U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Standards Support & International Engagement

2019 Wind Program Peer Review

Jim Ahlgrimm

April 30 – May 2, 2019

International Engagement

- Standards
- Collaborative Research and Development

Why standards?

- **Internationally recognized standards are needed to:**
  - assure minimum levels of safety,
  - remove market barriers,
  - provide high quality reproducible test results.

Lower Risk

- **Where needed: supplemented with domestic standards to address US specific needs.**
- **Benefits of standards:**
  - Objective design criteria based on industry experience
  - Open markets (global design requirements)
  - Assist with removal of deployment barriers (e.g. noise)
  - Standard products – volume manufacturing
  - Feedback from field performance to design requirements

Lower LCOE

Standards Organizations

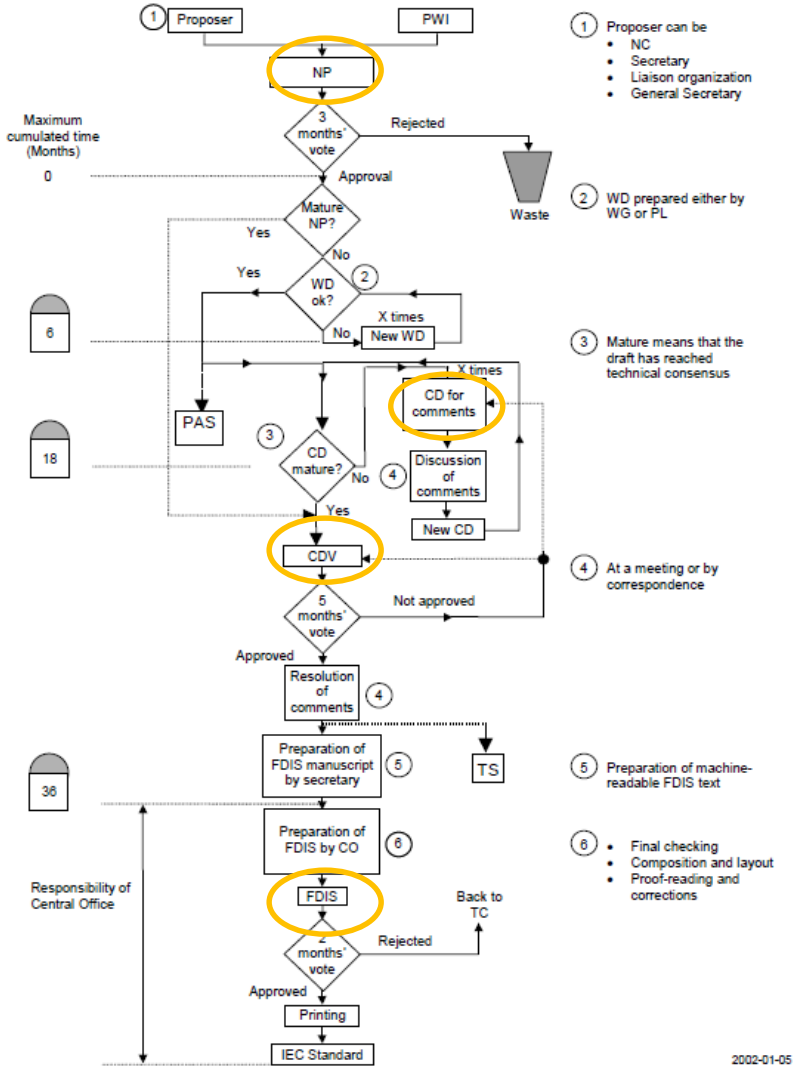
- **International Electrotechnical Commission (IEC)**
  - Technical Committee (TC) 88 – wind energy generation systems
    - TC-88 Chair, Jeroen Van Dam, NREL
    - US Technical Advisory Group (TAG)
  - Conformity Assessment Board (CAB) – issues certificates
- **American National Standards Institute (ANSI)**
  - American Wind Energy Association (AWEA)

Standards revision cycle and terminology

- NP or NWIP: New Work Item Proposal
- CD: Committee Draft
- CDV: Committee Draft for Voting
- FDIS: Final Draft International Standard
- MT: Maintenance Team

Typical Standards revision cycle
3-5 years.

Development of IEC Standard



Wind Standards - Technical Approach

- Actively participate in international and domestic standards development.
- Leverage knowledge developed in other parts of the program.
- Understand issues industry is struggling with and what the boundaries of our knowledge are to help define R&D needs.

IEC & TC88

IEC is the main focus of the activities

- International Electrotechnical Commission (www.iec.ch)
- Most widely accepted international wind turbine standards
- TC88 responsible for wind turbine specific standards: 61400 series
- TC88 has 22 participating countries and 13 observer countries
- US TAG (Tech Advisory Group) manages US contributions through ANSI.

Country	P/O Status
Australia	O-Member
Austria	P-Member
Belgium	O-Member
Brazil	O-Member
Bulgaria	O-Member
Canada	P-Member
China	P-Member
Czech Republic	O-Member
Denmark	P-Member
Egypt	O-Member
Finland	P-Member
France	P-Member
Germany	P-Member
Greece	P-Member
India	P-Member
Ireland	O-Member
Israel	P-Member
Italy	P-Member
Japan	P-Member
Korea, Republic of	P-Member
Netherlands	P-Member
New Zealand	O-Member
Norway	P-Member
Poland	O-Member
Portugal	P-Member
Romania	O-Member
Russian Federation	P-Member
Serbia	O-Member
Slovenia	O-Member
South Africa	P-Member
Spain	P-Member
Sweden	P-Member
Ukraine	O-Member
United Kingdom	P-Member
United States of America	P-Member

International Energy Agency
Wind Technology Collaboration Program

Mission of IEA Wind

*"...to stimulate co-operation on wind energy research and development and to provide **high quality information and analysis to member governments** and commercial **sector leaders** by addressing **technology development** and deployment and its **benefits, markets, and policy instruments**."*

– IEA Wind Strategic Plan

IEA Wind has broad membership

OECD Participating Countries:

Europe:

Austria, Denmark, Finland, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the European Commission

North America:

Canada, Mexico, and the United States

Asia and Pacific:

Australia, Chinese Wind Energy Association, Japan, and South Korea

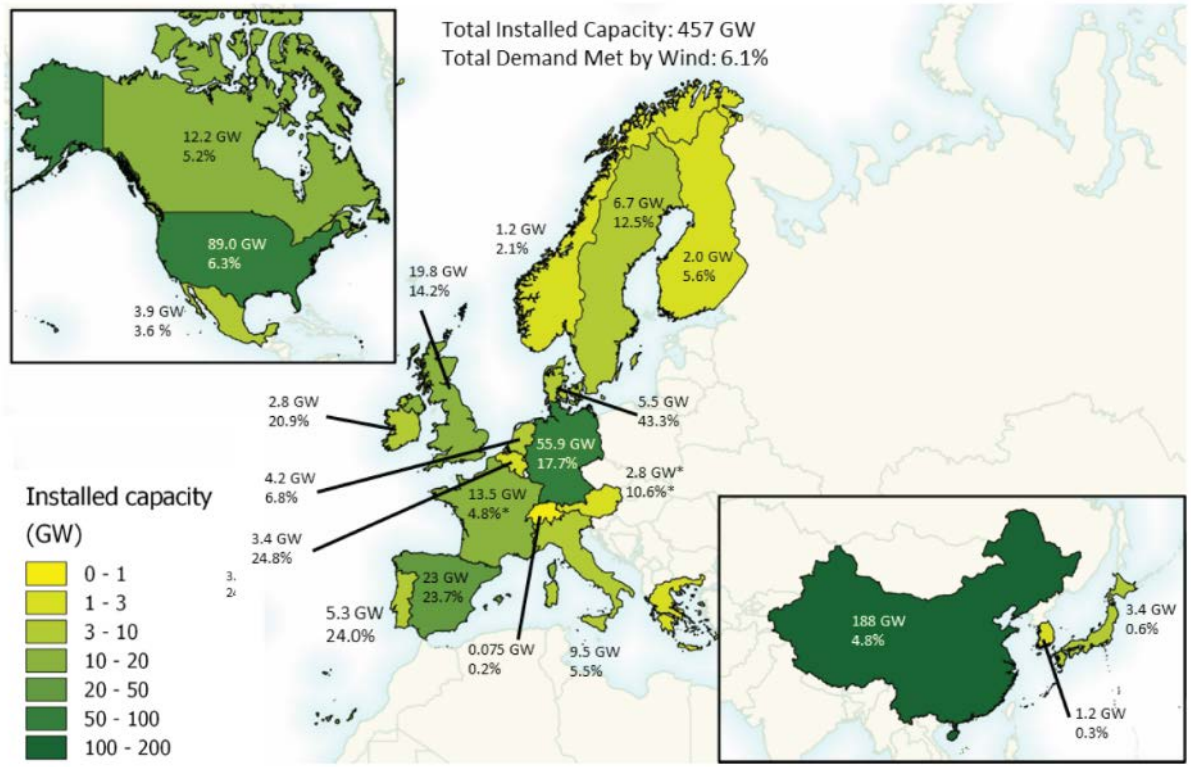
International Organizations (sponsors):

Chinese Wind Energy Association and the European Wind Energy Association

iea Energy Technology Network

Membership Represents 85% of Global Capacity

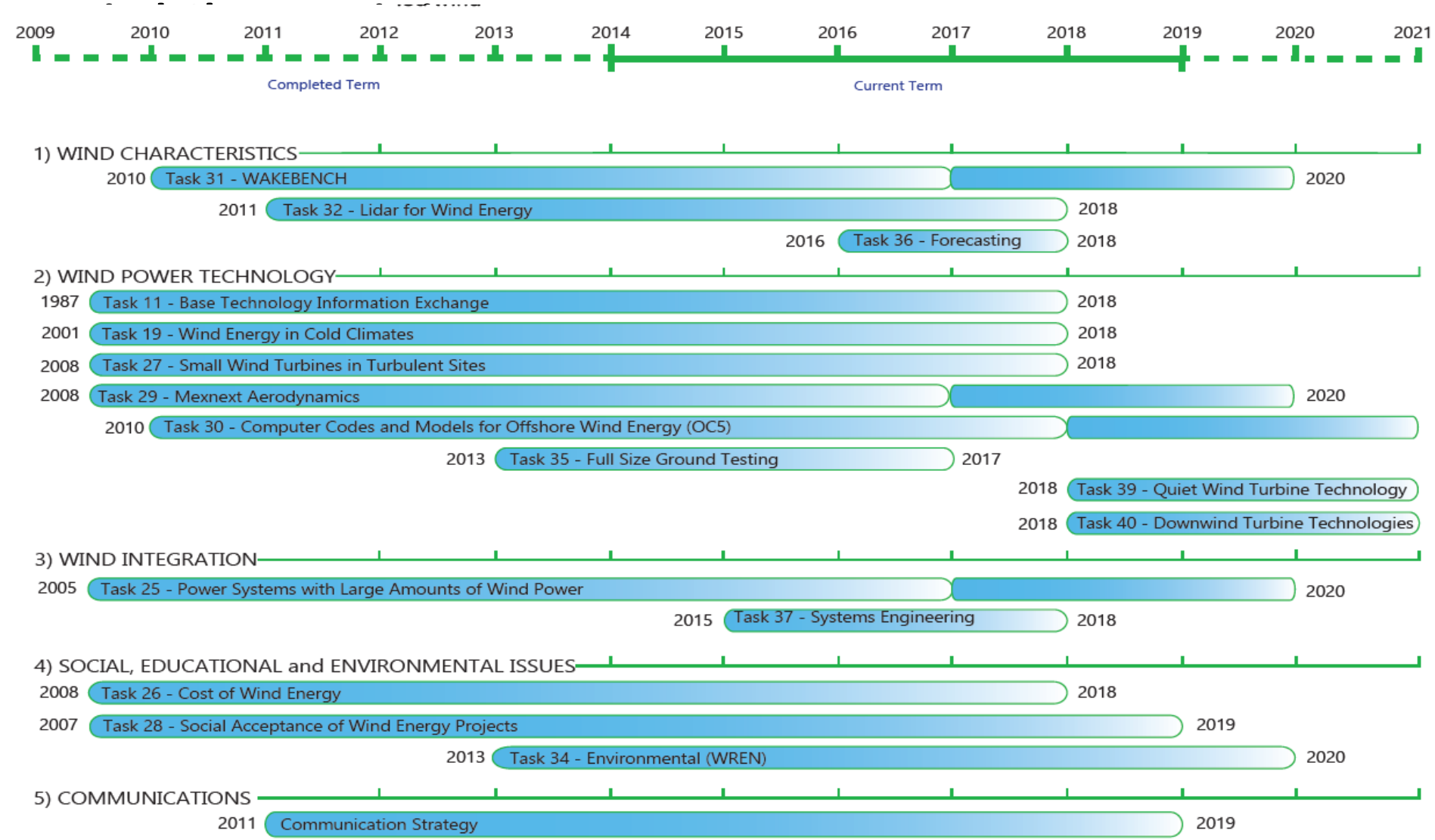
- Austria
- Belgium (2015)
- Canada
- Chinese Wind Energy Assoc.
- Denmark
- European Commission
- Finland
- France (2015)
- Germany
- Greece
- Ireland
- Italy
- Japan
- Korea
- Mexico
- Netherlands
- Norway
- Portugal
- Spain
- Sweden
- Switzerland
- United Kingdom
- United States
- WindEurope



Active Research Tasks of IEA Wind

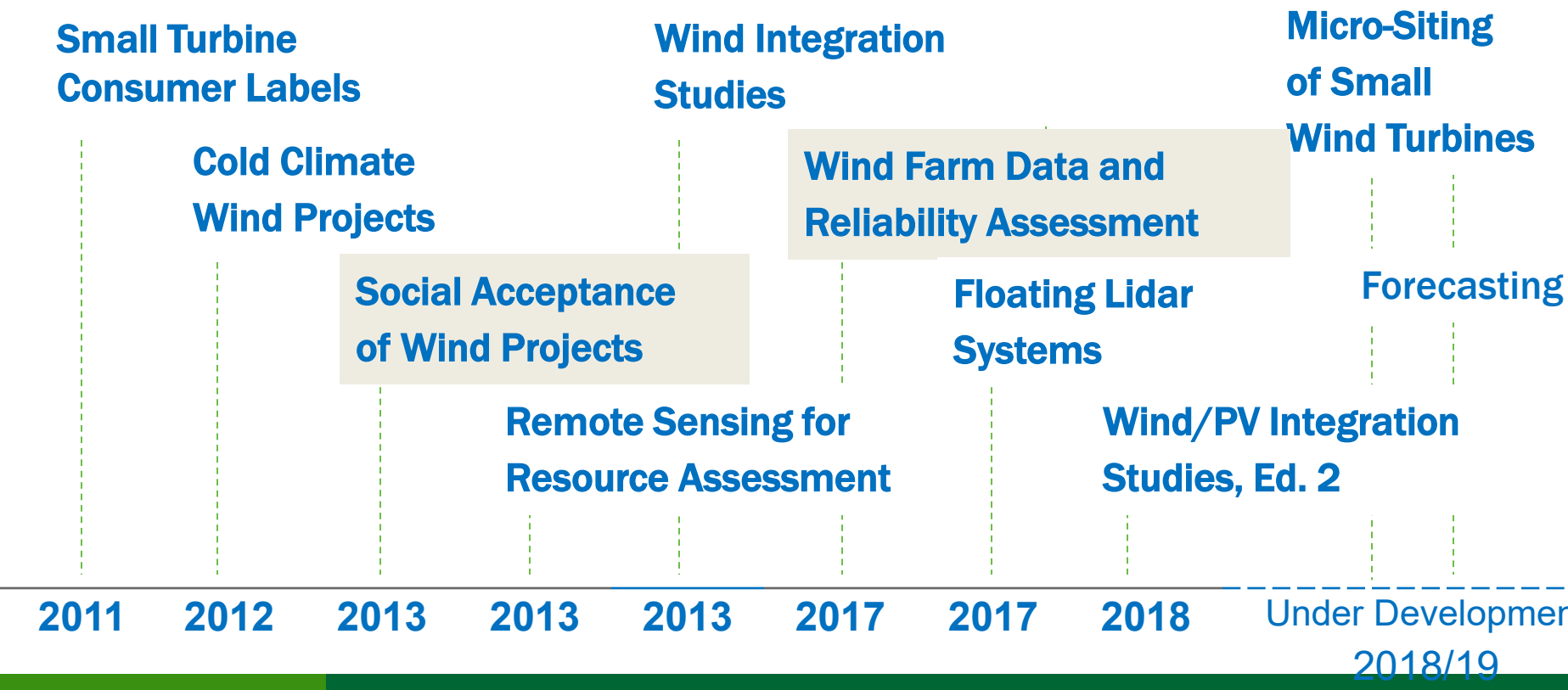
- Life Extension (Task 42)
- Enabling Distributed Wind (Task 41)
- Downwind Turbine Technology (Task 40)
- Quiet Wind Turbine Technology (Task 39)
- Systems Engineering (Task 37)
- Forecasting (Task 36)
- Environmental Assessment and Monitoring for Wind Energy Systems (Task 34)
- Lidar: Wind lidar systems for wind energy deployment (Task 32)
- WAKEBENCH: Benchmarking wind farm flow models (Task 31)
- Dynamic Codes and Models for Offshore Wind Energy (Task 30)
- Aerodynamic Data Analysis of the EU MEXICO Project (Task 29)
- Social Acceptance of Wind Energy Projects (Task 28)
- Cost of Wind Energy (Task 26)
- Power Systems with Large Amounts of Wind Power (Task 25)
- Wind Energy in Cold Climates (Task 19)
- Base Technology Information Exchange (Task 11)

16 Active Tasks – 2014-2019 Priority Areas



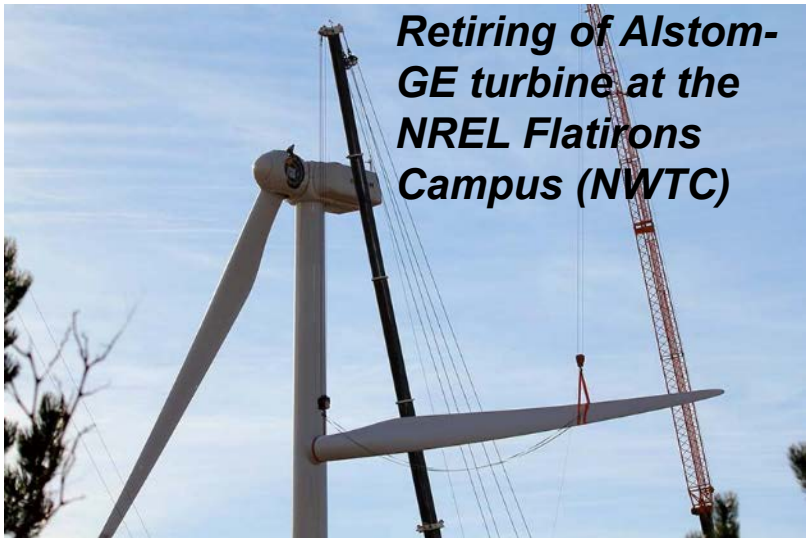
Recommended Practices: Basis for Standards

- Recommended practices serve as guidelines in advance of formal standards
- 16 recommended practices have been issued



DOE International Partnership Agreements (NREL example)

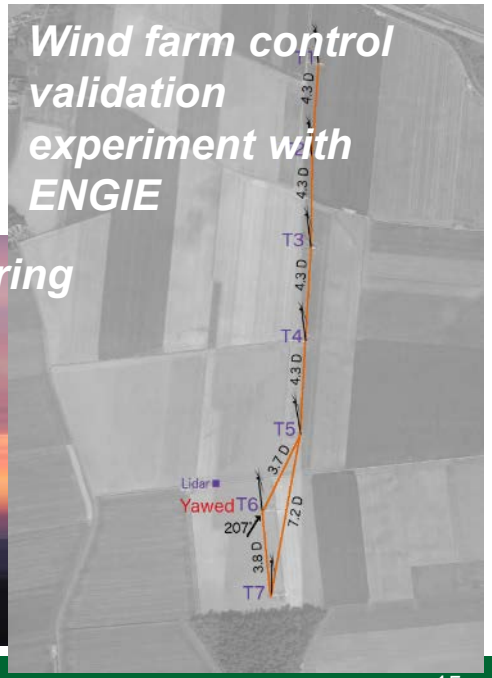
- NREL has 50+ active agreements with international partners
- $55.8M of total international contract value
  - $10.9M of international funds to NREL
  - $12.9M of DOE shared resources
  - $32.0M of international partner shared resources


Retiring of Alstom-GE turbine at the NREL Flatirons Campus (NWTC)

International partnerships are critical for advancing R&D and commercializing innovation because wind is a global industry dominated by large international corporations

Downwind turbine blade study with Hitachi


Many recent international wake steering & wind plant control partnerships



Wind farm control validation experiment with ENGIE

DOE International Researcher Exchanges

- International researcher exchanges are essential to staying at the forefront of innovation and working with the best and brightest
- Exchanges are done through CRADAs, MOUs, and other agreements
- Typical researchers are graduate level Masters or PhD students, PostDocs, or Professionals (Professors, researchers at Research Centers)

Latha Sethuraman

- University of Edinburgh, UK
- NREL PostDoc
- Now NREL Staff Member

Dries Allaerts

- KU Leuven, Belgium
- NREL PostDoc

Liz McMaster

- University of Florida, USA
- NREL Post Undergraduate
- Accepted to European Wind Energy Master Program - Technical University Denmark

Javier Sanz Rodrigo

- National Renewable Energy Centre (CENER), Spain
- NREL Visiting Professional

David Schlipf

- University of Stuttgart, Germany
- NREL Visiting Professional

Pietro Bortolotti

- Technical University of Munich, Germany
- NREL PostDoc
- Now NREL Staff Member