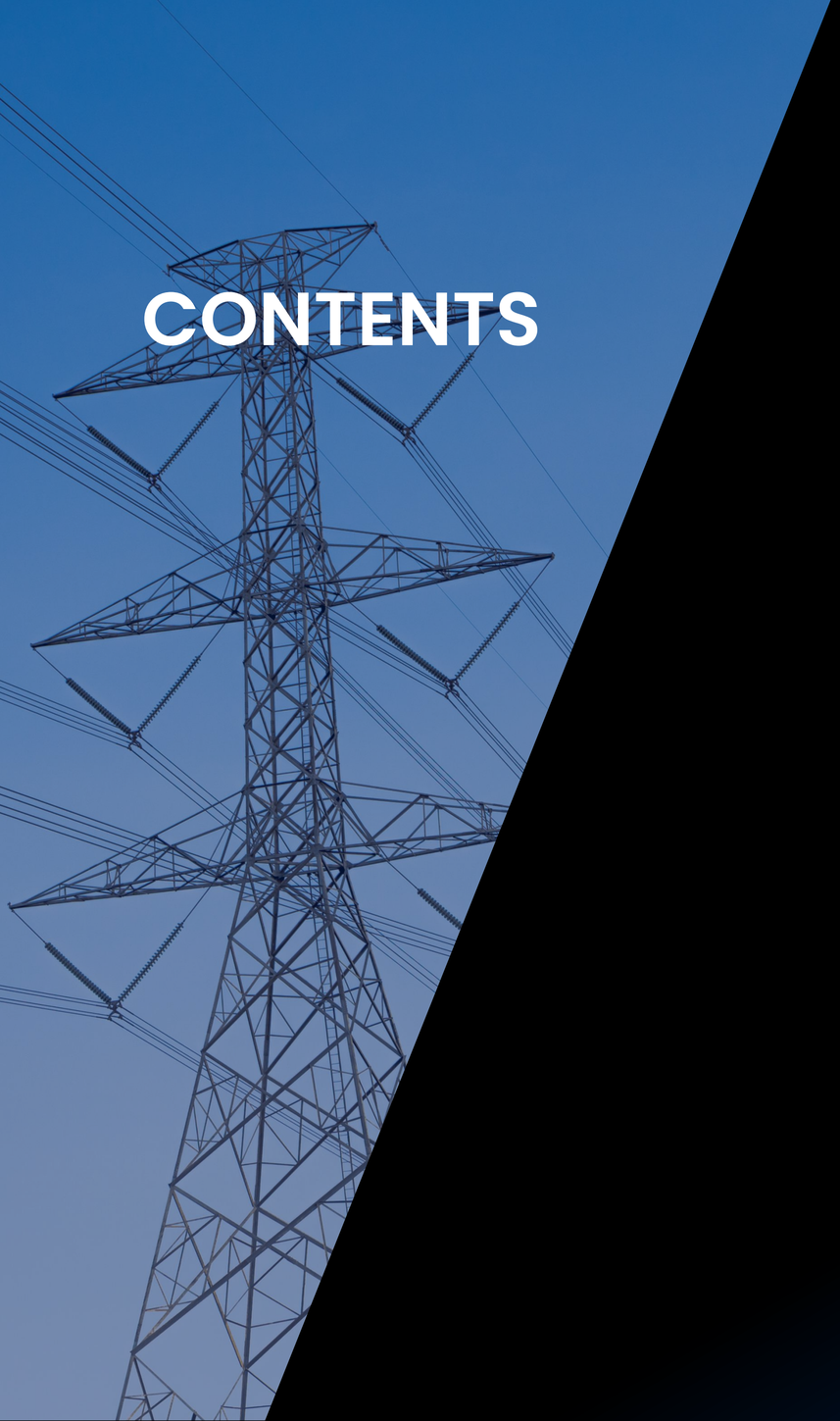
YOFC
Smart Link Better Life.

Electrical Power Solutions and Applications of YOFC

Yangtze Optical Fibre and Cable Joint Stock Limited Company
Yangtze (Hubei) Electrical Power Cable Co., Ltd.



CONTENTS

I. Demand Analysis

YOFC
Smart Link Better Life.

Development trend | **Environment-friendly** | **Intelligent development** | **Low-carbon**

Power generation side

6 power generation groups

National strategic policy forcing to adopt new clean energy technologies.

Transmission & distribution side

SGCC、CSG

Large-capacity & long-distance cross-region power transmission forcing to adopt new transmission & distribution technologies.

Consumer side / Microgrid

Industrial & household

Consumption

- Large-unit power generation
- Long-distance transmission technologies
- Nuclear power, wind power & photovoltaic power

unit：1×10^9kWh

Categories	2025		2035		2050	
	Power generation	Proportion	Power generation	Proportion	Power generation	Proportion
Summation	92570	100.0%	117140	100.0%	142989	100.0%
Conventional hydropower	14832	16.0%	19157	26.0%	22484	15.7%
Coal power	43155	48.9%	30458	5.2%	8155	5.7%
Gas power	5892	6.4%	6055	7.4%	4863	3.4%
nuclear power	5116	5.5%	8723	20.6%	12288	8.6%
Wind power	10193	11.0%	24133	20.0%	13578	30.5%
photovoltaic	8533	9.2%	23425	1.1%	43057	30.1%
Solar thermal power	300	0.3%	1305	3.3%	3529	2.5%
Biomass and others	2539	2.7%	3885	16.40%	5035	3.50%
Proportion of clean power generation	45.0%		68.8%		90.9%	

- Transmission grid: UHV AC transmission & UHV DC transmission
- Distribution grid: automation and intelligence

- Distributed power generation, power load, onitoring, protection & automation devices
- All-round monitoring, protection and optimization scheduling

I. Demand Analysis

Stable smart power grid → **Continuous & stable demand for cables**

Power generation side

- Power generation and corresponding engineering projects have supporting construction requirements for OPGW cable-power generation and engineering contractor construction

Power transmission / distribution side

- Power grid enterprises account for more than 90% of the market demand for OPGW cables-State Grid, China Southern Power Grid

Consumer side / microgrid

- Smart city and other construction projects have an increasing demand for power cables with fibre composite (energy flow + information flow)

SGCC: 国家电网公司 STATE GRID

CSG: 中国南方电网 CHINA SOUTHERN POWER GRID

Local independent grid company

1. Inner Mongolia Electric Power (Group) Co., LTD
2. Shanxi Regional Electric Power (Group) Co., Ltd
3. Guangxi Water Resources And Electric Power Group Co., Ltd
4. Sichuan Hydropower Investment and Management Group Co., LTD
5. Yunnan Baoshan Electricity Co., LTD

Power engineering contractor construction

1. China Power Engineering Consulting Group Limited
2. China Hydropower Engineering Consulting Group Corporation
3. HydroChina Corporation
4. China Gezhouba Group International Engineering Co., Ltd.

II. Products & Applications of YOFC

YOFC
Smart Link Better Life.

Explore new opportunities under new policy - based on cables, layout solutions.

1. Full coverage of OPGW & OPPC structures
2. Special wire and cable products
3. Electric power fittings & ancillary products
4. Insulated optical unit cable products & solutions
   - Insulation optical unit fibre composite Overhead Ground wire (IOPGW) & construction scheme
   - New optical fibre to terminal composite cable (IOPPC & supporting cable) & construction scheme
   - New anti-icing solution for electric overhead wires
5. Power line, pipe network information solutions

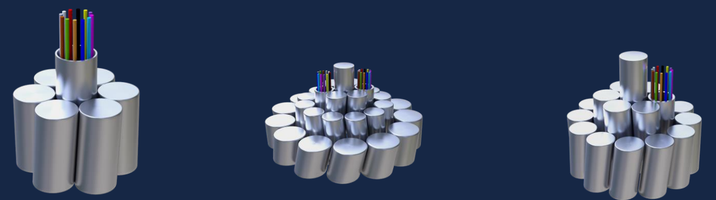
II. Products & Applications of YOFC

YOFC
Smart Link Better Life.

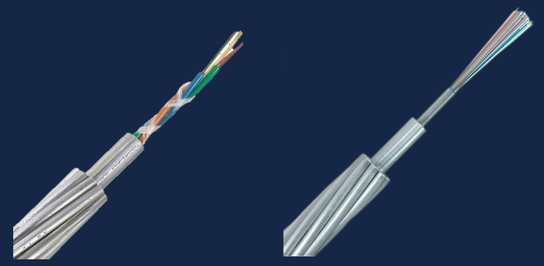
2.1. Full coverage of OPGW & OPPC structures

2.1.1 Full coverage of OPGW structure

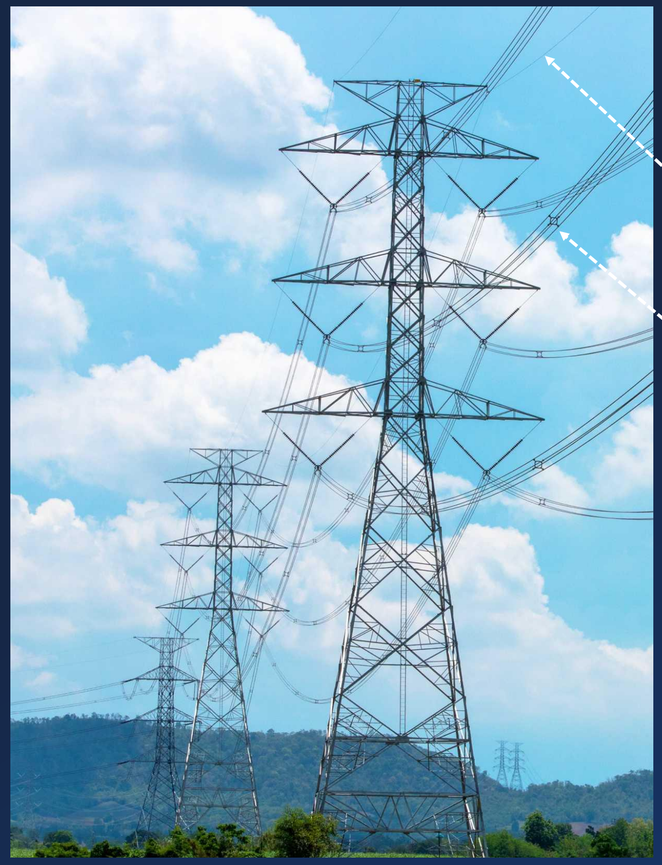
- OPGW: Optical fibre composite overhead ground wire
- Standard: DL/T832 and IEEE 1138 Standard for fibre optic composite overhead ground cables



SUS OPGW



AL-Tube OPGW



Power special optical cable:

OPGW optical fibre composite overhead ground cable

OPPC optical fibre composite overhead phase conductor

Power communication Optical fibre:

- Ultra-low loss G.654.E fibre
- Ultra-low loss G.652 fibre
- Small od low loss bending insensitive fibre

II. Products & Applications of YOFC

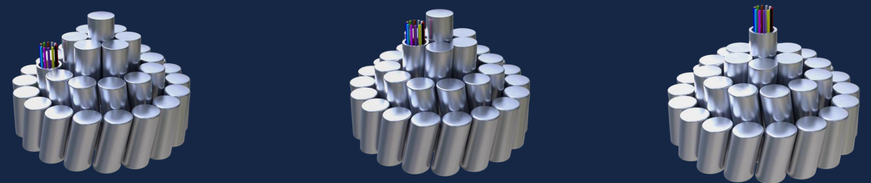
YOFC
Smart Link Better Life.

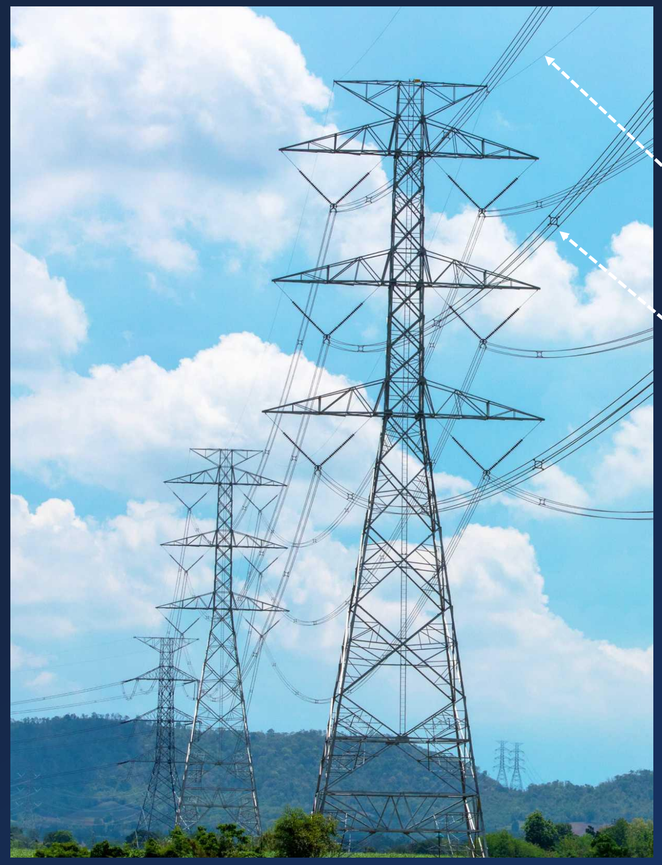
2.1. Full coverage of OPGW & OPPC structures

2.1.2 Full coverage of OPPC structure

- OPPC: optical fibre composite overhead phase conductor
- Standard: DL/T1613 Standard for optical fibre composite overhead phase conductor

Stainless steel optical units are available in different positions





Power special optical cable:

OPGW optical fibre composite overhead ground cable

OPPC optical fibre composite overhead phase conductor

Power communication Optical fibre:

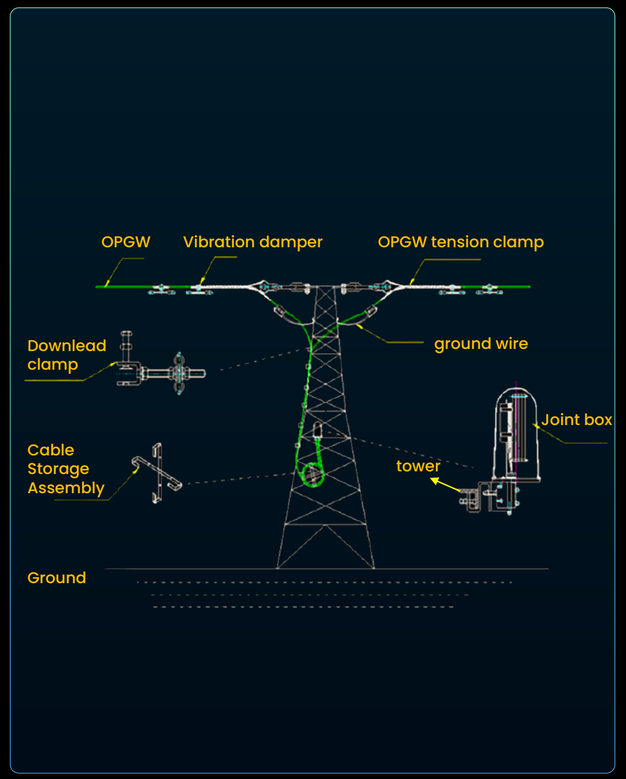
- Ultra-low loss G.654.E fibre
- Ultra-low loss G.652 fibre
- Small od low loss bending insensitive fibre

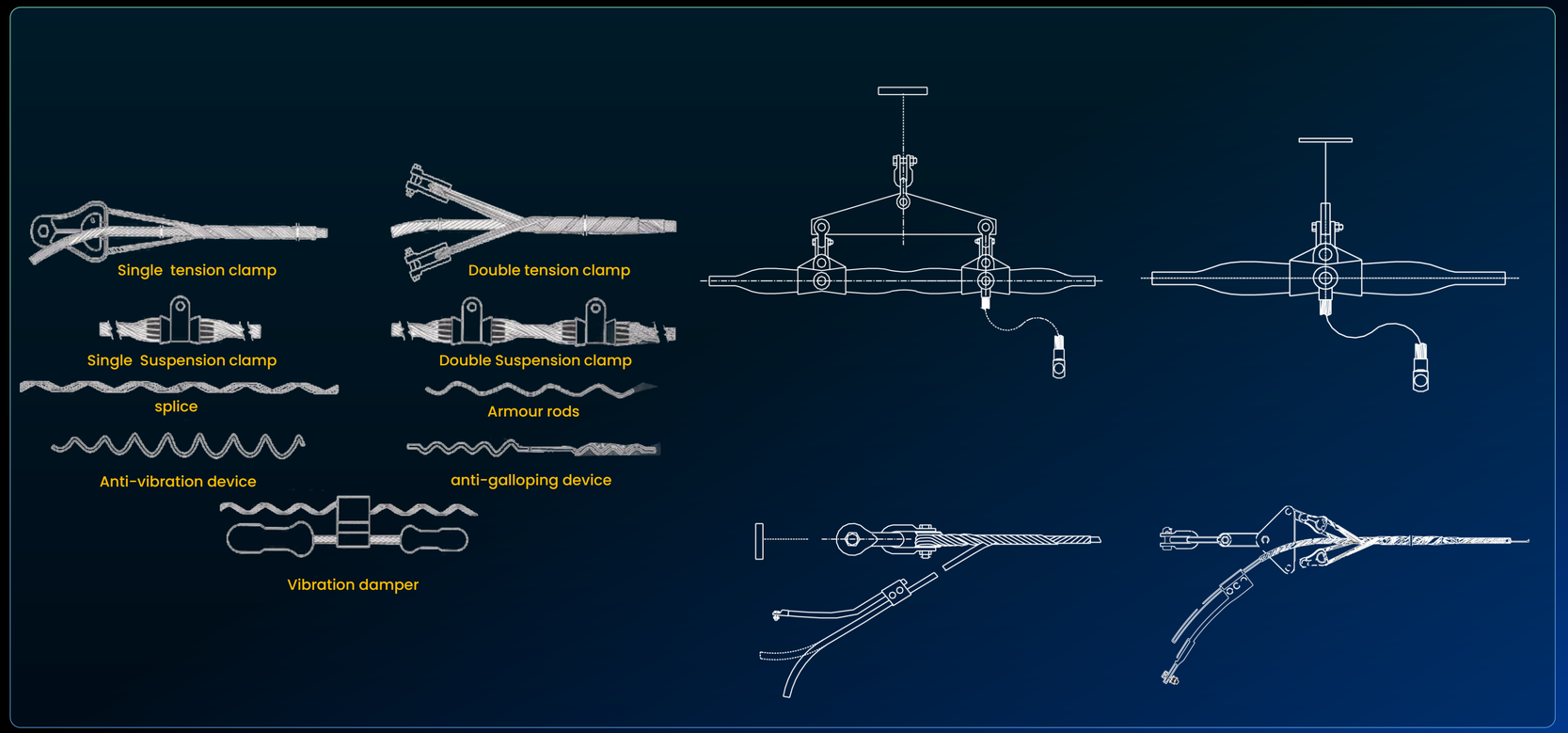
II. Products & Applications of YOFC

YOFC
Smart Link Better Life.

2.2 Electric power fittings & supporting equipment

Connect and combine various devices in power system for transmission of mechanical load, electrical load or protection, mainly including suspension clamp, tensioning clamp, connection fittings, connecting fittings, protection fittings, etc.





II. Products & Applications of YOFC

YOFC
Smart Link Better Life.

2.3. Insulated optical-unite overhead cable & supporting application

2.3.1 IOPGW — Segmented Insulation

- IOPGW: Insulated optical-unite optical fibre composite overhead ground wire
- Application scenario: Insulated optical units can be grounded with single-point grounding that can be isolated in sections of ground, significantly reducing the power loss of transmission lines

1. The optical unit of the sensing fibre is used to monitor the force, temperature, and vibration of the overhead cable. The optical element of a communication fibre is used to transmit communication signals.
2. The coating material of insulated optical unit can withstand the high temperature of the ground wire in the case of short circuit and other faults.
3. The insulated optical unit can be directly led to the ground for split-connection, the optical fibre split-connection and photoelectric separation are simple, which can improve the line construction efficiency and reduce the line construction time.
4. The insulated optical unit can realize the piecewise insulated single point grounding, especially suitable for melting ice operation of power lines, significantly reduce the power loss of transmission lines.

II. Products & Applications of YOFC

2.4. Insulated optical-unite overhead cable & supporting application

2.4.2 IOPPC Insulated Optical-unite direct to electrical terminal

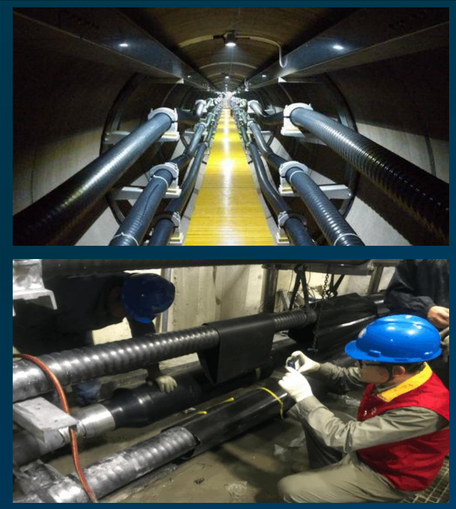
IOPPC: Insulated optical-unite optical fibre phase conductor

Application scenario:

- The insulated optical units is combined with the overhead phase line and underground power cable respectively
- The insulation optical unit of overhead phase line direct insulation down and optical fibre direct to the electrical terminal. Realize the bidirectional flow of energy flow and information flow in 10KV distribution network with low-cost
- Promoting the automation construction of power distribution network

IOPPC facilitates rapid and low-cost expansion of 10KV distribution network

- Any point of the optical unit is quickly and directly led down
- IOPPC is 3 times faster than traditional OPPC
- Significantly reduce line construction and operation costs
- Optical fibre directly to the tower transformer and switch, to achieve accurate control



Power distribution cable Optical fibre complex Integrated power distribution network automation

- The optical unit is integrated into power cable of distribution network to realize real-time monitoring of power cable temperature and ampacity
- Realize the bidirectional flow of energy flow and information flow with real-time feedback and monitoring. Automating the last mile of electricity consumption

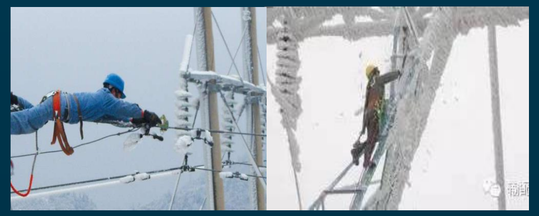
II. Products & Applications of YOFC

YOFC
Smart Link Better Life.

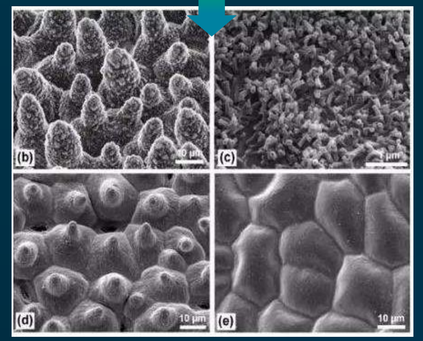
2.5. Exploration and attempt of anti-icing of new power overhead wires

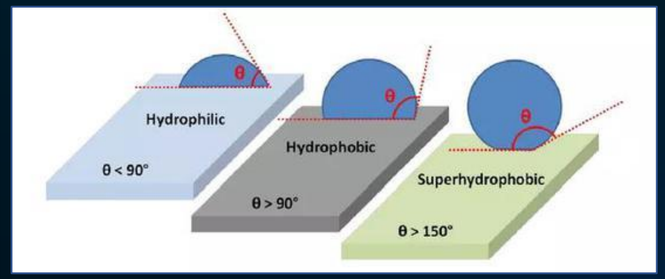
- New anti-icing technology improves the stability of transmission lines in extreme harsh conditions
- Application scenario: New super hydrophobic and controllable micro heating power cable. Improve performance

Against extreme weather disasters of overhead power



Mechanical de-icing





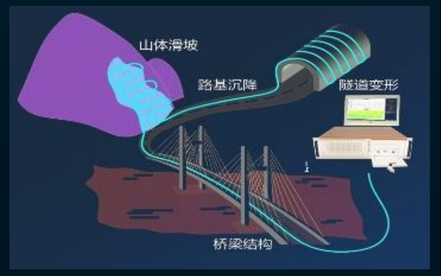
- Superhydrophobicity: Destroy droplet adsorption and nucleation
- Micro heating: Prevents solidification from developing further

II. Products & Applications of YOFC

2.6 Power line and pipe network information solution of YOFC

Integrated YOFC sensing and monitoring technology to create information solutions for power lines and pipe networks.

Power optical fibre sensing system integrates power cable line monitoring, alarm, fault analysis, fault location, fault management, line maintenance and line management, effectively reducing the monitoring operation cost of smart grid, improving the monitoring efficiency.



Distributed optical fibre temperature strain detection system

- Cable stress and strain monitoring (icing monitoring)
- Cable tunnel settlement monitoring
- The temperature strain monitoring of submarine cable

Automatic monitoring and protection system for optical cable line

- Power cable online monitoring
- Electric power communication line on-line monitoring

Distributed optical fibre temperature measurement system

- Distributed fibre-optic tunnel fire monitoring
- Distributed fibre-optic cable fire monitoring
- Electrical equipment over hot point monitoring

Distributed optical fibre vibration detection system

- Third-party Cable Damage
- Cable tunnel excavation prevention
- Cable flapping monitoring

Optical fibre perimeter monitoring system

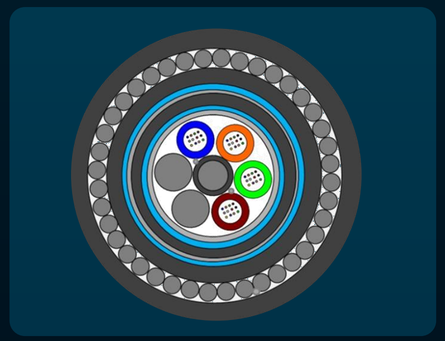
- substation
- Power plants
- Hydropower station

III. Products & Applications in other Fields

3.1 Flame retardant and fire resistant optical cable products & applications

- Optical cable products for maintaining effective line communication under flame conditions
- In the communication lines with requirements on fire safety, such as key communication stations, ships, aerospace, subways and large public places, etc. Fire-resistant optical cable plays an important role in fire rescue, communication guarantee and normal operation of equipment in disaster

GYZS53/GYFZS53



GYZS53+33/GYFZS53+33

Product features:
- Excellent mechanical and temperature properties
- Refractory layer and LSZH sheath have excellent fire retardant performance

Application scenario:
- subway tunnel and other pipelines/directly buried laying

Optical cable combustion test

Fire resistance
- The ability of specimens burned in flame to maintain circuit integrity under specified test conditions

Circuit integrity
- The ability of a cable to operate continuously under specified test conditions

III. Products & Applications in other Fields

3.2 Anti-rat and anti-bird optical cable products & applications

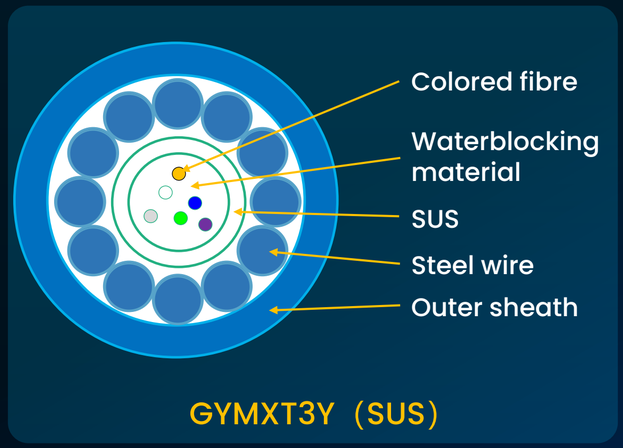
- Application scenarios: The optical cables set up in the field are often pecked and gnawing by birds and rodents, and the optical cables are easily damaged
- Using metal bushing instead of conventional plastic bushing can prevent the damage and effectively improve the anti-damage level of optical cable

Woodpecker

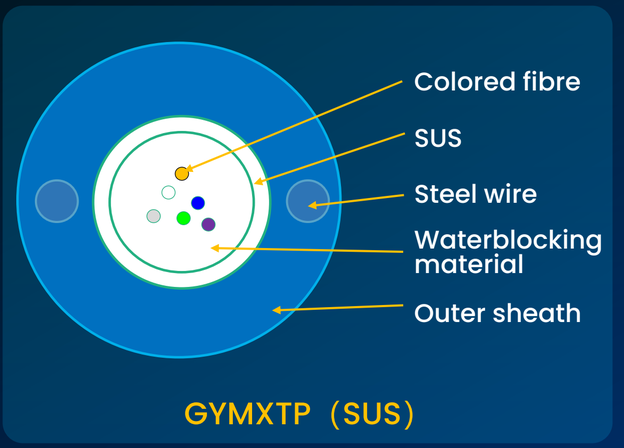
Crow

Bamboo bird

Rats and others nibbled at the cable



GYMXT3Y（SUS）

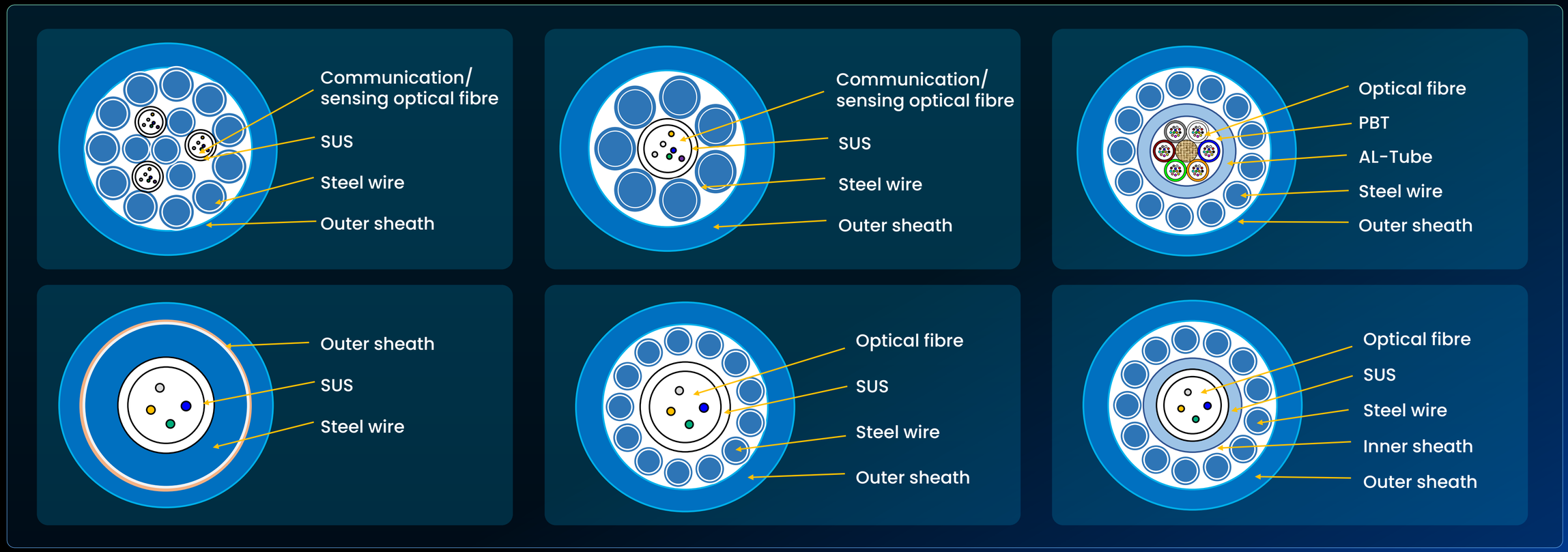


GYMXTP（SUS）

III. Products & Applications in Other Fields

3.3 Harsh environment resistant special optical cable products & applications

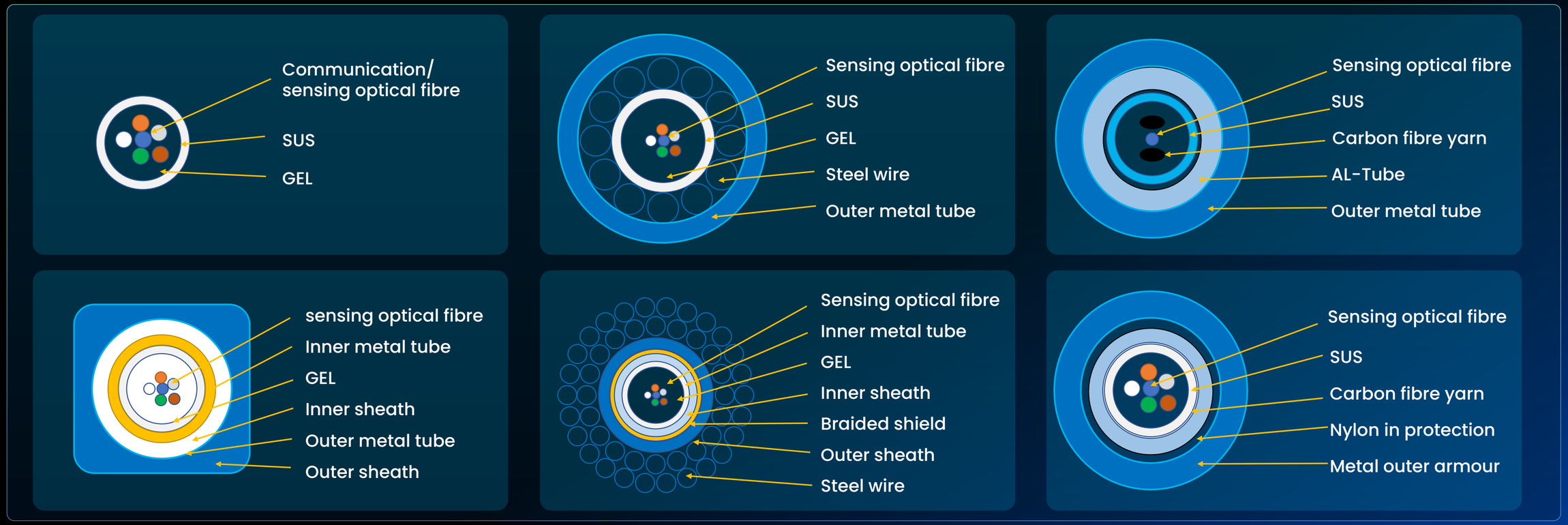
Optical cable product composed of metal cladding structure and high density polyethylene sheath, which can protect optical fibre in harsh environment and improve the reliability of optical cable.



III. Products & Applications in Other Fields

3.4、Product & application of oil well detection cable

Using the excellent compression and corrosion resistance of metal pipe unit combined with the advantages of sensing optical fibre of YOFC . Developed high-temperature and corrosion-resistant oil well detection optical cables. Realize the accurate detection of downhole operation environment and improve the intelligent perception level of oil well system.



IV. Successful Cases — CELEC OPGW in Ecuador

In 2019-2020, YOFC win the bidding of CELEC（National Company of Electricity of Ecuador) to deployed OPGW in the national principal line of transmission of electricity. YOFC supplied the OPGW cables of 35000 FKM, with good quality.

IV. Summary

YOFC
Smart Link Better Life.

1. OPGW products & supporting fittings, OPPC products & supporting fittings of YOFC meet the needs of power communication network construction.
2. Insulated Optical-unite overhead cable & supporting application.
3. The combination of communication and sensing products supports effective disaster warning and prediction of major network.
4. Optical fibre composite of power cable, support distribution network large-scale, fast and low-cost fibre coverage.
5. Actively explore anti-icing cable products and solutions.


YOFC
Smart Link Better Life.
Thanks!