# Handbook on Best Practices for the Successful Deployment of Grid-Connected Renewable Energy, Distributed Generation, Cogeneration and Combined Heat and Power in India

Funded by the U.S. Department of State

A Project of the Asia-Pacific Partnership on Clean Development and Climate (APP)

- **Project Focus**

  Identification of barriers to deployment and increasing the utilization of renewable energy and distributed generation projects in India by identifying enabling environments including, but not limited to, finances, regulation and policies

- **Project has three central components**
  - Workshops in India
  - Exchange visit to the U.S. of workshop attendees
  - Handbook on Best Practices for the Successful Deployment of Grid-Connected Renewable Energy, Distributed Generation, Cogeneration and Combined Heat and Power in India

# Participating Partner Countries and Organizations

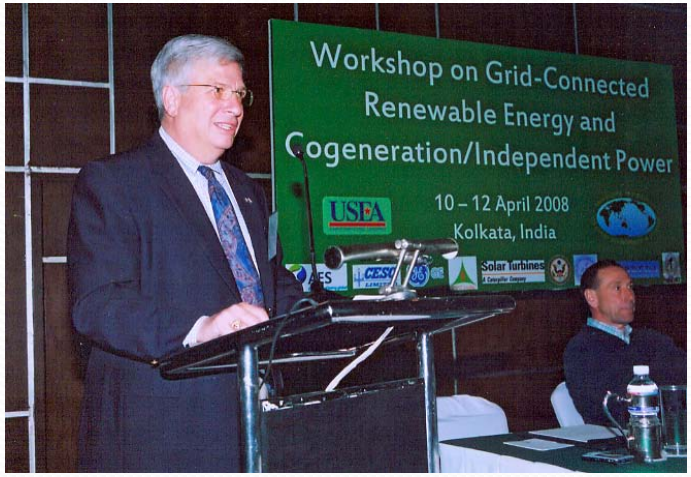
- **Convening Power of the APP – bring together industry, policy makers, regulators**

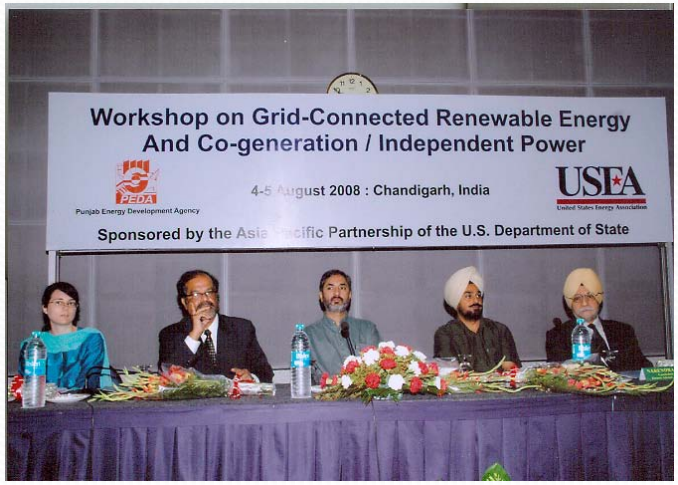
- **U.S.**
  - United States Energy Association
  - Bonneville Power Administration
  - GE Wind
  - Sacramento Municipal Utility District (SMUD)
  - Solar Turbines
  - USAID

- **India**
  - Ministry of New and Renewable Energy
  - Punjab Energy Development Agency
  - Punjab State Electricity Board
  - Punjab Electricity Regulatory Commission
  - PTC India Ltd
  - Turbomach India
  - Gujarat Energy Development Agency
  - Gujarat Electricity Regulatory Commission
  - GETCO
  - West Bengal State Electricity Distribution Company Limited
  - West Bengal Electricity Regulatory Commission
  - CESC
  - West Bengal Renewable Energy Development Agency

# Regional Workshops in India

- Workshops were held in three progressive Indian states: Gujarat, Punjab and West Bengal
- Over 240 Indian participants
- Focused on specific renewable energy and distributed generation projects and key issues that affect the interconnection of renewable energy/distributed generation projects
- Provided an open forum for regulators and other policy makers, utility executives, and project developers to discuss initiatives and changes that could help promote renewable energy and distributed generation projects.



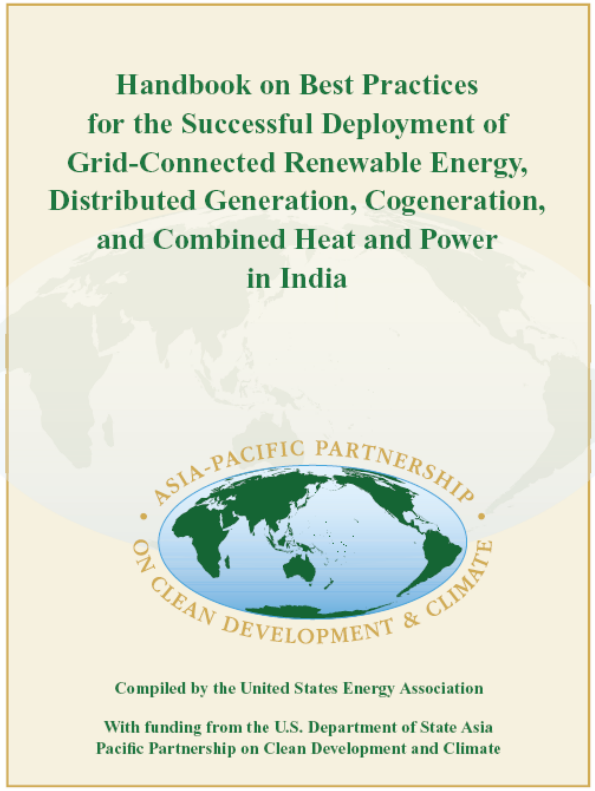
# Executive Exchange in the U.S.

- Senior participants in the workshops then traveled to the U.S. to meet with leaders in integrating renewable energy and cogeneration in the United States
- California and DC
- Discussions at the workshops and the U.S. exchange formed the basis for the Handbook

# Handbook

- Intended for policy makers, utility executives, regulators, and project developers

- The Handbook compiles information from multiple sources on the major barriers confronting the deployment of renewable energy and distributed generation projects into one document



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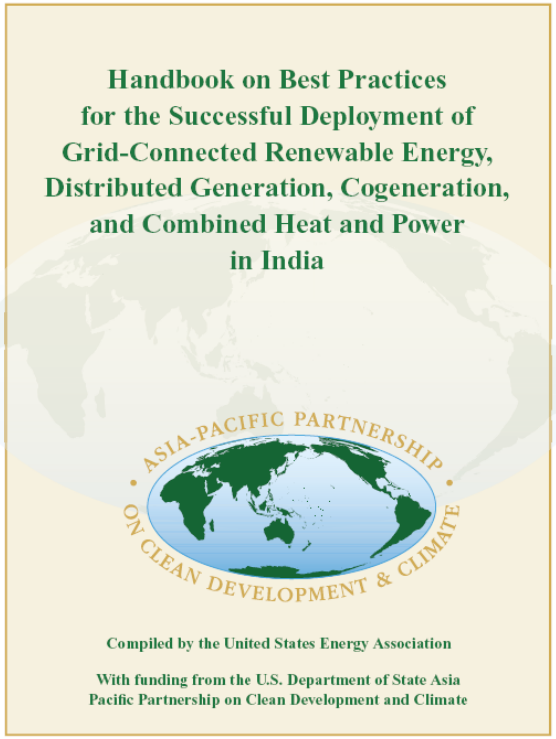

Each topic lists:

- The issue
- Perspectives of the utility, the regulator and the developer
- Description of the best practice
- Links for additional information

# Technical Issues: Grid Stability and Protection
# 3.2.15 Monitoring provisions

- Issue: Developers and utilities disagree over what if any monitoring of facilities and equipment is needed and who pays for the monitoring.

- Utility Perspective: Distributed generation facilities must be monitored for their connection status, real power output, reactive power output and voltage at the point of connection to ensure personnel safety and avoid operating problems, especially if the facility is exporting power to the utility.

- Developer Perspective: Utilities often insist on performing the monitoring themselves for a fee which increases the cost to develop the project. The utility is also not always familiar with the equipment the developer uses and will often insist the developer use familiar equipment that is more expensive so the utility can monitor it. Furthermore, most modern distributed generation units have multi-function microprocessor-based control systems with the capacity to log data around fault condition and store data.

- Regulator Perspective: Monitoring of equipment is important to maintain system integrity and is included in the contract or tariff between the developer and the utility.

- Solution/Best Practice: Units under 200 kW require no monitoring, units from 200 kW to 1 MW do not require monitoring if there is protective relaying that prevents the facility from injecting energy into the utility's network, and all units over 1 MW require monitoring. The monitoring arrangement should include a Remote Terminal Unit that performs SCADA, communications equipment, telephone circuit protection equipment, transducers, potential and current transformers, electrical energy and demand information, reactive power information, voltage information and alarms. The monitoring should display two seconds of data from before and after any fault and should keep data for the last 10 fault conditions. The utility should receive signals for remote monitoring of the isolation device status, normal voltage and frequency levels, and notice that the distributed generator is unable to connect to the utility network.

Source and For More Information: The NRECA Guide to IEEE 1547 (March 2006) pgs. 36-38
http://www.nreca.org/Documents/PublicPolicy/DGApplicationGuide-Final.pdf

# Available at: http://www.usea.org/Programs/APP/Best_Practices_Handbook_India_HYPERLINKS.pdf

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