1 PURPOSE

The purpose for the Critical Infrastructure Protection and Recovery (CIPR) Working Group (WG) is to provide a forum for the application, development and dissemination of systems engineering principles, practices and solutions relating to critical infrastructure protection and recovery against manmade and natural events causing physical infrastructure system disruption for periods of a month or more.

Critical infrastructures provide essential services underpinning modern societies. These infrastructures are networks forming a tightly coupled complex system cutting across multiple domains. They affect one another even if not physically connected. They are vulnerable to manmade and natural events that can cause disruption for extended periods, resulting in societal disruptions and loss of life.

The inability of critical infrastructures to withstand and recover from catastrophic events is a well-documented global issue. This is a complex systems problem needing immediate coordinated attention across traditional domain and governmental boundaries. For example, the US President issued Presidential Policy Directive PPD-21 that addresses "a national unity of effort to strengthen and maintain secure, functioning, and resilient critical infrastructure." This includes an imperative to "implement an integration and analysis function to inform planning and operations decisions regarding critical infrastructure." This working group will seek to support this and other policies with international reach.

INCOSE, as the premier professional society for systems engineering, can provide significant contributions toward critical infrastructure protection and recovery.

2 GOALS

This WG will provide and support opportunities to exchange knowledge and systems engineering information and solutions within the scope of the CIPR WG, both within INCOSE and with external organizations sharing similar interests and goals. The opportunities include systems engineering products (e.g. architectures, requirements, IV&V, etc.). This information will be disseminated through publications (papers, articles, briefings) and supporting meetings, conferences, panels, and other means.

Specific areas of knowledge include the following.

a) The events capable of causing infrastructure disruption for periods of a month or more, to include all aspects of their characteristics and impacts.

b) The socio-technical factors related to CIPR.

c) The overarching structure and inter-connectedness among the critical infrastructure domains.

d) The interaction among infrastructure systems under various degraded states of operation.

e) Possible conceptual and design solutions, and related information.

f) Strategies for verification and validation of solutions.

The CIPR WG will provide a collection of systems engineering and related products that provide understanding and solutions for domain stakeholders impacted by the events. This can include products developed by several working groups and initiatives, such as Architecture, Complex Systems, Model-Based Systems Engineering (MBSE), Decision Analysis, Enterprise Systems, Natural Systems, Resilient Systems, Risk Management, Cost Engineering, Human System Interaction, In-Service Systems, Reliability Engineering, Requirements, System of Systems, System Safety Integration, Automotive, Healthcare, Infrastructure, Power & Energy Systems, Transportation Systems, and Anti-terrorism. Other working groups also have knowledge to contribute as well.

The CIPR WG will endeavor to integrate and coordinate among standards, regulations and best practices of the impacted industries. It will also provide the organizing and development functions to establish new concepts and standards addressing CIPR.

Stakeholders with interest in CIPR are international and include all levels of government, defense and security agencies, critical infrastructure domain businesses and agencies, and society in general (e.g. regions, communities and citizens).

3   SCOPE

Certain manmade and natural events have a known potential to affect societies at a national, continental or even global scale. Such events can cause extreme harm well beyond those experienced from regional catastrophic events, especially when the effects will take longer than a month to recover. Three examples of events with the potential to cause critical infrastructure collapse include Solar Storms caused by Coronal Mass Ejections (CME), Electromagnetic Pulse (EMP) and Cyber Events (intentional and otherwise). The CIPR WG will pursue its goals by addressing these three classes of events, and other classes of events with similar potential, when identified.

The CIPR WG will promote and apply systems engineering principles with emphasis on policy, analysis and concepts useful to understand, protect and recover existing operational infrastructure, and to provide strategies, standards and concepts for more resilient approaches. It will promote and perform activities supporting the stated goals.

This scope is synergistic with other INCOSE WGs identified above (e.g. MBSE, System of Systems, Resilient Systems, Power & Energy, etc.). For example, the application of model-based approaches will be essential to analyze the problem and to communicate alternative conceptual solutions. Therefore, this WG will seek interest and participation from INCOSE members and the other INCOSE WGs. It will also reach out to engage international and governmental organizations, professional groups, critical infrastructure providers, and others stakeholders. MOUs, contracts and other kinds of agreements may be sought with external organizations as needed to further the effort. These agreements, if any, will be established according to INCOSE guidelines, processes and procedures.

The critical infrastructure domains addressed by the CIPR WG include the following. Other domains may be addressed as the need is identified.

1) Chemical and other industrial bases

2) Communications

3) Electrical & Energy production and distribution

4) Emergency Services

5) Financial Services

6) Food and Agriculture

7) Government Services & Facilities

8) Healthcare and Public Health

9) Information Technology

10) Nuclear Reactors, Materials, and Waste

11) Transportation

12) Water storage, treatment and distribution

13) Waste handling and disposal (water, refuse, hazardous)

14) Society at large

4 SKILLS AND EXPERTISE REQUIRED

CIPR WG needs members with the following skills and expertise. This list is not comprehensive and is not a requirement for membership.

- Organizational and technical leadership

- An advanced understanding of systems engineering

- Specialized engineering knowledge of critical infrastructure domains and associated systems and information

- Model-based methods and life-cycle management expertise

- An understanding of complex systems and systems of systems

- An understanding of system resilience and life cycle operational availability

- A strong willingness to learn and advance the knowledge of technical/engineering perspectives of CIPR including organizational relationships and others perspectives as needed.

These skills will be drawn from INCOSE members, and from engagement with groups external to INCOSE.

5   MEMBERS, ROLES AND RESPONSIBILITIES

Three co-chairs facilitate the group's decisions, which are made by consensus.

Role	Responsibilities
WG Lead Chair	Be the primary POC for all WG activities, communications and actions. This role includes relationships both internal and external to INCOSE. Responsible for annual budget and other financial activities. Responsible for operating process development and approval.
Technical Co-Chair	Convene monthly member meetings, maintain a list of technical projects and products, monitor progress on technical tasks, maintain the WG Connect site and external site, manage material and knowledge collection and distribution, and act as WG Lead when appropriate.
Logistics Co-Chair	Ensure that facilities and other resources are available for special meetings. Develop communications, programs, planning and arrangements for workshops, conferences, symposiums and special public meetings.

6   OUTCOMES (PRODUCTS/SERVICES)

The following comprises the agenda for the next three years, and may change based on the needs of the systems engineering community. Products will support an international collection of stakeholders with interest in CIPR, including all levels of organizations and individuals from the list of domains in Section 3.

Products:

1) SOS, FOS and System-specific systems engineering architecture products, documents and other SE process products as needed.

    a. 2015: A list of targeted CIPR products being sought and developed, with anticipated completion dates. This list will be maintained annually.

    b. 2016: Select and generate initial products with emphasis on those that organize the critical infrastructure "Big Picture".

    c. 2017-2018: Develop specific targeted product from the list.

2) Pamphlets addressing CIPR topics from each relevant INCOSE working group

    a. 2015: Put out a call to other INCOSE WGs for topics they are willing to contribute information to generate pamphlets or papers. This call will be conducted annually.

    b. 2016-2018: Work with the other WGs to generate pamphlets and papers. Publish as they become ready.

3) Papers, Articles, Briefings, Tutorials

    a. 2015: Call for papers in support of Energy Tech 2015 and IS2016. Calls will continue to be made in subsequent years.

    b. 2015: Development schedule for papers, articles, briefings and tutorials based on proposals made in response to calls for these products. This schedule will be maintained annually.

    c. 2016: At least one paper and one briefing.

    d. 2017-2018: Papers, articles, briefings and tutorials as scheduled.

4) Training Courses taught by CIPR WG members

    a. 2016: A list of CIPR members who will develop and provide courses and tutorials

    b. 2017: First course or tutorial on a CIPR topic taught by a CIPR member.

    c. 2018: Continued delivery of tutorials and courses based on requests and speaker availability. A schedule will be kept.

5) Provide References and other products to those needing information

    a. 2016: Make references available to members via INCOSE Connect. Maintain this site.

    b. 2017: Evaluate options for making key references available external to INCOSE.

    c. 2018: Establish and external communications presence that makes important resources available external to INCOSE.

<u>Services</u>:

1) Organize and support development of standards related to CIPR

    a. 2017: Establish a list of standards relevant to CIPR. Identify gaps in standards.

    b. 2018: Identify national and international policy issues related to CIPR

    c. 2018: Work with a selected standards-generating body to address policy issues, or to initiate development of a new standard.

2) Support INCOSE conferences, meetings, etc. addressing CIPR domains

   a. 2015-2018: Hold WG meetings at INCOSE IW and IS.

   b. 2015: Support Energy Tech conference in conjunction with the INCOSE PESWG.

   c. 2016: Develop a plan for supporting development of future CIPR tracks at INCOSE conferences.

3) Support external organizations related to CIPR

   a. 2015-2016: Develop a list other organizations, external to INCOSE, related to CIPR that have the possibility of collaboration and outreach.

   b. 2016: Develop a strategy for outreach to the listed organizations.

   c. 2016-2018: Support external conferences, meeting and other activities with the external organizations.

   d. 2016-2018: Pursue formalized relations with external organizations.

4) Provide expert assistance to users of CIPR WG products

   a. 2016: Develop a list of CIPR WG members able and willing to provide assistance to users of WG products.

   b. 2017-2018: Make the list available for use through INCOSE outreach processes.

5) Review results of CIPR-related research and developments (e.g., systems engineering products and courses) by systems engineers outside the CIPR WG.

   a. 2016-2018: Develop and maintain a list of products and courses developed by sources external to the CIPR WG, including other INCOSE WGs and groups external to INCOSE. This list will be developed by research of the members and made available through INCOSE Connect.

6) Capture Lessons Learned, Recommendations, etc. and apply to future products, research, etc.

   a. 2016-2018: Develop and maintain list of lessons learned and recommendations. The list will be updated annually and available to WG Members via INCOSE Connect.

7   APPROACH

▪ Meet monthly, on a day agreeable to a majority of the active group members. The purpose of the meeting is to share pertinent information, to review and advance technical projects, and to make decisions. Meetings will include call in, shared presentations, etc.

- Delegate between-meeting work on technical projects to one or more members and/or groups, who incorporate feedback from the group and flesh out details for discussion.

- Communicate by email and share results using INCOSE media, meetings, etc.

- Volunteers will be encouraged to participate in activities relevant to CIPR with organizations external to INCOSE, and to share resulting information and outcomes with the working group.

- Decisions regarding this charter will be made by the CIPR WG co-chairs as noted herein (see Section 5). Decisions regarding products, services and other activities will be made by consensus among the participants active in the specific activity.

- INCOSE can help this working group reach members external to the membership by providing a web portal to disseminate information to interested parties, and may include items such as a website and a wiki. In addition, INCOSE can distribute a brochure during symposia and conferences that summarize the CIPR WG, the available products and contact information.

8 MEASURES OF SUCCESS

- Papers & presentations submitted to the INCOSE Symposia, conferences and other organizations.

- Papers published in INCOSE and other organizations' publications

- Contributions of the group and individual members to efforts by other organizations

- Number of members and guests at each CIPR WG meeting

- Engagement of the WG and its members with external organizations related to CIPR.

9 RESOURCE REQUIREMENTS

CIPR WG will submit an annual budget request to obtain resources required to support this effort.

Working Group SharePoint Site on the INCOSE Connect.

Share Point Site external to INCOSE.

Need Global Meet account.

Resource requirements may require seeking resources external to INCOSE.

10 DURATION

The group will continue its efforts as long as there is a need to develop and communicate CIPR information and standards. This Charter will remain in effect until rescinded by the signatory.

11 SIGNATURES

WG Lead Chair   Date

21 June 2015

Technical Director, INCOSE   Date

Revision History

Date	Revision	Description	Author
06/30/2015	0	Initial Issuance	CIPR Working Group