

# Report on Capacity Building of the AREU Staff

PN. No. 15.2000.6-001.04  
Consulting Services for Capacity Building  
And Support to Afghanistan Renewable Energy  
Union

Government of Afghanistan



# Contents

<b>1. INTRODUCTION.....</b>	<b>1</b>
<b>1.0 Abstract.....</b>	<b>1</b>
<b>1.1 Objectives of this Report.....</b>	<b>2</b>
<b>1.2 Deliverable.....</b>	<b>2</b>
<b>2. BRIEF DESCRIPTION OF THE CAPACITY BUILDING PROGRAM.....</b>	<b>3</b>
<b>3. CAPACITY BUILDING OF AREU STAFF .....</b>	<b>5</b>
<b>3.1 Data Gathering, Compilation and Analysis .....</b>	<b>5</b>
<b>3.2 PV Project (s) Design .....</b>	<b>6</b>
<b>3.3 Latest knowledge of PV Project(s) Management     Methodologies/Mechanisms .....</b>	<b>8</b>
<b>3.4 Preparation of Information Brochures/Documents.....</b>	<b>10</b>
<b>3.5 Event Management.....</b>	<b>12</b>
<b>4. RISK IDENTIFIED AND MITIGATION PLAN.....</b>	<b>16</b>

# Acronyms

<b>Acronym</b>	<b>Description</b>
<b>AREU</b>	Afghanistan Renewable Energy Union
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit
<b>DABS</b>	Da Afghanistan Breshna Sherkat
<b>RE</b>	Renewable Energy
<b>MPPL</b>	Mittal Processors Private Limited
<b>PEC</b>	Provincial Energy Committee
<b>T&amp;D</b>	Transmission & Distribution
<b>SPOC</b>	Single Point of Contact
<b>GoA</b>	Government of Afghanistan
<b>STA</b>	Systematic Training Approach
<b>TOT</b>	Train the Trainers
<b>OJT</b>	On-the-Job Training
<b>IDEA</b>	Institutional Development for Energy in Afghanistan
<b>RE</b>	Renewable Energy
<b>ToR</b>	Terms of Reference
<b>IPD</b>	Investment Promotion Desk
<b>O&amp;M</b>	Operation & Maintenance

# 1. Introduction

## 1.0 Abstract

Renewable energy resources could play a vital role in the sustainable economic, social, and environmental development of Afghanistan. Heavy reliance of rural households on firewood, rising costs of fossil fuels, outdoor and indoor air pollution, and climate change are some of the challenges that can be addressed by diversifying our power production fuel inputs and adopting renewable energy technologies. In order to deploy and scale up renewable energy technologies and improve access to sustainable energy, clear policies and targets and dedicated institutions are crucial. Fortunately, Afghan government with the support of international community is setting ambitious targets for the renewable energy sector and is encouraging national and international investors to take part in the generation, transmission, and distribution of renewable energy especially electricity through Power Purchase Agreements or very cheap land leases.

**The overall scope of the entire project on a broader perspective can be defined as below –**

- Enabling AREU to so that it can provide relevant information to the private power companies regarding policy framework and approval processes.
- Developing a five-year strategy for AREU.
- Developing skills for the analysis of data from the energy sector for the client's use.
- To ensure that AREU/private sector is well-trained on PV project(s) design and event management.
- Developing the technical capacity of AREU.
- To ensure AREU members are equipped with the latest knowledge on PV project management methodologies/mechanisms.
- Recommending tax concessions for RE power projects including Custom Duty concessions for advocacy by AERU with the Government of Afghanistan.

### **1.1 Objectives of this Report**

The objectives of this report are broadly stated as follows –

- Develop skills for the analysis of data from the energy sector for the client’s use.
- To ensure AREU/private sector is well-trained on PV project(s) design and event management.
- Develop the technical capacity of AREU.
- Ensure AREU members are equipped.

### **1.2 Deliverable**

The deliverable of this assignment and Capacity Building of the AREU Staff will be defined by and bound to the following parameters.

- Data gathering, compilation and analysis.
- PV project(s) design.
- Latest knowledge of PV project(s) management methodologies/mechanisms.
- Preparation of information brochures/documents.
- Event management.

## 2. Brief Description of the Capacity Building Program

The Capacity Building Program of AREU staffs are formulated after detailed discussion with AREU officials on their specific needs and requirements and the present studies of the renewable energy sector of the country.

The Capacity Building of the AREU Staff will comprise of effective practical and theoretical Workshops, Class-room Trainings and Field Visits that will enhance the knowledge and understanding of AREU Officials to prepare, manage and handle effective and feasible solutions.

Development of AREU Staff and RE Sector		
Sl. No.	What	How
1	Program and Agendas	1. Workshops 2. Classroom Trainings 3. Field Visits
2	Resource Assessment	1. Site-specific Resource Assessment 2. Organizational Resource Assessment 3. Market & Tariff Assessment
3	Technology Development and Demonstration	1. Pilot Demonstration Programs (Stand-alone, Roof-top and Mini-Grid) 2. Standard Developments 3. International and Advanced Technology Transfer – Designs and Calculations of Isolated, Grid-Connected and Roof-Top Solar Power Plants / ROI Calculations / Paybacks 4. Renewable Energy Markets
4	Commercials	1. Business Model Development and Demonstration 2. Demonstrate cost-recovery by private sector 3. Financial risk mitigation for PPPs 4. Mechanisms to access capital
5	People	1. Awareness programs

		<ol style="list-style-type: none"> <li>2. Developing Curricula / certifications</li> <li>3. Advertisements</li> </ol>
6	Political Will	<ol style="list-style-type: none"> <li>1. Awareness of RE benefits</li> <li>2. Coordination with government at different levels</li> <li>3. Demonstration of benefit to constituents</li> <li>4. Demonstration of economic benefit</li> </ol>
7	Regulatory Environment	<ol style="list-style-type: none"> <li>1. Develop legal basis for private sector</li> <li>2. Transparent guidelines</li> <li>3. Technical standards</li> <li>4. Oversight/monitoring (especially O&amp;M)</li> </ol>

**Note:**

*On special considerations and approvals, a team of highly qualified and experienced professionals in Delhi/India can arrange effective and stretched Workshops and Field Visits for the AREU Staffs, which will add immense and measurable values to the Capacity Building Programs.*

*This particular program has been considered after discussion with GIZ and AREU officials.*

## 3. Capacity Building of AREU Staff

### 3.1 Data Gathering, Compilation and Analysis

With reference to Monitoring of the Solar Power Plants, keeping up the health of the Solar PV System is of paramount importance, and continuous monitoring is required. As most of the Solar PV Plants are installed in remote locations, the Operations & Maintenance (O&M) provider will need to use all ways and means to get firm information about the plant performance daily.

The O&M provider usually will have a limited knowledge of the local weather conditions and the effect of the terrain on plant performance. When the Generation goes down/dips, their engineer's/monitoring personnel cannot step outside the control room always to know which part of the plant is under performing or if there are weather related changes within the plant in a large acreage set-up.

Therefore, to bridge the information gap and to get seamless updates about plant performance, Monitoring systems are very essential. Monitoring is possible even from a central office of the client or the O&M provider's Headquarters (HQ) in a different location, with proper authentication measures. The latter complements the efforts of the monitoring personnel at site and is more tweaked towards analysis of the data, as received. Predictive analytics is the way forward for organizations which have a matured O&M plant monitoring set up.

Irrespective of size of the plants, comprehensive monitoring is important for tracking yields at the plants minute by minute. Therefore, to aid this goal the monitoring systems should run uninterrupted at all the times. Monitoring the generation /yields regularly provides vital piece of information in advance when the system performance is low or is likely to fail. Based on the measures, preventive maintenance can be carried out to enhance the performance and the health of the system or the maintenance schedules judiciously planned.

It becomes essential to ensure:

- High levels of availability and performance,
- Lower downtimes
- Quicker fault detection tools & techniques.
- On site weather station data,
- Production data from the panel strings, arrays, inverter, and transformers.

### **Data Communication:**

Solar Photovoltaic monitoring systems can have wired or wireless data communication. Most Photovoltaic monitoring systems are wireless based; Wireless remote monitoring is not restricted by region and distance, especially in remote areas and it may serve the purpose better.

Supervisory Control and Data Acquisition (SCADA):

Monitoring and control go hand in hand and invariably SCADA systems are the backbone of any Remote monitoring system.

### **Key Results obtained from Compilation and Analysis:**

- Sun energy [kWh/m<sup>2</sup>]
- Module level Data
- Radiation [W/m<sup>2</sup>]
- The total energy production [KWh]
- Energy forecast [kWh]
- Capacity Utilization Factor [%]
- The Performance Ratio (PR [%]).
- The specific energy [kWh/kWp] - An indicator of production based on the available irradiation (location and orientation).

With cost effectiveness being the mantra to be achieved in Solar Power plants across the world the people's attention will next be towards reducing O&M costs. Here is where a robust monitoring system will be a big enabler. Though every part of the plant and every input attribute cannot be controlled to the desired levels, continuous monitoring of the energy generation as per expected forecast and insolation will ensure that the efficiency of the plant is maintained at a high level through the life of the plant. The latest generation of SCADA complementing the Internet Of Things with extensive data security protection measures will possibly drive the next generation O&M.

### **3.2 PV Project (s) Design**

For the renewable energy system particularly solar energy system the major factor responsible for increasing the yield and decreasing the cost is Optimally Designing the system. Various methods are being utilized by different organizations in planning and sizing the grid-connected PV systems.

This overview of solar photovoltaic systems gives a basic understanding of:

- Evaluating a site for its solar potential
- Common grid-connected PV system configurations and components

- Considerations in selecting components
- Considerations in design and installation of a PV system
- Typical costs and the labor required to install a PV system

***“The efficiency of any solar power system depends on two critical aspects – Good design and quality components.”***

A high yielding solar power plant always starts with a good design. In most solar EPC/installation companies, design team is a critical element. A Solar PV Designer has to design and develop site plans for solar panel installation. The Design Engineer takes the initial system concept ideas and translates them into fully detailed construction ready designs. Coordinating with multiple team members and customers, the Design Engineer balances the necessity of a customer solution with the efficiency of standard practices.

Solar PV Designing will predominantly revolve around following three points:

- Calculations & Design
- BOM Preparation and Costing Analysis
- Overseeing project execution

**The Advanced Solar PV Plant design procedure comprises the following steps:**

- Use custom software tools to design PV systems (Solarpro, PVCOMPLETE etc.)
- Various inputs like the load, peak power, module voltage, global irradiance and tilt angle are given, and detailed technical aspects of the PV system are obtained.
- Perform accurate system sizing calculations
- Create electrical single-line diagrams, panel schedules, or connection diagrams for solar electric systems, using computer-aided design (CAD)/ PVsyst software
- Run PVsyst reports for system production estimates, develop optimal designs with SLD, PML, conduit and wire scheduling, routing and equipment plans, and conceptual 3-D renderings.
- Execute designs that adhere to grid compliance and permitting requirements.
- Building detailed bills of materials based on system specifications and performing costing analysis.
- Coordinates with management team to develop complete proposal packages.
- Work across functionally with sales, project management and installation teams to ensure clients’ needs and internal deadlines are met.
- Troubleshoot design and construction issues in the field.

### 3.3 Latest knowledge of PV Project(s) Management Methodologies/Mechanisms

Each project has its own complexities in terms of financial models, managerial capabilities, project evaluation, project structures, technical requirements etc. and right Project Management Methodology is required to overcome these.

Solar PV Project Management aims to address the challenges in terms of project management, project construction, financial management and assessing the risks involved in the project development.

Solar PV Project Management is a rapidly evolving field which require expertise in providing solutions in financial, design engineering, construction, logistics and supply chain, equipment technology, applications and services with aim to reduce the construction time and improve project performance.

#### **PV Project(s) Management Methodology/Mechanism:**

##### **A. Project Planning & Feasibility Analysis -**

- Project Execution model assessment.
- Prefeasibility Study, Preliminary Site survey, Geo Technical survey, energy resource assessment.
- Planning - Project Timelines, process flow, guidelines etc.
- Who? What? When? Where? Why? How? How much? Analysis
- Financial Analysis, Planning, Risk Management, Funds Arrangement, Budgeting.
- Preparation of Detailed Project Report (DPR).
- Necessary Approvals
- Preparation of qualifying criteria for selection of EPC, O&M contractors
- Guidance to Client about suitable practices for erection and commissioning of power plant.
- Project Benchmarking – Designs, Generation, etc.
- Risks, challenges, Success factors analysis and Expert recommendations.
- Project documentation

##### **B. Engineering and Due Diligence -**

- Making, Review/Vetting of System Designs and Diagrams (civil, mechanical and electrical) including drawings, layouts, specifications, Plant Orientation, Tilt of Panels, positioning, Spacing and Layout Designing etc.
- Selection of best available products & technologies based on technical rationale and Client's priorities.
- Generation Pattern Analysis.
- Grid Assessment

- Resource & Climate Assessment
- Technology Assessment
- Energy Yield Estimation Verification
- Due Diligence - Project Capacity, Project Layout, Project Performance, Power Evacuation planning etc.

**C. Procurement -**

- Finalizing Equipment - Technical Specifications & RFQs
- Vendor Identification and Dissemination of RFQ,
- Techno Commercial Evaluation
- Manufacturing Facility Inspection
- Vendor Finalization
- Contracts assessment and negotiation.
- Supply Chain Management

**D. Installation & Commissioning -**

- Project Execution
- Real time planning and site management
- Quality management Adherence to workplace safety standards
- Pre-commissioning, Commissioning and Testing of the Plant
- Client Training, Project Hand-over to Client

**E. Operations & Maintenance Vendor Finalization -**

- Service Requirement Diagnosis
- Warranty offering Diagnosis
- Preventive Maintenance
- Corrective Maintenance
- Insurance Contracts
- Operation & Maintenance Manual
- Performance analysis
- Reporting

### 3.4 Preparation of Information Brochures/Documents

The Information Brochures on multifarious topics in the Renewable Energy Sector of Afghanistan will help this Green Energy Sector to spread its awareness and capabilities among the consumers, investors, policy-makers and developers.

The preparation of Information Brochures and their circulation will also help the Renewable Energy sector of Afghanistan to grow its outreach on a national and a global level.

#### **Preparation Methods –**

The Information Brochures and Documents should be prepared in one-pager style.

Pictorial views and illustrating diagrams will dominate the Information Brochure with data in bulletin points which will describe the main essence of the diagrams.

The approach and outlook of the Information Documents should be colorful, touchy and vibrant.

This will spread out the message of the Information Brochure effectively.

#### **Target Audiences –**

- Consumers
- Investors
- Policy-Makers
- Developers
- Power/Energy/Utility sector officials

### Information Brochure/Document Contents –

The contents of the Information Brochure should broadly cover the Technical, Financial, Awareness and Opportunity aspects of the renewable energy sector, which will include the multifarious topics as stated below.

Technical Aspects	Financial Aspects	Awareness and Opportunities Aspects
<ul style="list-style-type: none"> <li>• Latest Photo-Voltaic Solar Power Plant Technologies</li> <li>• Latest Photo-Voltaic Solar Power Plant Technologies</li> <li>• Photo-Voltaic Cell Technologies</li> <li>• Inverter Technologies</li> <li>• Battery Storage Technologies</li> <li>• Wind Power Generation Technologies</li> <li>• Hydel Power Generation Technologies</li> <li>• Geo-Thermal Power Generation Technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Financial Models</li> <li>• Investor's Benefits</li> <li>• Contractor's Benefits</li> <li>• Multifarious Cost Aspects Involved in a Solar Power Project</li> <li>• Multifarious Cost Aspects Involved in a Wind Power Project</li> <li>• Multifarious Cost Aspects Involved in a Hydel Power Project</li> <li>• Multifarious Cost Aspects Involved in a Geo-Thermal Power Project</li> <li>• Solar Power Tariff Aspects</li> <li>• Wind Power Tariff Aspects</li> <li>• Hydel Power Tariff Aspects</li> <li>• Geo-Thermal Power Tariff Aspects</li> </ul>	<ul style="list-style-type: none"> <li>• Present Renewable Energy Market Scenario</li> <li>• Predicted/Forecasted Renewable Energy Market Scenario</li> <li>• Benefits of using Renewable Energy</li> <li>• About Solar Power/Energy</li> <li>• About Wind Power/Energy</li> <li>• About Hydel Power/Energy</li> <li>• About Geo-Thermal Power/Energy</li> <li>• Opportunites of Solar Power Generation in Afghansitan</li> <li>• Opportunites of Wind Power Generation in Afghansitan</li> <li>• Opportunites of Hydel Power Generation in Afghansitan</li> <li>• Opportunites of Geo-Thermal Power Generation in Afghansitan</li> <li>• Awareness towards Generation and Use of Renewable Energy</li> </ul>

### 3.5 Event Management

An Event Management plays a very critical role in the arrangement and management of events like seminars/functions/meetings/road-shows in regard to the renewable energy sector.

Events like seminars/functions/meetings/road-shows of the various verticals of the renewable energy sector are extremely important on a national and a global level in order to attract and facilitate the investors, policy-makers, contractors and consumers.

So the entire arrangement and management of the events become very obvious to make those events attractive, lively, worth-making and successful.

#### Reasons to exhibit Events

- Get the chance to shake hands with industry experts and influential decision makers.
- Showcase your products, brand and activities in an exciting setting focused on the latest innovations and market trends.
- Make new contacts whilst updating and developing existing relationships face to face with your clients and partners.
- Exploit a great marketing tool and our promotional solutions to create interest and business opportunities before, during and after the event.
- By participating as an exhibitor you will have the opportunity to address an audience of industry professionals and scientists, dealing directly with individuals which can help elevate your organization to new heights and make an impact on future markets in these complex economical times.

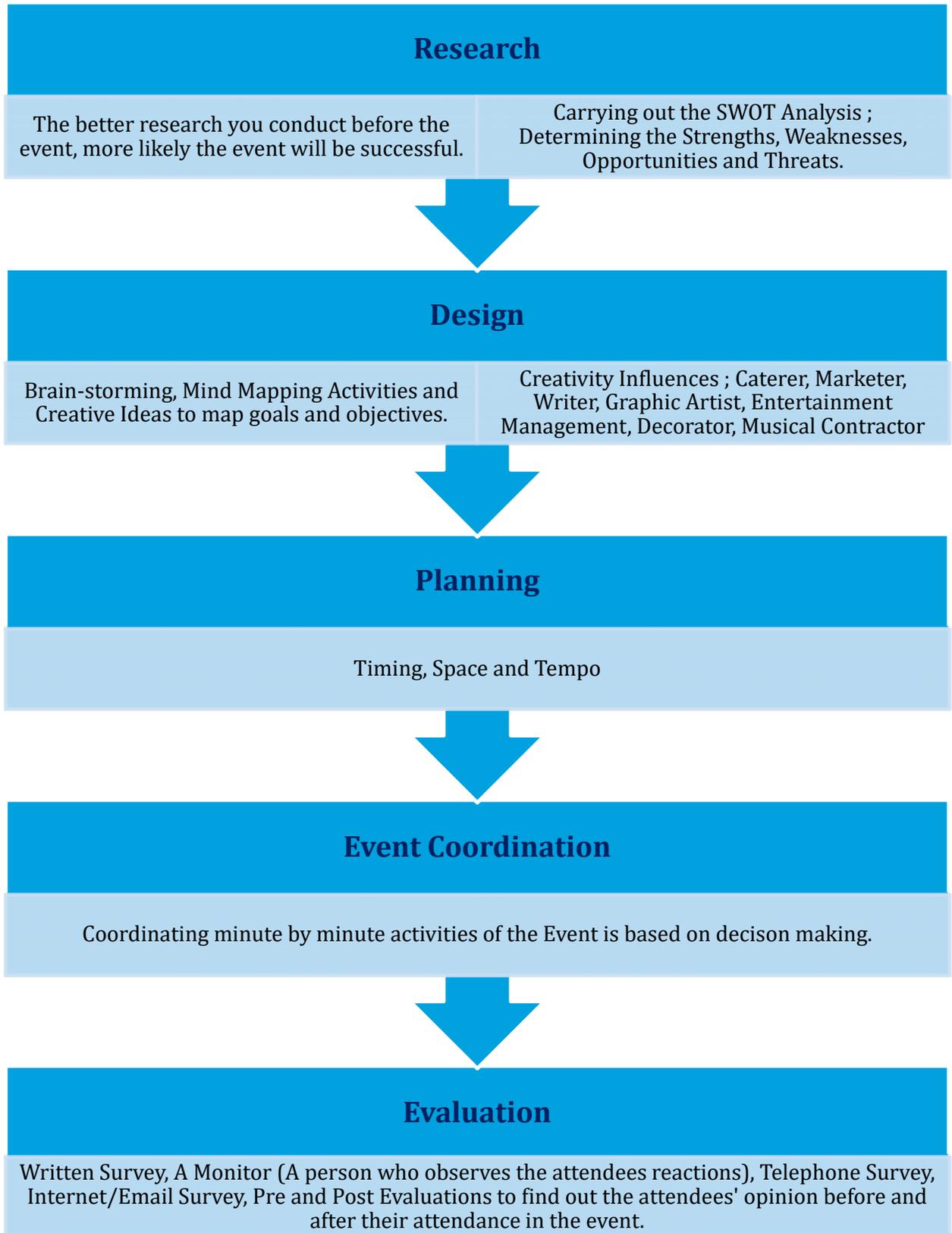
#### Visitors' Profile to be decided

- Government Officials & Policy Makers
- Project Developers & EPC Contractors
- Distributors & Channel Partners
- System Integrators
- Banks, IPPs & Investors
- Architects and Consultants
- Facility Managers
- Senior Corporate Executives
- Captive Power Consumers
- R & D Institutions
- Technology Developers
- Project Procurement Officials

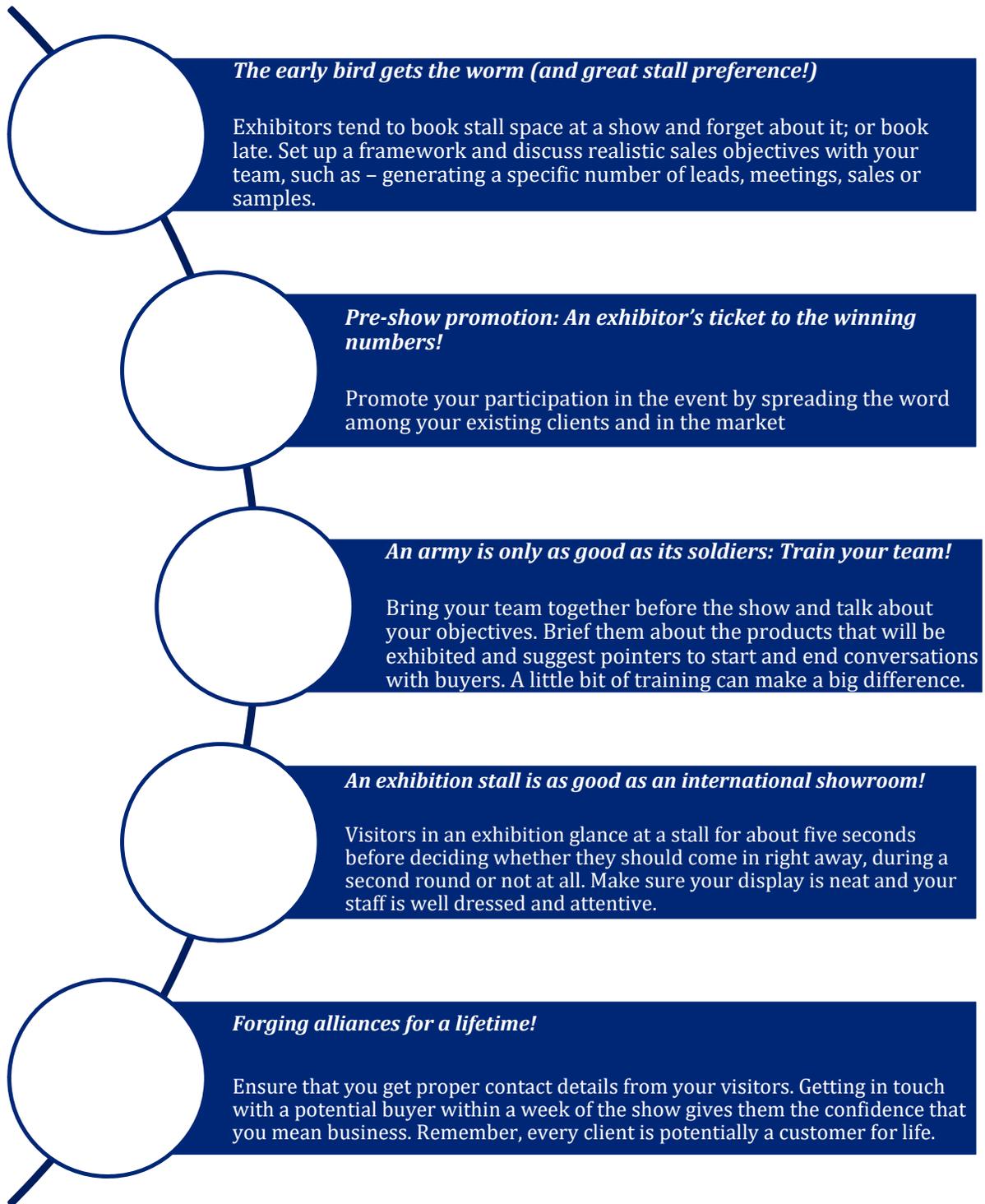
The different phases and life-cycle of an event management system can be broadly defined as below.



## 5-Steps to a Successful Event



## 5 Steps to Maximize Business Gains in an Event



## 4. Risk Identified and Mitigation Plan

During the interactions with the AREU members, various issues have emerged that need to be addressed for smooth execution of the project.

The key issues and the probable mitigation measures for the Capacity Building Programs are detailed here below.

Sl. No.	Key Issues	Mitigation Measures
1	Incorrect Information	<ul style="list-style-type: none"><li>• Verification and cross-checks of information at various defined steps before final printing of the Information Brochures/Documents.</li><li>• Legal validations.</li><li>• Legal Disclaimer.</li></ul>
2	Planned Capacity Building Program Sessions not be carried out due to sudden and unwarned security threats and issues	<ul style="list-style-type: none"><li>• Alternate planning to be done to carry out the Capacity Building Programs in a safe place and with total security vision in mind.</li><li>• Proper communication made to client along with an arrangement to carry out the Capacity Building Programs on said date and time at a different secured place or on a later defined date and time at the same place.</li></ul>

This material and the information contained herein prepared by Mittal Processors Private Limited (MPPL) is intended to provide general information on a particular subject or subjects and is not an exhaustive treatment of such subject(s) and accordingly is not intended to constitute professional advice or services. The information is not intended to be relied upon as the sole basis for any decision which may affect you or your business. Before making any decision or taking any action that might affect your personal finances or business, you should consult a qualified professional adviser. None of MPPL, MPPL its member firms, or its and their affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this material.

©2017 Mittal Processors Private Limited (MPPL)