Industrial Safety

PLATAFORMA TECNOLÓGICA ESPAÑOLA DE SEGURIDAD INDUSTRIAL



Resilience & Interdependencies

(Critical Infrastructures: Safety & Security integration, Risk Mgt. and Business Continuity)

CRITIS 2017

(Lucca, 11 October 2017)

Javier LARRAÑETA PESI Secretary General ETPIS Executive Board

tecnalia Inspiring Business







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- ETPIS PESI: Technology Platforms on Industrial Safety & Security
- Security and CIP (Industry Resilience & Critical Infrastructures)
- ETPIS-PESI Strategy in H2020 Secure Societies (SafeFuture, SafeInfrastructures and Safety-Security Integration)
- Integrated approach for Risk Management, Business Continuity and Resilience considering Dependencies



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ETPIS & PESI: Technology Platforms on (integral) Industrial Safety & Security





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ETPIS- PESI 2020 Vision



« Innovation and technology development (R&D+i) based on a global and integrating vision on Industrial Safety and Risk management» (Safety + Security)

Deployment areas:



• OSH

- Environmental Safety
- Corporate Security and Resilience based on the CIP European Directive (plants, transport infrastructures & utility networks)





1.- Industry (Corps & SME, Associations)

- \bigtriangleup Enterprises and Industrial Corporations (many sectors)
- △ Technology-based SME, Engineering & Consultancy firms)
- △ Associations (Manufacturing, Energy, Security, PPE, Fire, etc)

2.- Government: Ministeries & Regional Bodies

- △ Ministry of Economy (Innovation & Research): CDTI
- △ Ministry of Industry & Energy: DG Industrial Safety, SETSI ICT Telecomms (INCIBE Cybersecurity)
- △ Ministry of Employment (OSH)

Industrial Safety

- △ Ministry of Public Infrastructures (Transport Inf, Haz.Goods...)
- $\bigtriangleup\,$ Ministry de Agriculture, Food and Environment
- △ Ministry of Interior (DG PCyE, CNPIC, DG-Traffic)
- △ Public Bodies from Autonomous Governments

3.- Academia and Research Institutions & Labs

- \bigtriangleup Research Institutes, Labs, Technology Centres
- $\bigtriangleup\,$ R&D units at Universitiess

4.- Other relevant institutions

- △ Asociación Española de Normalización (AENOR)
- \bigtriangleup Insurance, Prevention & medical services: accidents at work, professional disseases



PESI partners



60 Founding Members (PESI: non-profit Association)

Around 850 active Organizations +2500 technicians members





H2020: Industrial Leadership (NMBP) and Societal Challenges (Secure Societies)

Adaptation of PESI's Focused Groups to HORIZON-2020 (since 2013)

- Industrial Safety (Smart Working Environmets, Structural Safety & ageing infraestructures –industrial plants, transport infrastructures & utility networks-)
- Human & Organizational Factors (safety culture, Road Safety at Work,...)
- Corporate Security (CIP, resilience, business continuity and ciber-security)
- Inter-platforms Group on Nanosafety and Nanotoxicology
- Inter-platforms Group on Smart City

HORIZON-2020	INDUST	TRIAL LEAD	ERSHIP				SOCIETAL CHALLENGES						
ETPIS (PESI): New Focussed Groups	ITC	NANO	BIO	MAT	PROD	SPACE	HEALTH	FOOD	ENERGY	TRANSP	CLIMATE	SEC-SOC	
SafeFuture		х			Х			x	х	x	x	х	
ERANET (SAF€RA)					Х								
Safe-Production (&Safety Products)		Х			Х				Х			Х	
Safe-Energy									Х	Х		Х	
Safe-Infrastructures					Х				Х	X	Х	Х	
Safety Transport (haz. goods)										x		х	
Security: convergence with Safety (& CIP - Infrastructures Protection-)												x	
- Emergencies	Х				Х	Х				Х	Х	Х	
- Cibersecurity	Х								х	Х		Х	
Nanosafety & Nano-toxicology (Joint ETP Group)		x	x	x	x		x	x				х	
Environmental Safety		x	х	х	х	х		x	x	x	x	х	
Miscellaneus													
- Ageing at Work (Healthy & Active Ageing)	Х				Х		Х						
- Road Safety (at work)										Х		Х	
- Prevention Culture & Training					Х							Х	





PESI (ETPIS): new FGs for H2020 since 2016

3 Deployment Areas (focused Groups):

• SAFETY

- INDUSTRIAL SAFETY (Smart working environments & Factory 4.0): PPEs, Safety products & systems, Sensoring-Monitoring, NDT, RAMS & Assets Management including Ageing)
- Structural Safety (Safe-Infrastructures, in coord. with Construction & Transport ETPs)
- Emergencies Management (joint with FG-Security)
- (New 2017) Civil use of RPAS-drones on Safety-Maintenance & Security (joint with FG-Sec)
- **SECURITY** (inc. Industrial Cybersecurity)
 - Governance, Resilience & CIP: Safety-Security Integration (ETPIS)
 - Technologies for Security & Assests Protection
 - Industrial CIBERSECURITY

HUMAN & ORGANIZATIONAL Issues

- Safety Culture and Ageing at Work
- **RSW** (Road Safety at Work)
- (near future) Human factor in Security & CIP (Insider threats)







PESI (ETPIS): Inter-Platforms Groups for H2020

- 3 National Inter-Platforms Groups (*Hubs*):
 - **GICI** Smart City (Safety & Security and Resilience)
 - Transport Safety (hazardous goods and mass public transport)
 - Nanosafety and Nano-toxicology

• New strategy for HORIZON-2020: from SafeFuture to Common House







PESI Focused Group GT-Security

• Launching FG-Security (Madrid, UNESA, Feb- 2012) with the **CNPIC** (Ministry of Interior); (previous works during 2 years!!)





- Subgroups:
 - Integral Security: integration Security-Safety and Resilience (ISF)
 - Industrial Cybersecurity: Automation systems &SCADA (CCI)
- Coordination: Dr. Bolaños, Security Director at GAS NATURAL Group
- Members: IBERDROLA, REPSOL and other relevant CI Operators







Security issues and CIP

Security & Resilience related to "Industrial" Critical Infrastructures





Integral Security and Resilience: the new paradigm

• World context: Security and Defence

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New threats with new means (intelligence, cyber-arms)

DES

- National Strategies (USA, EU) on Security and Critical Infrastructures Protection (CIP) Directives:
 - Convergence from a National Security (& Defence) vision :
 - Risk Analysis, physical and logical security plans
 - Military technologies (dual use) for Corporate Security
 - CIP of "private-operated" critical or relevant Infrastructures (industrial plants / energy / oil & gas/ water/ transport inf.&networks/ telecomms...)
 - complex industrial installations &infraestructures (more than HQ buildings and IS)
 - Cybersecurity (IS but mainly SCADA)
 - Business Continuity and Resilience
- New driver: Disaster Resilience (climate change increasing nat.disasters)
- Smart & Secure Cities: our Citizens and infrastructures are the new target (NY, Madrid, London, Paris & Brussels)



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H-2020 - SEC-2016/2017 (last call August-2017): topics

CIP: Pression, detection, response and mitigation or precyber threats to elements of the European critical infrastructure

 Critical Infrastructures (for the Smart City): Water Systems, Energy Infrastructure (power plants and distribution), Transport Infrastructure and mean. transportation, Communication Infrastructure, Health Services, Financial Services

SECURITY

DISASTER RESILIENCE : safeguarding and securing society, ding adapting to climate change (Response, Awareness/Civit procession Systems, Bio threats, CBRN etc.

- FIGHT AGAINS
 - SONT CALATENNAL SE

JIGITAL SECURITY:

- Cyber Security for SMEs and Individuals, Security Economics, EU and Intel Coordination in Cybersecurity Research and Innovation, Cyber Security Threa and Threat Actor, Privacy and Data Protection
 - **Digital Security and SMEs**

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Framework for corporate security in Spain: National Security Strategy & CIP Law



Deployment of the National CIP Law (CNPIC):

- Sectors & Critical Infrastructures :
 - Private Operators
 - Public Administrations
- Sectoral White-Books (13: 8 industry-related)
- **PSO Operator Security Plan**
- PPE Specific Protection Plans (individual Cls)
- Entreprise Security Organization and Plans
 - New integrated Strategy & Risk management (adaptation of Saf-Sec systems & plans)
 - Certification of Sec plans/systems (CNPIC)
- + New Law for Security Private Services (security subcontractors in Operators)







Systems and Technology towards an integral Security and Resilience

- Organization and new responsabilities in Safety & Security
 - Integrated Risk Analysis & Business Intelligence (TS/CI, new risks: conflicts and radicalization)
 - Operational Reliability and Safety (engineering / process): industrial and environmental Safety and OSH
 - Security of industrial installations, infrastructures and networks
 - Information Security (IT-OT: Cybersecurity)
 - GRC Strategy & organization based on a real SECURITY-SAFETY integration
- New Framework (CIP Directive & National Laws, H-2020/Security):
 - Convergence safety- security (from different visions: industrial safety, cybersecurity and corporate security): integrated Risk Mgt. and Dependencies
 - DRS (Natural Disasters Resilience, including climate change) and Tech. Accidents (Civil Protection and emergencies plans): Crisis Mgt.
 - Critical Infraestructuras **Protection** (industry / utilities/ transport /...) towards BC
 - Cybersecurity (IS security, automation& control systems/SCADA)
 - Business (essential services) Continuity and Resilience





Security, Risk Management and Infrastructures protection

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PESI: technology challenges on (industrial) Security

Some priorities in R&D and innovation:

- Convergence model for corporate security & resilience in industrial environments and infrastructures (*Secu.Safety*)
- Secu.Safety by design: new methodologies and techniques
- New integrated **Risk Analysis** tools (criticity and **dependencies**)
- Scenario simulation for integral Safety-Security, under a multi-risk multifactor approach: natural risks and technology/ industrial risks, for industrial zones surrounding Cities (population, civil protection and emergencies Mgt.)
- Cyber-security (SCADA): tools, new generation ICS, maturity models...
- Systems Integration and Interoperability: production systems (alarms, process control) and security (access, CCTV...): integrated Control Centres
- Personnel Security (CI Operators: privacy issues)
- Safety Transport (hazardous materials, mass t.) & Logistics Security: transport inf. and networks, value-chain, vehicles, interaction, routes, etc.
- Smart grids (electricity): standarization of Security issues
- ..

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- Business Continuity and Resilience (modelling and indicators)
- PPP between Cities/Regions & CI Operators on Security & Resilience





PESI - FG Security: relevant initiatives on Security

• Launching FG-Security:

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- Integral Security & Resilience, Cybersecurity (automation systems)
- European R&D projects in Security Services & Resilience (Regional/City Gov., LEAs, Security Services and Corporate Security Dept.)
 - INNOSEC, INSEC (PESI members: coordinators & partners)
 - HARMONISE ...
- INGRID Laboratories by TECNALIA: Cybersecurity on Smart Grids (IBERDROLA and Spanish Smart-Meters & energy systems Manufacturers)
- Creation of the CCI (Industrial Cybersecurity Center): Maturity model (adopted by German Cert. bodies: DEKRA, TÜV Nord...)
- PSOPHIA Project (DGHOME): Human Factor in Security (CI Op.)
- +20 R&D projects funded by Spanish R&D Funds
- 2015 Security Calls: Spain nº 1 in returns (grants)
- Promoting FG on Safety-Security Integration







PESI contribution to CI Security: PSOPHIA (Personnel Security & social Engineering)

🚽 🛕 🎘 Herramientas 🛪 🗽 些 🛪 🦢 🕂 Opciones de vista 🐐 🗙 Cerrar Pantalla 1 de 14 👻 レ PSOPH Co Funded by The Prevention, Preparedness and Consequence rorism and other Security-related Risks Programme of the Europea Union PSOPHIA GUIDELINES FOR CRITICAL INFRASTRUCTURE (CI) EMPLOYEES WP4.1 (GI) Project reference number : HOME/2012/CIPS/AG/4000003789 Project title : Increasing Security Awareness of Critical Infrastructure OPerators introducing Intelligence Techniques and focusing on Psychosocial and Human factors- PSOPHIA Project duration : 18 months Start Day: 01.04.2013 Funding Scheme: CIPS 2012 Author: Olivia Gualda

2017



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PESI: Safety-Security- Resilience & Interdependencies (CRITIS, Lucca, 11 Oct 2017)



PESI: 2016/2017 events related to Security & CIP

European Commission: "Infoday H2020 Secure Societies: CIP"

• PESI hosting the event (Bilbao, 8 March-2016)

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CDTI-PESI: National Infoday H2020 Secure Societies (Madrid, 2016 & 2017)

EC-DGs: evaluation of a *Joint Initiative on Safety-Security integration Promoters:* ETPIS, EADS, EOS, IMG-S (Brussels, 13 May 2016)

European Resilient Regions (Scotland, Lombardy-Milan, Rome, Basque C.)

• CIP & Resilience Network, JRC and DGHOME (Bilbao, 13-14 June 2016)

European Cong S2R Forum: Safety & Security Research in Europe

• (Bilbao, 26-28 Oct-2016)

SMI2G (H2020 Security calls): brokerage and project proposals presentations (Brussels, February 2016/2017)

DG HOME CoU (Community of Users): DRS funded projects (Resilience models) (Brussels September 2017)

CRITIS-2017 !!





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ETPIS SafeFuture & H-2020 PPPs (related to Safety-Security integration, Resilience and CIP)





SafeFuture

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Safety as a trade-mark of the technology "made in EU" Safe innovation for sustainable future

Way to achieving (by 2020) a new safety paradigm for European industry. Safety as a key factor for successful business and an inherent element of business performance. Industrial safety performance progressively and measurably improved in terms of reduction of reportable accidents at work, occupational diseases, environmental incidents and accident-related production losses. "Incident elimination" and "learning from failures" cultures embedded in design, maintenance, operation at all levels in enterprises. Structured self-regulated safety programs in all major industry sectors in all European countries. Measurable performance targets for accident elimination and accident free mind set workplaces as the norm in Europe.

Safe Infrastructures:

Safe Life extension of process plants, power plants, transport & utility infrastructure networks, ...
Intensification of NatCat (NaTech)
Design and monitoring for long term operation
Reliability & Resilience



Safe Energy:

•New safety challenges in renewable energies (wind, H2, solar, bio-fuels, fuel cells, photovoltaic,...)

Safe energy production and storageSmart grids

Safe Products/Production :

- •Green jobs
- •Value chain and interdependencies
- Nanosafety
- •PPEs & Smart Working Environments

Resilience: Protection and Cyber-security

Example: Multi-Risk / Risk-Risk tradeoffs – safety for sustainable integration, interaction and risk governance:

 "Agreed Approach to Risk-Risk Tradeoff management" (the Multi-Risk initiative); difficulties in putting together different risk mitigation policies and ensuring their compatibility



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Safety for Sustainable European Industry Growth

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Safe-Infrastructures: vision

- SafeFuture / Safe-Infrastructures vision:
 Safety-Reliability-Resiliance
 - Research towards new concepts and systems, with Safety & Reliability as essential elements in Industrial plants and Utilities networks
 - Industrial infrastructures: similar technology & organizational challenges related to ageing >>> common research objetives for safety & reliability
 - Industrial Control Systems: also ageing , IT/OT evolution + cyber-security threats !!

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Special impacts

buried or non-accessible structures



Continuous monitoring of critical areas.





Hazardous or hostile environments



Ageing structures













Smart Working Environments (SWE) in the Industry 4.0

OSH/Safe-Production (related to **PPP FoF**): Wearables 4.0, Emergencies **Factory 4.0** (Control Systems, Robots, interoperability...): **Cybersecurity threats**



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Safety and Reliability: added challenges

• Systems, Process and life-time modelling integration:

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- SHM structural health monitoring
- Sensoring & Inspection systems
- Design & engineering methods (inherent safety)
- RAMS (Reliability-Availability-Maintenance-Safety)
- Assest /process modelling (life-time), advanced DSS
- New issues: Security and protection
- Information Systems (IT/OT)

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- Software maintenance (ageing/upgrading: risky processes)
- IT/OT evolution (IoT, Big-data, cloud comp., cyber-physical s.
- Cyber-security (increasing threats)
- Resiliance and Business continuity models
 - New tools for: RM, BCM and Resilience







Instrumentation and Monitorization

Monitorization of processes / machines

- Monitorización y control de variables (sensores, instrumentación, sistemas)
- Control remoto: sistemas y comunicaciones (GPRS, WiFi, etc.)
- Transición desde sistemas propietarios hacia aplicaciones en tecnología Web y en la "nube"

• New problems on Security:

- Sistemas embebidos (componentes)
- Sistemas abiertos
- Ciberseguridad





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PESI: Safety-Security- Resilience & Interdependencies (CRITIS, Lucca, 11 Oct 2017)



Safety-Security (operation & maintenance)

BC EXPLOSIO TOP GATE

EXPLOSION

Leak

LEAK

Pipe Split

PIPE SPLIT

Loss of Protection

System PROTECTION SYS

2017

- **RAMS** (Reliability, Availability, Maintenance & Safety +Security) as the reference model
 - Analysis, Evaluation and Risk Mgt. (stepts in the life-cyicle)
 - Predictive Models for maintenance (based on situation: diagnosis, prognosis)
 - Learning from behaviour (artificial intelligence)
 - Monitoring integrated Systems
 - Life-Cycle and Ageing Management
 - **ICS** Cybersecurity

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INFORMATION SYSTEMS evolution: IoT, Big-Data, Cloud comp., Cyber-physical S. !!





PESI: Safety-Security- Resilience & Interdependencies (CRITIS, Lucca, 11 Oct 2017)





Security in ETPIS SafeFuture & SafeInfrastructures strategy

- Safety and Health at work (processes)
 - Smart Working Environments
 - Civil Protection & Emergencies
- Asset mangement (ageing of infrastructures and extend life-time)
 - Sensoring, inspection technologies, structural HMS
 - New materials and smart components (cyber-physical systems...)
 - Engineering techniques, maintenance & repairment

• Safety and reliability:

- Inherent safety and Risk-based design, RAMS
- Modelling systems, DSS...
- **Protection** (critical and no-critical infrastructures)
 - Security issues
 - CyberSecurity (ICS, SCADA)
- **IT/OT & Industry 4.0** (technology evolution: challenges and threats)
- Governance, Risk Mgt. and Resiliance :
 - Disasters (natural, accidents, evacuation, cascading effects on CI)
 - Dependencies between Operators (resilience, prevention of cascading effects)
 - PPP on Urban Resilience (cooperation with Municipalities/Regions)





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PESI integrated approach Risk Management, Business Continuity and Resilience (considering Dependencies)







Risk Management and Risk concept evolution

Conventional Risk concept:

• Threat / hazard – Vulnerability – Consequences

Risk Management (ISO 31000)



Resilience capability in an advanced Risk concept:

• Threat / hazard – Vulnerability – Resilience – Consequences







PESI integrated approach for BC and Resilience in CI

Integrate Risk Mgt and Emergency Mgt within an advanced Business Continuity Model

Bussines Continuity Management in Cl





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RA and BIA (Dependencies assesment)

- Risk and Dependencies Assesment:
 - Functions and Services evaluation (criticity level)

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- Resources (requirements):
 - Personnel
 - Equipment
 - SW systems, ITC
 - Utilities (Inter-dependencies)
 - Materials ...
- Business Impact Analysis:
 - Intra-dependencies
 - Inter-dependencies (external CIs)
 - Cascading effects (up-stream & down-stream)







Criticity evaluation (categories) and Dependencies

	INTRA-DEPENDENCIES	Direct Impacts	Control Rooms (Operat ion)	Security Control Rooms	Info Systems (OT/IT, ciber) &Comm	Staff - Mgnt Board & Crisis Committee	Essential Teams	other staff & ext person nel	Critical Proc-1	Critical Proc-2	Critical Proc-n	Security Equipment & Systems	(essential) Equipment & appliances	Infraestr uctures (building s)	External Services &Supplies	Others
Categor ies	Critical Elements of the Cl						-		-	-			-		-	
1	Control Rooms (Operation, Security, Integral)															
1	- Security Control Rooms															
	Information Systems (OT/IT, ciberseg.)															
- 11	&Communications (voice, radio, IP)															
ш	Staff - Mgnt Board & Crisis Committee															
ш	 essential Teams (Op&Maint, Emerg, ITC) 															
- 111	- other personnel & subcontractors															
	Critical Processes (industrial/essential service,															
IV	restricted areas; safety systems)															
IV	Critical Process-2															
IV	Critical Process-n										_					
V	Security Equipment & Systems															
VI	Equipment & appliances (esential)															
VII	Infraestructure (buildings, installations)															
VIII	External Services & Supplies (Subcontr&Providers)															
IX-X	Others (economic, legal, Soc accept., specific)															



Inter-dependencies (critical elements) with external CI

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	INTER-DEPENDENCIES	Direct Impacts	Energy	Gas/oil	Water	Telecoms (voice, data &ISP)	Location & Environment	Transport Infrast. (road, train	Logistics (& purveyance)	Security, Civil Protection & Emergencies	Others
Categories	Critical Elements of the CI		•				•	•	•	•	
I.	Control Rooms (Operation, Security, Integral)					5					
1	- Security Control Rooms					5					
	Information Systems (OT/IT, ciberseg.)										
Ш	&Communications (voice, radio, IP)					5					
Ш	Staff - Crisis Committee										
Ш	- essential teams (Op&Maint, Emerg, ITC)							4			
Ш	- other personnel & subcontractors										
	Critical Processes (industrial/essential service,										
	restricted areas; design, organization, tasks,										
IV	safety systems)										
IV	Critical Process-2								4		
IV	Critical Process-n										
V	Security Equipment & Systems										
VI	Equipment & appliances (esential)										
VII	Infraestructure (buildings, installations)						2	2			
VIII	External Services & Supplies (Subcontr&Providers)										
IX	Economic & Legal (Stability); Societal acceptance										
x	Others (specific in the CI)										



Inter-dependencies: cooperation between CI Operators

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- CI Operators: Security and Resilience Plans developed evaluating the main and direct dependencies and considering other "theoretical inter-dependencies" (defined by the strategic sectoral security plans coordinateb by Governments and Operators)
 - depedencies not based on an in-detail analysis for all active elements in the CI network/system (previous experiencies...)
 - Sec Plans and related information considered "classified" or "restricted"
 - Difficulties for sharing relevant information
- Build spaces for confidence: e.g. CERT and Technical Committees (led by National Agency for CIP) for CI Operators Security Dpts.
- Resilience **Exercices**: Cyber-exercices





Urban Resilience and CI Operators

- Community requirements for availability and resilience of the essential services (CI) at Local and Regional levels
- Public contracts (concessions) for Utilities and other public services operated by private companies: include clauses for QoS and "resilience" plans to the Operators
- New collaboration schemes between CI Operators and CIO and Municipalities and Regional Governments (PPP for Security and Resilience)







Thank you so much for your attention:

Questions or comments ?

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Cybersecurity Laboratories: <u>INGRID</u> by Tecnalia (Smart Grids) and Sec4Scada



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Sec4SCADA





Electric network management and operation

- Integration of Distributed Generation, storage and Electric Vehicles
- Active Demand Side Management
- Monitoring and supervision of MV/LV grid, based on AMI infrastructure

Advanced energy systems architecture: microgrids for energy efficiency improvement in urban areas and remote locations

Energy storage: power converters, control strategy and systems

Data analytics for network management and other smart grids applications

Final use of energy optimization:

- Smart energy management in buildings
- MicroCHP economic dispatching
- Smart analytics of consumption patterns and demand flexibility



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Safety for Sustainable European Industry Growth

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INGRID by TECNALIA: singular international laboratory with high experimental capacity in highvoltage and power

INGRID is a singular international laboratory with a high experimental capacity in high-voltage and power, which includes the testing of equipment and components related to smart grids and electric systems for renewable and intelligent management of electrical energy (electric vehicles, smart building, demand management...).

Ingrid is an alive and adaptable infrastructure which, in close contact with industry and the scientific community worldwide, supports applied research and technological development of companies, making up a node for international collaboration.



INGRID involved 7 main platforms:

Platform for electrical equipment testing Platform for high power electronic equipment and energy conversion Platform of electric systems for renewable energies Platform for energy storage Platform for energy distribution management and microgrids Platform for electrical vehicle-network connection Platform for Smart Grids communications





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INGRID - Platform for distributed management and microgrids

This platform will enable the development and demonstration of smart grids technologies and equipment involving the implementation and testing of algorithms for the interconnection to different renewable energy sources and the distributed generation as well as the improvement of the energy supply quality in the distribution network. This platform will comprise of a specific area for the development and testing of combined heat power generation, allowing the trial and tests for CHP individual equipment certification (home equipment mainly) and their network integration as generation elements.

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TECNALIA: Smart Grid Testing Tools

Design and development of Testing Tools for Smart Meters & Smart Data concentrators and other data communication equipment of the Smart Grid according to international standards.















INGRID: Evaluation of cybersecurity SmartGrids systems & components







- Manufacturers of:
 - Smart Meters (Service Nodes)
 - Smart Data Concentrators (Base Nodes)
 - PLC boards (Chipsets)
 - Smart Grid communication equipment
- Utilities
- Technology services and outsourcing companies
- Laboratories
- Suppliers of Smart Grids and Smart Meters technology

SERVICES

- Turnkey & Joint development
- Help manufacturers for certifications
- Definition of specification of Testing Tools
- Provide Testing Tools to ensure reliability and interoperability of the technology

TESTING TOOLS

- DLMS Companion Debugging Software
- DLMS Functionality Testing Tool
- PRIME Certification Testing Tool for Service Nodes
- PRIME Certification Testing Tool for Base Nodes

