

Joining Technology for Wind Energy

2nd General Assembly Stakeholder Meeting

JOINING SUB-PLATFORM TO *MANUFUTURE*

Friday 4th July 2014

CDMA building, rue du Champ de Mars, 21, 1050 – Bruxelles

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Current Status

- **Demand:**
  Global societal challenge of the 21st century → Need for more Energy!

  → **Climate Protection Summits**

  Kyoto Protocol (1997)
  → Reducing the emissions of climate-damaging greenhouse gases

  South Africa (2011)
  → The extension of the Kyoto Protocol was decided
  → Intensify the efforts to lower the emissions of greenhouse gases

- **Aim:**
  To limit the rise in the average temperature on Earth to 1.5 - 2°C
- Ratification process for the European Union was instigated on November 6, 2013.

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Next Steps

- **Legislation process**

  → Incorporation into the national law of the member states by February 2015.

- **Essential objective**

  → 20 % reduction in the emissions of CO_2
  (compared with the level in 1990)

- **Long term strategy** (until 2050)

  → Replacing all the fossil energy carriers

  → Path to restructure fully to renewable energy sources:

  - Replacement: fossil energy carriers → sustainable energy sources
  - Saving of primary energy → raising energy efficiency

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Demand

- **Upcoming material challenges**
  - → Material spectrum extends
    - - Higher-strength structural steels (e.g. towers for wind energy)
    - - Special steels (e.g. for gearbox components)
  - → Modern materials in different plate thicknesses
  - → Thick-walled installation components

- **Joining technology**
  - → Qualified newly developed processes
  - → Refined processes
  - → Economically viable / resource-conserving processes

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Ambitious Targets: Lagging Behind the Plans!

- **Wind power strategy in Germany**
  - Plan: 10 GW of installed power (2020)
  - Status: Around 200 MW installed (2011)
    (Corresponding to 1 % of the planned expansion!)
    → Lack of production capacities
      - Wind turbines
      - Structural steel engineering structures
    → Decrease of the return on investments
      - High costs → Conventional technologies
- **European Technology Platform for Wind Energy**
  → Need to develop technology → Highly cost-efficient wind turbines!
  → Additional power of around 10 - 15 GW (every year)
  → 300 GW by 2030
  → Replacement of old facilities (“repowering”)

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Solutions: Research and Development (1)

- Decisive bottleneck during production → Welding!

- Optimising of joining technologies
  → Cost-efficient
  → Time-efficient

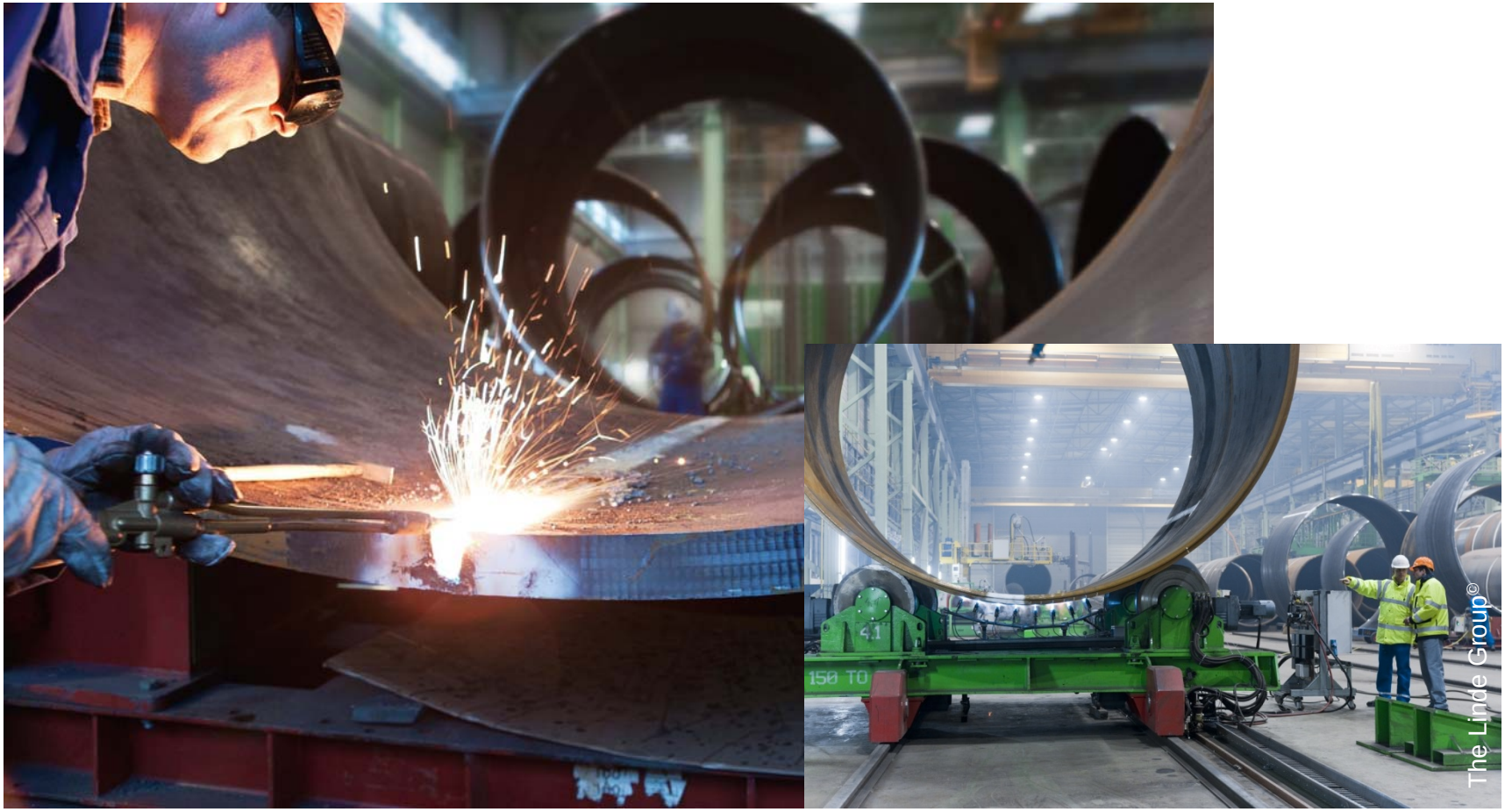
- Develop adequate production capacities
  → For towers
  → For moving components in the gondola



Raising the Competitiveness of European companies

High-tech solutions → **limit production relocation** → countries with lower wage levels

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Solutions: Research and Development (2)

- **Easy-to-mechanise high-productivity processes**
  → Better economic viability (e. g. beam welding processes)
- Mechanised process sequences in a **reliable process** / boundary conditions
- Reliable process parameters / mechanical-technological joint properties
- **Testing** procedures → Mechanical-technological properties
- Utilisation properties → manufacturing quality / monitoring / service life
- Realistic toughness requirements → Avoiding brittle fracture
- Qualification of high-strength and ultrahigh-strength steel grades / combination
  → Prevented by the lack of → relevant **standardisation**
  → non-existent **qualification**
- Health and Safety aspects for welding technologies

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Solutions: Research and Development (3)

Requirements

→ Approved, certified welding procedures for use on the construction site

→ No size restriction for parts produced in the factory

→ Shell segments, welded on site → Much larger tower diameter possible

Definition of notch cases (depending on the welding process)

→ design of welded structures → reduction of the welding effort

Automation already started from batch size 1 (for small series and large assemblies)

→ integration of sensors → seam tracking / gap and seam profile measurement, adaptive process control in "real time"

→ Flexible Production

→ Cladding (use of titanium → plating, welding of cladded plates)

FIFA World Cup 2014

Thank you very much
for your attention.

