



IEC System for Certification to Standards  
Relating to Equipment for Use in Renewable Energy Applications



# IECRE Certification for PV Systems

**Forum on Regional Cooperation:  
Developing Quality Infrastructure for Photovoltaic Energy Generation**

**Santiago, Chile**

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# Ensuring the Reliability of Photovoltaic Power Systems Using International Standards and the IECRE Conformity Assessment System

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# Background



- Industry **Growth**
  - Demand increasing steadily >20% per year
  - Significant increase in large commercial plants
- Concern for **Quality / Bankability**
  - Doubts about adequacy of existing standards
  - Need for improved understanding of reliability
  - Validation of product lifetime for investors
- Need for **Conformity Assessment**
  - Assurance of security for investments in PV
  - Objective evidence of performance

# Conformity Assessment



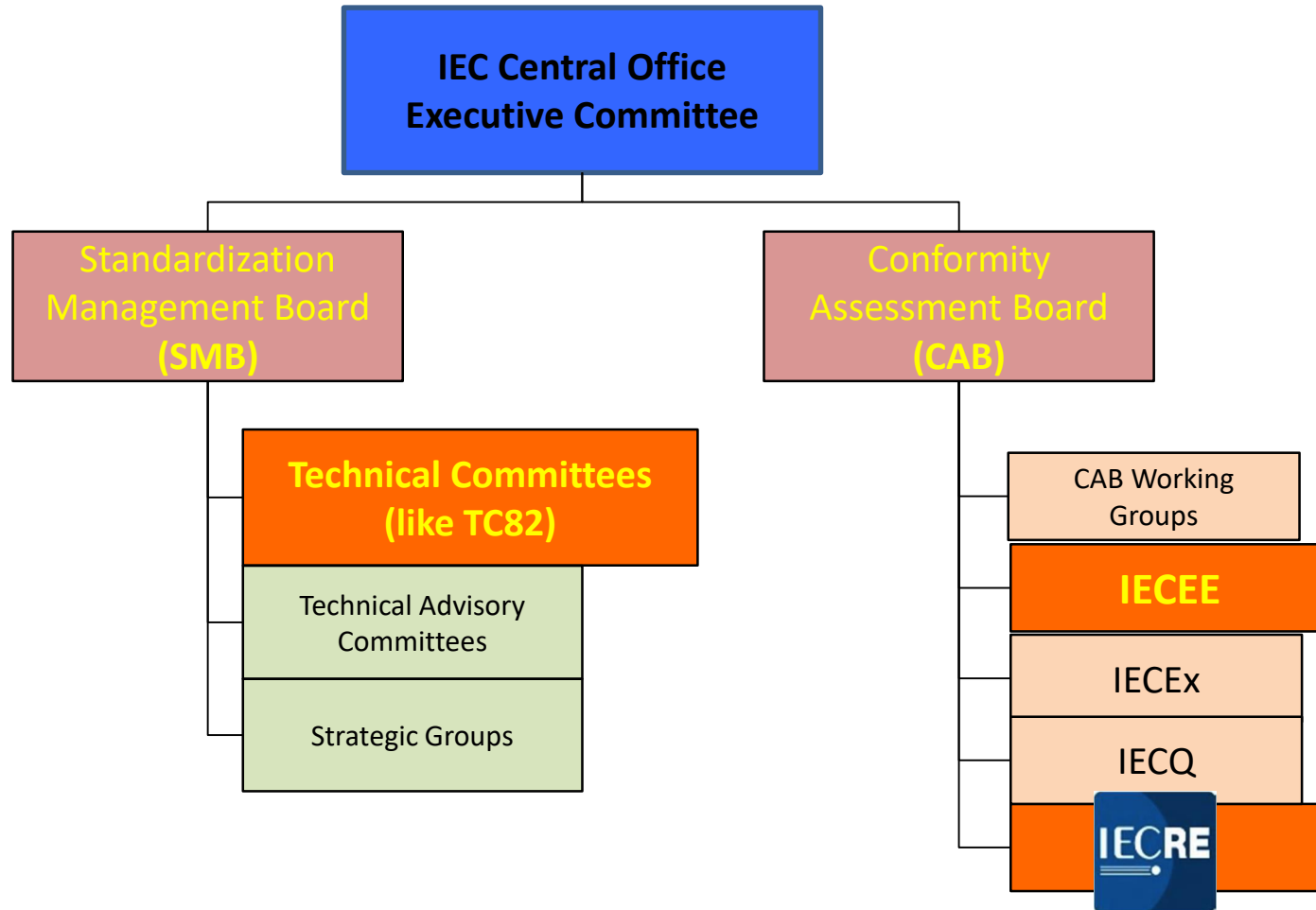
- Evaluation against **international** standards
  - May use national or regional standards if no international standard is available
- Improved **quality** and **performance**
  - Assurance that PV plant will operate as designed for its expected lifetime
- Increased **confidence** for investors
  - Financial return meets expectations
  - Risk is reduced

# Benefits of IEC Systems



- IEC **Brand**
  - Global recognition – multiple industries
  - International recognition (e.g. WTO + UN)
  - IEC Reports and Certificates used nationally
- Open and Transparent **Process**
  - Clear Rules in process and results
  - Consistency in processes among participating Certification Bodies & Test Labs
- Industry and market provide **direct input**
  - CA systems driven by market demand

# IEC Organization

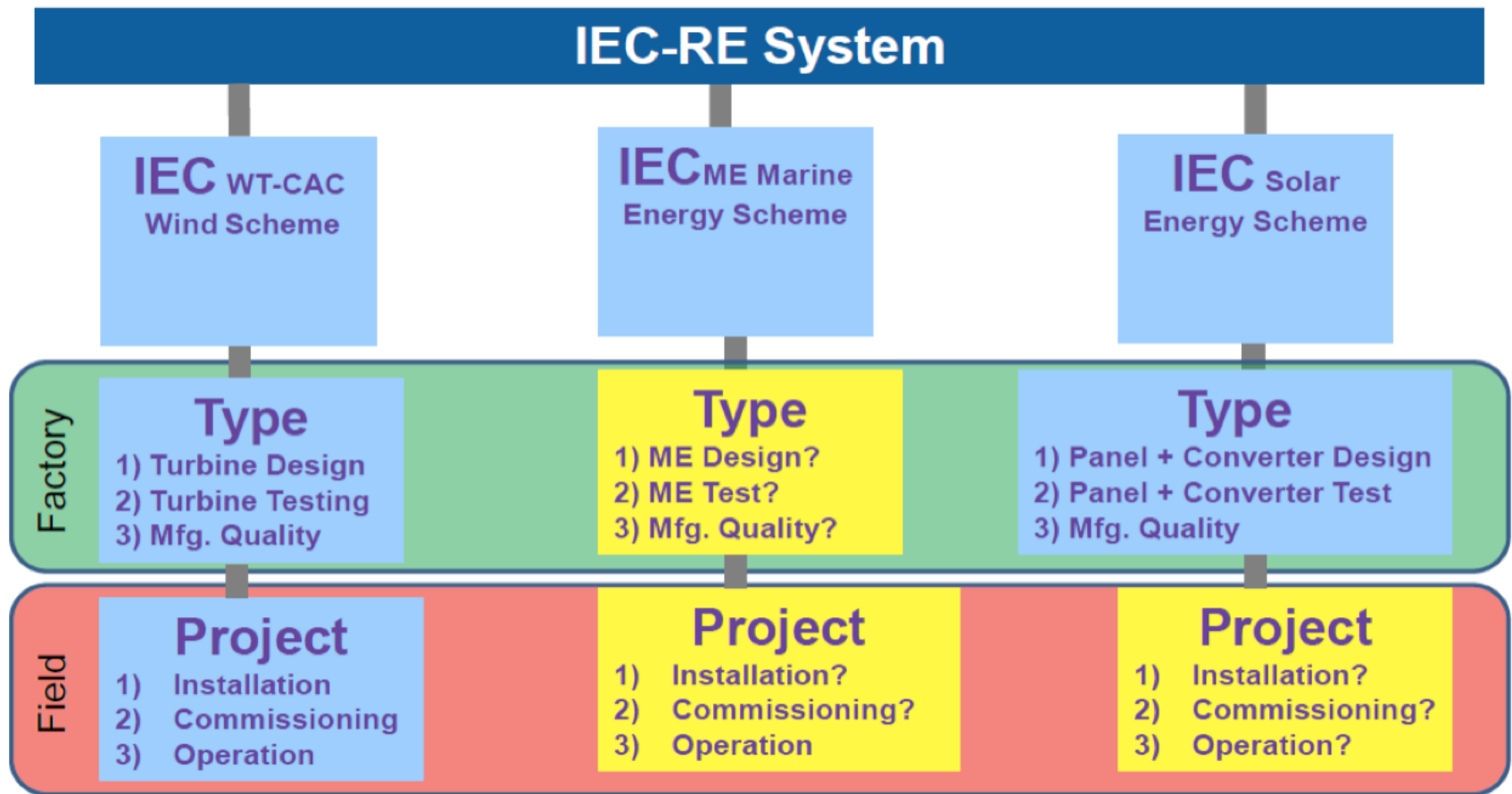


# Wind Turbine History



- Wind industry identified the need to address the “**system aspect**” of large complex projects
  - Not covered by any existing CA scheme
- Formed Wind Turbine Conformity Assessment Committee (**WT-CAC**) in 2011
  - IEC structure / policy requires **separation** of standardization and CA activities
- Concept developed for new CA system (**IECRE**)
  - Similar requirements exist for large **Solar PV** power plants as well as **Marine Energy** projects
  - Specific differences and details apply for each industry

# RE Common Elements



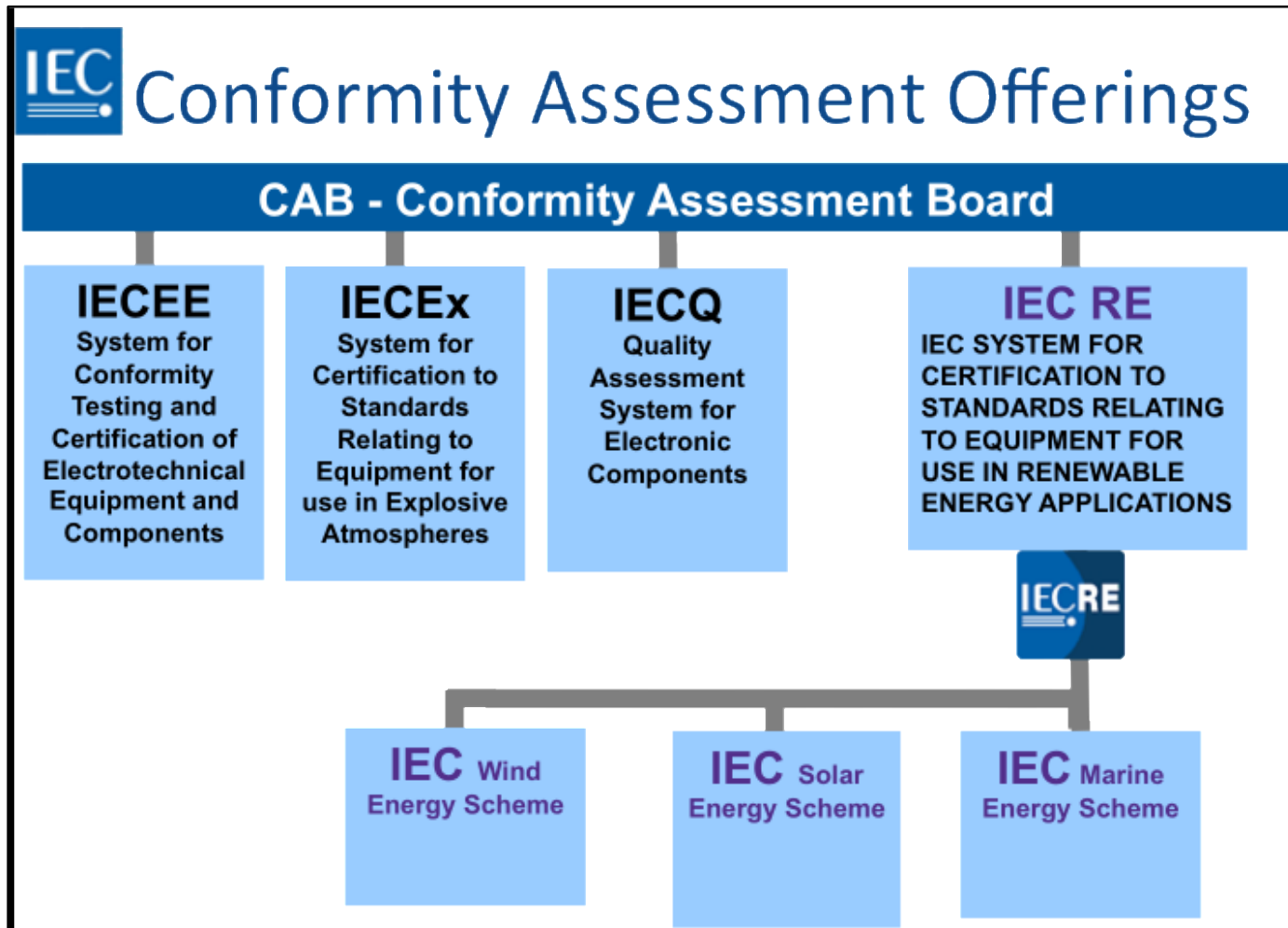


# IECRE Formation



- June 2013 CAB approves the creation of a **Renewable Energy** Conformity Assessment System
  - Oct 2013 Kick-off meeting in Aarhus, Denmark
- June 2014 CAB approves the **Basic Rules** for operation of the IECRE system
- Sept 2014 First Management Committee (**REMC**) meeting
  - Each industry sector established an **Operating Management Committee** (OMC) to address their specific needs and define the certification schemes required

# IEC Conformity Systems



# PV-OMC Progress

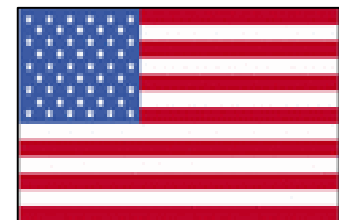
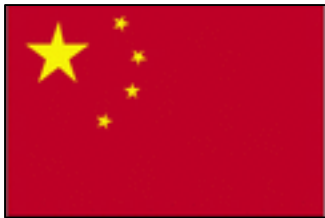


- Approved **Rules of Procedure (RoP)** April 2016
  - Updated Ed. 2 balloted in Sept 2017
- The PV-OMC is concentrating on determining the most critical issues for **stakeholders** and how they can be addressed by **certifications**
- **Operational Documents** will describe requirements for different certification offerings
  - Multiple aspects of certification tied to lifecycle / events
  - Certificate often required for financial milestones

# PV-OMC Member Bodies



- 12 Countries represented by National Committees

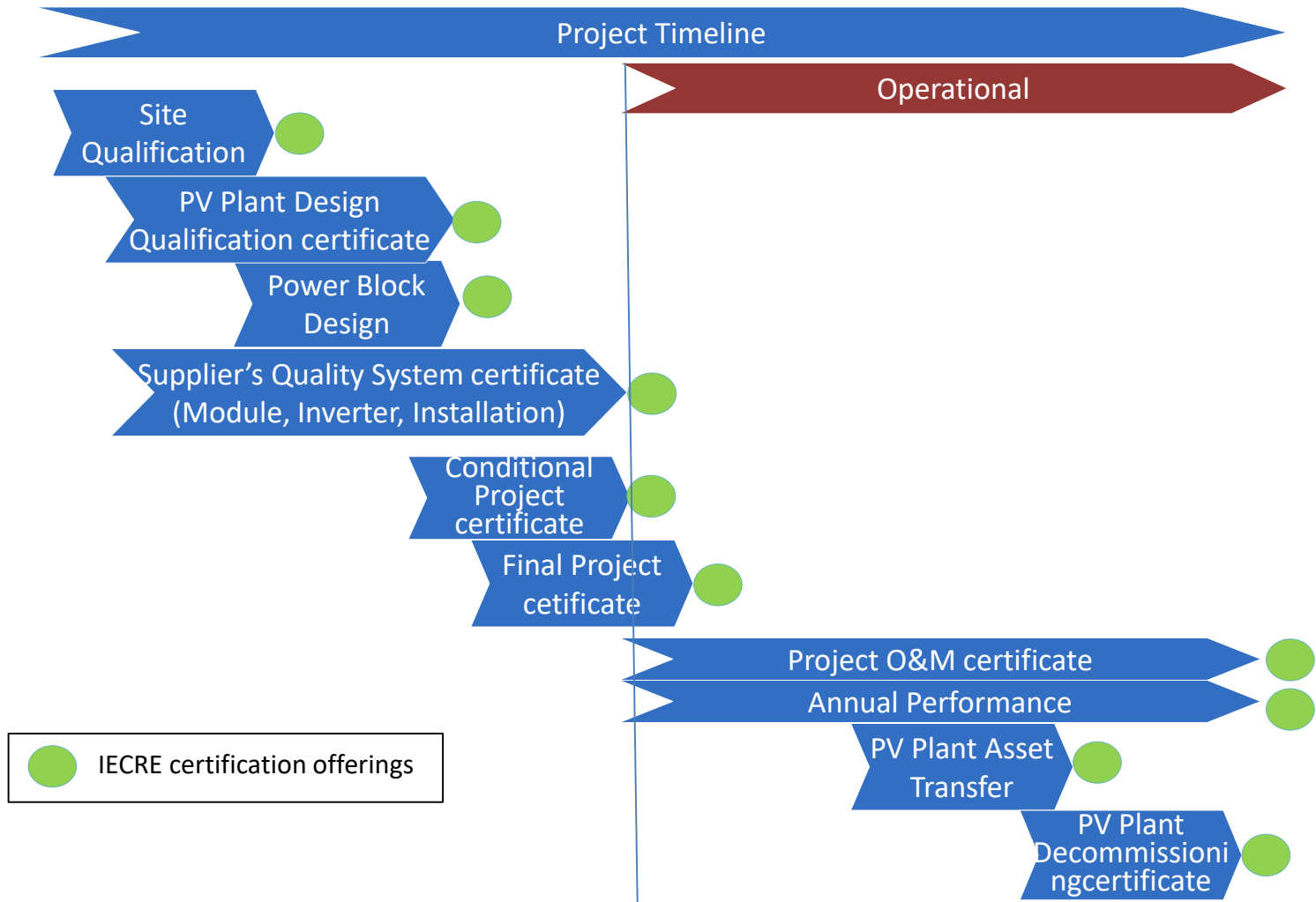


# Aspects of Certification



- Conformity assessment will be performed and certificate issued for an individual PV power plant on a specific site
- **Design Phase**
  - Site evaluation
  - Design evaluation
  - PV equipment evaluation
  - Structural and electrical code compliance
- **Implementation Phase**
  - Installation
  - Output measurement
  - Commissioning surveillance
  - Operation and maintenance surveillance

# System Timeline View



# Certificate Categories



- PV Site Qualification certificate
- PV Power Block design qualification certificate
- PV Plant Design qualification certificate
- Conditional PV Project certificate  
(construction complete / commissioning)
- Annual PV Plant Performance certificate
- PV Asset Transfer certificate
- PV Decommissioning certificate

# PV System Certificates



- Need confidence that *each step* during a project is completed correctly
- For simplicity, today we will discuss four steps:
  - Design qualification (ready to proceed with construction)
  - Substantial completion (ready to operate)
  - Annual performance (final completion, or annual check up)
  - Asset transfer (define health of plant as basis for acquisition)



# PV System Certificates



## Example considerations

- Local code requirements met
- **Component selection**
  - **Qualified for application**
  - **Quality control during manufacturing**
- Safety:
  - Restricted access if appropriate
  - Continuously monitored
  - Overcurrent protection
- Good design
  - Shading considered
  - Trenching

# PV System Certificates



## Example considerations

- Local code requirements met
- Commissioning completed
- Component quality verified
- Quality management during installation
  - Workers trained with oversight
  - Any design changes reviewed
  - Continuous improvement
- Performance check
  - Does power output match the design?

# PV System Certificates



## Example considerations

- Based on measured weather and original model, does plant perform as expected?
  - Energy availability (e.g. if inverters break, the plant could be unavailable)
  - Performance index (measured performance divided by expected performance based on measured weather)
- O&M costs
  - Relative to planned cost, how much did it cost to keep the plant running?

# PV System Certificates



## Example considerations

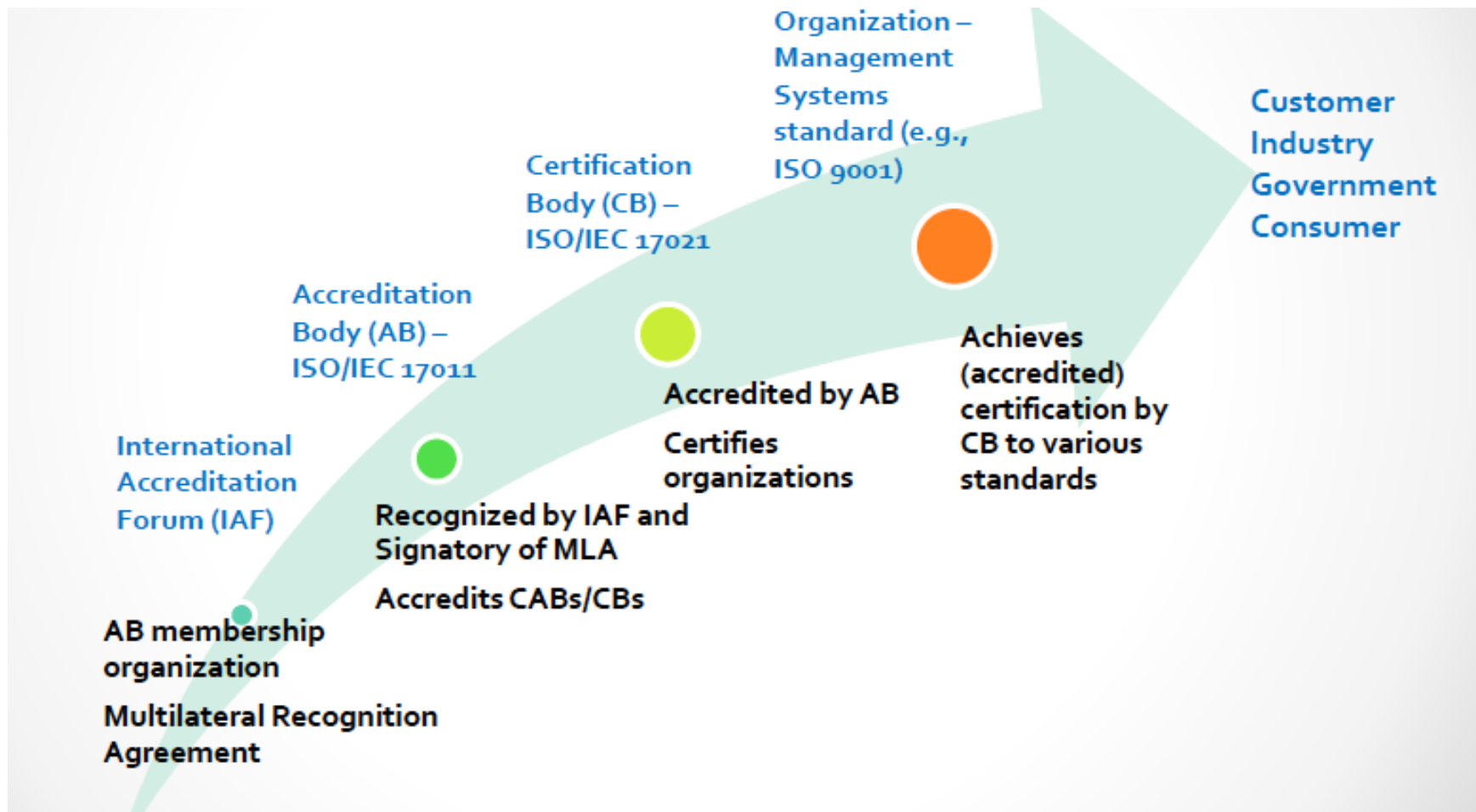
- Has plant output been consistent with original model?
- Have O&M costs been consistent with original model?
- Is there evidence of problems to come? (Cracked cells, weeds growing through the modules, hot spots)

# Operational Documents



TITLE	OD	STATUS
Conditional PV Project certificate (commissioning)	401	Published 2016
Conditional PV Project certificate (construction complete)	401-1	Draft in process
Annual PV Plant Performance certificate	402	Published 2016
PV Plant Design Qualification certificate	403	Draft in process
PV Site Qualification certificate	403-1	Draft in process
PV Power Block Design Qualification certificate	403-2	Future work
PV Asset Transfer certificate	404	Draft in process
PV Decommissioning certificate	409	Future work
PV Module Factory QMS certificate	405	Published 2016
PV System Installation QMS certificate	410	Future work
PV Inverter Factory QMS certificate	4xx	Future work

# Mutual Acceptance



# Next Steps



- Finish **Operational Documents (ODs)**
  - Scope and requirements for each certificate offering
- Approve **Participant Applications**
  - Certification Bodies / Inspection Bodies / Test Labs
  - Begin peer assessment process during 2017
- Start **Issuing Certificates** in the PV sector
  - Project Completion
  - Power Plant Performance
  - Module Factory QMS

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International Electrotechnical Commission  
Technical Committee 82 - Solar photovoltaic energy systems



Thank you for your attention  
Questions?

Contact [george@sunset-technology.com](mailto:george@sunset-technology.com)

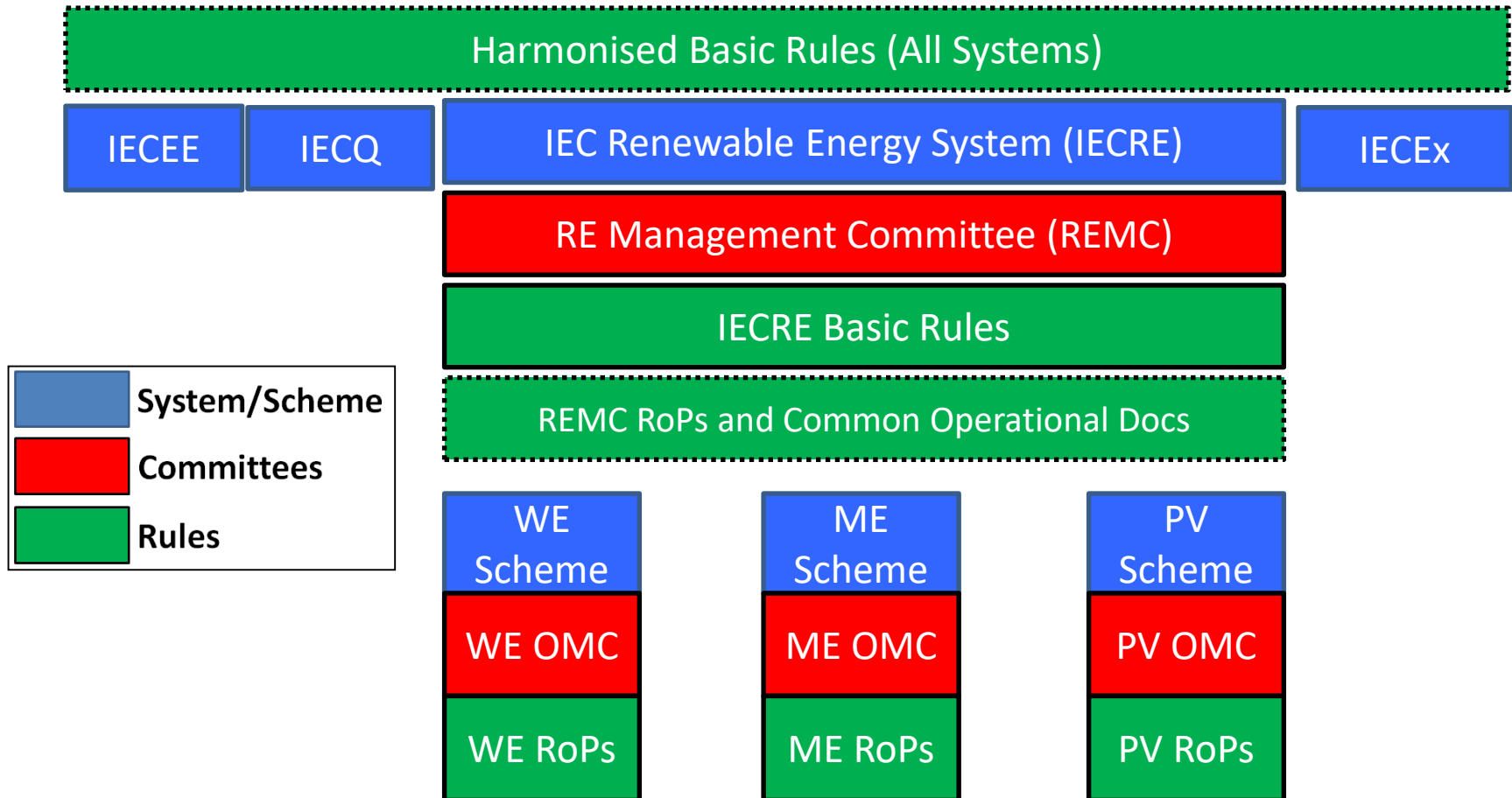




# BACKUP SLIDES



# IECRE Hierarchy





# Existing CA Systems

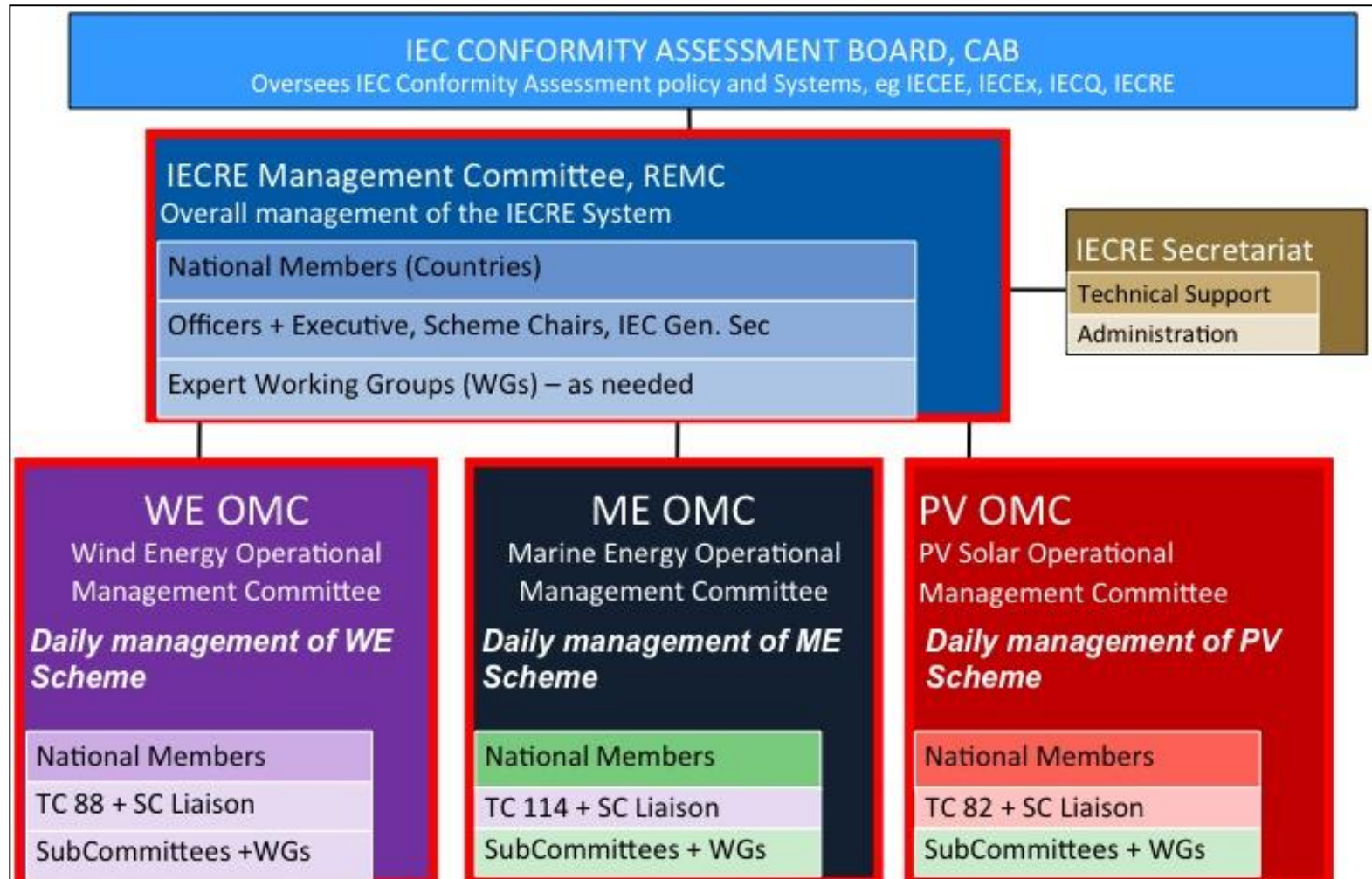
- **IECEE**
  - System for conformity testing and certification of **electrotechnical equipment** (specific categories including PV modules)
  - Oversees the Certification Body (CB) Scheme and recognizes CB Testing Laboratories (CBTL)
- **IECEX**
  - Conformity assessment for equipment operating in **explosive atmospheres**
- **IECQ**
  - Quality assessment system for **electronic components** and associated materials

# IECRE Basic Rules



- Scope
  - Governing documents
  - Membership
  - Organization
  - RE Management Committee
  - Officers, Executive and administration
  - Committees reporting to the MC
  - Legal provisions
  - Standards
  - Voting
  - Finance
  - Dissolution of the IECRE System
- IECRE System [Basic Rules](#) approved by CAB in June 2014

# Organizational Structure



# PV-OMC Officers



- PV OMC Chairman:
  - [Adrian Häring](#) (Germany)
- PV OMC Vice-Chairman:
  - [Sewang Yoon](#) (Korea)
- Next meeting planned for [December 2017](#)
  - Madrid, Spain

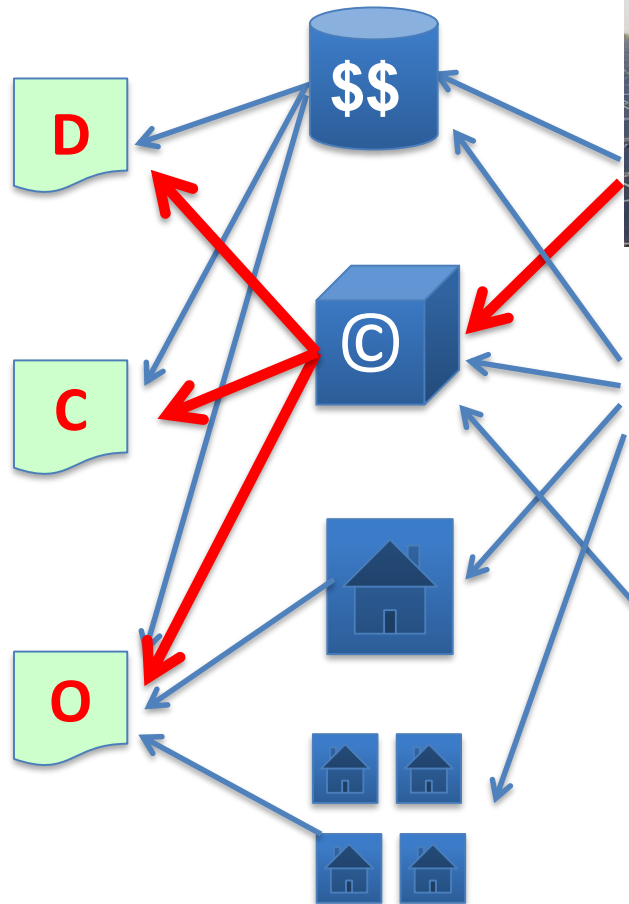




# System Certifications



- **Lifecycle Stage**
  - Design
  - Commissioning
  - Operation
- **Operator Class**
  - Utility
  - Commercial
  - Residential
  - Aggregate
- **Location Class**
  - Ground
  - Roof
  - BIPV







# ANSI - Onion Analogy



# Peer Assessment

