



SPESS Phase II

APEC Project: Demonstration and Promotion of Energy Resilience tool based on Solar-Powered Emergency Shelter Solutions (SPESS) for Natural Disaster in APEC(EWG13 2019A)

Session 2
APEC Sustainable Energy Center(APSEC)

Shan Liu

Marketing Specialist

■ Outline

◆ Introduction—APEC Sustainable Energy Center(APSEC)

- Establishment of APSEC
- Two Pillar Programs
- Two Flagship Events

◆ Case description— APEC Funded Project

- Project background/General information
- Project review/Outcome
- Current work plan and potential cross-fora collaboration

Establishment of APSEC

APEC Sustainable Energy Center(APSEC) was established at the 11th APEC Energy Ministerial Meeting in 2014, which was written into the 22nd APEC Leaders' Declaration. It is a major achievement of the Chinese government responding positively to the initiative of APEC leaders to participate in energy cooperation in APEC region.



Sep. 2014

11th EMM, Beijing Declaration, China

Nov. 2014

22nd APEC Leaders' Declaration

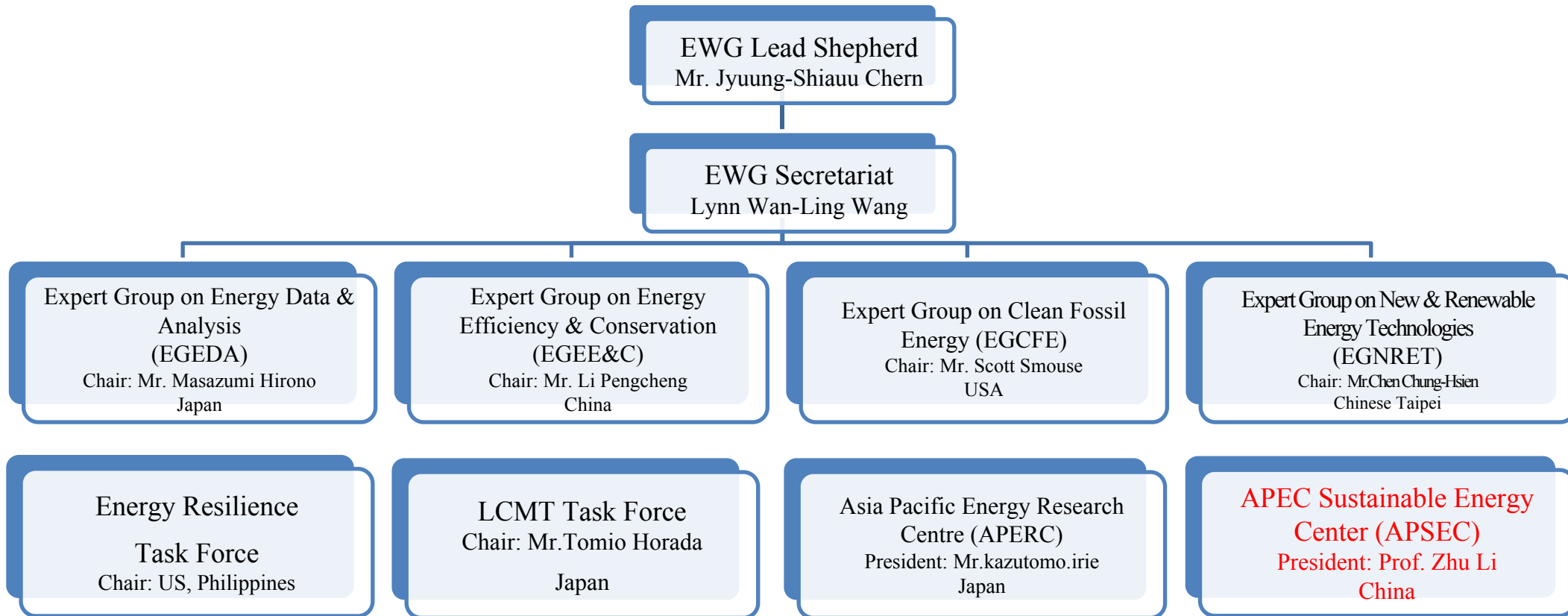
Oct. 2015

12th EMM, Cebu Declaration, Philippines

Nov. 2015

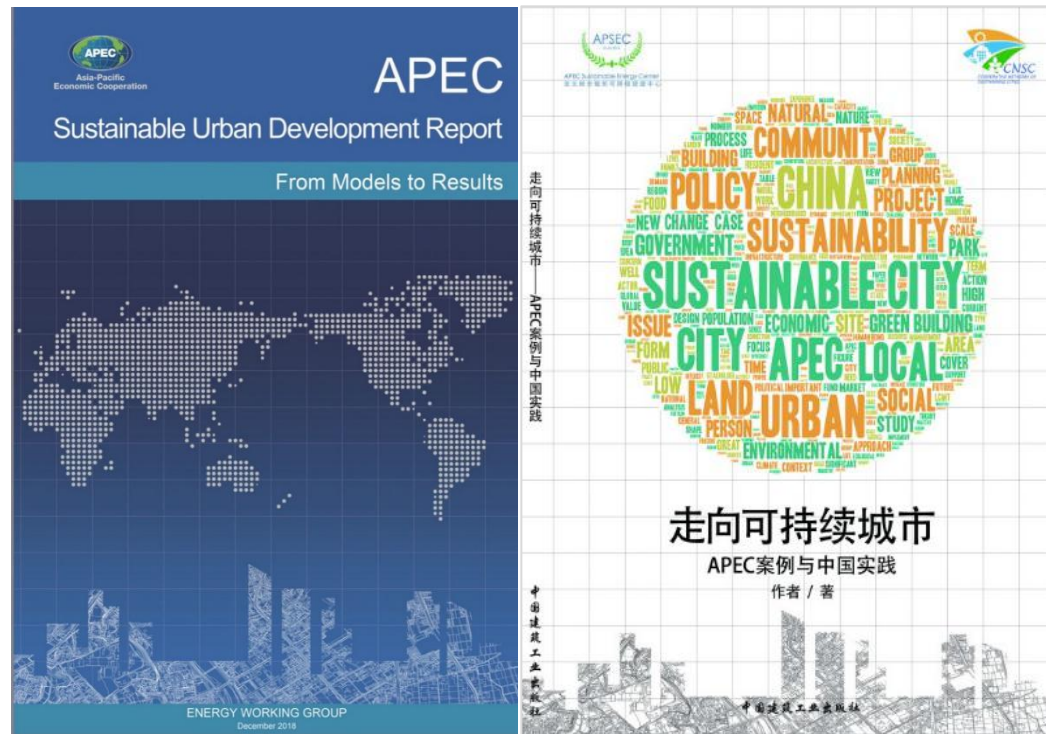
23rd APEC Leaders' Declaration

APEC Energy Working Group Structure



Two Pillar Programs

Research programs, namely **APEC Cooperative Network of Sustainable Cities (CNSC)** and **Clean Coal Technology Transfer (CCT)**. Producing high-level research results and core publications.



Publications of CNSC



Publications of CCT

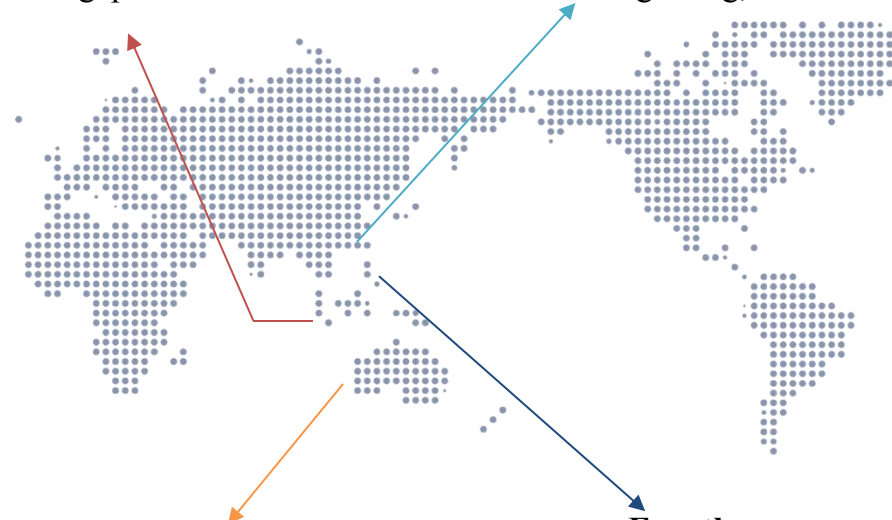
Annual Flagship Cities Workshop

APEC Workshop on Sustainable Cities



Second
April, 2017
Singapore

Third
May, 2018
Hong Kong, China



First
May, 2016
Canberra, Australia

Fourth
May, 2019
Taguig City, Philippines

FIVE Years 'Growth

Annual Anniversary Event



5th Asia-Pacific Energy Sustainable Development Forum
September 18-20, 2019 Tianjin • China



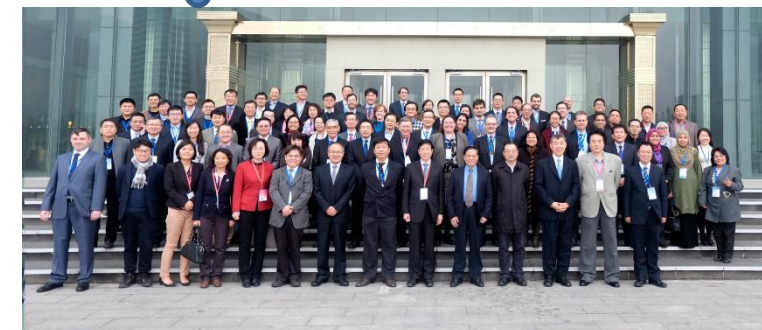
3rd Asia-Pacific Energy Sustainable Development Forum
September 21-22, 2017 Tianjin • China



1st Asia-Pacific Energy Sustainable Development Forum
September 21-22, 2015 Tianjin • China



4th Asia-Pacific Energy Sustainable Development Forum
September 20-21, 2018 Tianjin • China



2nd Asia-Pacific Energy Sustainable Development Forum
November 3-5, 2016 Tianjin • China

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Case Description

• Background

Globally, Asia Pacific Region is **highly prone to climate change impact** , 70 percent of all natural disasters happen in the region — such as

- 2008 Earthquake in China's Sichuan province
- 2010–11 Queensland Australia floods & 2011 Thailand floods,
- 2011 Great East Japan Earthquake and the ensuing tsunami,
- 2012 Superstorm Sandy in US,
- 2013 Super Typhoon “Haiyan” hitting eastern Philippines,
- 2014 Ubinas Volcano explosion in Peru
- 2018 Sulawesi earthquakes in Indonesia

— are important reminders of the severe situation APEC community faces.



In 2018, half of the 281 natural disaster events worldwide occurred in the Asia-Pacific region

Source: www.apec.org
www.unescap.org

Case Description

- **Background**

1. **Low-carbon technology** to benefit building resilience
2. APEC 2015's priority areas was **Building Sustainable and Resilient Communities** to strengthen APEC community's energy-resilience and sustainability affected by natural disasters
3. **SPESS Phase I** proposed by APEC Sustainable Energy Center (APSEC)
APEC project **EWG22 2015A**—Developing Solar-Powered Emergency Shelter Solutions (SPESS) as an Energy-Resilience Tool for Natural Disaster Relief in APEC Community.



Rainbow Home
designed by Tianjin University,
School of Architecture

- **General Information**

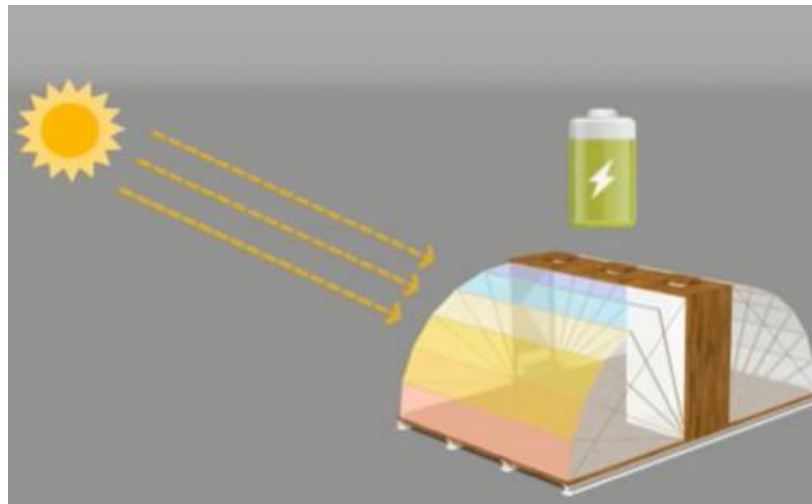
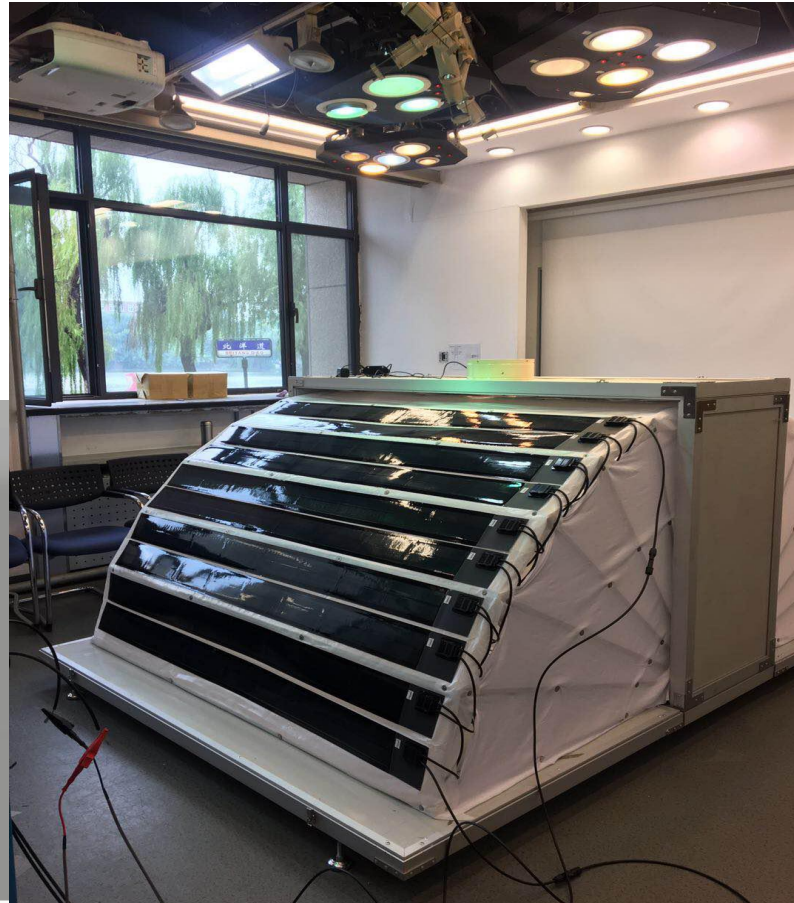
- a) **Modular emergency shelter** integrated solar energy and emergency shelter solutions to assist distressed communities affected by natural disaster;
- b) Thin film PV power generation and energy storage system;
- c) An energy resilient tool for **post disaster resettlement**.

Source: www.apec.org

Case Description

• General Information

SPeSS Phase I-APEC-Funded Project (EWG222015A) Developing Solar-Powered Emergency Shelter Solutions (SPeSS) As an Energy-Resilience Tool for Natural Disaster Relief in APEC Community.



Hanergy MiaSole FLEX CIGS Think-film Solar Module



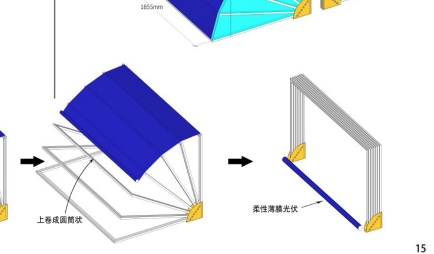
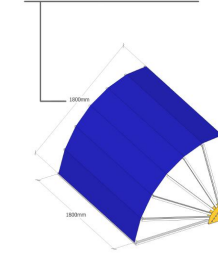
■ 柔性薄膜光伏铺设

方案三



直接将柔性薄膜光伏上卷成筒状放入避难所内

柔性薄膜光伏尺寸: 1800mm*1800mm



15

Case Description

Objectives:

1. **To promote low-carbon energy technology innovation** in APEC, through advancing the integration of solar energy and emergency shelter technologies in the development of SPESS;
2. **To improve capacity of APEC stakeholders (especially those from developing members)** in adopting science-based approaches for emergency preparedness and post-disaster response, through harnessing an innovative, low-carbon, energy-resilient technology of SPESS;
3. **To develop *Recommendations on deploying SPESS*** that responds to the varying climatic, economic and cultural conditions of APEC member economies, helping bring low-carbon energy measures into the mainstream of APEC's science-based Disaster Management framework.



Project Review SPESS Phase I

Start-up phase
Project promotion in APEC

Development phase
Academic discussion

Development phase
Call for competition

Finalization phase
APEC Workshop B

(Energy Work Group)
12.2015 - EWG 50
05 2016 - EWG 51
10. 2016 -EWG 52

**Pre-research; seek co-
sponsorship**

**First APEC Workshop
on SPESS,
Tianjin, China, 07.2016**

**Discussion on Energy
Supply of Post- disaster
Emergency Shelter**

**SPESS Open
Innovation Competition
09-10 2016**

**Call for competition;
Innovative SPESS designs**

**The final APEC
Workshop on SPESS,
Tianjin, China, 09.2017**

**Final project report
discussion**

SPESS phase I in APEC Project Database:

<https://aimp2.apec.org/sites/PDB/Lists/Proposals/DispForm.aspx?ID=1754>

Project Review SPESS Phase I—First Workshop



The 1st APEC workshop on SPESS in Tianjin University, July 28-29,2016

30 experts and participants from 10 APEC economies **shared the experience of their economies** and reached agreements on some mainly topics, such as **SPESS Open Innovation Competition** and literature survey in **emergency shelter and solar energy in APEC region**

SPESS Open Innovation Competition

Name: 3D Puzzle shelter
Designer: Tianjin University



*If it interests you,
you are very much welcome to contribute
to & benefit from SPESS project.
Let's work together to make SPESS
another quality APEC project.*



Name: Harbour
Designer: Shijiazhuang Tiedao University

Name: Accordion Shelter
Designer: Huazhong Agricultural University



Name: Rainbow home
Designer: Tiajin University

Project Review SPESS Phase I—Final Workshop



The Final APEC workshop on SPESS in Tianjin University, November 3-5, 2016

More than 30 APEC experts and participants from China, Indonesia, Malaysia, Philippines, Thailand, Singapore, The United States and Viet Nam have joined this workshop. **Four Innovative SPESS designs** shared by different teams from China have called strong attentions and **receive comments from APEC Experts. Academic Discussion on project final report.**



Literature Survey
Developing Solar-Powered
Emergency Shelter
Solutions as an Energy-
Resilience Tool for Natural
Disaster Relief in APEC
Community
EWG 22/2015A

5/10/2016

SPESS Phase I outcome

<http://publications.apec.org/Publications/2016/07/Literature-Survey-Developing-SolarPowered-Emergency-Shelter-Solutions-as-an-EnergyResilience-Tool-fo>

The literature survey provide information on the potential application of SPESS within the APEC Community. Especially on **provide emergency shelter and solar research** in the 12 APEC economies .



Based on of previous Literature Survey ;workshops and SPESS open innovation competition. This report sets out recommendations to provide reference information on the **potential application of SPESS within APEC region.**

<http://publications.apec.org/Publications/2017/11/Recommendations-on-Deploying-SPESS-for-Energy-Resilience-in-Disaster-Stricken-APEC-Community>



Recommendations on Deploying
SPESS for Energy-Resilience in
Disaster-Stricken APEC Community

APEC Energy Working Group

October 2017

Post Disaster Solution



Search For Trapped People



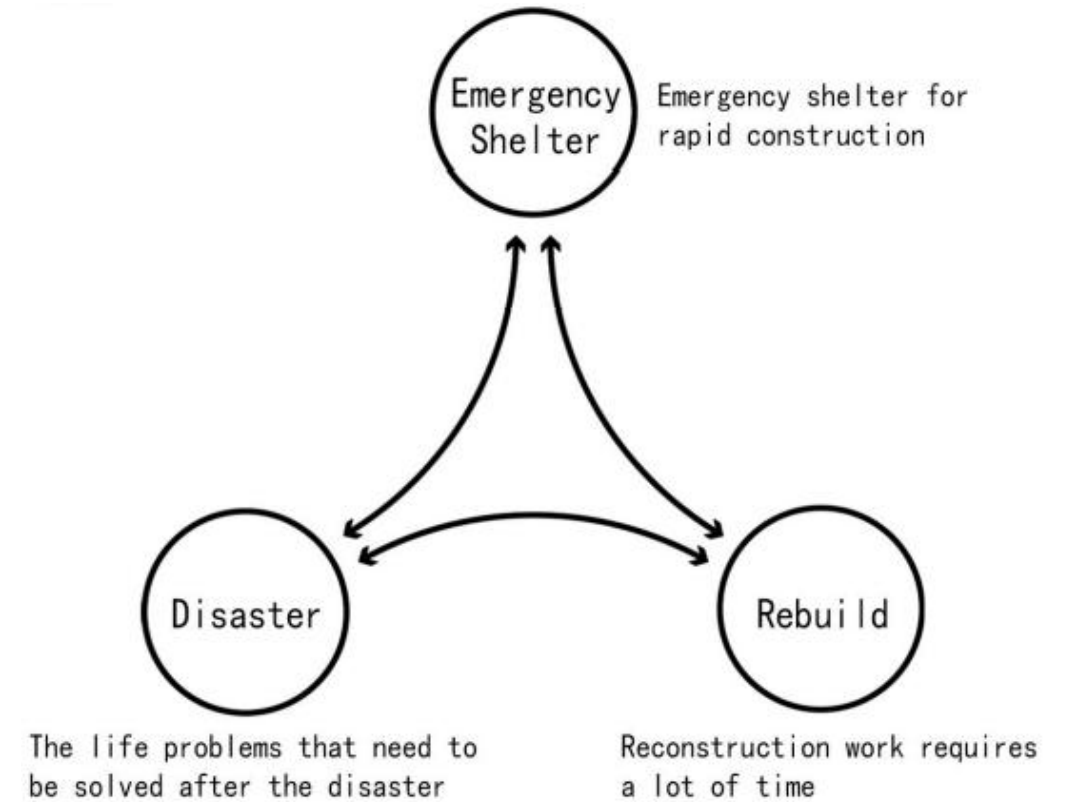
Investigation Of Disaster Scene



The Broken Street



The River Silted Up



Post Disaster Solution



Duffy Shelter (design by UK)

Made by Wood;(W)185cm (D)125cm (H)142cm



Paper Loghouse(design by Japan)

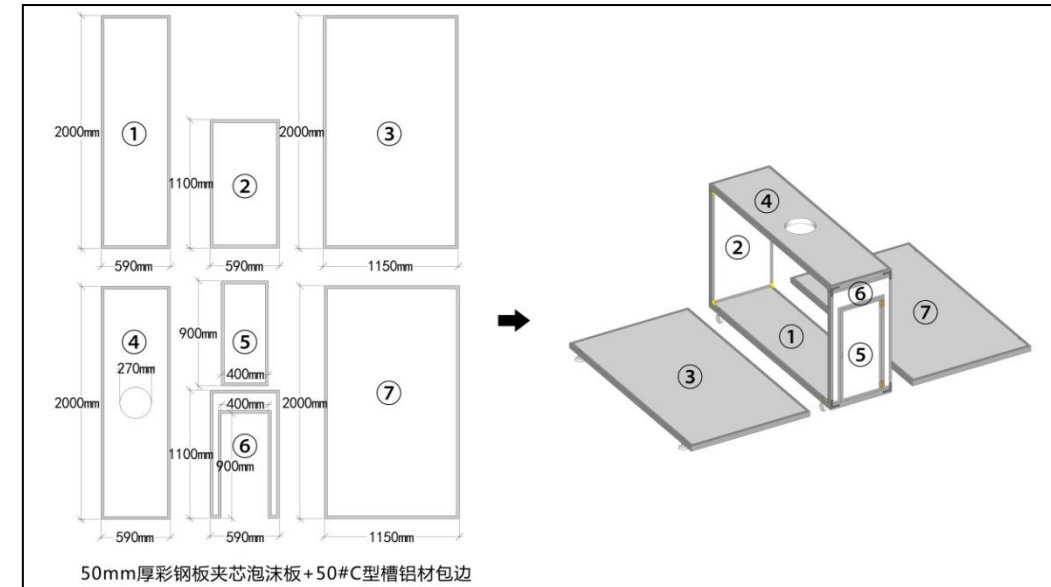
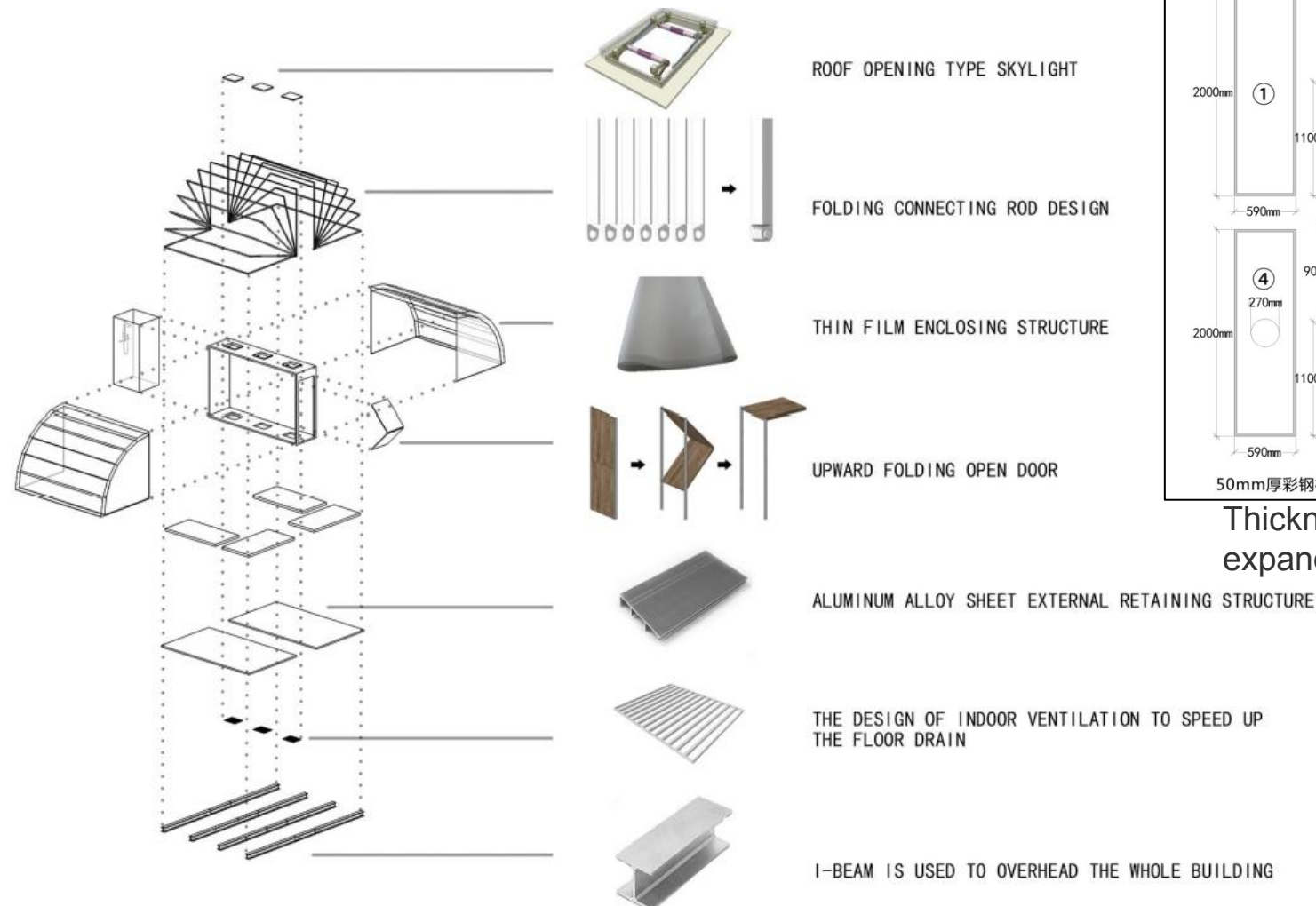
The walls are made from 106mm diameter, 4mm thick paper tubes



Solar tent(design by Italy)

The tent is made by tarpaulin(50% cotton and 50% acrylic) with six pieces thin film PV modules, total power generation 780W

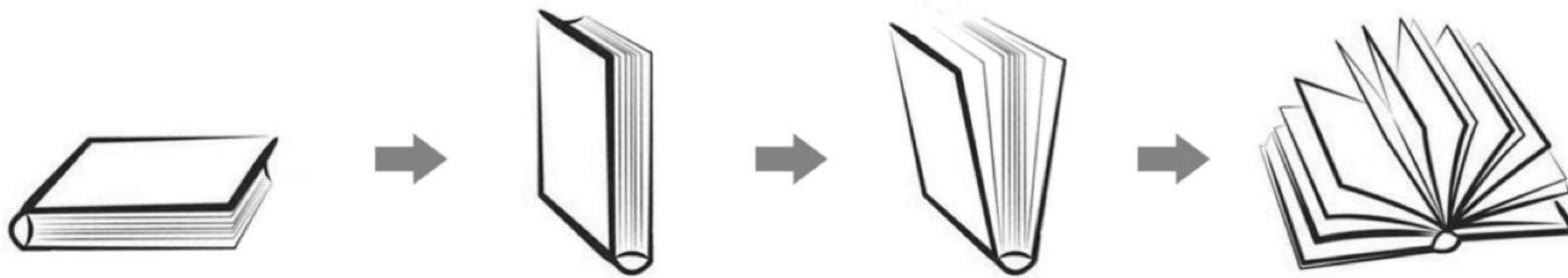
Structure Disassembly Graph



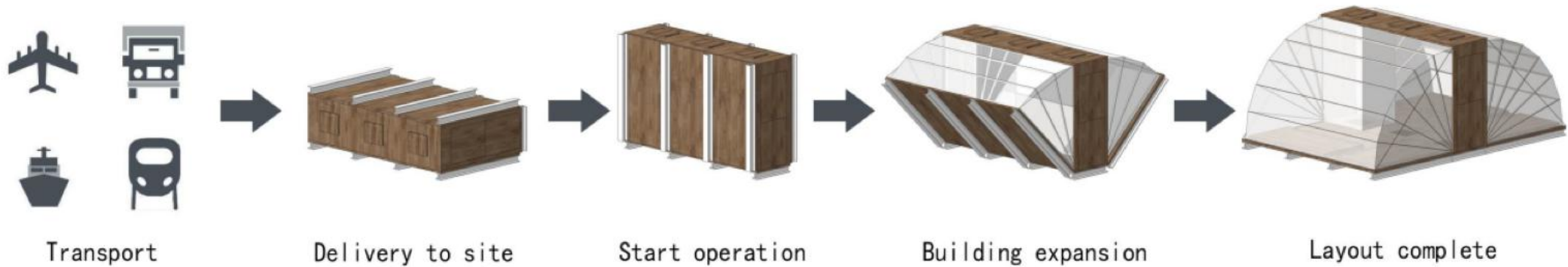
Thickness: coated steel (0.5mm) ; insulation board(50mm); expanded polystyrene board (50mm)

- ◆ Quickly assemble
- ◆ Comfortable living
- ◆ Energy self-sufficiency

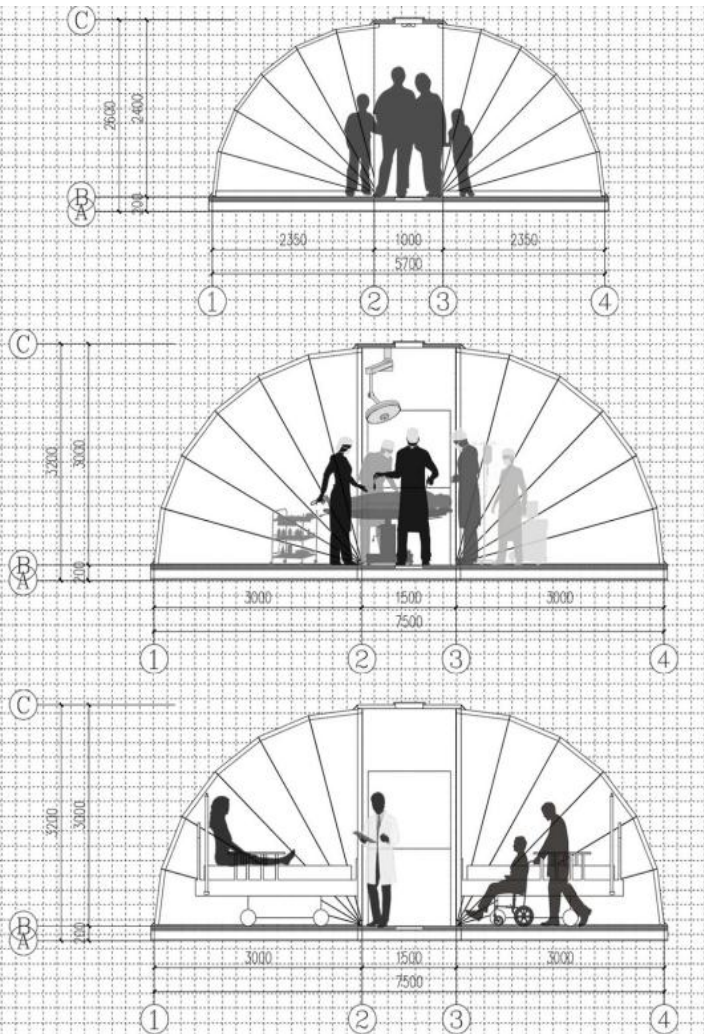
Building Shape Generation



Inspired by the way of opening books. Not only can the convenient transportation, but also can expand and function layout quickly, to ensure that local people have a small home for shelter as soon as possible.



Split Style and Lift Scene



The small building can accommodate 4-6 people which is used for a family or a separate individual. It only meets the requirements of the most basic life.



The big building is mainly used as a temporary public building, it can be used as a small reading room, a temporary hospital which can accommodate six hospital beds and an operation room or a complex and surgical ward.



ENTERTAINMENT



REST

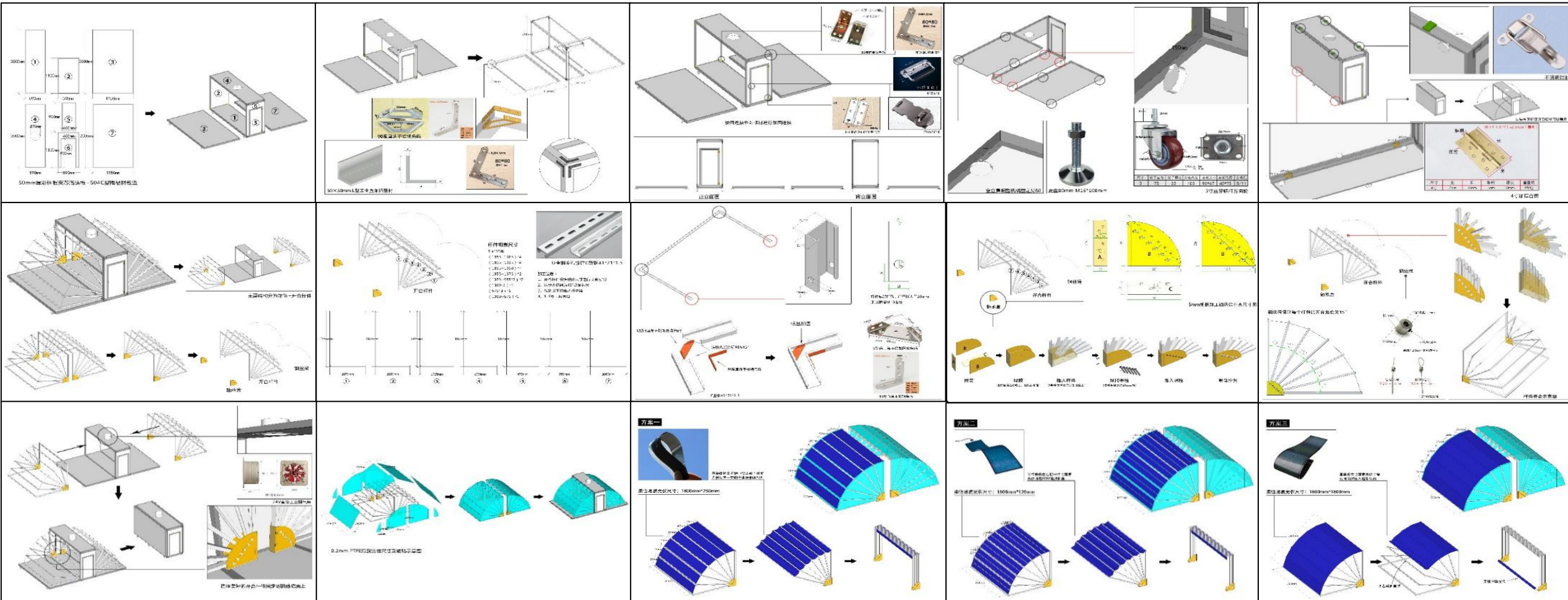


COMMUNICATE



WORK

Production Manual



Prototype Building



杆件制作



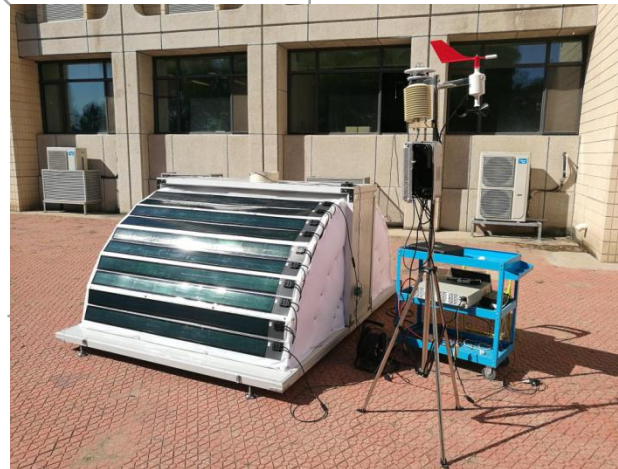
薄膜铺贴



零件组装

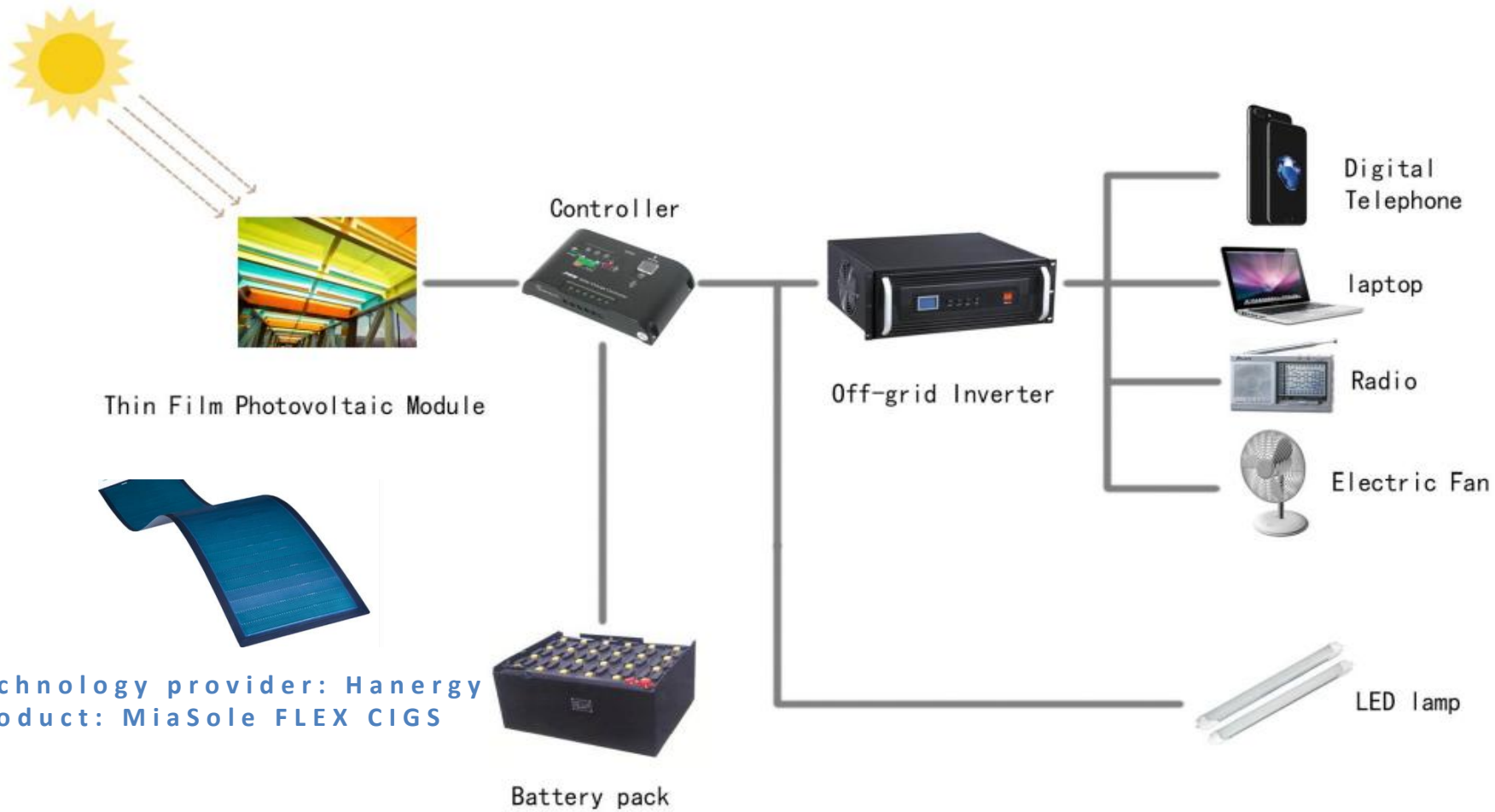


板材加工



光伏安装

Energy System Analysis



Selection of off grid photovoltaic power generation system

Equipment	Specification	Quantity
PV lead - acid battery	24V/250Ah	4
PIN/PIN/PIN triple-junction a-SiGe solar cell	50W/1245mm*635mm	10
PV controller	24V/20A	1
PV inverter	24V-220V/2000W	1

Energy consumption analysis of power equipment

Equipment	Power	Time	Number	Power Consumption	Power Consumption
Led lamp	23W	6h/day	2	0.276kwh/day	1.296kwh/day
Electric Fan	50W	3h/day	2	0.30kwh/day	
MT	60W	3h/day	4	0.72kwh/day	

Post Impact and Continued Work of SPESS Phase I

APSEC was approved a new APEC funded project (SPESS Phase II) —Demonstration and Promotion of Energy Resilience tool based on Solar-Powered Emergency Shelter Solutions (SPESS) for Natural Disaster in APEC (EWG13 2019A)

Main Objective: carry out outcome of EWG 22 2015A—provide technical support, establish workshop and technical training to engage key APEC stakeholders, and establish demonstration project in China and other susceptible economics to natural disasters.

Project No.	EWG13 2019A
Project Status	Endorsed by APEC EWG in 2019
Proposed by	China
Co-Sponsoring Economies	Indonesia; Thailand; Papua New Guinea; Philippines; Hong Kong, China; Australia
Expected Start and Completion Date	11/2019 to 12/2020

APEC Concept Note

Project Title:	Demonstration and Promotion of Energy Resilience tool based on Solar-Powered Emergency Shelter Solutions (SPESS) for Natural Disaster in APEC.
Fund Source (Select <u>one</u> only):	<input type="checkbox"/> General Project Account (GPA) <input type="checkbox"/> Trade and Investment Liberalization and Facilitation Special Account (TILF) <input type="checkbox"/> APEC Support Fund (ASF) – General Fund <input checked="" type="checkbox"/> APEC Support Fund (ASF) – Sub-Fund. You must nominate the sub-fund here: <u>EELCM</u> .
APEC forum:	Energy Working Group
Proposing APEC economy:	P.R.China
Co-sponsoring economies:	
Expected Start Date:	11/2019
Project Completion Date:	12/2020
Project summary:	Accounting for 70 percent of all natural disasters, the Asia Pacific is highly prone to climate change impact. This project will promote application and demonstration of total solution of energy supply and comfortable indoor environment for ERS(Emergency Relief Shelter), based on SPESS, emphasizing the characteristics of people-oriented, promoting the application of sustainable, high energy efficiency and environmental protection, and responding to APEC's concept about "cooperation, safety, security, efficiency, green technology, and comprehensive development". This project aims to solve the key problems faced by disaster victims in the Asia-Pacific region, such as the energy supply and the basic living guarantee. This project will carry out outcome of SPESS open innovation competition (EWG 22 2015A), provide technical support, establish workshop and technical training to engage key APEC stakeholders, and establish demonstration project in China and other susceptible economics to natural disasters.
In 150 words - • What is the issue that you will address or examine in your project? • Outline the key things your project will do, in terms of what, where, when and with whom. (Summary <u>must be</u> no longer than the box provided. Cover sheet must fit on one page).	Total cost of proposal: (APEC funding + self-funding): 100,000+100,000, USD 200,000. Total amount being sought from APEC (USD): 100,000. By category: -- Travel: 70,000 ----- Labor costs: 50,000, -- Hosting: 50,000 ----- Publication & distribution: 25,000 ----- other: 5,000.

Project Overseer Information and Declaration:

Name: Li Zhu

Title: President of APEC Sustainable Energy Center

Organization: APEC Sustainable Energy Center

Postal address: Room 215 Library of Science (Yifu Building), Tianjin University, Weijin Road 92, Nankai District, Tianjin, P.R.China.

Tel: +86 022-27400847 / +86 139 2017 2808 ----- E-mail: zhuli1977@tju.edu.cn

As Project Overseer and on behalf of the above said Organization, I declare that this submission was prepared in accordance with the Guidebook on APEC Projects (the Guidebook) and any ensuing project will comply with said Guidebook. Failure to do so may result in the BMC denying or revoking funding and/or project approval. I understand that any funds approved are granted on the basis of the information in the document's budget table, in the case of any inconsistencies within the document.

Li Zhu

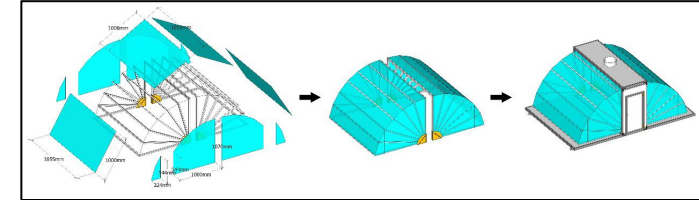
Name of Project Overseer / Date: 2019

SPESS Phase II (EWG13 2019A)—Work Plan

Timeline	Key Activities	Deliverables
Nov.2019 to Jan 2020	<ol style="list-style-type: none"> 1) Status quo survey of energy-supply for ERS during post-disaster relief in APEC; 2) Determine work objective of Energy Supply Solution tool based on SPESS; 3) Formulate the work plan, implement demonstration and development. 	Survey report/ Creation plan
Feb.to March. 2020	<ol style="list-style-type: none"> 1) Host economy prepares a background briefing 2) Analyse technology issue that invited APEC members facing on disaster relief 	Notice of participation/Meeting material
April to May 2020	Workshop A: <ol style="list-style-type: none"> 1) Develop training programs, organize training and promotion activities. 2) Selection of volunteer APEC economies for future pilot project; organizing technical visit and communication in Manado, Indonesia. 	Technical visit / Promotional activities/ SPESS product display
June to July 2020	<ol style="list-style-type: none"> 1) Workshop A summary; feedback collection 2) Preparation for Workshop B 	Summary report
Aug to Oct.2020	Workshop B: <ol style="list-style-type: none"> 1) Carry out technical analysis of SPESS, organizing technical seminars 2) Discussion on develop pilot project in volunteer APEC economics(implementation plan and recommendations) 	Technical analysis /Discussion
Nov to Dec 2020	<ol style="list-style-type: none"> 1) Project summary; Finalization of Recommendations based upon outcomes of previous survey & workshops 2) Preparation of pilot project implement in following year 	Project Summary / develop pilot project

Plan on Workshop A

- Tentative location: Manado, North Sulawesi Province, Indonesia
- Date: April to May 2020
- Objectives: **Cross-fora collaboration with PPSTI to enhance project outcomes.**



1. Technology transfer: School-based training programs on SPESS technology , such as :

- 1) Rainbow Home Kit Training(assemble ,deployment and operation etc.);
- 2) Renewable Energy Technology (building integrated PV; smart power/ self-sustained green community);
- 3) Knowledge/technology exchange on disaster management(Big data on: pre-response and post-disaster situations)

2. Pilot project establishment: selection of volunteer APEC economies for Rainbow Home deployment

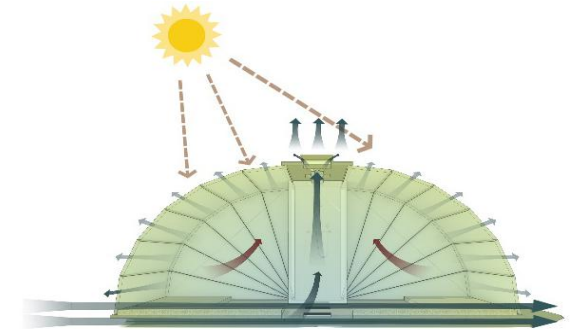
- 1) Background briefing on disaster relief(such as, disaster relief mechanism) ;
- 2) Organizing technical visit(potential project location).

3 Joint research : Input on final project report (literature survey, performance simulation, parameter optimization, experimental data analysis etc.)

4. Other potential collaborations are welcome...

Plan on Workshop B

- Location: Tianjin, China
- Date: Aug to Oct.2020
- Objectives: **Implementation plan and project recommendations.**



1. Based on workshop A outcome,

- 1) Organizing technical seminars to carry out technical analysis of Rainbow Home;
- 2) Draft up project implementation plan;
- 3) Formulate integrated solution on efficient disaster relief mechanism for natural disasters and investment in disaster risk reduction in APEC.

2. Finalize project report,

Receive comments and evaluations from APEC experts.



THANK YOU!

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