

Standardisation

Opportunities and risks for the cable industry

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Chairman IEC TC20



Ladies and gentlemen!

Around 25 years ago, I looked at my colleagues dealing with standardization and saw them carrying very heavy documents to the meetings. I said "This is the work I will never do".

Now, you see me here as a living example for "Never say Never".

Because I am now more than 20 years involved in standardization work, I would like to give my personal impression on these specific items and I think, there are some good reasons to look at it in more detail.

Standardisation, why?

... just to spend unavoidable efforts and costs?

... to serve as an essential key to the market?

... just to create an exciting amount of touristic events at exotic places?

... an excellent possibility to identify and to push ahead trends of technology?

Key factors: market relevance and resources

Standardization. Why?

Is it just to spend an amount of unavoidable efforts and cost? Or does it serve as an essential key to the market?

Is it just to create an exciting amount of touristic events at exotic places? Or is it an excellent possibility to identify and to push ahead trends of technology?

Whatever the answer is, I think, there are two key factors; one is market relevance of standards and the other is resources.

Now, I have grouped my presentation into four parts.

Content of presentation

Technical aspects



2 Standards

4 Conclusions

1 Background

3 Policy



Commercial aspects

Additional information see Appendix A and the Notes view

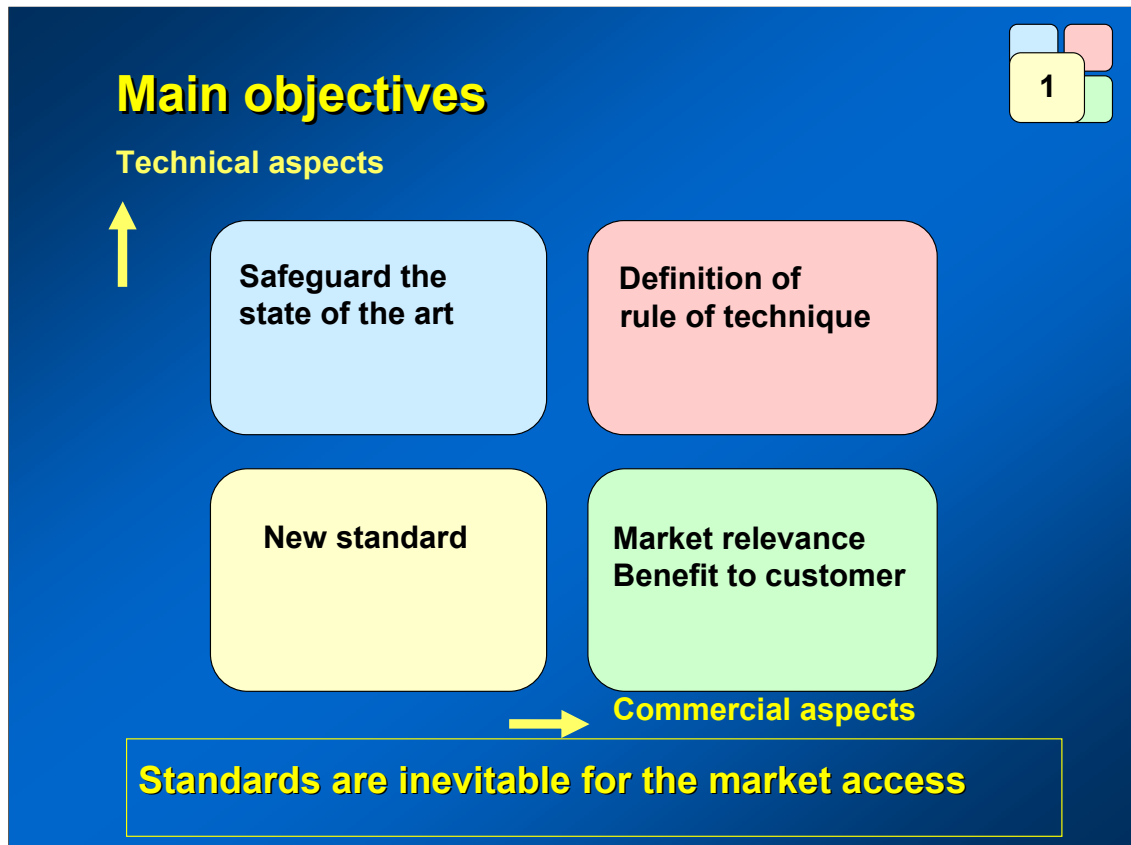
The four parts of the presentation are shown here in a so-called portfolio-view. This is used also for other items to demonstrate the firm interaction between technical and commercial matters and cannot be divorced. The presentation does not give any detailed information about specific standards, statistics, procedures or differences in products, as the range between

- power and telecom
- short cords and long distance connections
- low and high voltage

does not allow this. Therefore, it will focus on principle matters to help to reconsider the standardization policy of the company according to the market needs.

I will start this presentation with some background information, followed by a short view on standards. The main chapter will deal with the standardization policy of the companies. Finally, I will draw some conclusions.

Of course, a lot of the content is “power-minded” due to my personal background and experience. However, thanks should be given to Michel de Vecchis for his valuable comments during the preparation of the parts on the standards for telecom matters.

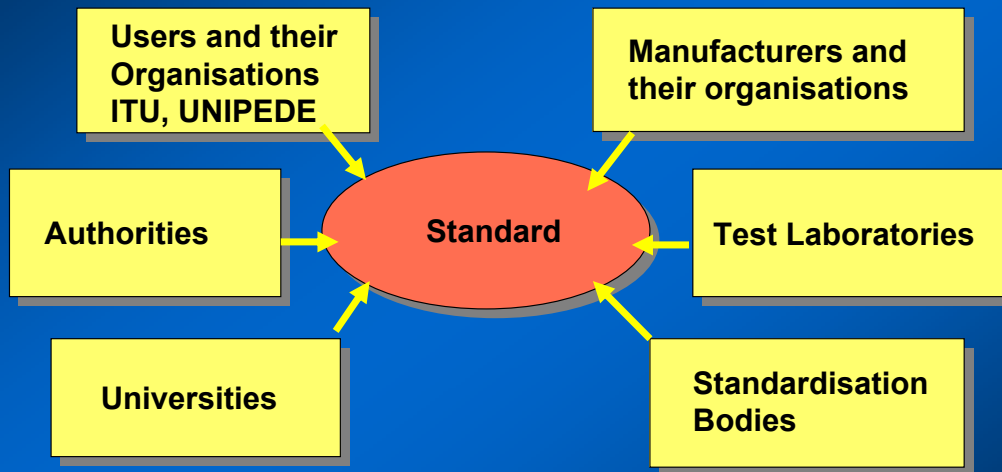


If we try to introduce a new standard, the classic approach is, that we try to safeguard the state of the art which is established in the market.

If this has a good market relevance and shows benefits for the customer, then we have a definition of rule of technique, which is inevitable for the market access. This is still true today for most power cables but becomes difficult in case of telecommunication systems.

Involved players

1



Especially for Telecom, User Organisations like ITU have an important influence!

Who are the players involved in the standardization ?

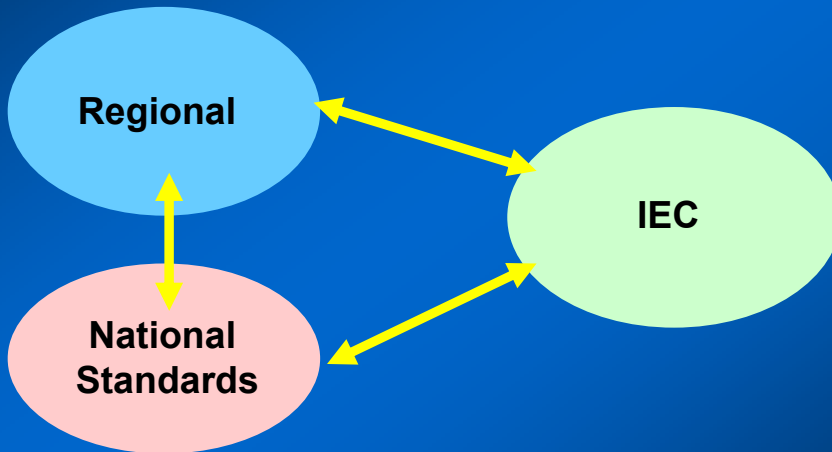
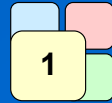
These are, of course, manufacturers, test laboratories, standardization

bodies, universities, authorities and/or users and their organizations.

Especially, for example, ITU, in the telecom field it becomes more and

more influential on the standardization itself.

National, regional and international standardisation



Despite globalisation differences in requirements still remain because of legal, climatic or system conditions

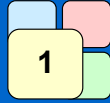
Where are we playing with the standardization?

We have three main areas; first area is national standardization, second is regional standardization, for example like Europe, Asia and America. They all do their standardization in a different way.

And we have, of course, the International Electrical Commission, which is IEC and I will concentrate on this in my following presentation.

Creating different standards in all three areas is tying up a lot of resources. If the specific situation in a single market allows it, advantage should be taken in adopting IEC standards as national or regional standards.

Mission of IEC



The IEC is the leading global organisation that prepares and publishes international standards for all electrical, electronic and related technologies.

These serve as

- a basis for national standardization and as**
- a reference when drafting international tenders and contracts.**

My presentation concentrates on IEC, as referring to different regions or nations is too complicated here.

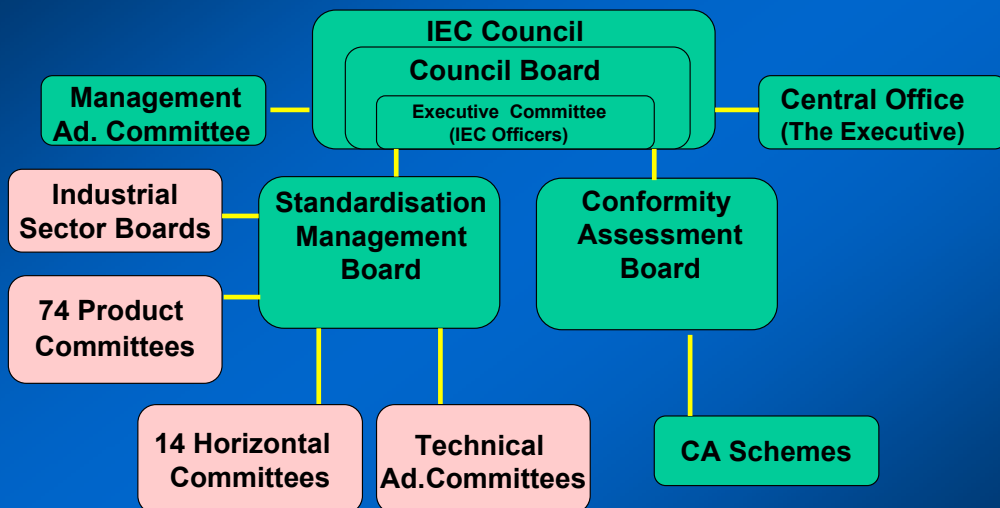
There are, in spite of globalization, some differences in requirements, which still remain, because of legal, climatic or system conditions.

Now, "What is IEC? " It is best explained by the official mission statement of IEC, which is written in the above slide.

You may see where the resources can be spent. If you concentrate in all three areas, i.e. national, regional and international with the same amount of efforts, you have to spend big amounts of money.

Structure of the IEC

1



With no powerful input from product committees requirements will be set by others

This is the structure of IEC. Do not be afraid, I will not go into details.

The green coloured boxes are more or less of administrative nature. So, I will concentrate on the active parts. (pink coloured boxes)

The first part is the so called "Industrial Sector Boards". They have to ensure the continuation of the market relevance of the standardization and they consist of senior executive managers with good marketing experience to insure this goal. Power cables are covered by Sector board 1, which is responsible for transmission and distribution. Telecommunication cables are covered by Sector Board 4.

We have in total 74 Product Committees, where 5 cable committees are among them, which I will show later. We have also 14 Horizontal Committees. They have to ensure the consistency of all IEC standards and to avoid any duplication of the work. They are supported by the so-called Technical Advisory Committee, for example, on safety matters and on environmental matters.

The message here is: If we do not have any powerful input from Product Committees, then requirements will be set by others. This could be a source of danger, if the requirements are not set by the directly involved players in the market like customers and manufacturers.

Voting rules

1

Proposal stage

25% of P-members in favour
but at least 4 P-Members

Minimum participation

Approval stage

two-thirds majority of
P-members in favour or not
more than one quarter negative

No dominance over
minorities

Voting

by Participating members of
IEC

National Committees, not
companies

**The process is based on a consensus, is democratic,
has many steps and takes 3 years as a minimum**

Now a very short and brief look at the voting rules:

When preparing international standards for the proposal stage, we need at least 25% in favor of so-called participating members of IEC, but it should be at least 4 participating members, who actively take part in the standardization work to ensure “minimum participation”.

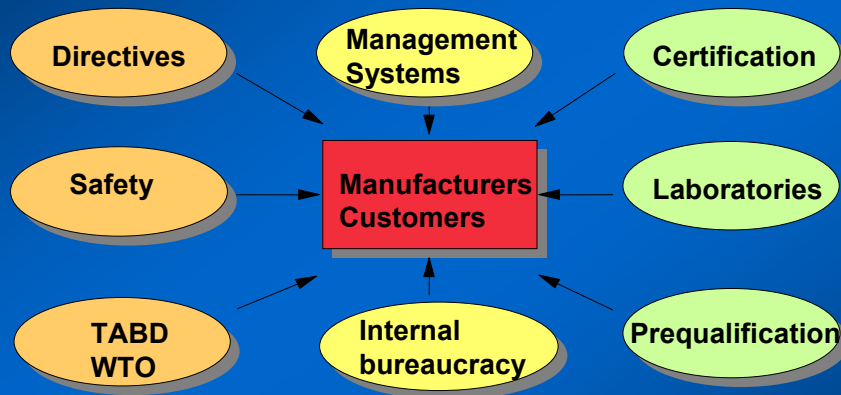
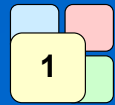
At approval stage, we need a 2/3 majority of participating members in favor, or not more than one quarter negative votes. This is to ensure that there is “no dominance over minority”.

The voting is done by participating members of IEC, which are National Committees but not companies. This should be always taken into account.

The conclusion of this page is that: The process is based on a consensus, is democratic and has many steps, which take 3 years as a minimum.

I would like to give some examples in the third part of my presentation, how to shorten this very lengthy process. The international standards are full consensus products.

Business and Bureaucracy around Standardization



Impacts from different sources require careful monitoring if you want to keep control

There are not only players, but also there is business and bureaucracy around standardization, which might affect our work.

We have **Certification** procedures, **Laboratory** matters and **Prequalification** procedures.

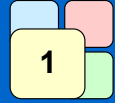
On the political side, **Directives** are to be taken into account, **Safety** matters and we have political organizations like the **Trans Atlantic Business Dialogue(TABD)** and **WTO**, which could bring simple messages on standardization: “tested once, approved everywhere”.

This is the philosophy behind these organizations, saying that all business should rely as much as possible on international standards.

We have some management systems, like on **quality** or **environmental** issues, which could have impact on standardization. And, of course, **Internal Bureaucracy** of the standardization organization itself.

The impacts from different sources require careful monitoring, if you really want to keep control.

Disadvantages of standardisation



- trade barriers
- restricted flexibility for product amendments
- limited freedom of innovation
- high efforts to create and maintain standards
- long lasting development of standards
- low system approach (commodity products)

**Cost of standardisation are not negligible:
approx. 0.005 to 0.01% of annual turnover.**

Now, move to the end of first part of my presentation.

Disadvantages and **Benefits** of standardization.

Standards can create or remove **trade barriers**. Whether they are considered as a disadvantage depends on the situation of the specific market.

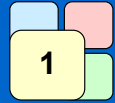
Also, there are other disadvantages written here in the slide.

The evaluation of **costs for standardization** is difficult to state, as the following has to be taken into account:

Price for buying the standard, Costs for participation in Standardization Bodies, Time for preparation, Time for internal coordination, Time for internal implementation, etc.

The approximate value in percent above seems to be low, but the absolute value cannot be negligible and the absolute amount can reach a significant and important amount.

Benefits of standardisation



- **setting the rule of technique (safety, quality and legal aspect)**
- **clear definition of interfaces**
- **cost saving and competitive tendering**
- **rationalisation of production**
- **reduction of efforts for type testing and their repetition**
- **reduction of special customer requirements**

Standards are and will remain an integral part of the business. Customers, governments and other authorities require standards.

On the other hand, of course, we have also **Benefits from the standardization.**

One is setting the rule of technique to cover safety, quality and legal aspects.

We have a clear definition of interfaces for customers and markets related to cable business.

We have cost savings and competitive tendering, especially for customers.

We have rationalization of production.

We have a good reduction of efforts for type testing and their repetition.

We have reduction of special customer requirements.

Nature of products: Power cables

Power cables, by their very nature, are generally not suitable for coverage by a horizontal system approach to standardisation. This is principally due to factors such as:

- the use of cables as *long-life products* (many decades) and their installation in inaccessible places (e.g. buried);
- the *wide variety of end-uses* to which a single cable type can be put;
- the role of cables as *connecting devices* (often over long distances) *between items of equipment/systems*.

All these factors demand continuity and stability of requirements in well-established standards

Now, I would like to move to my second part.

At the beginning, I would like to give you some information about the **Nature of Products**. First on **Power cables**:

It is written here on the slide .

Additionally, we could say:

- For power cables there are far more maintenance projects than new work items, as most of the standards are well established commodity products.
- System requirements are more or less stable and not rapidly changing
- One of the most important characteristics is reliability
- There are more regional influences than global (except domestic appliances and luminaries).
- There are only a few special products (i.e. for railways, ships, airfield, lighting, etc..)

Nature of products: Telecom cables

- For Telecom, *standardisation of products is less and less relevant.*
- Due to the *need of interconnectivity, standards are more and more defining functions and interfaces* and products have to comply with.
- Telecom systems are *changing constantly, with a continuous increase of transmission requirements.*

Standards should therefore be produced for communication systems of today, tomorrow, and even after tomorrow.

In case of **Telecom cables**, we have quite a different picture.

You can see it on the slide .

Standardization of products is less and less relevant.

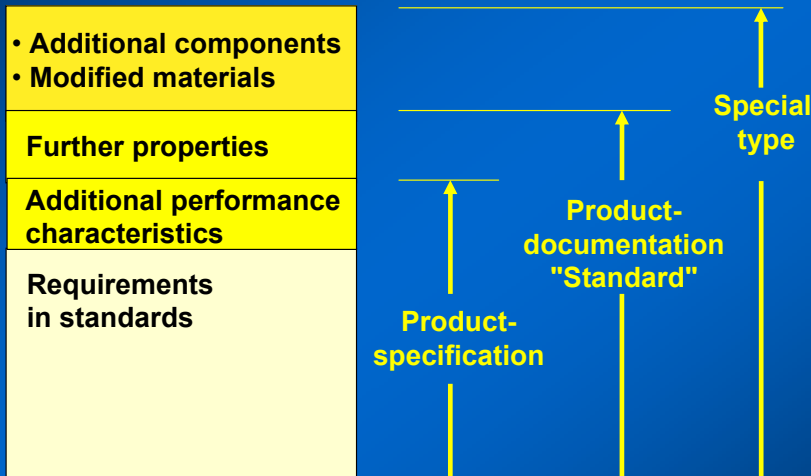
Due to the need of interconnectivity, standards are more and more defining functions and interfaces, and products have to comply with.

Telecom systems are constantly changing with a continuous increase of transmission requirements.

Telecom standards should therefore be produced for communication systems of today, tomorrow and even after tomorrow.

Telecom standards do have a global significance.

Optimization of technical specification



Cables are mainly commodity products but differences still exist between standards and products

In power cables we have a lot of different items: Materials, dimensions, interfaces, electrical properties, mechanical properties and other things. Most of the standards are set up as so called prescriptive standards, which include all step by step experience to ensure a high degree of know how in order to achieve safe and reliable cables. Of course, telecommunication has another contents due to their specific needs.

We have a set of requirements in standards. But we mainly add some additional performance characteristics, especially for services and for installation purposes. This is the precondition for developing products and it could be considered as an internal product specification. After choosing materials and designs, there are further properties in developing the cable. This leads to the product documentation of your standard product. Of course, there are some request from the market for additional components and modified materials. This is a special type and not covered by a standard.

The gap between requirements for a standard and further properties is becoming smaller and smaller. This is leading to commodity products. Cables (especially power cables) are mainly commodity products, but a certain margin is necessary for differentiation and for leaving the possibility of new amendments of products and innovation.

Mainly two factors lead to a reduced margin between standards and product documentation:

- Tendency to “Perfectionism” of experts (both from customer and from manufacturer) to let standards cover as much as possible
- Customer/market do not recognize additional performance characteristics and are not willing to pay for those.

Prescriptive versus Performance

The development of a prescriptive standard from “innovation” to “rule of technique” may result in a long process.



A “performance specification” would allow a higher degree of freedom and flexibility.

Now, this is the question of **Prescriptive** standard versus **Performance**

Summary Performance Standard

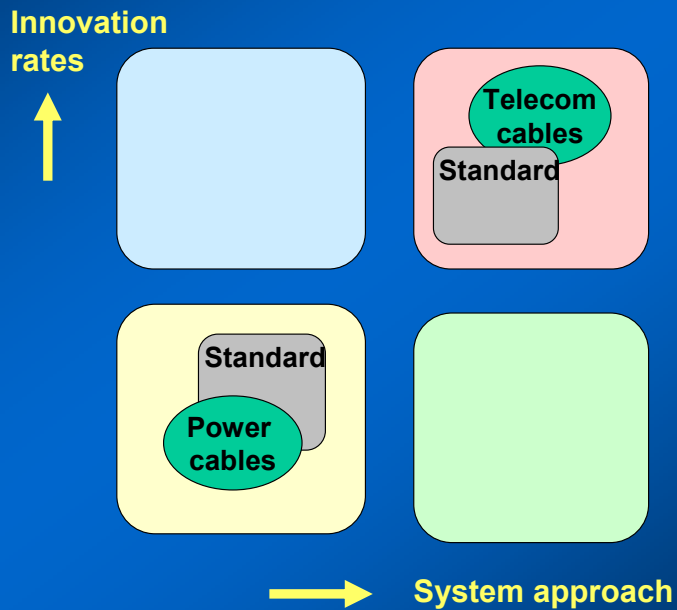
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- **promising at the first sight**
- **cannot totally replace prescriptive standard as many prescriptive requirements cover know how which cannot be disregarded without causing severe problems.**
- **possible option in case of really new products if only definition of pure performance is needed.**
- **Step by step introduction possible by setting more and more performance characteristics.**

Here you can read some conclusions.

A too fast introduction of performance characteristics can be dangerous as the “incubation time” of weak properties may be too long. Failures in a bad cable may occur after 15 or 20 years!

Products first or standards first



At the end of part 2, I would like to show again the difference between two kinds of our products.

Conventional products like **Power cables** in the past have been standardized after establishment in the market.

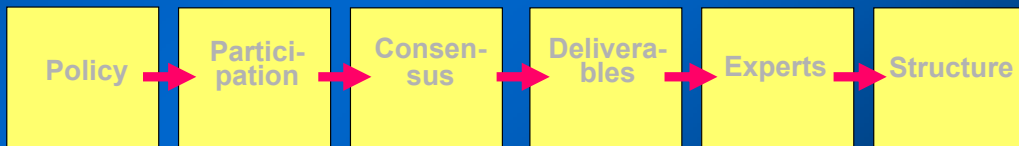
For **Telecom cables** with a high innovation rate and high degree of system approach, you need more and more standards first to cope with the global system requirements and interfaces before launching products on the markets. This is a challenge, which we have to cope with now and in the future.

Criteria for efficient, successful work



A lot of influences may cause problems (Customers, Authorities, 3rd parties). These cannot be influenced by manufacturers directly.

It is better to focus on internal solutions to achieve best results in saving resources and having success

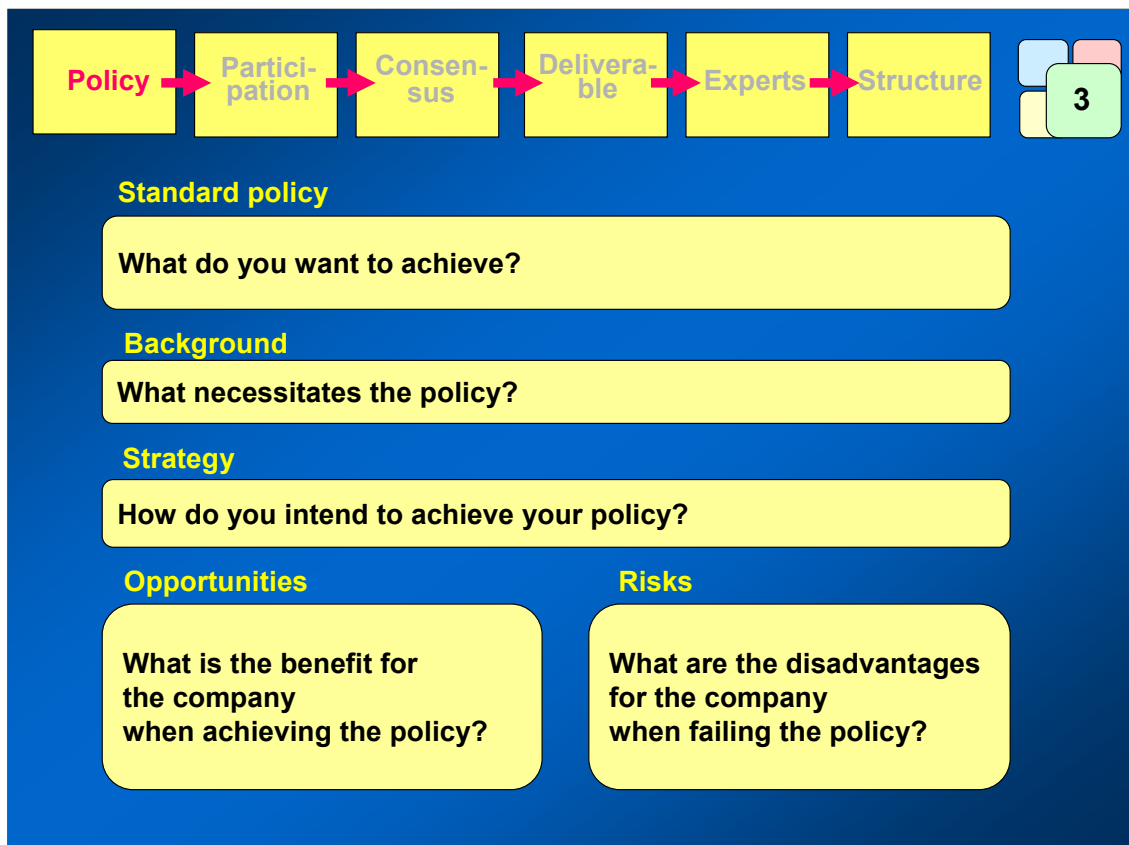


Now, let us move on to part 3.

Of course, there are a lot of influences, which may cause problems in delay and wasting resources caused by customers, authorities and third parties. Whatever they are and however they are involved in the standardization procedure, they cannot be managed directly by manufacturers.

So, I think it is better for me to focus on manufacturer internal solutions to achieve best results in saving resources and having success.

Based on my past experiences, I have identified six criteria, which we should focus on; 1st **Policy**, 2nd **Participation**, 3rd **Consensus**, 4th **Deliverables**, 5th (Choice of) **Experts** and 6th working **Structure** .



Coming to **policy**.

It is very essential to ask and answer the following questions:

Standardization policy should say "**What do you want to achieve?**"

The background should be stated "**What necessitates the policy?**"

In the strategy "**How do you intend to achieve your policy?**"

You should find something about the opportunity "**What is the benefit for the company when achieving the policy?**" and consider the following question on risks: "**What are the disadvantages for the company when failing the policy?**"



Clear market orientated policies according to different market segments drive all participants in the aspired direction.

Continuously control of standardisations activities in order to match with goals versus resources.

Keep standardisation as “private” as possible

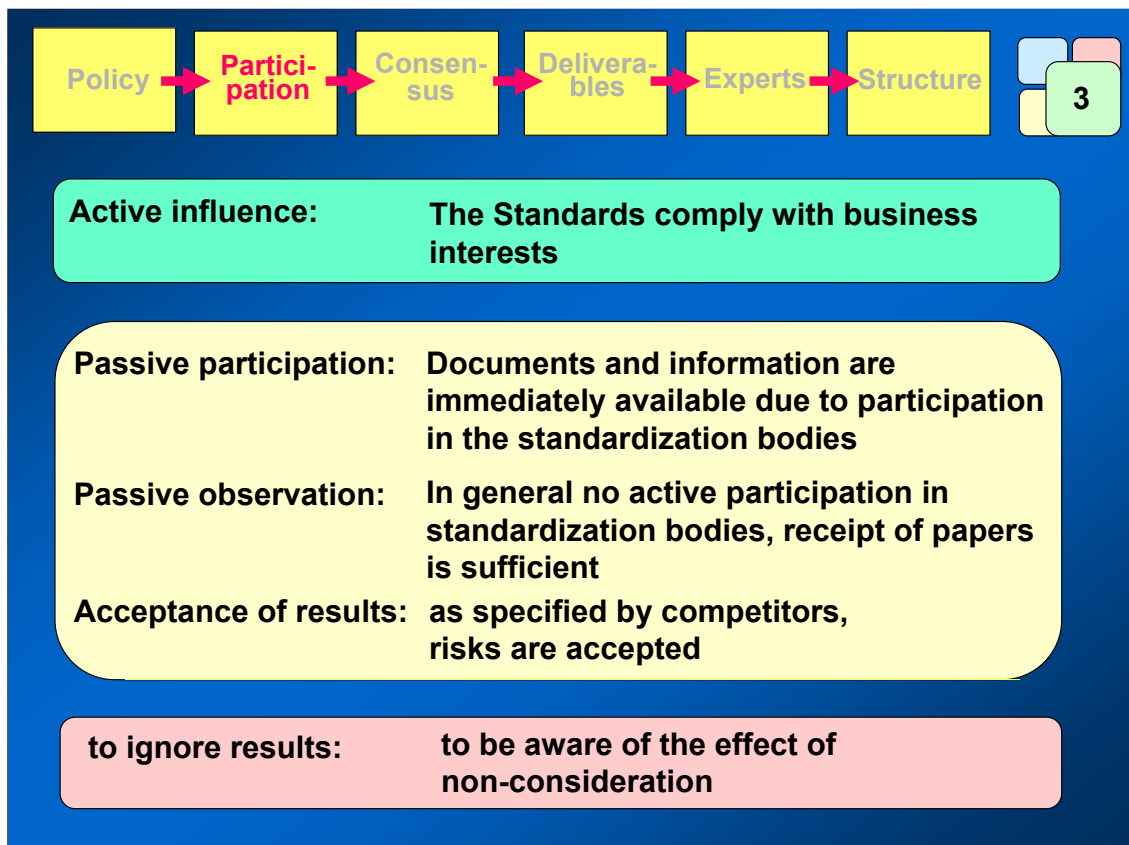
This needs to be documented in advance. So we need clear market-oriented policies according to the different market segments. These will drive all participants in the aspired direction.

We should set up company internal standardizations on regulations management, which need not be too exhausted. This should continuously control goals versus resources.

Finally, as far as **Policy** is concerned, keep standardization as **private** as possible.

“**Private**” standardization means that standards are prepared on initiatives of the most important players (customer and manufacturer) on a voluntary basis.

The content of a regulatory standard (set by legislation) cannot be amended according to the market needs.



Second point is **Participation**.

You can participate with the aim of **active influence**.

You can also decide for **passive participation**. There are three options. Either it is **Passive participation**, or you can choose **Passive observation** or you just **accept the result**.

Another option for you is just to **ignore the results**, but you should be aware of the effect of non consideration.

IEC has P-Members (Participating) and O-Members (Observing) but only P-Members can vote.

All these options can be reasonable. Therefore it should be decided on a case by case basis, but before starting the process according to the chosen policy.



Adequate participation provides good balance between resources and success

- provide sufficient resources
- use electronic work to the utmost
- face to face meetings remain inevitable to achieve negotiation results based on mutual consensus

Standardization can be done with you, without you or against you

If you decide for **participation**, then you should provide good balance between resources and success, by **providing sufficient resources**, by **using electronic work to the utmost**, but nevertheless, **face to face meetings remain inevitable to achieve negotiation results based on mutual consensus**. **Standardization can be done with you, without you or against you.**



Consensus is defined as follows:

General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments.

Note: Consensus need not imply unanimity.

Third item is **Consensus**.

Consensus in IEC is defined as written in the slide.

Although this official definition of IEC sounds a bit academic, it is essential to consider all aspects, especially “the views of all parties concerned”.



Evaluation of feasibility of consensus before starting the work prevents failures. So evaluate the situation amongst

- **manufacturers**
- **customers**
- **all other relevant parties**

Never introduce a standard without complying with the following two requirements: the user

- **has to recognise a benefit and**
- **is willing to pay for**

What is quite essential here, is that you should consider the view of all involved parties. This, I think, is best to do in advance .

That means: Evaluation of feasibility of consensus before starting the work prevents failures. So, evaluate the situation amongst manufacturers, customers and all other relevant parties.

Recommendation for this consensus is:

Never introduce a standard without complying with the following two requirements : the user has to recognize a benefit and the user should be willing to pay for it.



1 International consensus deliverables

- **International standards (IS)** (full consensus)
- **Technical specifications (TS)** (full consensus not (yet) reached)
- **Technical reports (TR)** (descriptive information)
- **Publicly Available Spec. (PAS)** (Consensus amongst experts)
- **Guides** (non normative publications)

2 Limited consensus deliverables

- **Industrial Technical Agreement** (outside IEC structure)
- **Technology Trend Agreement** (pre-standardisation)

Next deliverables:

This is a strange word for a kind of product, you can prepare.

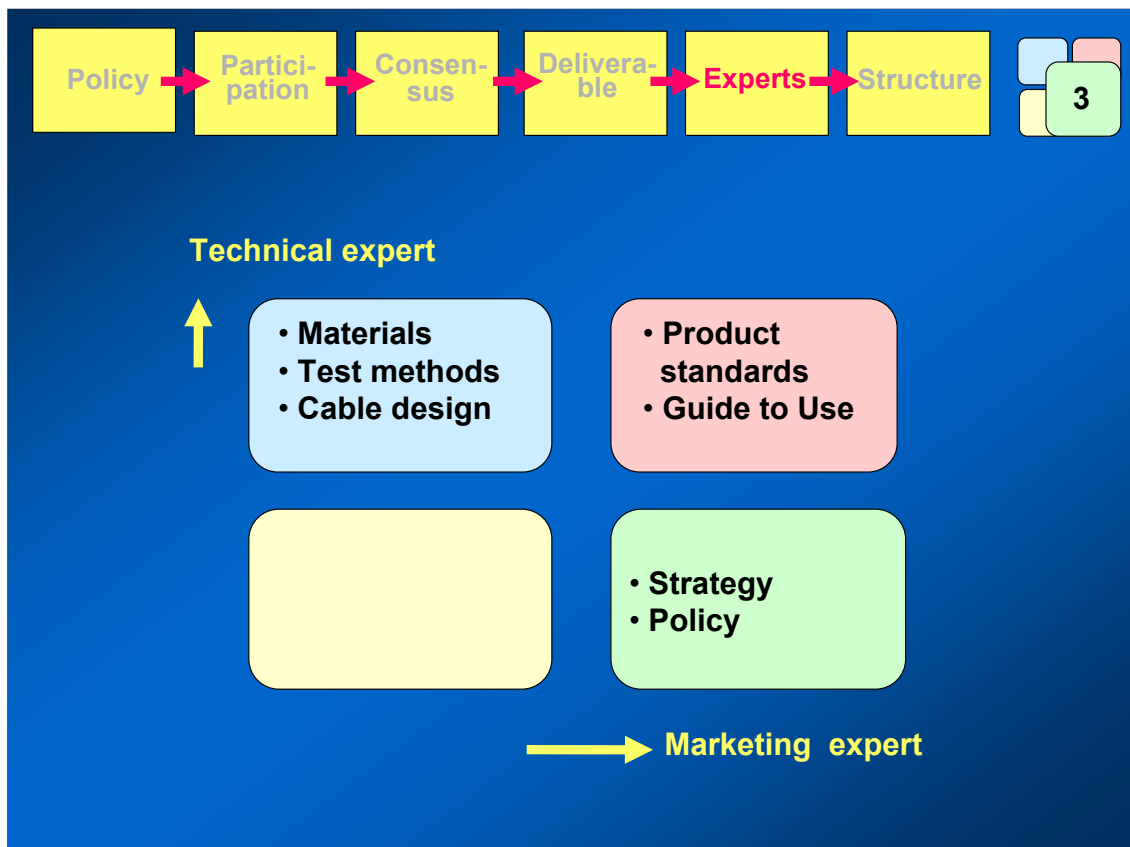
In IEC, we decide between so-called international consensus deliverables and limited consensus deliverables.

I will not go into too much detail, but international consensus deliverables comply with International Standards (IS), which require full consensus, as I explained before by voting and approval rules. There are Technical specifications where full consensus is not reached yet. And there are Technical reports, Publicly available Specifications and Guides.

Limited consensus deliverables are Industrial Technical Agreements. These are work items outside of the IEC structure but they can be published with an IEC logo to give a background support by the IEC organization. There are Technology Trend Agreements, so-called pre-standardizations, which can be used for the preparation of standards.

A careful choice of the type of deliverables can shorten the publication process significantly, if choosing limited consensus specification, or full consensus specification.

More detailed information about deliverables can be found at the website of IEC: www.iec.ch.



Some remarks on experts:

We have Technical Experts to consider and Marketing Experts to consider. But for Products standards and, for example, Guides to use, you need the expertise of both of them.

Setting requirements in product standards can be followed by two principles:

- to set all what is necessary
- to set all what is possible

Especially the latter can cause extra costs for the product, which may be recognized by the technical experts but not by the purchaser. This approach leads to sophisticated but still commodity products.

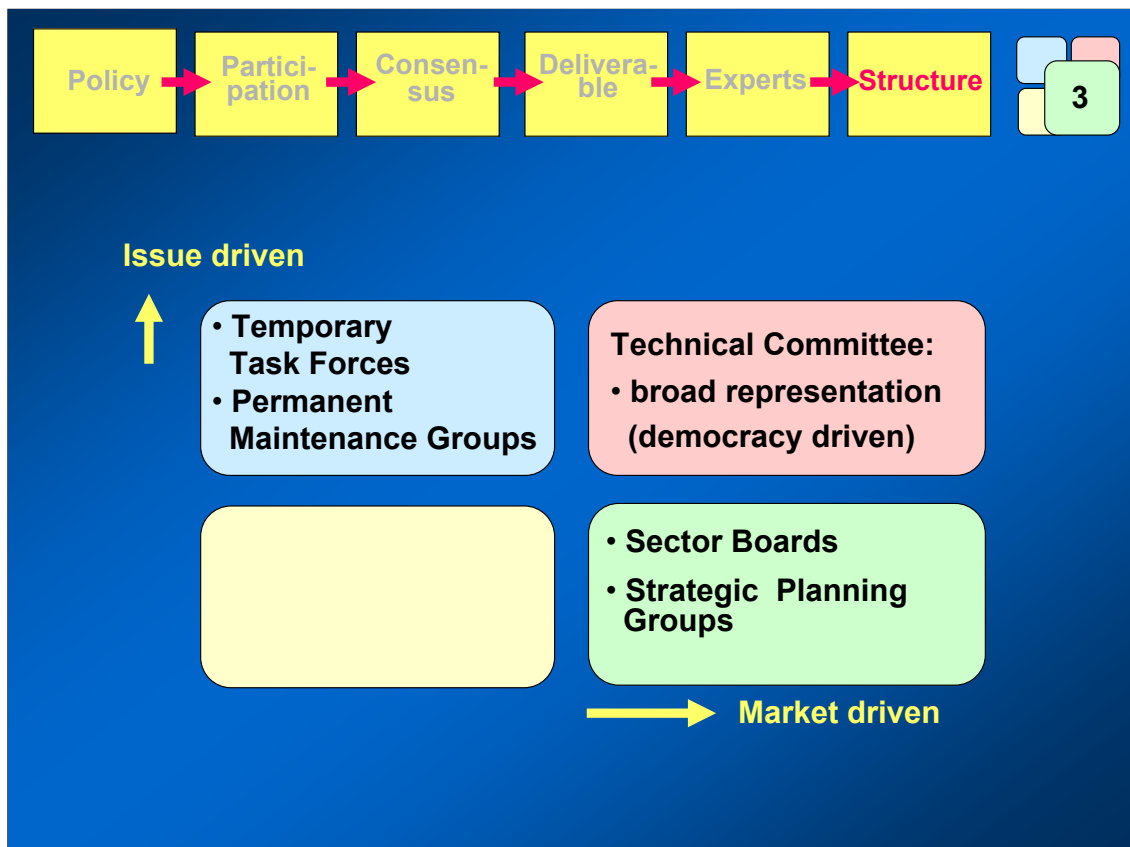


Only qualified and recognized experts can establish the strategy in the standard. So you need open minded experts with excellent

- o marketing background**
- o technical expertise**
- o knowledge about standardization procedures**
- o human faculty**

Don't forget good and early education of new recruits

So, only qualified and recognized experts can establish the strategy in the standards. The requirement for such experts are written on the slide.



Finally, Structure:

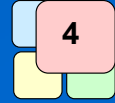
Here, I split into issue driven matters and market driven matters.

Issue driven matters: You can choose for new items temporary task forces. We use normally permanent maintenance groups to ensure continuity.

Market driven : There are sector boards and strategic planning groups.

Finally, you need technical committees with a broad representation which is democracy driven to comply with the voting rules.

Routine work (maintenance, administrative) should be done more effectively by highly qualified permanently paid experts in the associations



Conclusion 1

In the important markets of the cable industry standardisation is definitely a strategic issue to ensure

- **the status of rule of technique (legal background) as well as**
- **access to market (commercial background).**



Conclusion 2

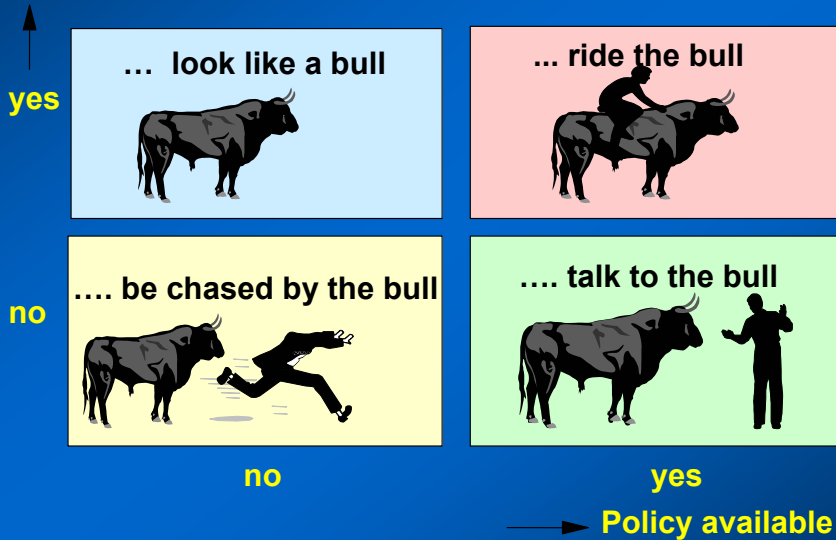
Consequently the industry has to be proactive because

- **with no strong input others will set the requirements as they wish to do**
- **there will be more regulatory standards than voluntary ones**

Conclusion 3 You may ...

4

Resources available



To make the conclusion a bit clearer, I would like to present my last portfolio on the matter of Resources and Policy.

Just as an example here, I took a bull as a strong animal.

If you have no policy but have good resources, you may look like a very strong bull.

If you have a policy but no resources, you can have good talks with the bull.

If you have both, you can ride on it.

But if you have nothing, you may be chased by the bull.

My message is very simple :

If we have decided to use standardization as a marketing tool, it should be dealt with just like other management activities:

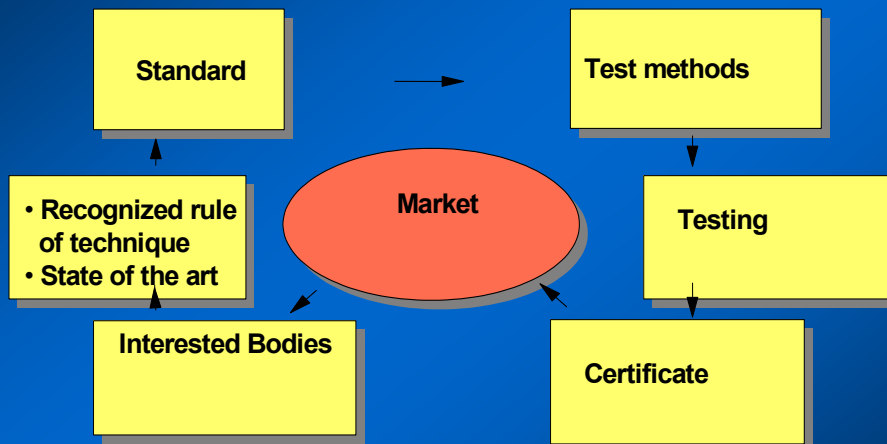
Proper planning and efficient controlling.

Thank you very much for your patience.

Appendix

Additional information

What are the main steps of standardisation?



The process of standardisation is mainly controlled by manufacturers and users on a private basis

What are the objectives of IEC?

- Meet the requirements of the global market efficiently
- ensure primacy and maximum worldwide use of its standards and conformity assessment schemes
- assess and improve the quality of products and services covered by its standards
- establish the conditions of interoperability of complex systems
- increase the efficiency of industrial processes
- contribute to the improvement of human health and safety
- contribute to the protection of the environment

What is the task of Sector Boards?

- ... are responsible for the advising on priorities and ensuring the continuing market relevance of IEC standards
- ... comprise senior executives with market awareness who provide strategic guidance

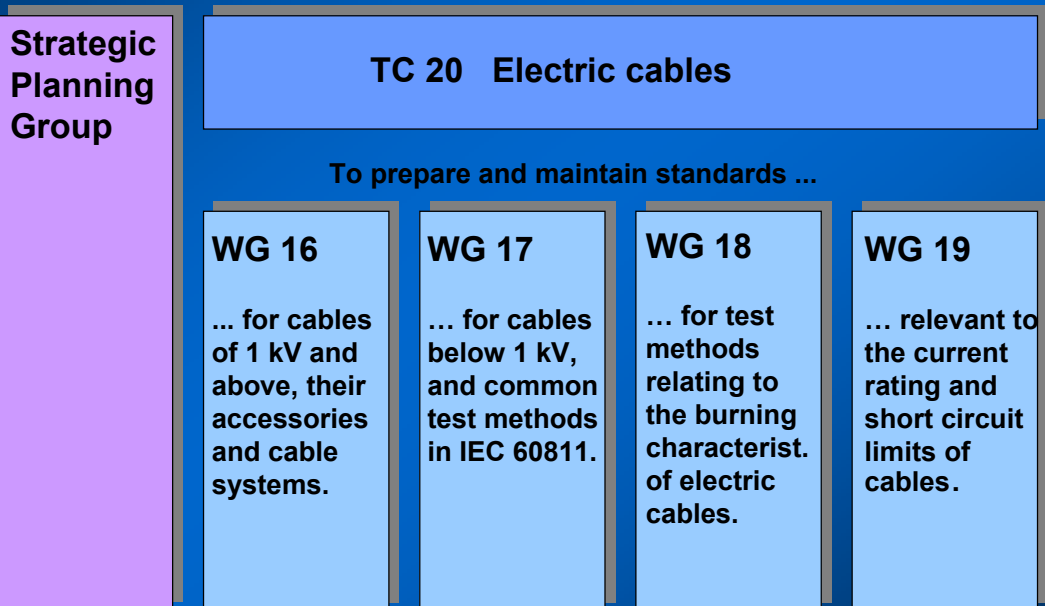
As TC 20 products in general are not suitable for a system approach, therefore TC 20 role is a passive one.

Market relevance is covered by the Strategic Planning Group

For Telecom Cables it is essential to find as quick and early as possible the system conditions.

Therefore activities in SB 4 are of vital interest

What is the structure of TC20? (Power Cables)



What is the scope of TC20?

Task

To prepare international standards for the

- **design**,
- **testing** and
- **end-use recommendations** (including current ratings)...

Products

... for insulated *electrical power and control cables*, their *accessories* and *cable systems*,

Application

... for use in *wiring* and in *power generation, distribution and transmission*. The applications cover an *unlimited range of voltage and current*.

What is the structure of TC46? (conv. Telecom Cables)

Sector
Board 4

TC 46 Cables, wires, waveguides, r.f. connectors
and connectors for communication and signalling

To prepare and maintain standards for ...

SC 46A

Coaxial
cables.

SC 46B

Waveguides
and their
accessories

SC 46C

Wires and
symetric
cables

SC 46D

R.F.
connectors.

What is the scope of TC46?

Task

To establish and maintain standards regarding

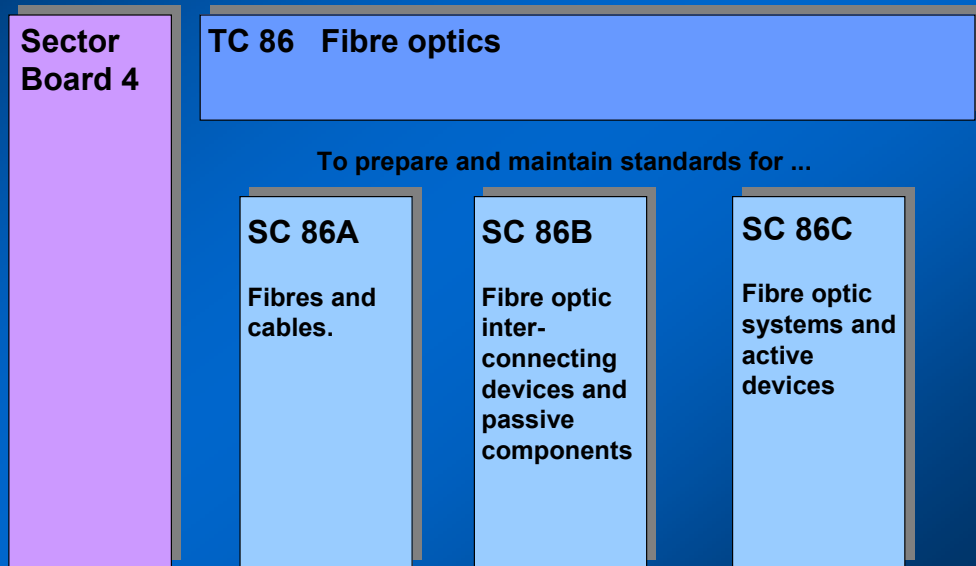
Products

cables having metallic conductors , wires, waveguides, r.f.
connectors and accessories

Application

for analogue and digital transmission systems
and equipment for communication and signalling.

What is the structure of TC86? (Fibre Optic Cables)



What is the scope of TC 86?

Task

To prepare standards (terminology, characteristics, related tests, calibration and measurement methods, functional interfaces, optical, environmental and mechanical requirements)

Products

for fibre optic systems, modules, devices and components

Application

intended primarily for use in communications equipment to ensure reliable system performance using appropriate quality and assessment procedures

What are the functions of horizontal and advisory committees?

Horizontal Committees

- ... Ensuring the consistency of IEC publications in areas common to a number of technical committees by avoiding duplication of work and contradictory requirements
- ... improving coherency of the IEC publications system
- ... improving mutual understanding of engineers of different technical disciplines

Technical Advisory Committees

- ... help to ensure horizontal co-ordination and the inclusion of relevant requirements in IEC standards

What are the voting rules in IEC?

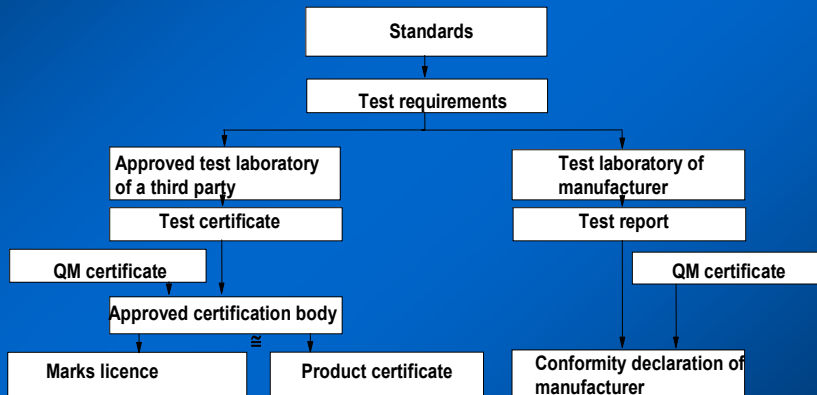
0	Preliminary stage: simple majority of P-members	(PWI)
1	Proposal stage: by 25% of P-members but at least 4 P-Members	(NP)
2	Preparatory stage:	(WD)
3	Committee stage: by Secretary/Chairman for revision, discussion or enquiry	(CD)
4	Enquiry stage: two-thirds majority in favour or not more than one quarter negative	(CDV)
5	Approval stage: two-thirds majority in favour or not more than one quarter negative	(FDIS)
6	Publication stage:	(IEC)

What are the project stages in IEC?

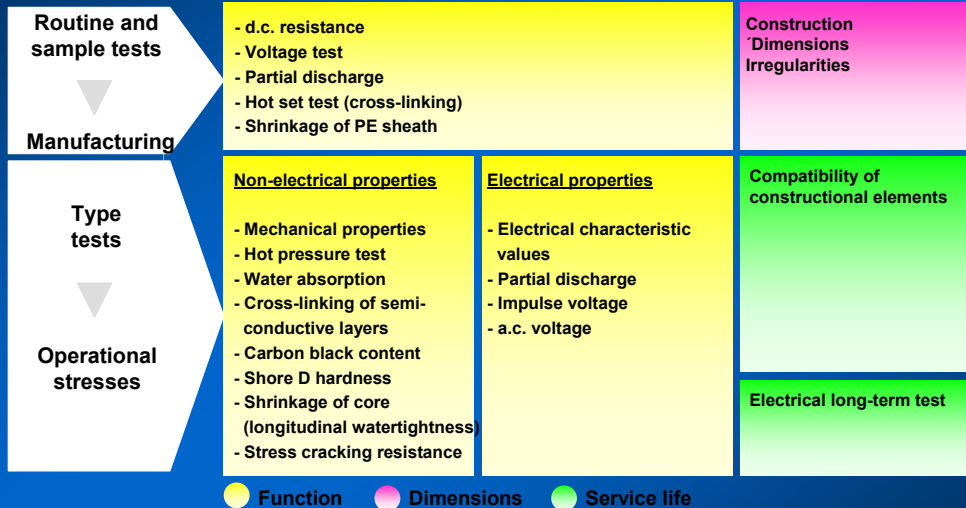
0	Preliminary stage: items, where no target date can be given	Preliminary work item (PWI)
1	Proposal stage: New standard or part, revision or amendment → inclusion into the work programme	New work item proposal (NP)
2	Preparatory stage: (within 6 months) Preparation of a working draft	Working draft (WD)
3	Committee stage: (within 2 years) to consider comments of Nat. Committees	Committee draft(CD)
4	Enquiry stage: Voting and consideration of comments, if necessary	Enquiry draft: Committee Draft for Vote (CDV)
5	Approval stage: (within 3 years) Voting	Final Draft International Standard (FDIS)
6	Publication stage: printing and distribution	International Standard (IEC)

The time schedule for publication allows 3 years

How to prove conformity with standards?



Example of a set of requirements of XLPE medium voltage power cables



● Function ● Dimensions ● Service life

A testing program adjusted to the operational stresses verifies that the requirements for the dimensions are fulfilled (installation of accessories) and that function and service life are ensured

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PKS BU EV TM (0/1)

How could a definition of a performance standard look like?



A set of requirements related to performance in use, which are proved by tests.

- *If the test results comply with the requirements the cable is considered as reliable, safe and of a sufficient quality.*
- *Prerequisite is that the testing system gives a sufficient picture of the real "life" of a cable*

What could be the criteria for an evaluation of a Performance Standard?

2

Flexibility in manufacturing

high

but extensive repetition procedure of type testing?

Freedom for future innovation

high

but expensive test regimes may need long time?

Reduction of product costs

good

but cost reduction might be claimed by others?

What could be the criteria for an evaluation of a Performance Standard?

2

Rule of technique

low, *reluctance to change from traditional approach?*

Competitive tendering

low, *as products are not as comparable as before?*

Additional requirements

high, *further proliferation likely for too weak specifications?*

Definition of interfaces

low, *better via prescriptive standard?*

What is the content of a standard? (i.e. Power cables)



2

- materials
- dimensions
- interfaces
- electrical properties
- mechanical properties
- thermal properties
- behaviour towards external influences
- guide to use (laying, ratings)
- test methods and requirements

Prescriptive standards include all step by step experience to ensure a high degree of know how in order to achieve safe and reliable cables