

# Overhead lines in Ireland

*The value in Cigré*

Jarlath Doyle

# Abstract

The main theme of my presentation is to give a brief overview of the valuable information and influence Cigré has and is having on the planning, design, construction and maintenance of overhead transmission lines in Ireland. ESB/EirGrid active participation in Cigré working groups has ensured that a best practice approach has always been adopted in the development of the grid infrastructure. The value this participation provides in terms of efficiency and reliability of design and construction cannot be underestimated.

# Agenda

- How Cigré participation has improved...
  - Gaining Planning Permission for OHL's
  - Design of OHL's
  - Construction OHL's
  - Maintenance & Renewal of OHL's
  - Vast amount of documents produced over the decades!

Planning Permission?



# Planning & Environment

## **Main Issues:-**

- **Perceived Health Affects →EMF**
- **Use of Underground Cables (E-W HVDC Connection)**
- **Visual Impact**
- **Perceived loss of property value**
- **Environmental Impact**

## **Action/Community Groups – now very well organised:-**

- **Lobby affectively at National & Local Government**
- **Large Public meetings**
- **Very good website/ Links with other action groups**
- **Produce Project Information Booklet with Monthly updates**
- **Use of Professionals:-**
  - **Public Relations experts**
  - **Under ground cable experts**
  - **Environmental Impact**
  - **Legal**

# Planning & Environment

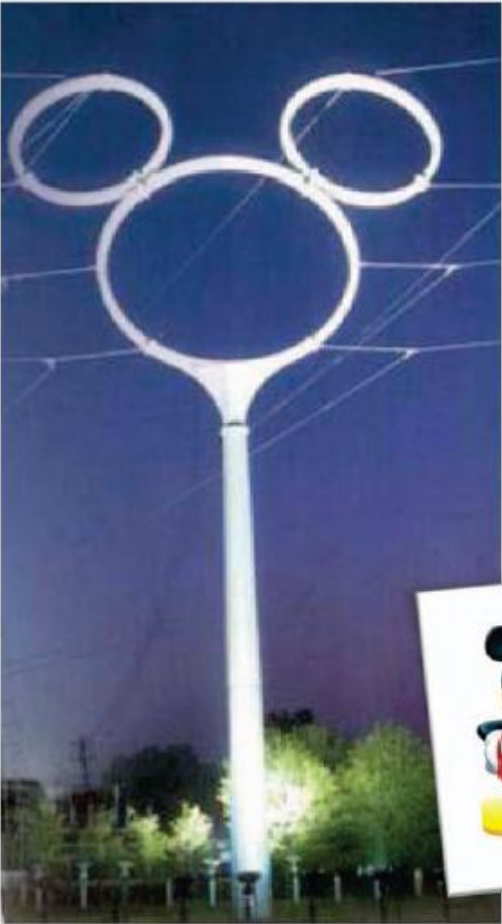
- **Cigré Technical Brochure 247** “*Consultation Models for Overhead Lines Projects*”
  - Use of external experts
  - Provide as much information as possible
  - Conduct open and engaging consultation
  - Allow stakeholder contribution
  - Embrace and suggest the use of ‘best practice’ mitigation measures
  - Community compensation?
    - Rationalisation of LV/MV/HV networks
    - Use of innovative designs
    - Still to be fully explored in Ireland.

# Planning & Environment

- **Cigré Technical Brochure 147** “*High Voltage Overhead Lines Environmental Concerns, Procedures, Impacts and Mitigations*”
  - *Permitting Procedures*
  - *Route selection*
  - *Land use*
  - *Ecology*
  - *Construction & Maintenance impacts*
  - *Audible noise impacts*
  - *Reducing visual impact*



# RVI Designs



# RVI Designs - Ireland

- Review of 220kV SC designs (1997)
  - Braced woodpole design
  - H-Frame design
  - Traditional hot rolled lattice steel design
  - Cold formed steel design
  - Cold formed steel compact delta configuration design
  - All designs assessed by independent landscape architects

# Braced Woodpole & H-Frame



• **Braced Woodpole**

**Lattice steel H-Frame**

# Cold formed & Hot rolled



Both lattice steel with horz. phase configuration

# Hot rolled & Cold formed



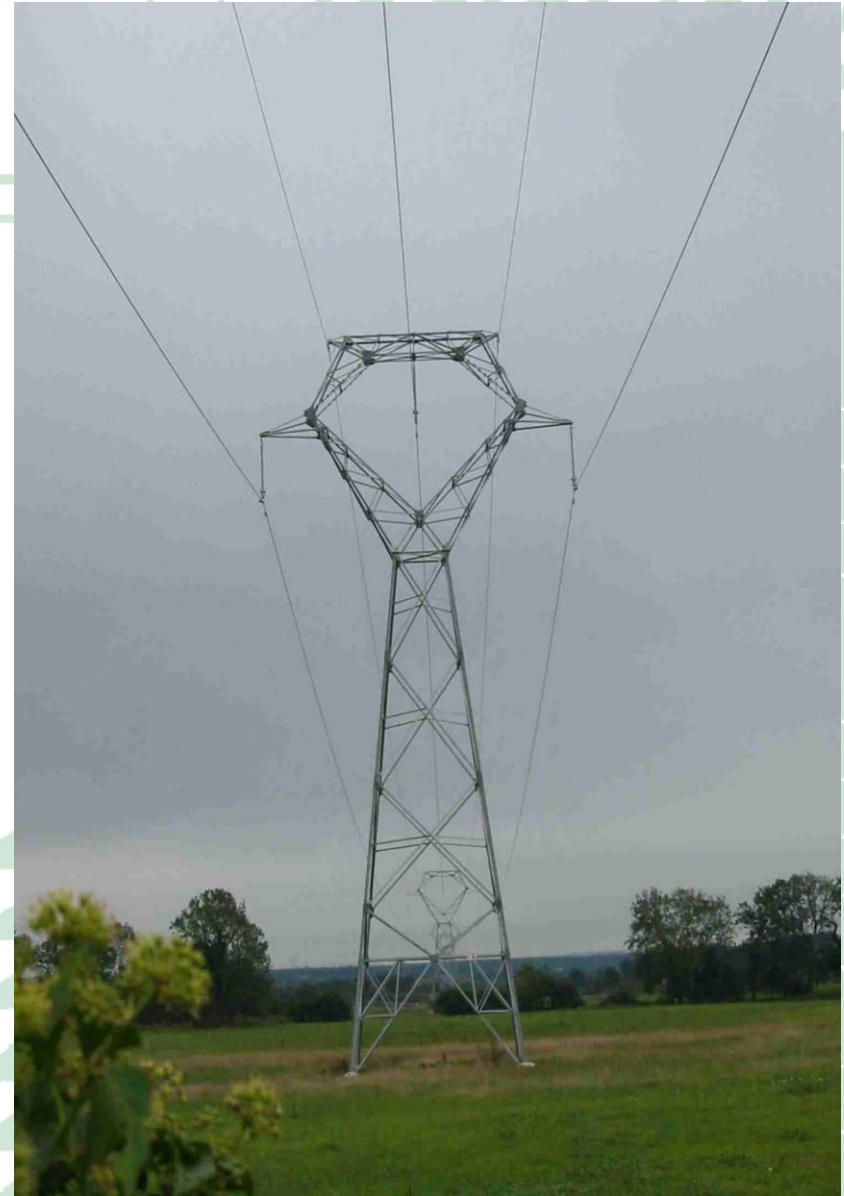
Compact Design

New cold formed design


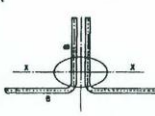
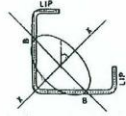
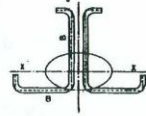

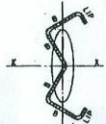
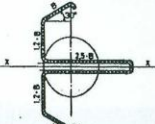
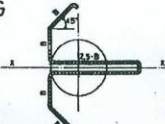
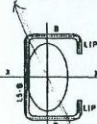
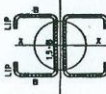
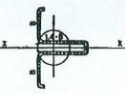
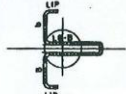

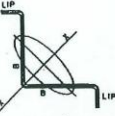
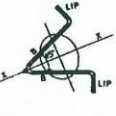



# Final Design in service

- Steel cold rolled
- Bar profiles
- Redundant bracing
- Raised centre phase
- Use of composite insulators
- **Camouflage technique**

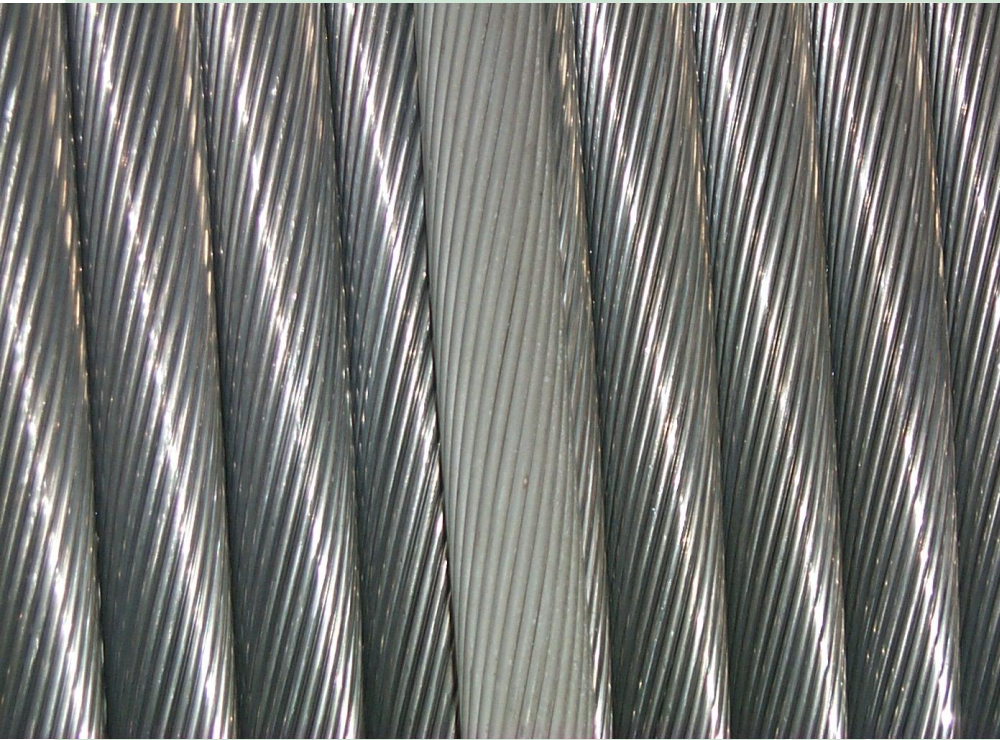


COLD-FORMED STEEL SECTIONS

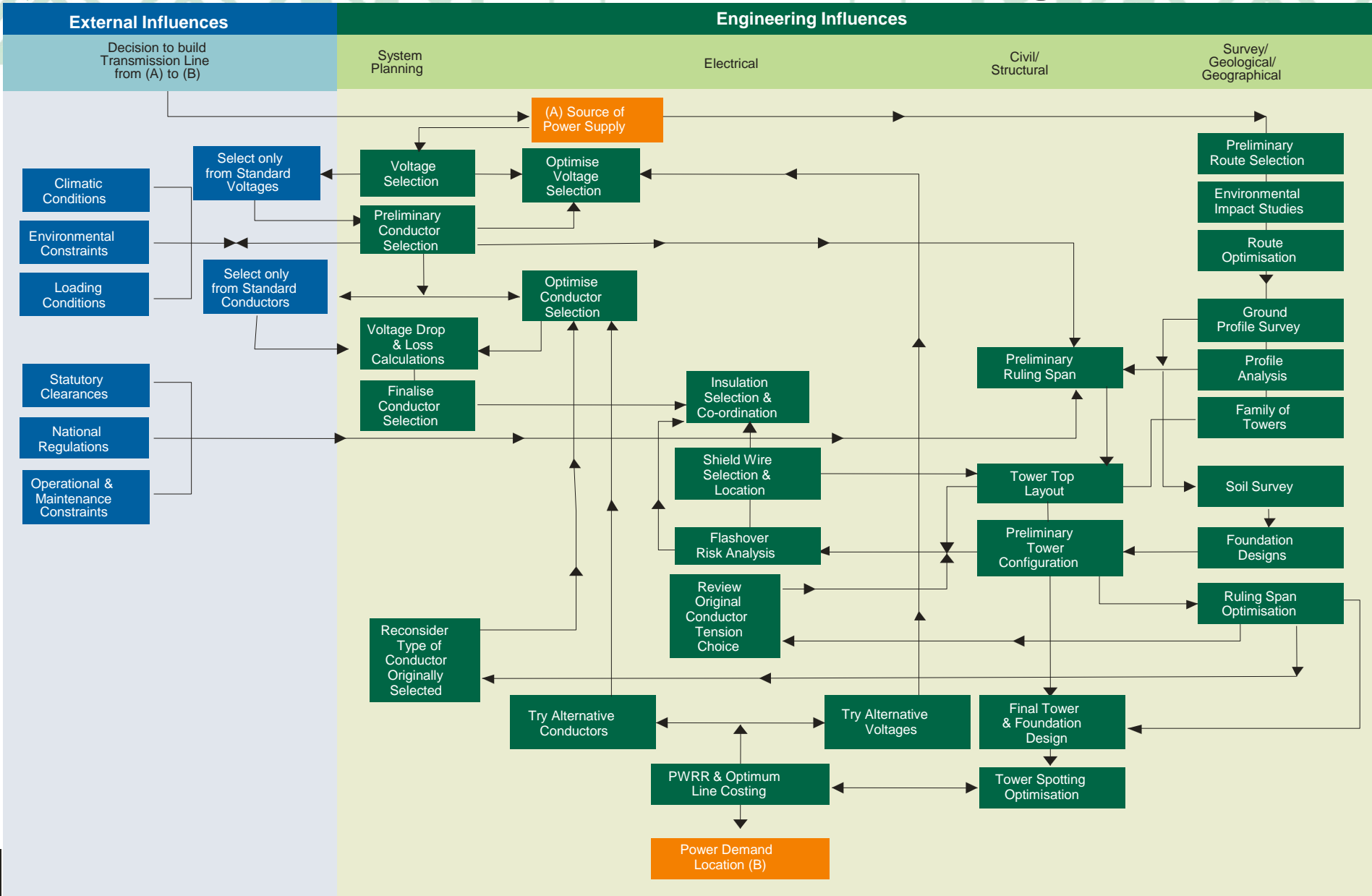
BA  (Flanges at 90 deg.)	2A 	BB  (Flanges at 90 deg.)	2B 
BD  (Flanges at 60 deg.)	BE 	BF  (Flanges at 60 deg.)	BG  (Flanges at 90 deg.)
BI 	BM 	BK 	BL 
BN 	BO  (Flanges at 90 deg.)	BP  (Flanges at 45 deg.)	DA  (Flanges at 90 deg.)



# RVI - Camouflage techniques



# Overhead Line Design



# Overhead Line Design

- Guidance on vast array of topics...
  - Main design guidance
    - **Cigré Technical Brochure 109** *“Review of IEC 828: Loading and Strength of Overhead Lines”*
    - **Cigré Technical Brochure 178** *“Probabilistic design of overhead transmission lines”*
    - **Cigré Technical Brochure 289** *“Reliability Based Design Methods for Overhead Lines Advantages, Applications and Comparisons”*
  - **Many other TB’s on Conductor, fittings, Insulators etc.**

# Overhead Line Design

- Overall design
  - Cigré influence on international standards
    - IEC 826, 1985 *Overhead Line Support Loadings*
    - IEC 826, 1991 *Loading and Strength of Overhead Transmission Lines (Reliability Levels)*
      - Cigré Commentaries
    - IEC 60826, 2003 *Design Criteria of Overhead Transmission Lines*
    - Cigré influence on Euronoms (EN50341)

# Overhead Line Design

- Requirement for constant learning....
  - Ongoing development of design due to:
    - Software improvements & Analysis techniques
    - Regulatory requirements
    - Climate change
      - TB 344 Big Storm events – what have we learnt?
      - TB 350 High Intensity Winds
      - TB 179/291 Atmospheric icing on OHL's

# OHL failures

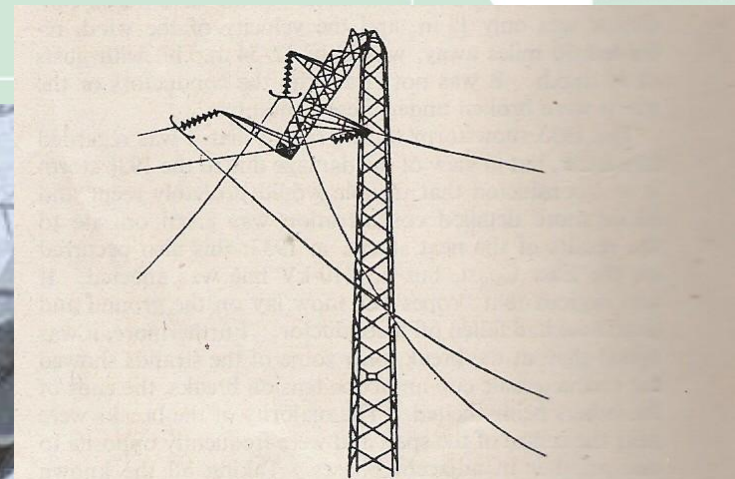


Fig. 4.—Typical failure during a snowstorm.

# OHL failures

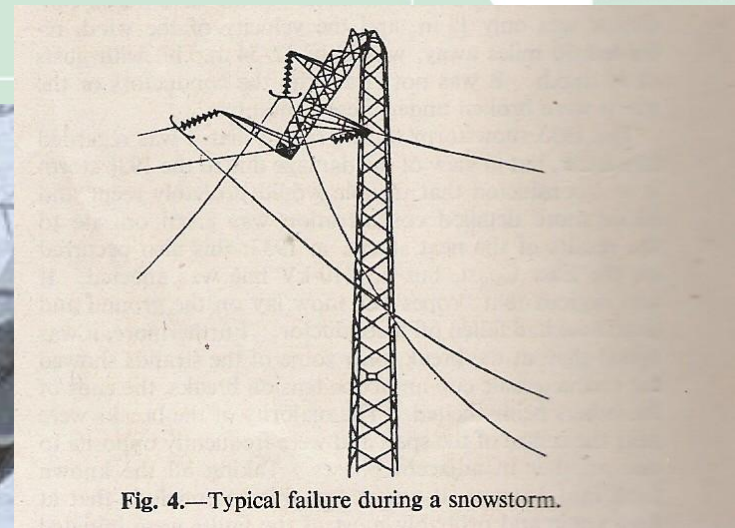


Fig. 4.—Typical failure during a snowstorm.

# Climate change impacts?

- **Ongoing Cigré work:**
  - **Risk assessment for climatic events**
  - **Statistics** regarding **ice loads** on conductors
  - **Implementation** of RBD methods for OHL
    - **Harmonisation** of Design methods
    - **Comparisons**
    - **Application**

# Overhead Line Maintenance & Renewal

- **Cigré Technical Brochure 353** *“Guidelines for the increased utilisation of overhead line”*
  - Increasing system capacity
    - Increase conductor rating (Area, temperature, Weather parameters)
    - Probabilistic rating
    - Real time monitoring
    - Increase voltage
- **Cigré Technical Brochure 425** *“Increasing Capacity of Overhead Transmission Lines - Needs and Solutions”*
  - *Mark Norton*

# Conclusion

- Cigré has played a major role in the development of the transmission system
- Allows designers in Ireland to ensure:
  - Best practice in design & Construction
  - Cost efficiency
  - Reliability
  - Public safety