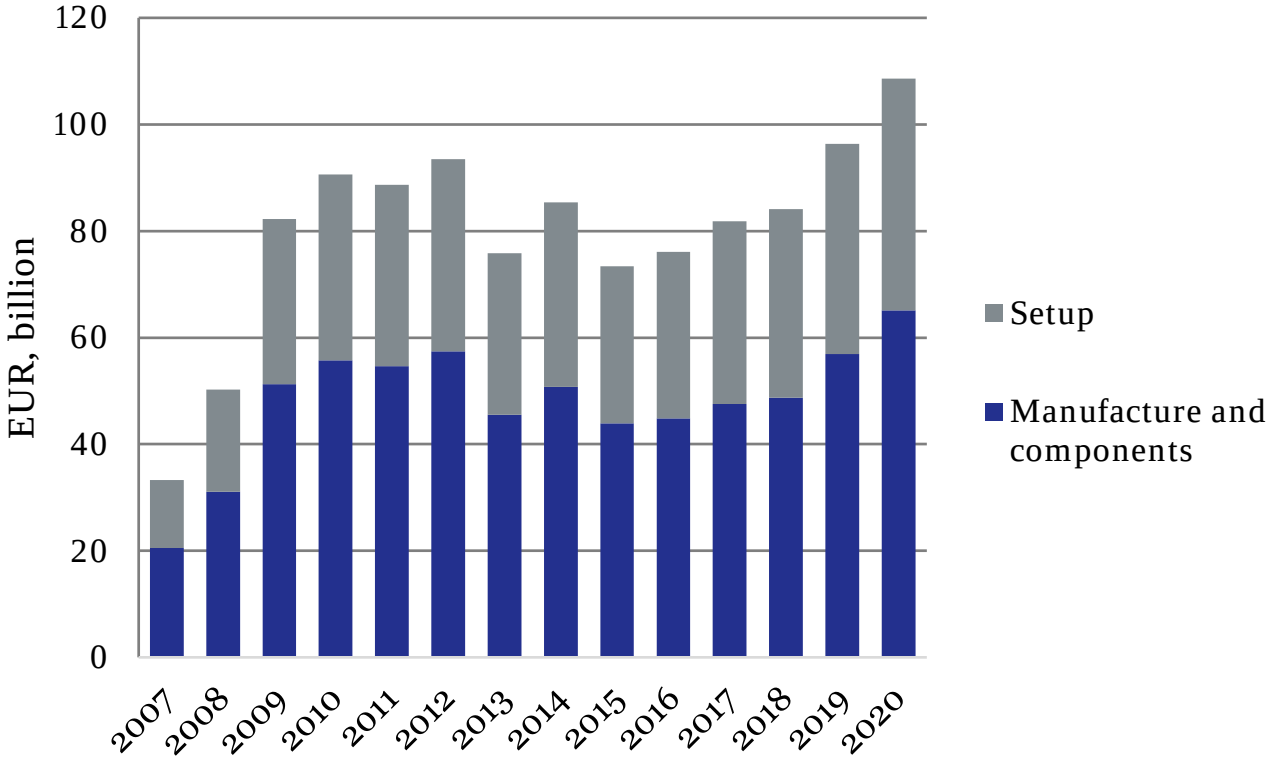
Investments in wind power by sector



Calculated on the basis total cost and assumed cost distribution development

Sources: IEA ETP (2014), IEA MTMR (2014)

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Finnish wind power industry

- Appendix 2

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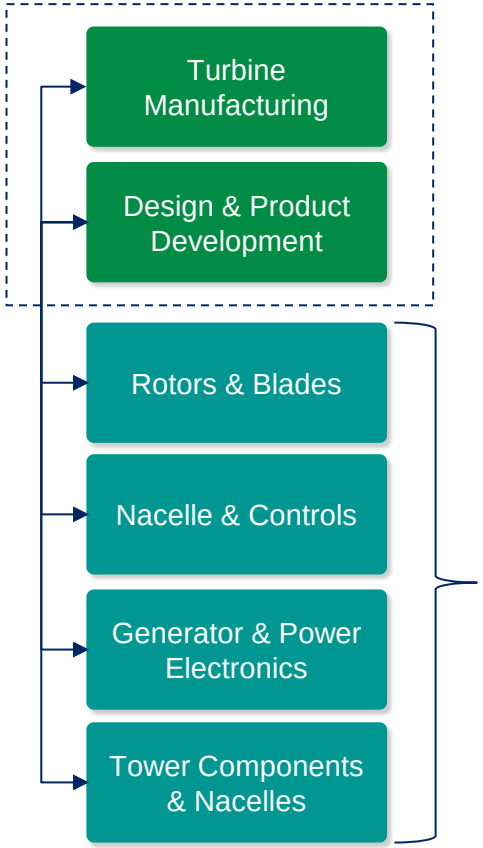
Wind power technology industry



Situation and trends 2014

- A few global players dominate the market: e.g. Vestas (DK), Enercon (DE), Goldwind (CHN), Siemens (DE), General Electric (USA), Gamesa (ESP)
- Design and product development are largely with in-house tools and methodologies

- There is a large number of subcontractors
- Subcontracting requires qualification approval from turbine manufacturers
- Key attributes are cost, reliability, and serviceability
- New components or component providers are selected if they provide clear benefits over existing components
- Continuous development of new components is ongoing even for the mature onshore market

Finnish opportunities

- Finnish experiences provide a basis for turbine manufacturing know-how
- Develop new disruptive turbines

- Develop tools and solutions for turbine manufacturers in conjunction with component manufacturers

- Develop new materials: harder, lighter, more durable, recyclable, alternatives to rare earth metals
- Create material-efficient structures, tailored structures, and manufacturing processes
- Improve modelling and simulation of component performance
- Develop energy efficiency of components
- Improve serviceability with products and concepts suitable for cold climates

Wind power project realisation

	Situation and trends 2014	*Finnish opportunities*
Financing, Insurance & Administration	• Funding and insurance come mostly from large investment funds and insurers • Legal and other administrative services are local	• Domestic financiers use their influence in turbine and component selection
Project Development	• Specialised organisations exist for project management	• Use references from the domestic market to extend services in other countries
Analytical and Planning Services Construction Transportation & Installation	• There is a large number of subcontractors • Value in services attracts both new entrants and turbine manufacturers to extend their offering • Increasing turbine size and hub heights challenge existing solutions for construction solutions, transportation, and installation • Offshore installations are increasing and require special equipment throughout their logistics chain	• Develop analytical and planning services based on domestic references • Use project management and construction experiences from the domestic market to offer services to other countries • Utilise marine industry experience in the development of floating platforms for offshore installations and maintenance • Use know-how in heavy machinery and develop special equipment required in offshore wind for harbours and ships

Wind power operation

	Situation and trends 2014	*Finnish opportunities*
Monitoring & Control Systems	• Funding and insurance come mostly from large investment funds and insurers • Legal and other administrative services are local	• Develop condition measurement equipment, wind turbine and equipment sensors, data communication equipment, and related software
Power Generation	• Large-scale wind power is run by utilities or independent power producers	• Low-cost wind power keeps electricity market prices low and benefits all industries
Operation & Maintenance	• There are specialised services for O&M	• Develop efficient maintenance service models, on regional and global bases
Smart Grids	• Variability of renewables is disrupting the existing market structures and creates a need to find intelligent solutions for grid stability	• Develop and demonstrate technologies and solutions for grid management and optimisation. • Engage the Finnish IT sector
Auxiliary Services	• Services are required for integrating variable wind power in the electricity market, e.g. forecasting and balance management, and related tools	• Use references from the Nordic electricity markets to expand services to other countries

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Wind power research & development, and innovations

	Situation and trends 2014	*Finnish opportunities*
Basic Research	• Wind power generation benefits from advances in various sciences, e.g. climatology and meteorology for generation and materials science for the components industry • Study of lighter and more durable materials is one of the current focus areas	• Discuss research efforts with the industry to find suitable specific areas where basic research can add value to current and future wind technologies
Wind Power Technologies	• The study of wind power technology uses various applied sciences. There are connections with power engineering, mechanical engineering, and civil engineering • Current topics include improvements in efficiency, e.g. through studying aerodynamics	• Coordinate research with the industry to find areas where Finland has genuine opportunities to become a world-class player • Coordinate research efforts across universities in combination with doctoral education
Wind Energy Integration	• Large-scale intermittent renewable power generation affects both the stability of the electrical grid and the market conditions • Research topics include both technical studies on grid integration and economic studies on how the market infrastructures should be arranged	• Research efforts can support the testing of large scale integration in the Finnish markets • Finland already has one of the “smartest” grids that can be used as a basis for large scale experimentation, including for scientific purposes • The deregulated Nordic electricity market also provides a good basis for market research

Finnish wind-technology-related university education

- Several universities offer energy technology and related education
  - Aalto University
  - Lappeenranta University of Technology
  - Tampere University of Technology
  - University of Jyväskylä
  - University of Oulu
  - University of Vaasa
- The university offering in wind energy is limited to a few courses
- One professorship (Lappeenranta University of Technology) is dedicated to wind
- There are no bachelor's or master's degree programmes for wind
  - With the exception of one bachelor's programme in spring 2011

Sources: Immonen (2011), University web sites

Company listings
– Component manufacturers (1/2)

Company	Products/services
ABB Finland	Electrical products and solutions for the wind power industry
Axco Motors	Generators
Componenta Oyj	Iron and aluminium components and casting solutions
Fibox Oy	Enclosures
Haitor Oy	Hydraulic tensioners
Hollming Works Oy	Mechanical engineering
Hydroll Oy	Piston accumulators
Häkkinen Group	Machining
Kumera Corporation	Machined components
Leinovalu Oy	Iron and steel component castings
Levator Oy	Wind turbine towers
Meehanite Technology Oy	Casting technology development
Merus Power Dynamics Oy	Power quality equipment
Mesera Yhtiöt Oy	Machined components
Metso Foundries Oy	Iron and steel component castings
Miilukangas Oy	Mechanical engineering
Moventas Gears Oy	Power transmission equipment

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings
– Component manufacturers (2/2)

Company	Products/services
Neorem Magnets Oy	Permanent magnets and magnet assemblies
Nordpipe Composite Engineering Oy	Blades
Obelux Oy	Aviation obstruction lights
Oy SKF Ab	Bearings manufacture
Parma Oy	Concrete towers
Peikko Finland Oy	Concrete fastening technology for towers
Pemamek Oy	Welding automation
Powernet Oy	Power supplies and battery chargers
Prysmian Finland Oy	Electricity cabling
Roxtec Finland Oy	Sealing systems
Schaeffler Finland Oy	Bearings manufacture
Stalatube Oy	Wind turbine towers
STX Finland	Wind tower foundations and tower components and services
The Switch	Drivetrains
Trafotek Oy	Electric components: filters, reactors, and transformer solutions
Uudenkaupungin Rautavalimo Oy	Iron castings

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings
– Turbines and monitoring equipment

Company	Products/services
ABB Finland Oy	Electrical products and solutions for the wind power industry
Labkotec Oy	Measurement devices, e.g. ice detectors
Landis+Gyr Oy	Smart meter and smart grid solutions
Mervento Oy	Direct-drive wind turbines
Moventas Gears Oy	Power transmission equipment
Vaisala Oyj	Weather sensors, wind resource assessments, wind power forecasting

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Project development (1/2)

Company	Products/services
ABO Wind Oy	Wind power project development and financing wind power parks
CPC Finland	Wind power project development and operating wind power parks
E.ON Climate & Renewables	Wind power project development and wind power generation
Element Power	Wind power project development and wind power generation
EPV Energia Oy	Wind power project development and wind power generation
Eurus Energy Finland Oy	Wind power project development and wind power generation
EV-Windpower	Project development
Ilmatar Windpower Oyj	Wind power project development and wind power generation
Infinergies Finland Oy	Project development
Innopower Oy	Wind power project development and wind power generation
Lagerwey Development Oy	Project development and turnkey wind power plant delivery
Lumituuli Oy	Wind power project development and wind power generation
Maatuuli Oy	Project development and turnkey wind power plant delivery
Megatuuli Oy	Wind power project development and wind power generation
Metsähallitus	Project development on government land
O2	Project development, financing, operation

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Project development (1/2)

Company	Products/services
Posion Energia Oy	Wind power project development and wind power generation
Propel Voima Oy	Wind power project development and wind power generation
Puhuri Oy	Wind power project development and wind power generation
Rödsand Vk Oy	Project development
Saba Wind	Wind power project development and wind power generation
Scandinavian Wind Energy SWE Oy	Project development
SG-power Oy	Project development
Smart Windpower Oy	Wind power project development and wind power generation
Suomen Hyötytuuli Oy	Wind power project development and wind power generation
Suomen Tuulivoima Oy	Project development
TM Voima Oy	Project development
Tornator Oyj	Project development
Tunturituuli Oy	Wind power project development and wind power generation
Tuulikolmio Oy	Wind power project development and wind power generation
Tuulisaimaa Oy	Project development
TuuliWatti Oy	Wind power project development and wind power generation
Tuuliveikot Oy	Project development
UPM-Kymmene Oyj	Wind power project development and wind power generation
Varsinais-Suomen Energia	Project development
Winda Invest Oy	Project development
Voimavapriikki Oy	Project development
wpd Finland Oy	Project development and services, operation and maintenance, financing

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings
– Analytical and planning services (1/2)

Company	Products/services
A & P Lundberg Oy	Electric and automation planning
Ahlman Group Oy	Environmental studies
Biota Tech Oy	Environmental studies and other services
CPC Finland	Wind power project development, constructing and operating wind power parks
Empower Oy	Wind power project development, electrification, and other services
Etha Ab	Support services for wind power development
FCG Suunnittelu ja tekniikka Oy	Infrastructural and environmental engineering
Hafmex Group	Wind measurements and other support services for wind power development
Gaia Consulting Oy	Wind power technology and market studies
Ilmatieteenlaitos	Wind measurements, wind potential assessments, wind power forecasts
Insinööritoimisto Erkki Haapanen	Support services for wind power development
Kala- ja vesitutkimus Oy	Environmental studies
Meritaito Oy	Seabed studies and other services for offshore wind
Mittakolmio Oy	Environmental studies and other services

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings
– Analytical and planning services (2/2)

Company	Products/services
NCC Rakennus Oy	Wind power project development, construction and other services
Numerola Oy	Support services for wind power development
Pöyry Energy Oy	Project development and other services
Ramboll Finland Oy	Project development and other services
Rejlers Oy	Project planning and turnkey-delivery services
RSC Finland Oy	Wind measurements
Sweco Oy	Project development and other services
Thermopolis Oy	Support services for wind power development
TLT Group Oy	Infrastructure construction and other services
TM Voima Oy	Project development
Tuulisaimaa Oy	Project development
Tuulisampo Oy	Wind measurement technology and services
Vaisala	Weather sensors, wind resource assessments, wind power forecasting
Wind Controller Oy	Support services for wind power development
World in a Box Finland Oy	Software development for wind energy planning
WSP Finland Oy	Project development and other services
YIT Rakennus Oy	Wind power project development, construction, and other services
YRJtechnology Oy	Wind measurements

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Construction

Company	Products/services
Andament Group Oy	Infrastructure construction services
Cramo Finland Oy	Rental services and other construction services
Skanska	Building, foundation, and other infrastructure construction services
Empower Oy	Wind power project development, electrification, and other services
NCC Rakennus Oy	Wind power project development, construction, and other services
Peikko Finland Oy	Concrete fastening technology for tower foundations and tower connections
Ramirent Finland Oy	Rental services
Rudus Oy	Concrete and other infrastructure construction services
STX Finland	Wind tower foundations and tower components and services
Technip Offshore Finland Oy	Offshore construction services
TLT Group Oy	Infrastructure construction and other services
YIT Rakennus Oy	Wind power project development, construction, and other services

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Transportation and installation

Company	Products/services
Afons Håkans Oy	Sea transport services
Cramo Finland Oy	Rental services and other construction services
DSV Air & Sea Projects Oy	Sea transport services
Empower Oy	Wind power project development, electrification, and other services
Finnish Sea Service Oy	Special cargo transport and services at sea and underwater
Havator Oy	Logistics planning, transportation, and installation
HL Heavy Lift Shipping Ltd Oy	Marine transport
Infratek Finland Oy	Infrastructure services
JBE Service Oy	Installation and maintenance services
JTA-Connection	Installation and maintenance services
Kaplaaki Oy	Lifting services at sea
Kaskisten satama - Port of Kaskinen	Harbour services
Kuljetusliike Ville Silvasti oy	Special transport services
Levator Oy	Wind turbine towers
Meriaura Oy	Sea transport services
Meritaito Oy	Seabed studies and other services for offshore wind
Mobimar Oy	Offshore wind-farm services
Ramirent Finland Oy	Rental services
STX Finland	Wind tower foundations and tower components and services
Vaasa Engineering	Automation and electrification services
YIT Rakennus Oy	Wind power project development, construction, and other services

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Component manufacturers

Company	Products/services
ABO Wind Oy	Wind power project development, financing wind power parks
Asianajotsto Bergmann Oy	Legal services
Asianajotsto Bird & Bird	Legal services
Asianajotsto Hammarström Puhakka Partners Oy	Legal services
Asianajotsto Krogerus Oy	Legal services
Asianajotsto Mäkitalo Rantanen & Co Oy	Legal services
Castren & Snellman Oy	Legal services
Fondia Oy	Legal services
Impax Asset Management	Financing of wind power projects
Inspira Oy	Financing services
LähiTapiola Keskinäinen Vakuutusyhtiö	Financing of wind power projects
O2	Project development, financing, operation
Oy Risk Consult Ab	Insurance services
SEB	Financing of wind power projects
Taaleritehtaan Pääomarahastot Oy	Wind power financing through wind power fund
Tuulitapiola Ky	Financing of wind power projects
wpd Finland Oy	Project development and services, operation and maintenance, financing

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Operation and maintenance

Company	Products/services
3DWS	Maintenance services
Airice Oy	Maintenance services
Bladefence	Maintenance service: inspection, repair, and maintenance of blades
CPC Finland	Wind power project development, constructing and operating wind power parks
Empower Oy	Wind power project development, electrification, and other services
Hafmex Group	Maintenance services
Hafmex Group	Wind measurements and other support services for wind power development
Infratek Finland Oy	Infrastructure services
JBE Service Oy	Installation and maintenance services
JTA-Connection	Installation and maintenance services
KL-Lämpö Oy	Maintenance services
Moventas Gears Oy	Power transmission equipment
O2	Project development, financing, operation
Oy SKF Ab	Bearings manufacture
Polar Wind Technologies Oy	Maintenance services
Schaeffler Finland Oy	Bearings manufacture
STX Finland	Wind tower foundations and tower components and services
wpd Finland Oy	Project development and services, operation and maintenance, financing
YIT Rakennus Oy	Wind power project development, construction, and other services

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Company listings – Auxiliary services

Company	Products/services
Axpo Finland	Wind power sales to electricity markets
Buildercom Oy	Data management services
Dismantle Oy	Wind power mill dismantling services
Empower Oy	Wind power project development, electrification, and other services
Energiakolmio Oy	Wind power sales to electricity markets
Fuchs Oil Finland Oy	Lubricants and services
MastCraft	Wind measurement masts
Moventas Gears Oy	Power transmission equipment
O2	Project development, financing, operation
Onninen Oy	Material and information services
Polar Wind Technologies Oy	Maintenance services
Realfinans Oy Ab	Financing services
Rejlers Oy	Project planning and turnkey-delivery services
Vaisala	Weather sensors, wind resource assessments, wind power forecasting
YIT Rakennus Oy	Wind power project development, construction, and other services

Sources: LUT (2013), Prizztech (2013), TT (2009), Company web sites, Finnish Wind Association

Benchmarking: Keys to success of Finnish forestry machines

- Companies: Ponsse, Valtra, Timberjack, Logset, Fixteri, etc.
- Strong individuals who started up a business in Finland.
- Close co-operation with users – customer feedback one of the main foundations of R&D.
- Strong forestry industry as a whole – a long tradition of collaboration over the entire value chain.
- Inherent need for cost-effective supply chains and logistics due to long distances – the forestry industry supported forestry machinery R&D and financed machine investments.
- Brilliant combination of ICT and automation in forestry machine manufacture.
- Early start of manufacturing in export countries (e.g. Valmet in Brazil).
- Research support (from Metsäteho).
- The role of legislation has been minor.

Benchmarking: Keys to success of Finnish biomass-fired boilers

- Companies: Ahlström, Metso/Valmet, Ariterm, Renewa, etc.
- A strong forestry industry has meant domestic demand for biomass-fired boilers – need to utilise otherwise difficult side-streams of the forestry industry.
- Bioenergy has been a national priority for a long time, and has enjoyed political support both at both national and EU levels.
- Strong and long-lasting R&D support (VTT & universities; Tekes)
- Regular domestic investments
  - Opportunities to time after time demonstrate new technologies on the domestic market – has proved vital for first commercial-scale references.
  - Increase in design and engineering know-how
  - Development and strengthening of sub-contractor networks

Keys to success

- The road to success is lined with conscious efforts and decisions.

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Source of pictures: iStockphoto

Domestic market and test platform support ideas

- Integration of wind power and other renewables to the power grid

Idea: ***Smart grids*** and wind farm management, both onshore and offshore, will require IT solutions. Hence, the ***Finnish IT sector*** should be brought onboard as a new player, in addition to manufacturing.

Idea: A future competitive advantage could be to build and develop wind in ***remote locations***, in Finland and across the globe – starting with Finland – a sort of ***project export***

Idea: Industry could promote the wind turbine brands with Finnish components, to a) increase local acceptance for projects that use Finnish components, and b) increase the possibilities for Finnish companies to win contracts with turbine manufacturers. (“***Suosi suomalaista***”)

Impact assessments

- Appendix 3

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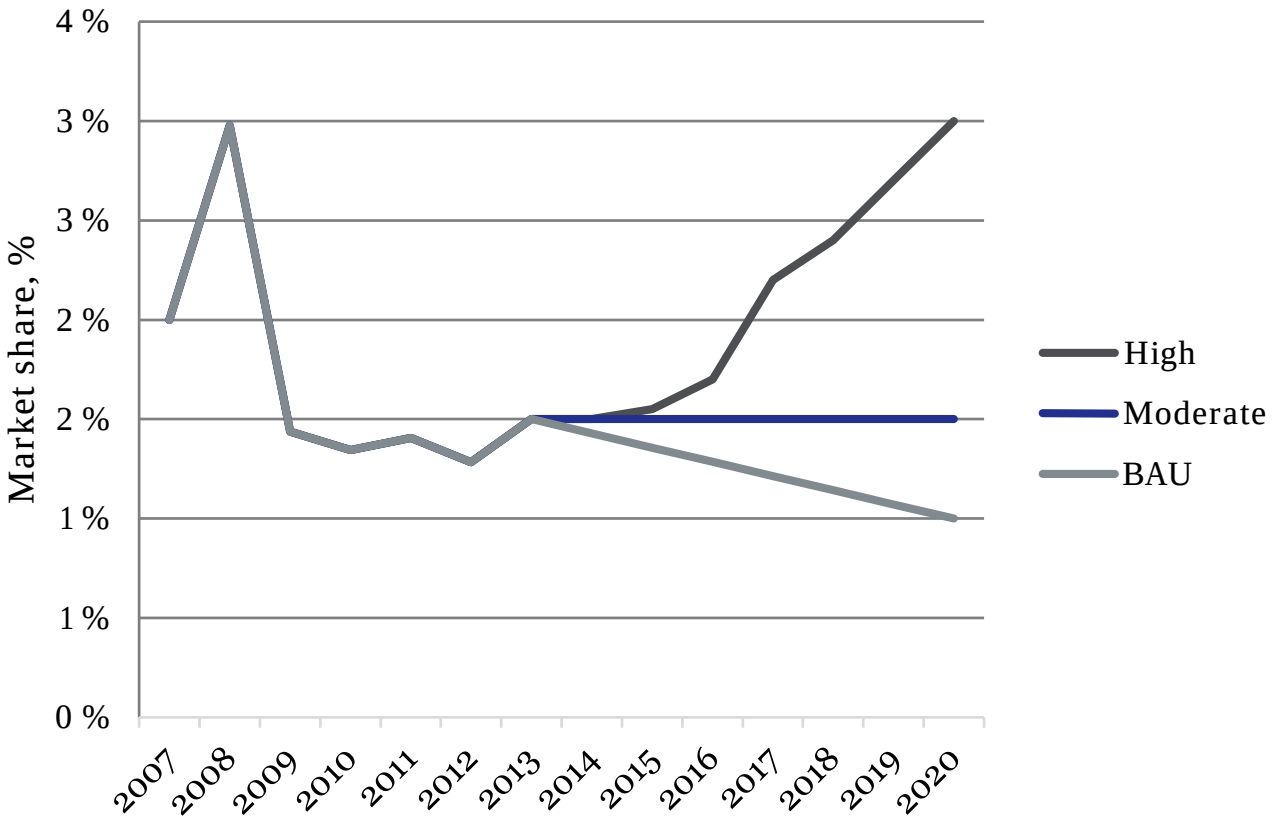
Assumed market share of the Finnish wind industry in three scenarios



- The financial crisis and subsequent market turmoil after 2008 affected Finnish industry significantly, including the wind industry
- The Finnish wind industry has lost some of the global market share, mainly to Chinese manufacturers
- Market share increases depend on the ability to develop and market new innovative products

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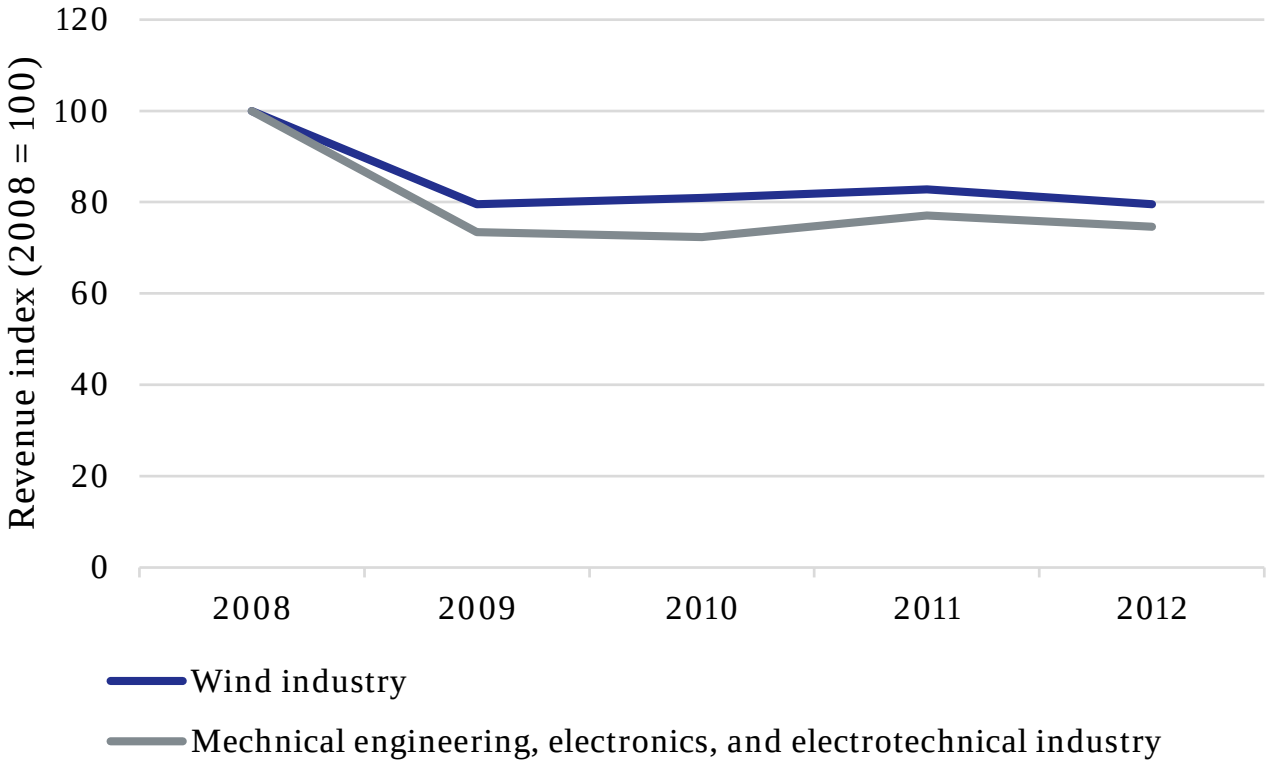
Sources: Historical wind market share based on data from 30 Finnish wind industry component manufacturers

Effect of post-2008 financial crisis on Finnish industries



- The financial crisis and subsequent market turmoil after 2008 affected Finnish industry significantly, including the wind industry
- The wind industry has been slightly more resilient to the downturn

Sources: Data from 30 Finnish wind industry component manufacturers, Finnish Technology Industries

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- Pemamek Oy
- Powernet Oy
- STX Finland Oy
- The Switch Oy

Other organisations

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- German Wind Energy Association/ Bundesverband WindEnergie
- Spanish Wind Energy Association/ La Asociación Empresarial Eólica
- Finnish Wind Power Association/ Suomen Tuulivoimayhdistys
- VTT Technical Research Centre of Finland

Report background

- The Roadmap 2014–2017 has been commissioned and steered by the Wind Power Technology Group of the Federation of Finnish Technology Industries
- Analysis is based on earlier literature, company financial data, and interviews and workshops with The Wind Power Technology Group members, and interviews with wind power and industry associations
- The work was been conducted by an independent expert organisation, Gaia Consulting Oy, in April–May 2014. Gaia's team consisted of Dr. Iivo Vehviläinen, Dr. Markku Hagström, Håkan Jonsson, Aki Pesola, Karri Lehtonen, and Dr. Pekka Pokela
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Thank you

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