

Asia Power Quality Initiative

An Initiative towards Education and Awareness in PQ Domain

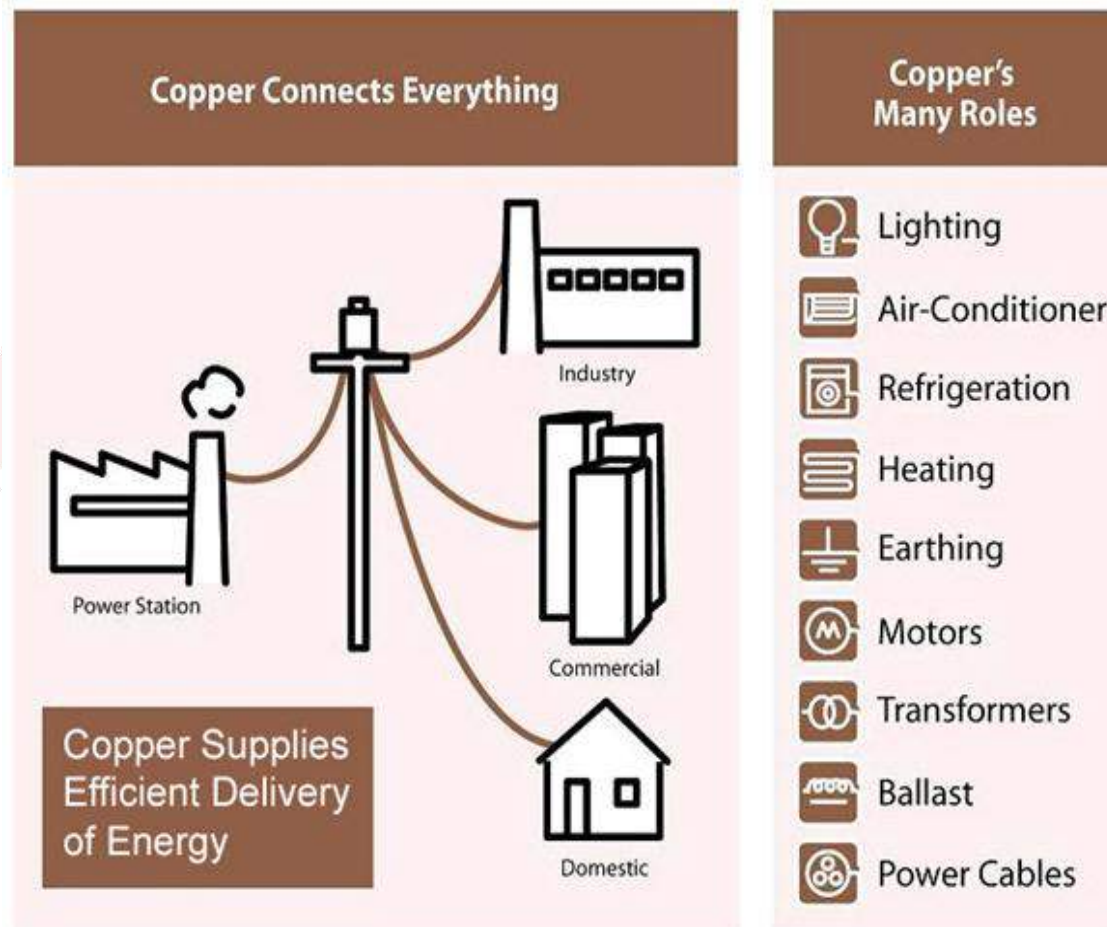
CPRI-Bangalore

– 18 Nov 2011

Manas Kundu, Director (Energy Solutions)
International Copper Promotion Council (India)

ELECTRICAL ENERGY EFFICIENCY

Copper: integral to electrical energy efficiency



INTERNATIONAL COPPER ASSOCIATION (ICA)

- 🌐 Not for profit organization
- 🌐 Leading organization for promoting copper worldwide
 - 31 offices in 24 countries on 6 continents
- 🌐 38 member companies comprising:
 - producers representing more than 80% of world output
 - world's 8 largest copper and copper alloy fabricators
- 🌐 \$90M program budget in 2010 including co-funding.

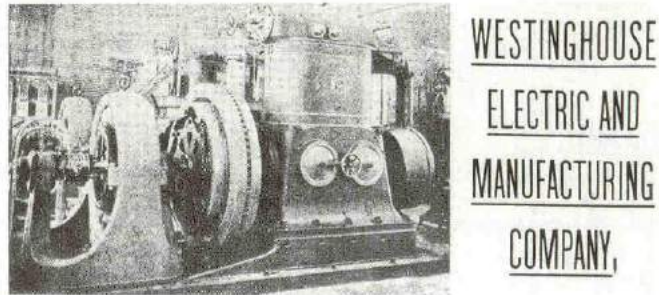
WHAT IS THE ICA NETWORK?

- 🌐 Integrated global industry platform
- 🌐 Knowledge-based
 - Independent, expert, “non-commercial” voice
- 🌐 Market-focused and Impact-oriented
 - Demand growth /defense – copper use
 - Technology development and commercialization
 - Regulatory impact and market access through health and environment science
- 🌐 Member-driven

ICA MISSION

Defend and grow markets for copper based on its superior technical performance and its contribution to a higher quality of life worldwide.

ELECTRICAL ENERGY – USER PERSPECTIVE



400 HORSE-POWER POLYPHASE GENERATORS IN POWER HOUSE OF THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, AT EAST PITTSBURG, PA.

SOLE OWNERS OF THE
TESLA POLYPHASE SYSTEM.

The ideal system for the distribution of power and light in factories and mills. Motors, are lights and incandescent lights supplied from the same circuits.

The system adopted by the Cataract Construction Company for their great plant at Niagara.

Especially adapted for transmission of power over long distances.

All machinery in our new works at East Pittsburg driven by Tesla Polyphase Motors, supplied from a central power plant. RESULTS: High Efficiency, Convenience, Economy and Flexibility. Inspection invited.

NOTICE!

Induction motors operated by the so-called "Monophasic" system, offered for sale by the General Electric Company, are in fact multiphase motors and are broadly covered by the patents of Nikola Tesla owned by the Westinghouse Electric and Manufacturing Company.

The motors and systems of distribution advertised by the Stanley Electric Company, of Pittsfield, are also an infringement of the Tesla patents.

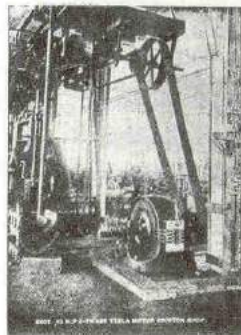
Suits have been brought against each of these companies, and are being pressed to a hearing as rapidly as possible.

It is the purpose of the Westinghouse Electric and Manufacturing Company to bring suits against all users of apparatus infringing the Tesla patents, in order that the rights of the company may be enforced.

Westinghouse Electric and
Manufacturing Company,

PITTSBURG, P.A.

BRANCH OFFICES IN ALL LEADING CITIES.



100 HORSE-POWER TESLA POLYPHASE MOTOR OPERATING MACHINERY IN SHOP AT EAST PITTSBURG.

- Productive factor
- therefore ...
 - Available
 - Quality
 - Low cost
 - ...

ELECTRICAL ENERGY – PRODUCT ...

- ... o essential public service?



- Answer:
 - Directive 85/374 CEE (25 july 1985)
 - European Court of Justice (27 april 1994)

ELECTRICAL ENERGY – PRODUCT, YES BUT ...



... Specific !

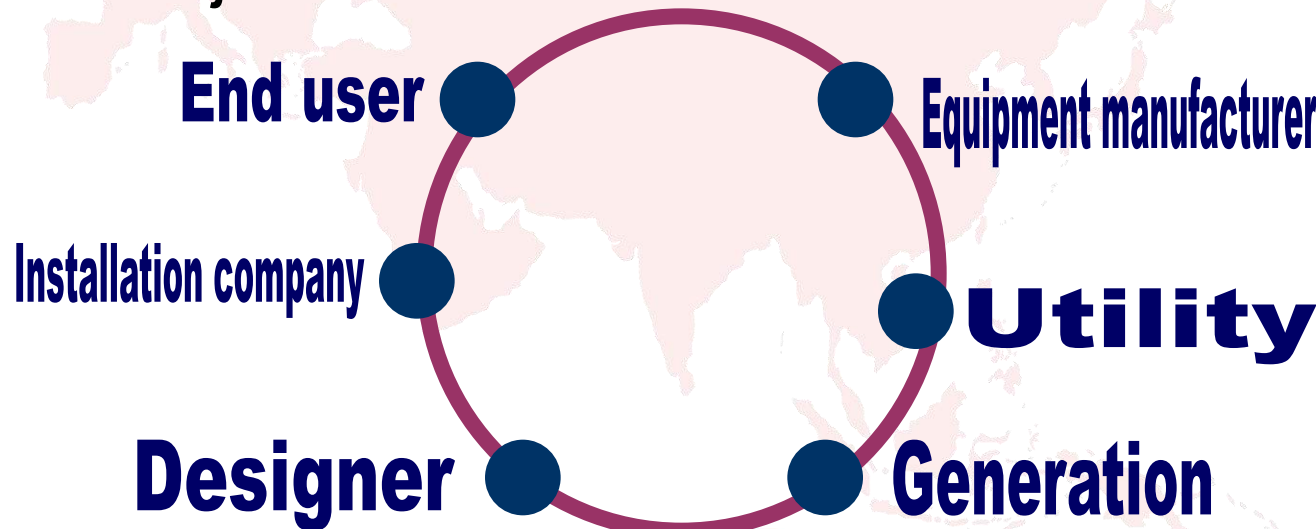
- Never used as it is ...
- ... but always transformed
- product quality \equiv expected quality of its transformation outcome

ELECTRICAL ENERGY – PRODUCT, YES BUT ...

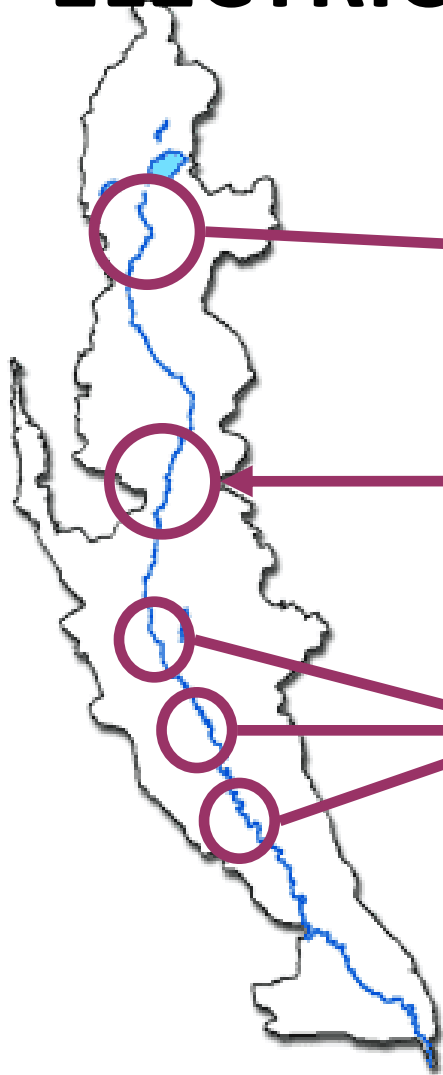


... Specific !

- Not just 2 actors on the scene but **several**



ELECTRICAL ENERGY – PRODUCT, YES BUT ...



- Pure @ spring ... and this is the expectation of the end user

- User waste pollute

- Level of pollution could not be tollerable by some end users

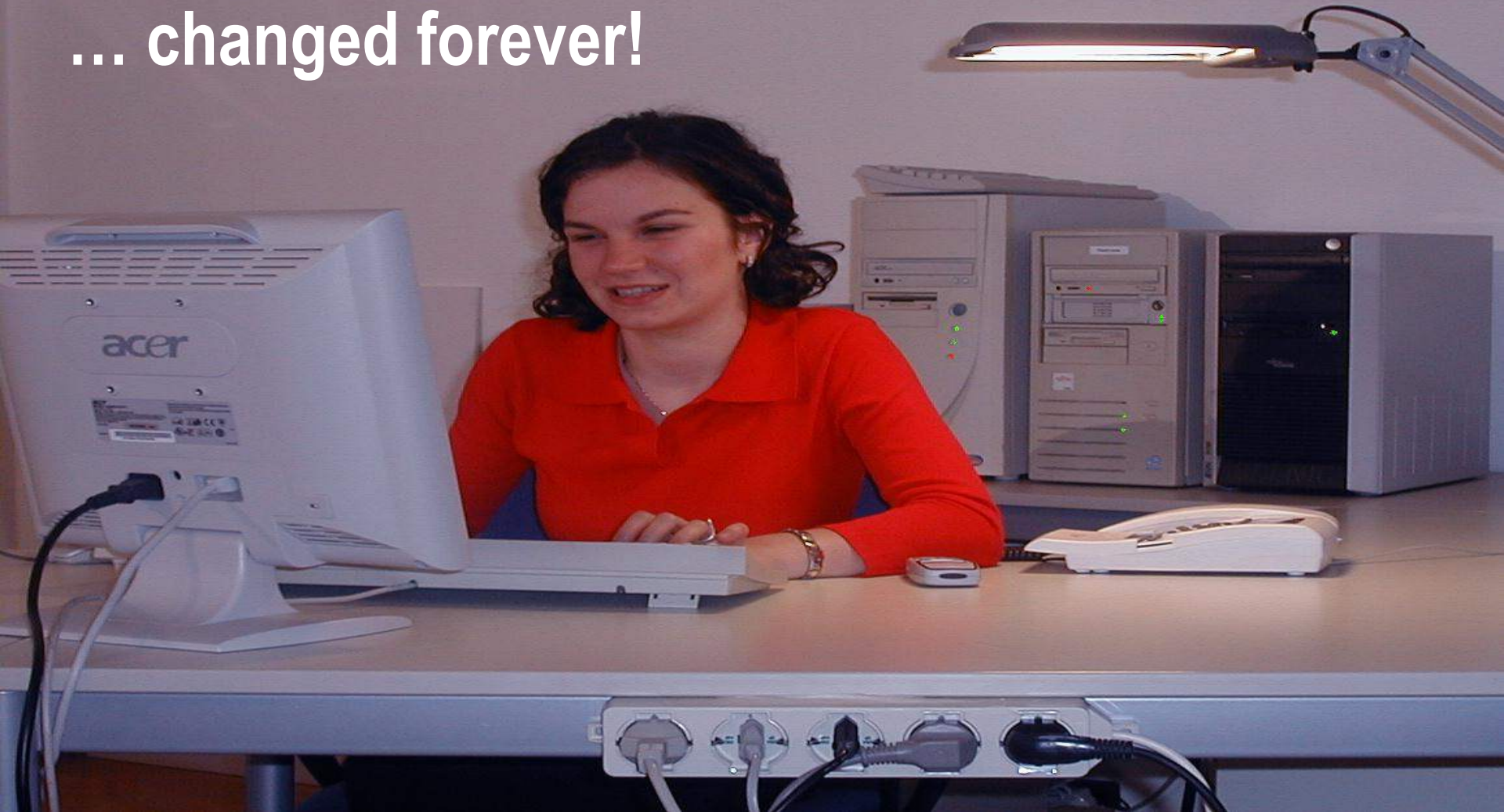
!

- in principle, even “natural level” could not be satisfactory for some end users

The world...



... changed forever!



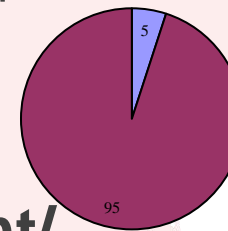
POWER QUALITY – A MAJOR ISSUE TODAY ?

1. Magnitude Of Harmonic Problems

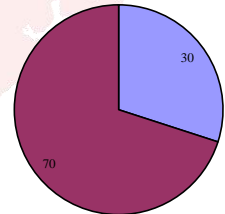
- Exponential Growth of Non-Linear Load
- Non-Linear Load Growth – USA
- Non-Linear Load Growth – Asia ?

LINEAR

NON - LINEAR



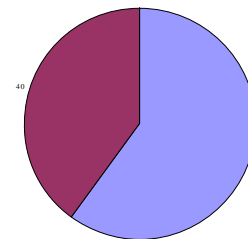
1960



1990

2. Intelligent Industrial Establishment/ Building /Utility

- Reliability
- Energy Efficiency
- Digital economy



2000

3. Awareness & Recognition

- Mid-1980 – USA – NEC, IEEE, & Education
- Asia, SEA, India, ME, - ?

4. Harmonics – an integral part of EMC

POWER QUALITY ?



... a hard job !

- There is no shared definition
- Relation between PQ & EMC
- It is not the same for everybody

POWER QUALITY – DEFINITION



- ISO 9000:
- “Quality is all inner and distinct elements that satisfy the clear or coercive **expectations of customers** and interested parties”.

POWER QUALITY – DEFINITION



- Mark McGranaghan:
- “Any power problem manifested in voltage, current, or frequency **deviation** that **results** in **failure** or **mis operation of customer equipment**”.

POWER QUALITY – DEFINITION



- M. Bollen:
- “Various sources use the term power quality with different meanings. [...] What all these terms **have in common** is that they treat the **interaction between the utility and the customer**, or in technical terms, between the **power system and the load**”.

POWER QUALITY – NOT ALWAYS THE SAME



- Different perspective
- ... even among the same group of end users

Utility

Equipment Manufacturers

PQ

End users

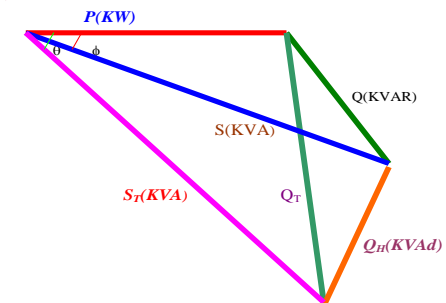
FALLOUTS OF POWER QUALITY EFFECTS

- **Effect of Voltage and Frequency Regulation**
 - Production line interruption
 - Quality rejection / batch rejection
 - Reprocessing / Bringing back on line
- **Unforeseen Harmonic Problems**
 - Overheating – leading to stoppage or failure
 - Increased Equipment Operating Temperature
 - Reduced Equipment/System Life
 - Premature Failure – Equipment/System
 - Generate Additional Losses & Enhanced kVA
- **Potential Risk of Internal Electrical Fire**
- **EMI Interference & Malfunctioning**
- **Distortion of Supply Distribution System**

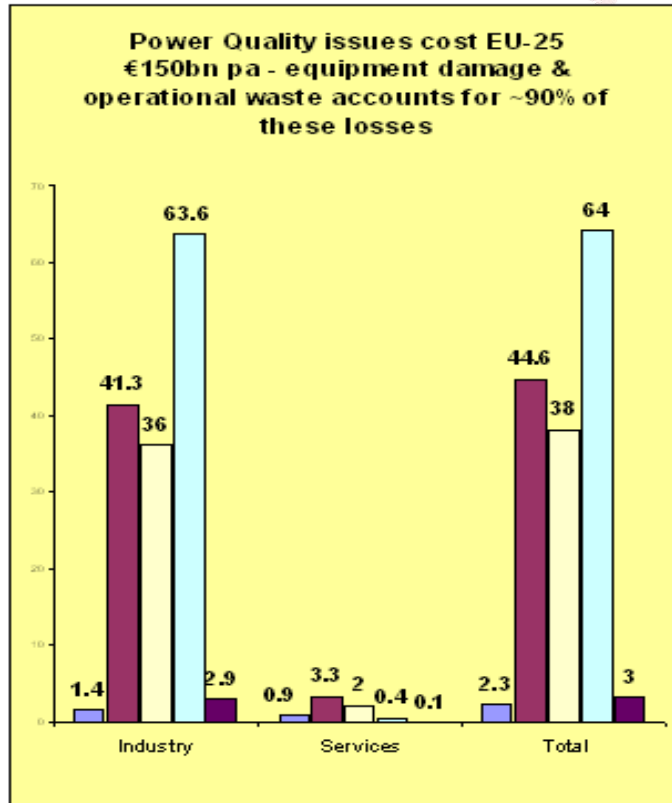


COST OF POWER QUALITY

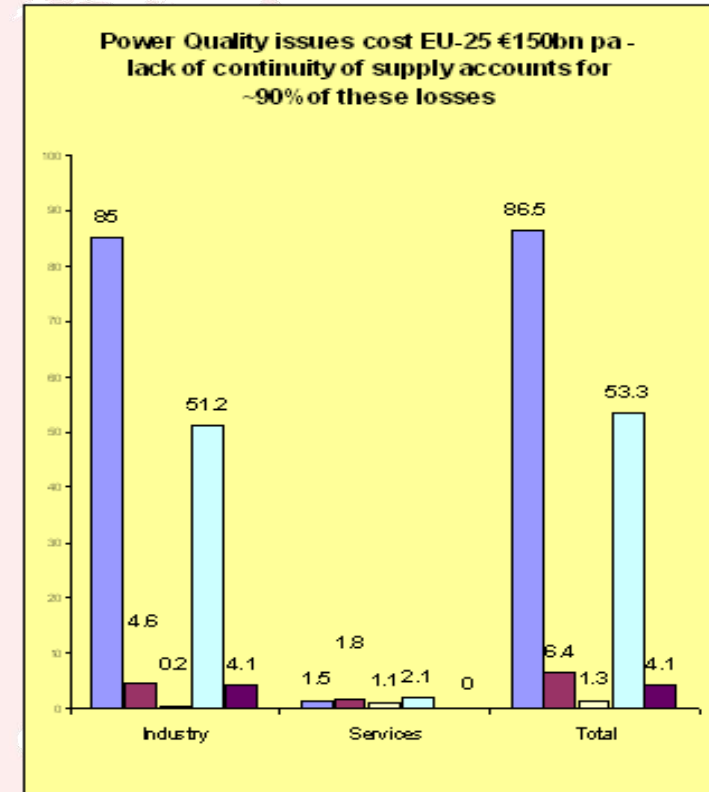
- **Economic**
 - Loss of Revenue
 - Tie up equipment capacity
 - Increased Electricity bill
 - Loss of opportunities
- **How does one evaluate**
 - Downtime
 - Revenue per hour
 - The cost of production
 - Equipment Problem
 - Troubleshoot the root cause
 - Determine the actual costs
 - Energy Cost
 - Actual Power
 - Reactive Power (PF) Penalties
 - MD Charge structure



PAN EUROPEAN SURVEY RESULT



- Labour losses
- WIP
- Process slow down
- Equipment damage
- Other costs



- Dips & SIs
- LIs
- Harmonics
- Surges & transients
- Flicker, unbalance & earthing

PQ EVENT COST

Cost per event €	Voltage dips	Short interruptions	Long interruptions	Surges and transients
Industry*	4 682	15 484	95 478	186 260
Services*	2 120	19 447	80 326	122 602
Average*	4 177	16 539	91 021	175 871

Remark*: 2 out of the 62 companies surveyed (semiconductors and retail) filtered out

CONCLUSION OF SURVEY

- **The cost of wastage caused by poor PQ for EU-25 according to this analysis exceeds €150bn.** “Industry” accounts for over 90% of this wastage.
- Industry suffers a loss for huge amount of resource unnecessarily.
- The nature of the main causes of poor power quality illustrates that better design and greater investment into these systems would eradicate most of these losses.
- This has always been LPQI contention – survey data only now support the premise.
- Measurement and diagnostics are significantly low for industrial sectors for which electrical power is so important.
- Industry [and others] would appear to be in denial about the levels of waste incurred and do not relate that to more obvious balance sheet type efficiency monitors.

ENSURING HIGH POWER QUALITY

-- whose responsibility!!



High Power Quality benefits all

It increases productivity, profitability & competitiveness,
It improves customer relationship & ensures better employee loyalty

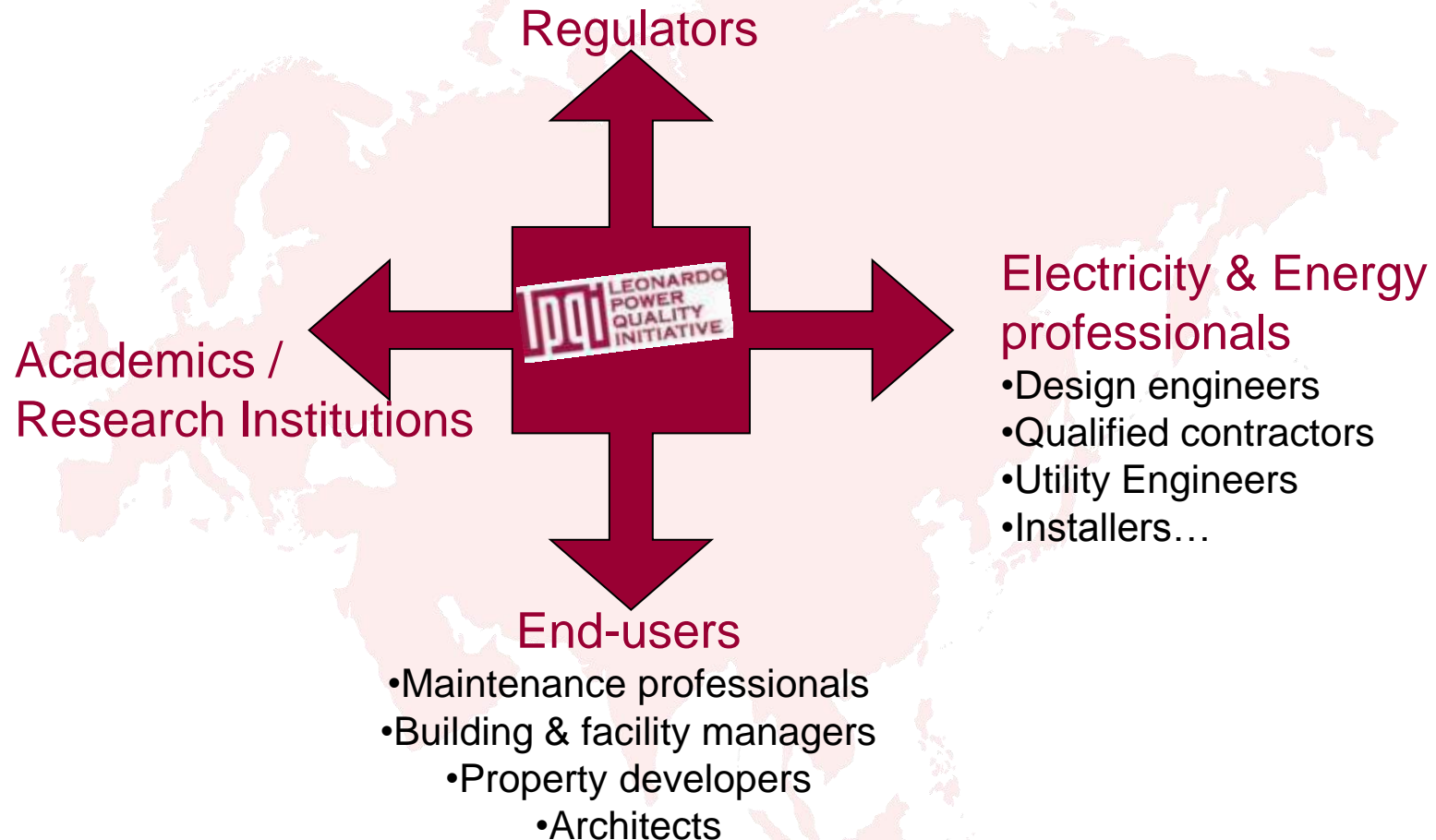
ASIA POWER QUALITY INITIATIVE (APQI)

- Program initiated in Asia with the background of the European Experiment (LPQI) – Continuing Professional Development
- A **neutral collaborative platform** shared by National Support Network (**NSN**) Partners to promote education and awareness and facilitate policy changes.
- **Objective:**
 - help manufacturing industries in Asia address Power Quality problems as a means to enhance their competitiveness in terms of better production output quality, reduced production costs, reduced production line interruption and batch losses.
 - Improved financial strength.
 - **Building up capacity** of industry / service sector in identifying and addressing PQ issues as a means to enhance their continuous quality delivery
 - Facilitate policy changes and market transformation towards '**Safe and Quality Power for All**'.

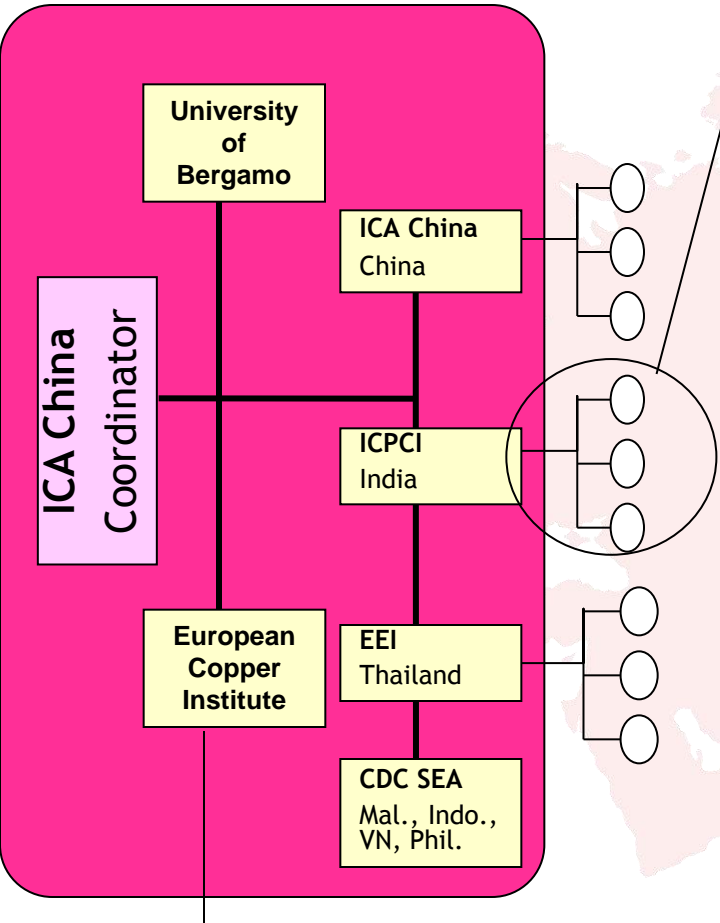
APQI STRATEGY

- **Geographical coverage:** China, India, Indonesia, Malaysia, Philippines, Thailand, Vietnam
- **Final beneficiaries:**
 - Industry managers and decision-makers
 - Electrical engineers and system designers
 - Utility Professionals
- **Raise awareness:**
 - Newsletter, press releases, articles, PQ briefs
 - Seminars
- **Build capacity:**
 - Web-based PQ knowledge center: case studies, e-learning software, extensive library of technical documents and training materials
 - Workshops / Training seminars
 - Technical articles in specialized magazines

OUTREACH



APQI already reaches 7 countries with more than 50,000 audience



APQI India - National Support Network

- Business intermediaries → Reach out to manufacturing industries
- Professional associations, institutes, societies → Reach out to electrical engineers and designers
- Academics, consultants, PQ advocates → Provide technical content
- PQ equipment suppliers, contractors → Provide technical content
- Specialized media, event organizers → Support dissemination
- Policy makers, utilities → Provide official endorsement, Lead policy and regulatory activities

BENEFITS

- **Industry associations:** means to enhance services to their members (including SMEs or Commercial and service sector).
- **Universities, Institutes of Engineers:** 1) a platform to publish articles and make themselves known, 2) a resource to help organize training workshops and seminars, and 3) role to facilitate technical content evaluation, topical study initiation etc.
- **Commercial partners** (consultants, equipment suppliers): communication media.
- **Power utilities, government agencies:** increased awareness and knowledge of power users on power quality; networking platform for Indian PQ advocates; synergize efforts towards gradually improving PQ, formulating policy and regulations.
- **Publication groups and specialized media:** a regular source of articles on power quality; possibilities of partnerships for events organization and for advertising.

FEW OUTCOMES

WELCOME TO APQI WEBSITE!

APQI is an initiative co-funded by the European Commission's Asia-Invest Program to improve the competitiveness of Asian manufacturing industries through enhanced knowledge and management of Power Quality.

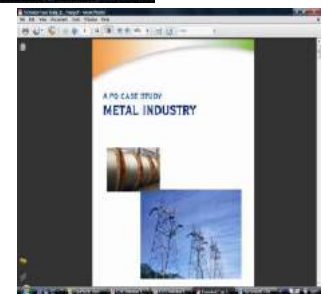
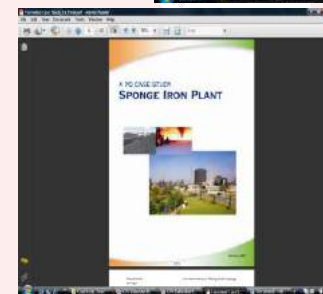
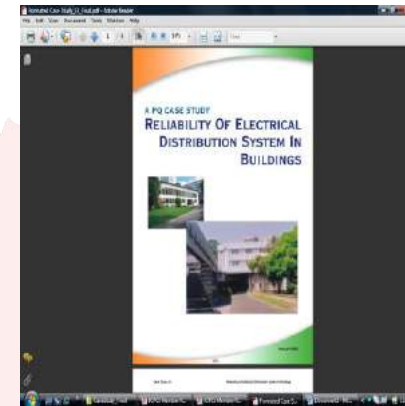
INTRODUCTION

The EU-Asia Power Quality Initiative (APQI) is a 32-month project implemented by the International Copper Association (China) and co-funded by the European Commission's Asia-Invest program. The APQI builds on the successful Leonardo Power Quality Initiative (LPQI), a 3-million Euro project funded by the European Commission that has established a strong power quality support network in Europe.

APQI CONTACTS

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Global Coordination



LEARNING FROM APQI : A FOCUS AROUND 3 MISSIONS



A reference
for all PQ matters in Asia

Education & training fine
tuned for individuals

Lead the dynamic
through adequate
knowledge management
& **e-dissemination**

A network of European /Asian
PQ experts
(standardization/certification
body participation)

Print publications

Website

Leads appropriate PQ study
(PQ Survey,
PQ Regulation report)

Electronic library

Forums

Seminars

Webinars

Address



<http://www.apqi.org>



Go

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