



Sandia, AWEA and National Renewable Energy Laboratory  
2006 Wind Turbine Reliability Workshop

# Design for Maintenance

## The drivers

1. **Capitol Cost**
2. **Regulation**
3. **Customer Perception**



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Design for maintenance: Capitol cost

### Accessibility; cost of space

Items include:

- Ladder design, hatches, overall layout
- Hub portholes
- Work decks
- Service elevators, worker weight assists



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Design for maintenance: Capitol cost

**Durability; cost of material**

Items include:

- **Stainless Steel components**
- **Corrosion systems**
- **Amenities, lighting, skylights, doors**
- **Auto-lube systems**
- **Fine filtration**



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Design for maintenance: Capitol cost

### Detailing; Why not?

Items include:

- Tie-points
- Inspection covers, ports, borescope access
- The NO-STEP decal



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Design for maintenance: Regulation

### GL, IEC Rules

- Focus is on Safety, Manuals

### AGMA 6006

- Sufficient comments re inspection ports
- Annex D addresses Maintainability



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### Design for maintenance: Customer Perception

- **Simplicity**
- **On-board hoists**
- **Less grease fittings**
- **Robust lightning protection**
- **Greater tolerance for alignment**
- **Eliminating alignment**



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Pitch Systems, Mechanical design for  
maintainability

### **Mechanical Guy:**

- Access to the hub
- Careful review of single point failure
- Lightning considerations
- Flexible attachment to hub
- **NO No-Step points!**



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Design for maintenance: Customer Perception

•What is important to YOU?

**Thank you for  
Your Attention**