

U.S.-CHINA RENEWABLE ENERGY PARTNERSHIP



U.S.-China RE Partnership (USCREP)

- Established in 2009 by China National Energy Administration and U.S. Department of Energy
- Coordinated by Energy Research Institute (China) and National Renewable Energy Laboratory (U.S.)
- Promotes public-private collaboration in support of accelerated renewable energy deployment
- Promotes knowledge exchanges and business partnerships in both countries

Current Work



Renewable Energy Technology

CSP tariff policy frameworks
PV financing



Standards and Certification

PV Quality Assurance from modules to systems
Collaborative round-robin testing of PV cells



Policy, Planning and Markets

Comparative RE policy and market design
Best practices in RE Planning and Grid Integration
Collaboration on 'New Energy Cities'



Grid Integration

Comparison of US-China RE grid codes
System design for distributed generation
Support for Chinese Variable Generation Integration Group

PV Financing Innovation



DOE “Solar Access to Public Capital” Working Group

Chinese Solar PV Financing Alliance

Expand
availability of
capital

Comprehend opportunities and barriers

Developers

Building industry around informational
elements:

EPC

Standard Contracts

Legal

Best Practices

Investment

Robust Datasets

Rating
Agencies

Engagement with investors

Certification &
Standards

Promote adoption by developers,
financiers, law firms

Lower cost of
capital

Work with government agencies, policy &
commercial banks to build extra credit
enhancement

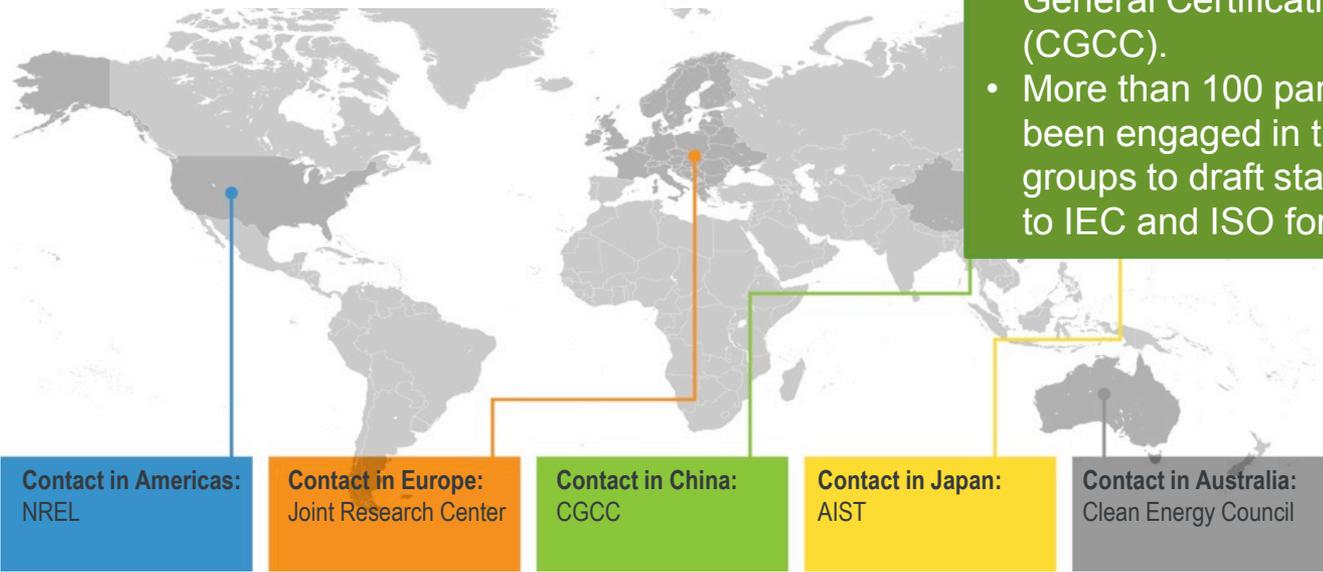
Manufacturers

Reduce
transaction
cost, time to
access capital

PV Quality Assurance



International PV Quality Assurance Task Force (PVQAT)



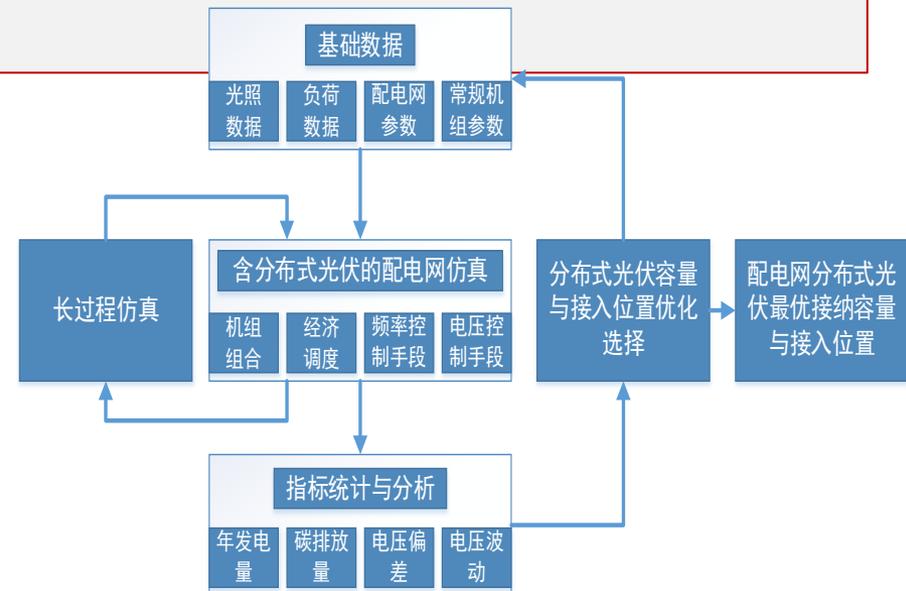
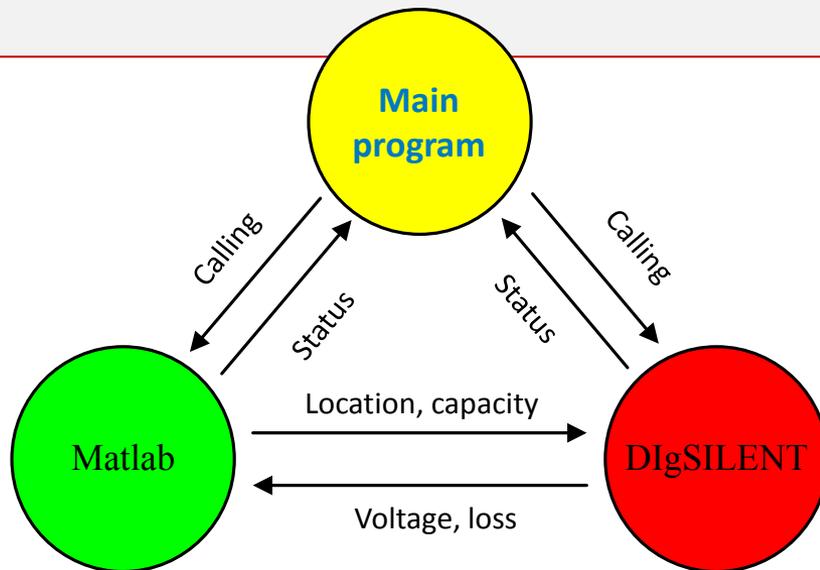
- China joined PVQAT in 2014 under the stewardship of the China General Certification Center (CGCC).
- More than 100 participants have been engaged in the 11 working groups to draft standards submitted to IEC and ISO for adoption

New Energy Cities

- **Complete project report: "Research on the Development of New Energy Cities in China and Low-Carbon Energy Cities in U.S."**
- **China and the United States identified 3-4 cities for the study**
- **Systematically researched the new energy development status in these cities**

Impact of high PV penetration on distribution network

1. China Electric Power Research Institute studied and mastered long duration simulation methods based on full-year solar resource data and load data, and proposed an optimization method for distributed PV generation that minimizes grid loss and maximizes annual power generation.
2. Analyzed the impact of connecting high penetration distributed PV generation to the distribution grids, and proposed technical solutions such as voltage reactive control, relay protection adaptability, islanding prevention, gridding forecasting and scheduling.



Simulation platform illustration Flowchart of optimization planning method

Variable Integration: CVIG as a platform

- **Founded in 2014**
- **Conducted four large seminars and four lectures**
- **Participated by a dozen of experts from NREL, UVIG, MISO, WECC and experts from Denmark and Germany**
- **Research on power system planning methods, power flexibility, market mechanism reform for large-scale wind power integration and distributed generation**
- **Research report: “Integration Large-Scale Renewable Generation: Releasing Power System Flexibility”**



Future Cooperation Opportunities



Increasing importance in U.S.-China Renewable Energy Collaboration

- **U.S.-China Joint Announcement on Climate Change at 2014 APEC meeting**
- **The United States intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025.**
- **China intends to achieve the peaking of CO2 emissions around 2030 and to make best efforts to peak early and intends to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030.**
- **Renewable energy is a key pathway to realize the goals and it is a key area to deepen collaboration.**

Deepen policy dialogue and research on market mechanisms

- **Renewable energy development strategy and policy dialogue**
 - U.S. Clean Power Plan
 - China Energy Revolution Strategy
- **Innovative research on market mechanisms**
 - Fluctuate power generation market mechanism
 - Market mechanism to release power system flexibility
 - Promote reform and innovation in U.S. and Chinese power markets
- **New Energy Cities**
 - New Energy City for the future
 - 100% renewable energy areas
 - Concepts and methods for planning and design
 - U.S.-China city visits and training workshops

Improve investment, finance, and trade environment

- **Basic conditions for distributed power generation market**
 - Standard contracts
 - Power station quality assurance
- **Innovation on business models and investment/financing tools**
 - Asset securitization
 - Yieldco
- **Investment trade**
 - Participate in promoting policy dialogues on investment trade
 - Create better environment for mutually beneficial cooperation

Promote integration of fluctuating and distributed power

- **Utilize CVIG exchange platform**
- **Flexible power system trends of the 21st century**
- **Micro-grid**
- **Smart-grid**
- **Standard specification comparison and analysis**
 - Connect distributed PV generation into low-voltage grid

Strengthen technological innovation and industrialization

- **Focus on enterprises**
- **Solar thermal power generation projects**
 - Continue promoting technological research and demonstration projects on concentrated solar power (CSP)
- **Smart energy systems**
 - Internet technology applications
 - Energy Internet
- **Integrated energy systems**
 - Integrate and optimize renewable energy and end-use energy systems

中美可再生能源合作



中美可再生能源合作 (USCREP)

- 2009年由中国国家能源局和美国能源部共同成立
- 由中国能源研究所和美国国家可再生能源研究室协调
- 支持公私合作关系，加速可再生能源的推广
- 促进两国的知识交流和商业合作

目前工作



可再生能源技术

聚光太阳能发电上网电价政策框架
光伏发电融资



标准和认证

从组件到系统的光伏发电质量认证
光伏电池循环协作式的测试



政策、规划和市场

可再生能源政策和市场比较
可再生能源规划和并网的最佳实践
“新能源城市”合作



电网整合

中美可再生能源电网标准对比
分布式发电的系统设计
支持中国可再生能源并网研究协作组

光伏融资创新



美国能源部“太阳能项目获取公共资金”工作组

中国太阳能光伏融资联盟

扩大可用资金

了解机遇和障碍

开发商

建立行业内的信息标准化：

总承包

标准合同

法律

降低资金成本

最佳实践

投资机构

强大数据库

与投资方沟通

评级机构

降低交易成本和获取资金的时间

促进开发商、融资方和律所

认证和标准

与政府机构合作、政策和商业银行建立更多的信用增级

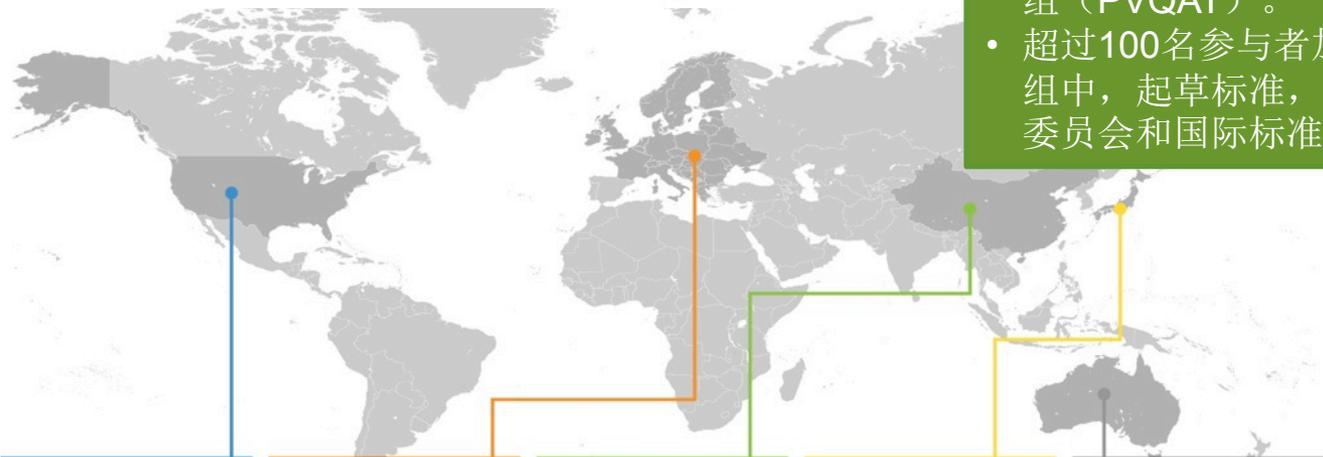
制造商

光伏质量认证

国际光伏质量认证专责小组 (PVQAT)



- 在鉴衡认证中心的带领下，中国于2014年加入国际光伏质量认证专责小组（PVQAT）。
- 超过100名参与者加入到11个工作小组中，起草标准，并递交到国际电工委员会和国际标准委组织进行采纳



美洲联系方：
国家可再生能源研究室

欧洲联系方：
联合研究中心

中国联系方：
鉴衡认证中心

日本联系方：
产业技术综合研究所

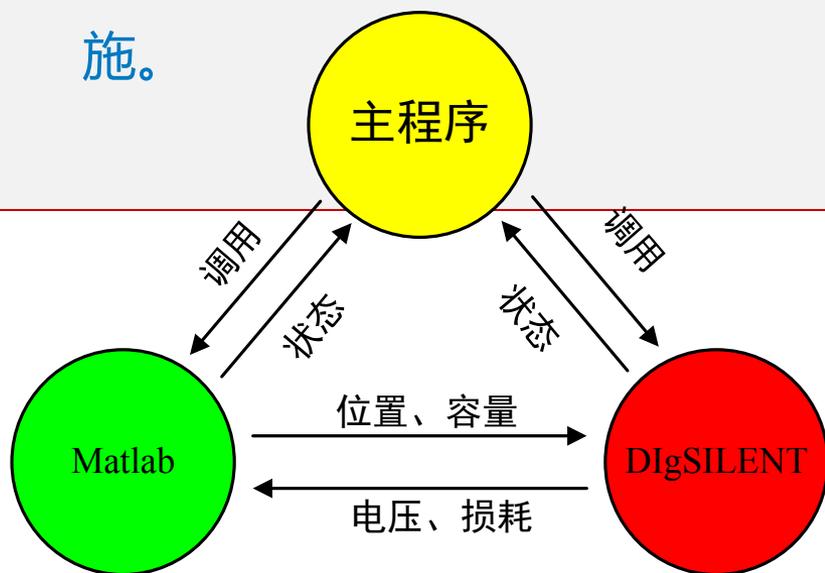
澳洲联系方：
清洁能源理事会

新能源城市

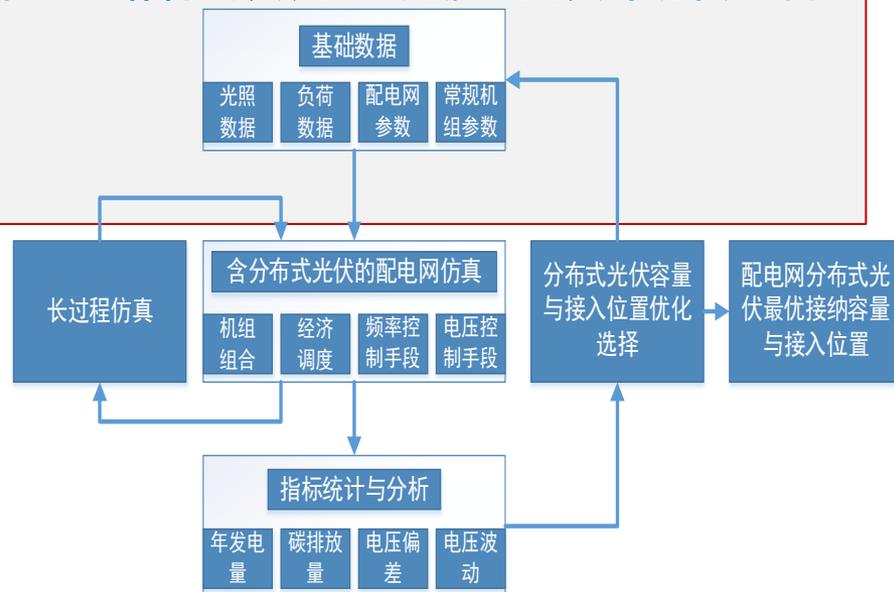
- 完成《中国新能源城市和美国低碳能源城市发展研究》项目报告
- 中美各确定3-4个城市作为研究对象
- 系统研究几个城市新能源发展状况

高比例光伏对配电网的影响

- 1、中国电科院等机构学习掌握了基于全年光资源数据和负荷数据的长过程仿真方法，提出了基于电网损耗最小和年发电量最大的分布式光伏发电优化规划方法。
- 2、分析了高渗透率分布式光伏发电接入配电网的影响，提出了无功电压控制、继电保护适应性、孤岛防治、网格化预测与调度等技术解决措施。



联合仿真平台示意图



优化规划方式流程图

并网研究：可再生能源并网研究协作组（CVIG）是一个平台

- 2014年正式成立
- 4次大型研讨会和4次报告会
- 美国NREL，UVIG，MISO，WECC和丹麦、德国专家数十人参与
- 电力系统规划方法、电力灵活性、市场机制改革 for 大规模风电并网、分布式发电
- 研究汇编《大规模可再生能源电力并网消纳：释放电力系统灵活性》



未来合作机遇



中美两国可再生能源合作日益重要

- **2014年APEC会议中美双方发布应对气候变化的联合声明。**
- **美国提出到2025年温室气体排放较2005年整体下降26%-28%**
- **中国提出2030年左右中国碳排放有望达到峰值，并将于2030年将非化石能源在一次能源中的比重提升到20%。**
- **可再生能源是实现目标的关键途径，是深化合作重点领域**

深化政策对话和市场机制研究

- 可再生能源发展战略与政策对话
 - 美国清洁电力计划
 - 中国能源革命战略
- 市场机制创新研究
 - 波动性发电的电力市场机制
 - 释放电力系统灵活性的市场机制
 - 推动中美电力市场改革创新
- 新能源城市
 - 面向未来的新能源城市
 - 100%可再生能源区域
 - 规划设计理念和方法
 - 中美城市互访、培训会

改善投融资和贸易环境

- 分布式发电市场基础条件
 - 标准合同
 - 电站质量认证
- 商业模式和投融资工具创新
 - 资产证券化
 - Yieldco
- 投资贸易
 - 参与推动投资贸易政策对话
 - 创造更好互利合作发展环境

推动波动性和分布式发电并网

- 借助**CVIG**交流平台
- **21世纪灵活电力系统趋势**
- 微电网
- 智能电网
- 标准规范对比分析
 - 分布式光伏发电接入低压电网

加强技术创新和产业化

- 以企业为主体
- 太阳能热发电项目
 - 继续推进CSP技术研究和示范项目建设
- 智慧能源系统
 - 互联网技术应用
 - 能源互联网
- 集成能源系统
 - 可再生能源与终端能源系统的集成优化