

3Km_20Km 『Wireless Information Highway』 transmission system for 【offshore wind power】 and 【onshore wind power】 power generation systems

Equipped with military-grade PTP Mesh Loops wireless multi-loop, multi-path, multi-redundancy,
and automatic repair connection mechanisms

1. 3Km_20Km 【Offshore Wind Power】 & 【Onshore Wind Power】 power generation system installation environment diagram



Image source: <https://www.technice.com.tw/technology/energy/29576/>

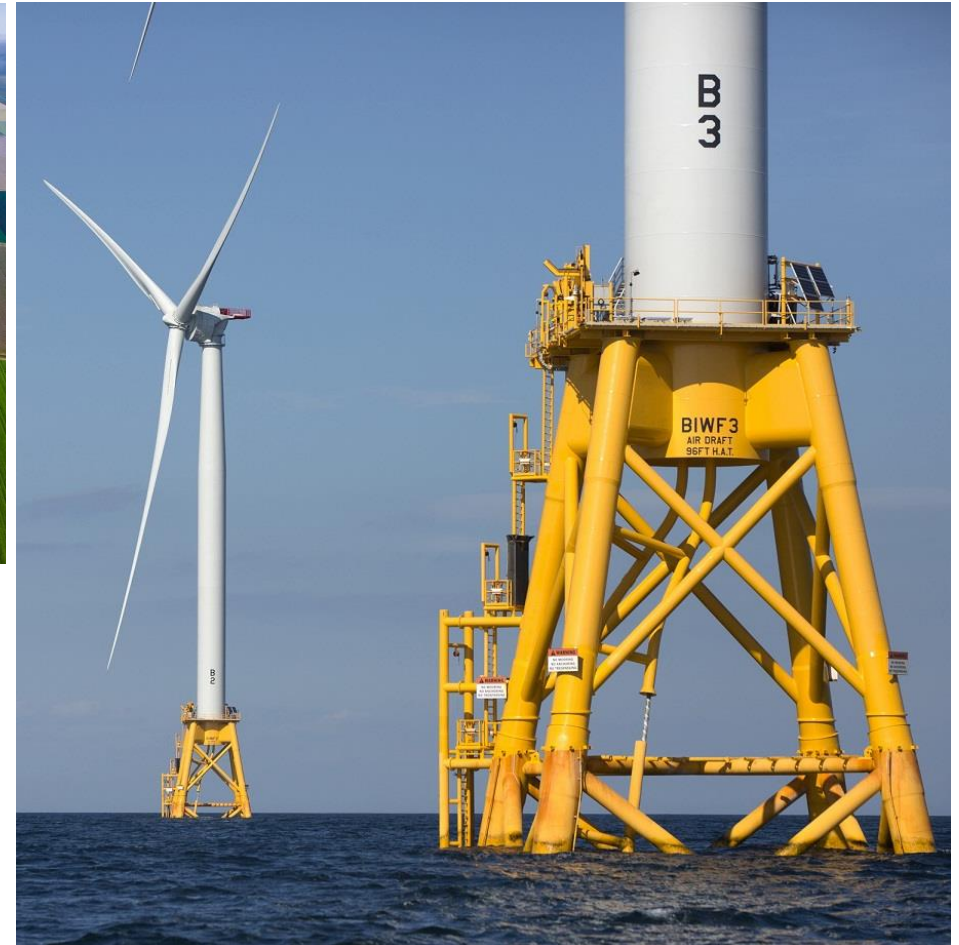


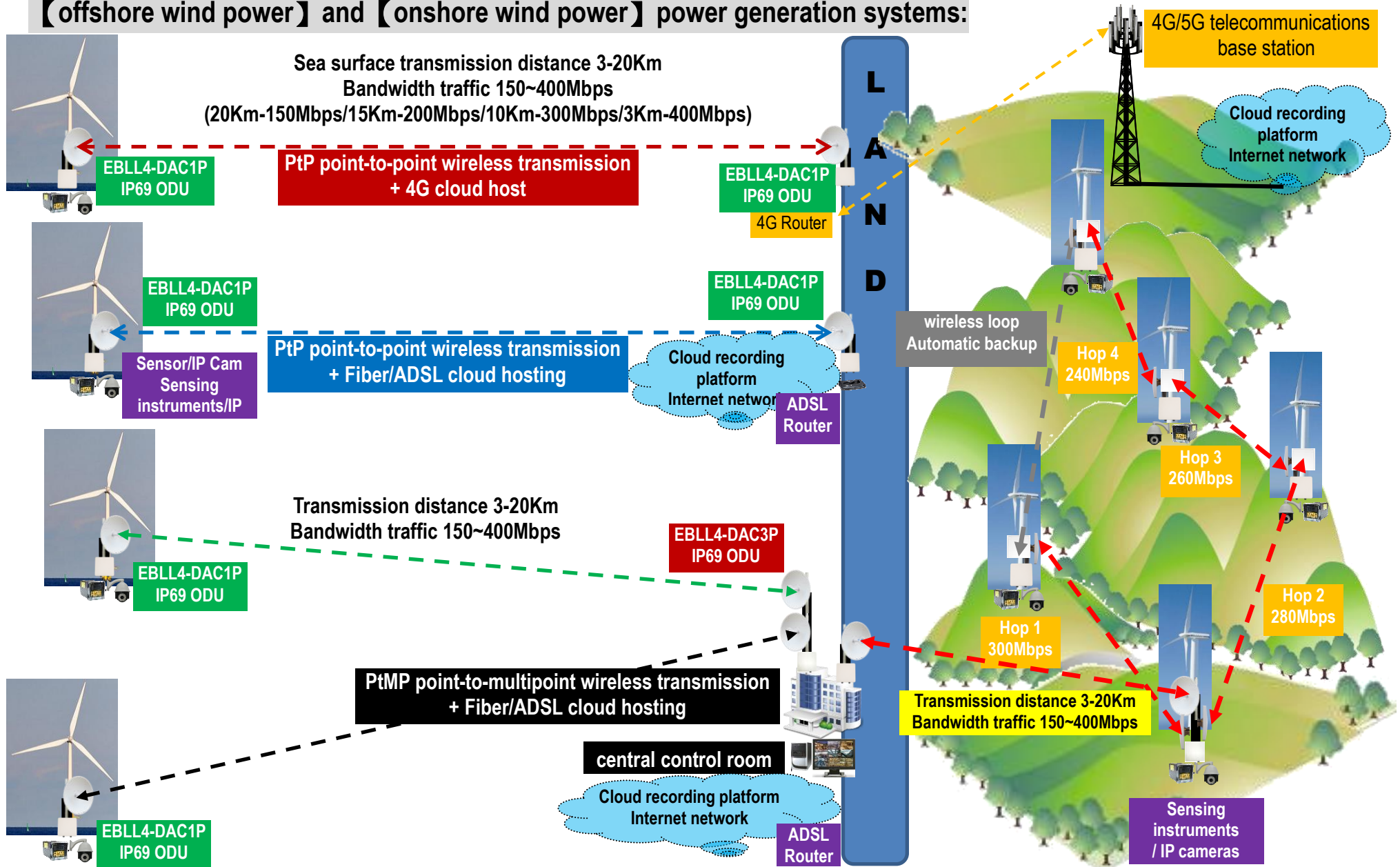
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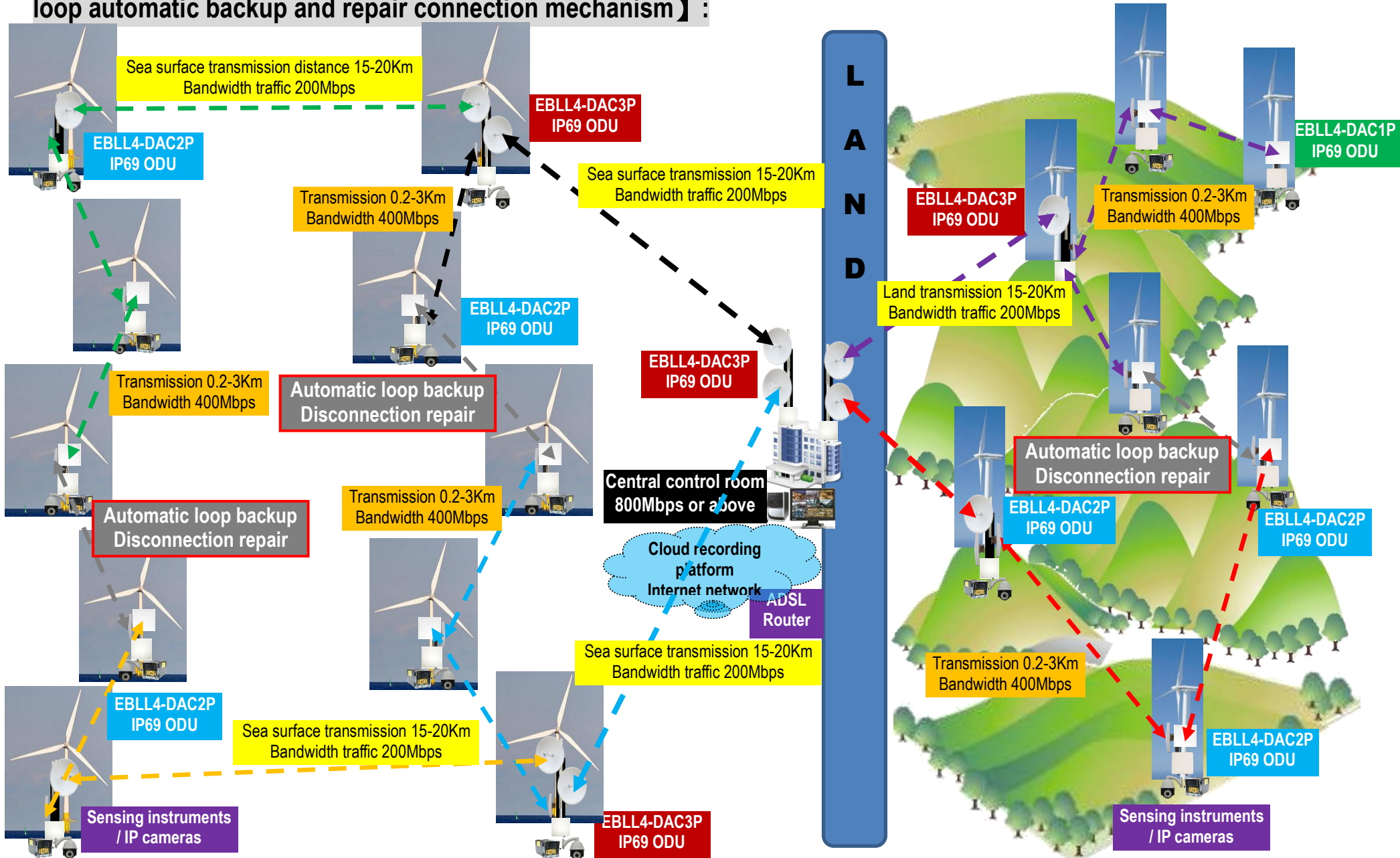


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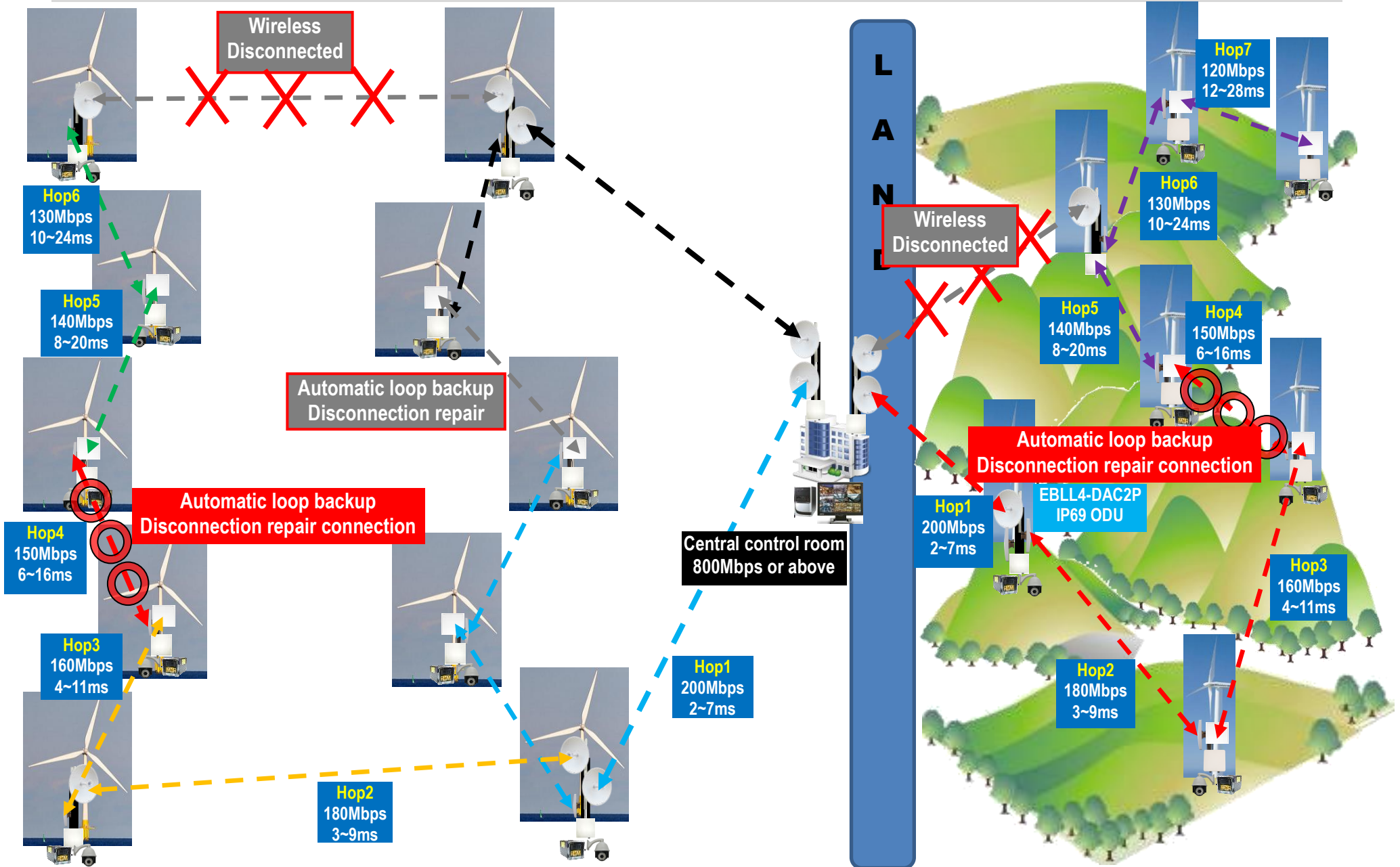
2. 『Point-to-point』, 『Point-to-multipoint』, 『Multi-point relay platform』 wireless backbone transmission system for 【offshore wind power】 and 【onshore wind power】 power generation systems:



3. Using multi-point relay platform technology, the structure forms a 『 wireless information highway 』 , with a 【 multiple loop automatic backup and repair connection mechanism 】 :



4. **【 Multiple loop automatic backup connection mechanism 】 disconnection repair transmission operation diagram:**



5. Explanation of military-grade PTP Mesh Loops wireless multi-loop, multi-path, multi-redundancy, and automatic repair connection mechanism:

<< Technical description of automatic loop backup and repair connection transmission >>

- **Planning and design:** First confirm those devices in the wireless transmission system that need to play the role of "automatic loop backup and repair connection transmission mechanism".
- **Set up wireless transmission equipment:** Let the wireless devices at both ends "connect to each other to form loops", and then the "software of the wireless transmission system will automatically disconnect the loops" and enter a state of detecting transmission disconnections and repairing them at any time (can be done at the same time Supports wired networks - including optical fiber network and wireless loop backup and repair functions).
- **Manually adjust the designated loop backup repair priority path:** By setting the Cost path parameter size, the specified backup repair connection transmission path and priority can be achieved.
- **Automatically repair the connection:** When any connection in the entire wireless transmission system is interrupted, the equipment that detects transmission disconnection and backup will automatically restore the connection to achieve the effect of repairing the transmission connection; maintain wind power related detection and capture Get the recorded data and continuously transmit it to the back-end database or keep the remote control mechanism running.
- **Time to repair transmission connection:** It takes about 10~120 seconds to automatically repair and complete the connection. Reduce the time and amount of data lost in collecting data.
- **Multi-circuit redundant disconnection and repair connection mechanism:** The core software built into the wireless device automatically detects, evaluates, calculates and determines which loop transmission connections are interrupted/repared; especially suitable for optical fiber wired networks Used for backup transmission repair.

6. Explanation of multi-point relay platform wireless transmission technology architecture and patented transmission advantageous technologies and application methods:

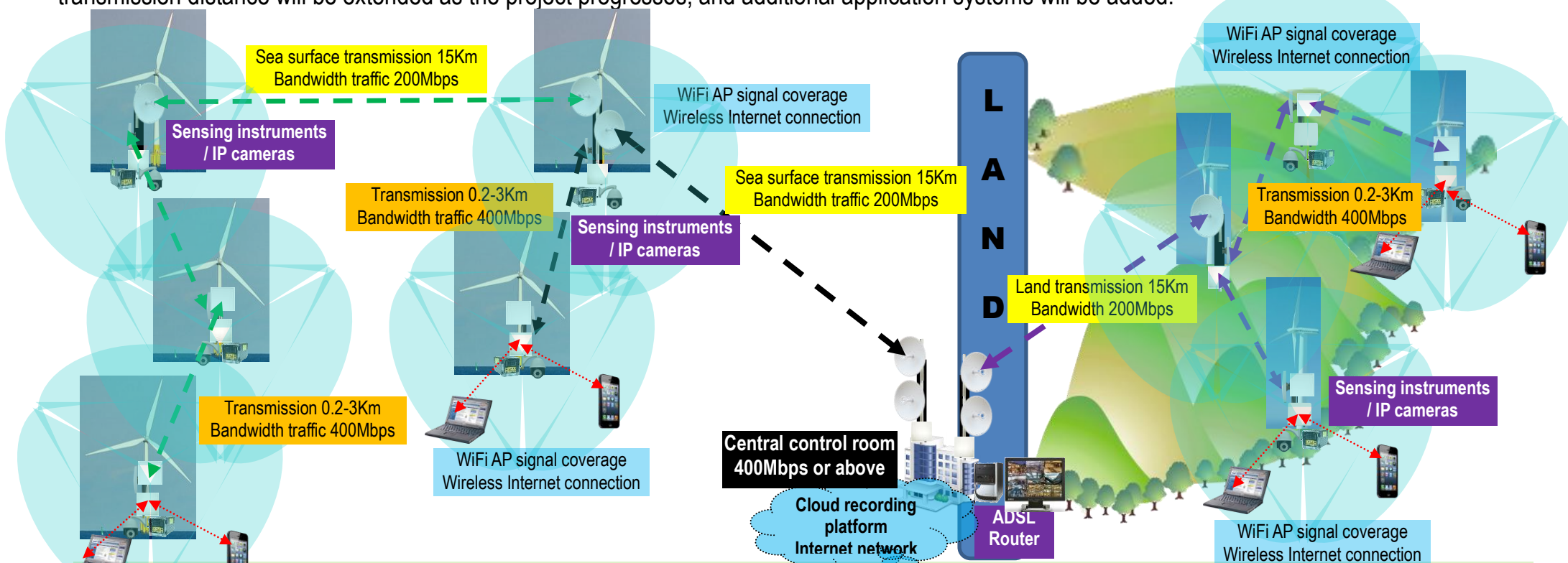
<<Explanation of multi-point relay jumping wireless transmission technology >>

- **Multi-point relay platform jumping technology can support up to several platform jumping:** Relay platform forwarding technology has been developed to the 4th generation. **It can theoretically support 250 platform jumping.** It has been tested for 30 hops and has been used in practical operation cases for more than 14 hops. , unless multiple circuit backup is provided, it is recommended to control it within 15 jumps!!
- **Each relay jump will reduce the bandwidth traffic:** 3-4 hops before the relay jump, **each hop will reduce the bandwidth traffic by about 8-20Mbps**, after the 4th hop, it will decrease by about 5~10Mbps each time, and after the 10th hop, The bandwidth traffic will no longer be reduced (or only reduced by 2~5Mbps per hop).
- **Packet transmission low latency (Low Latency):** The first 3 hops of the relay hop, **each hop adds a delay of 1~2ms**, and after the 4th hop, another 1~2ms (3~4ms) will be added for each hop. The 10th hop From now on, a delay of 1~2ms (5~6ms) is added to each hop, so the 10th hop is about 30ms and the 15th hop is about 60ms.
- **Multi-point relay platform supports transmission distance:** each section of wireless relay platform transmission has an independently defined transmission distance; theoretically it can transmit about 0.1-20Km, but in practice it is recommended to be within about 3km, unless it is between shore and The first windmill has long-distance transmission requirements, but it is better to control it within 15Km as much as possible.
- **Point-to-multipoint relay platform:** In the future, consider providing new technology applications of PTMP MESH to improve the multi-path connection backup mechanism of mesh network MESH!!

7. Application explanation of the phased introduction of the 『Wireless Information Highway』 of 【offshore wind power】 and 【onshore wind power】 power generation systems:

- The first phase 『during the construction of the windmill base』 : 【Wireless Internet connection signal coverage】 + 【Real-time monitoring of construction】 + 【Real-time detection data transmission】

>>Erect temporary wireless transmission backbone: Through the installation of relay platforms, the number of wireless relay platforms and transmission distance will be extended as the project progresses, and additional application systems will be added.

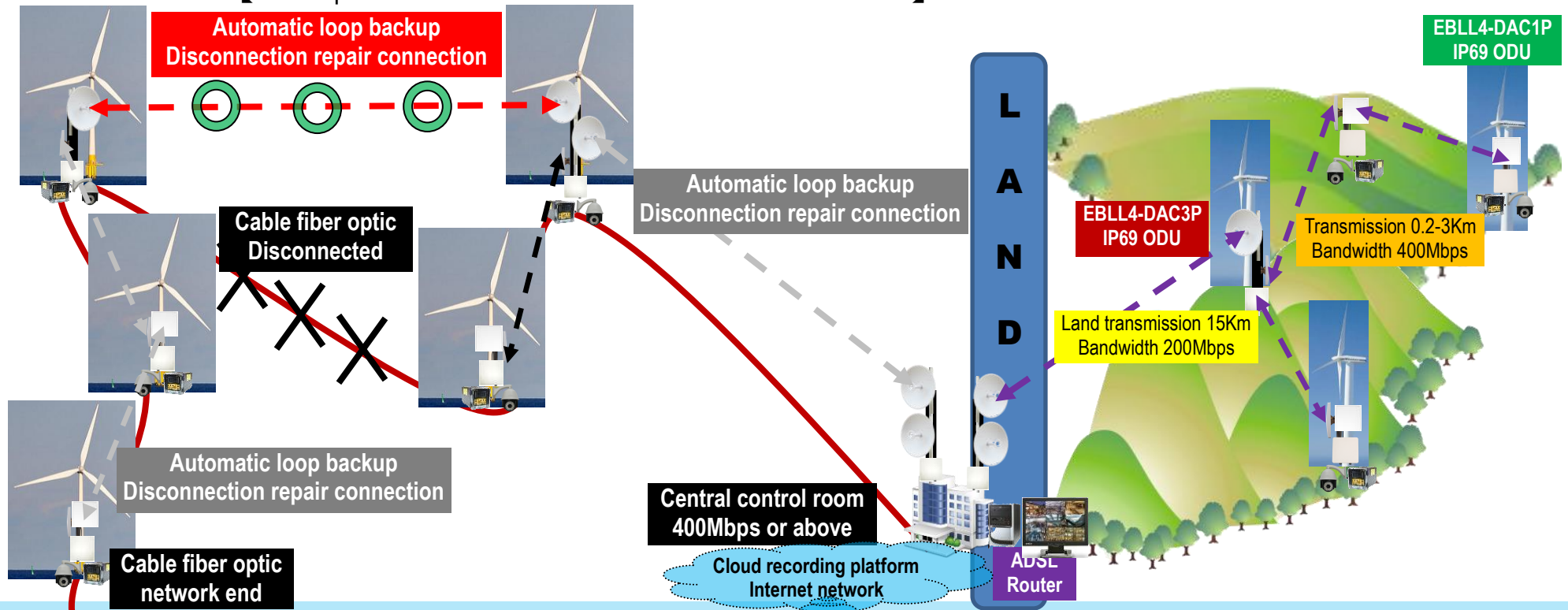


The number of wireless relay hops and transmission distance will be extended as the project progresses and additional application systems will be added >>

- Planning and design: During initial planning, reserve scalable wireless product models as much as possible, so that future system extensions and the addition of special technologies can be accommodated.
- During construction: based on actual application requirements, video surveillance backhaul, Internet connection to various services, detection instrument data collection and transmission, remote management and control, etc.
- Stacked back-end network management system: With the introduction of communication and data transmission requirements of various systems, based on confidentiality control, security control and network management, it is necessary to stack more wireless transmission and system Lulu information security management.

■ The second phase 『 during the construction of wired optical fiber network 』 : In addition to the first phase application + 【 wired optical fiber and wireless transmission 】 backup transmission test verification

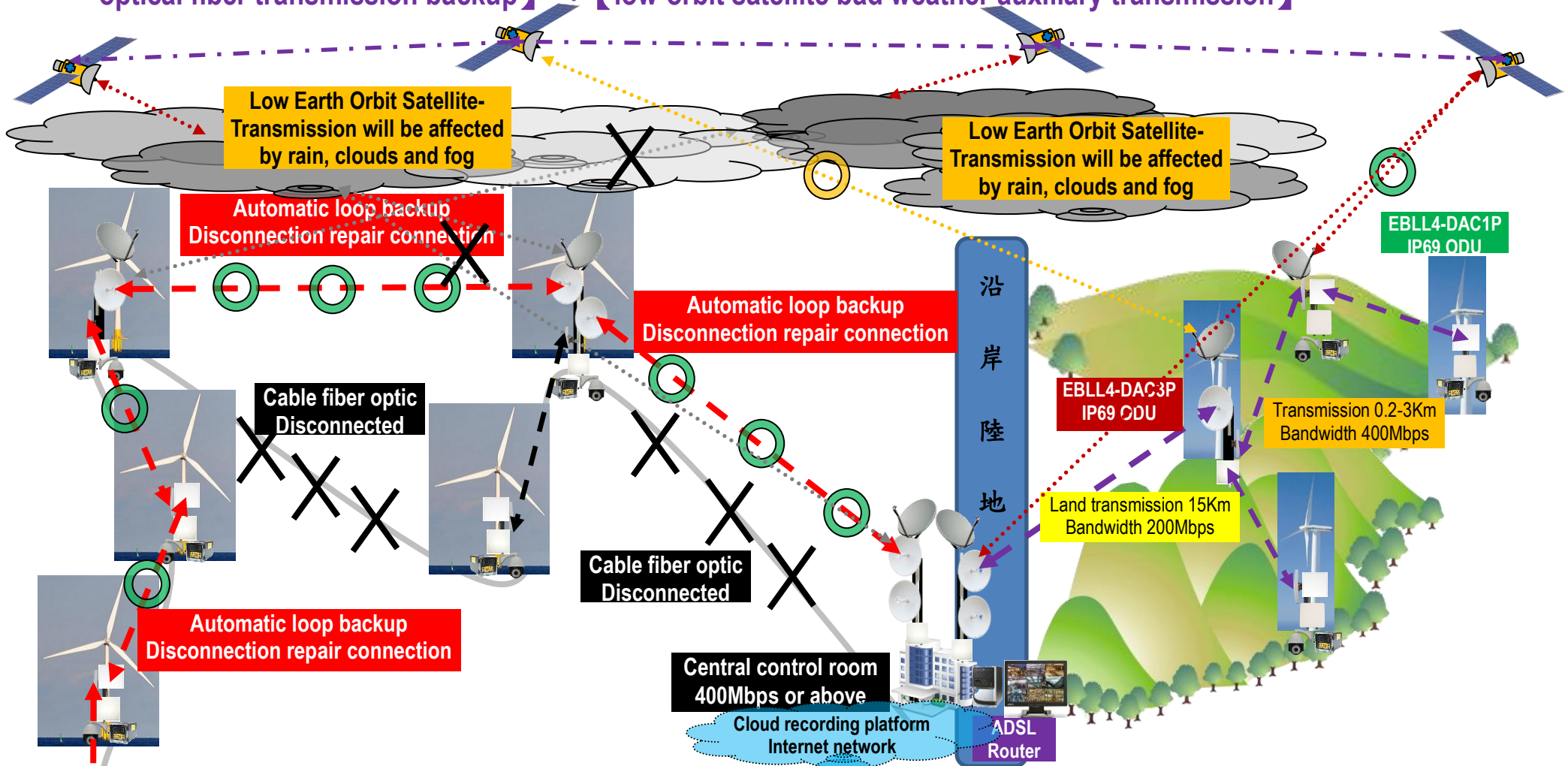
>>>Wired optical fiber network construction test: Maintain the operation of the 『 Wireless Information Highway 』 and perform backup transmission test verification of the 【 wired optical fiber network and wireless transmission network 】 .



<< Execute redundant transmission test verification of "wired optical fiber network and wireless transmission network" >>

- During the construction of the wired fiber optic network: Maintain the operation of the "Wireless Information Highway" and **continue to provide various network services such as video surveillance backhaul**, Internet connection services, detection instrument data collection and transmission, remote management and control, etc. working normally.
- Test and verify the redundant transmission mechanism of wired networks and wireless networks: Each wireless network transmission and wired optical fiber network will form a **"multiple loop redundant mechanism"**. Each loop formed in each segment is independently detected and Automatically execute the operation mechanism of disconnection or connection restoration to maintain normal link transmission operations.
- **Wireless multi-point relay platform system can be flexibly extended and expanded:** With the increase in the number of wind power generation installations and the continuous laying of optical fiber wired networks, the wireless transmission network can easily be extended and expanded to meet the needs of windmill owners. The system is running on demand.

■ The third stage 『acting as an automatic backup and repair mechanism after completion』 : Implementing 【wired optical fiber transmission backup】 + 【low-orbit satellite bad weather auxiliary transmission】



<<Explanation of problems such as rain attenuation and cloud fog signal attenuation in outdoor wireless transmission systems >>

WiFi wireless uses 2.4GHz & 5GHz frequencies for spatial transmission. It is indeed affected by air humidity, air impurities, rain, clouds, sandstorms, etc. However, the actual impact varies greatly. Except for sandstorms, the signal strength is usually affected by about 2 ~8dB. The attenuation of wireless signals in most rainy days is 2-3dB. Even if there is a heavy rain of 200mm/h, the impact is within 8dB. The signal strength, stability and bandwidth traffic of wireless transmission are reduced by about 1 ~Level 3, within the designed reserved signal value buffer reserve range in the early stage of wireless system installation, the impact is limited, **so WiFi wireless transmission is suitable for use in offshore wind power systems.**

8. **【Offshore wind power】 and 【onshore wind power】 power generation systems, the advantages of using PTP Mesh wireless transmission technology**

Advantage 1: Low installation and maintenance costs

PTP Mesh outdoor wireless transmission equipment, paired with corresponding outdoor dedicated antennas, even the highest-end product EBLL4-DAC3P, the investment cost of the entire outdoor wireless transmission system is within USD\$3,500 to USD\$5,000 (excluding special construction and maintenance), a system with an entire 100 wind power generation area requires only an investment of less than USD\$50,000 and can build a 『wireless information highway』 backup transmission system, which is very cost-effective!!

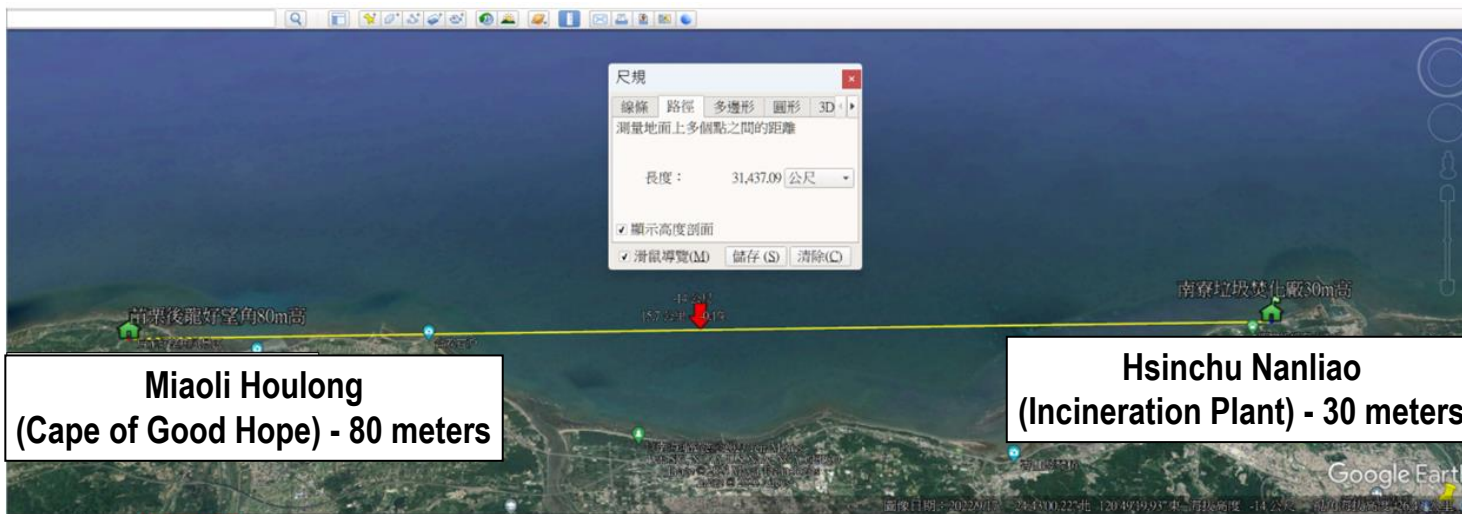
Because the mechanisms and accessories of outdoor wireless equipment are specially defined to meet the requirements of high-temperature sunlight, high wind pressure, high corrosion, and high wind and wave impact at sea, the risk factors of failure can be minimized; according to **【Hsinchu Science Industry Park】** the failure rate statistics of the outdoor wireless transmission system in the past five years, the annual failure rate can be reduced to less than 1%; therefore, the relative maintenance cost will be very low.

Advantage 2: Two outdoor wireless devices can easily build a 『15Km wireless information highway』

Recently, wireless long-distance transmission verification tests of 32Km and 10Km have been conducted (please refer to the attachment). If the distance from the interbank transmission to the wind turbine base is controlled to about 15Km and the erection height is above 15 meters, a few two units can be used. Outdoor wireless transmission equipment can easily build a 15-kilometer-long wireless transmission system with a bandwidth of 200-350Mbps, which is equivalent to building a 『15Km wireless information highway』 .

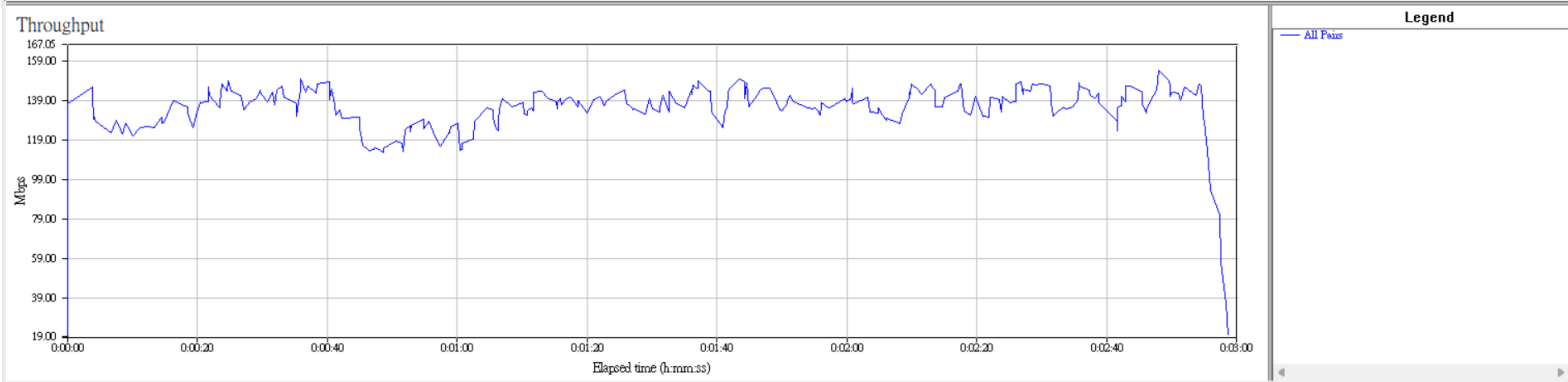
■ Test distance: Straight line distance between two points 31.43Km (PtP 31.43Km Bandwidth 134.9Mbps)

>> Two-point straight line section: Hsinchu Nanliao (Incineration Plant) - 30 meters, Miaoli Houlong (Cape of Good Hope) - 80 meters



Group	Pair Group Name	Run Status	Timing Records Completed	95% Confidence Interval	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Measured Time (sec)	Relative Precision
All Pairs			302		134.978	8.906	32.245		
	Pair 33 No Group	Finished	40	-1.477 : +1.477	17.954	10.804	32.245	178.629	8.247
	Pair 34 No Group	Finished	33	-0.991 : +0.991	15.053	9.646	25.141	175.376	6.584
	Pair 35 No Group	Finished	38	-0.994 : +0.994	17.124	11.150	25.848	177.526	5.806
	Pair 36 No Group	Finished	37	-1.175 : +1.175	16.539	11.145	26.605	178.968	7.104
	Pair 45 No Group	Finished	43	-1.555 : +1.555	19.294	10.530	31.176	178.294	8.058
	Pair 46 No Group	Finished	35	-1.404 : +1.404	16.017	9.737	26.255	174.810	8.265
	Pair 47 No Group	Finished	38	-1.367 : +1.367	17.145	10.448	29.261	177.311	7.973
	Pair 48 No Group	Finished	38	-1.758 : +1.758	17.288	8.906	26.918	175.847	10.169

Wireless bandwidth traffic: 134.9Mbps



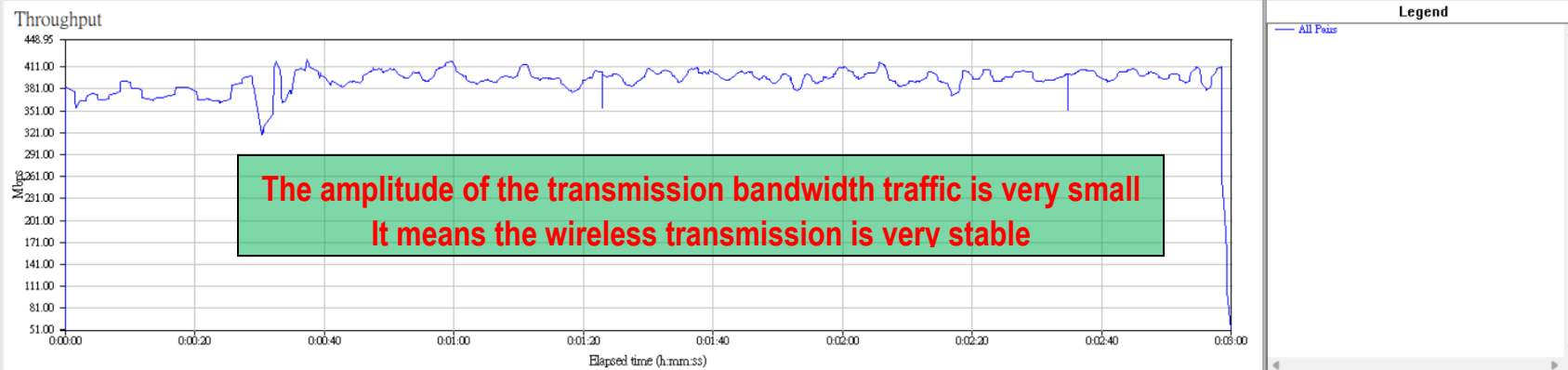
■ Test distance: Straight line distance between two points 10Km (PtP 9.9Km Bandwidth 391Mbps)

>> Two-point linear section: Miaoli Shuangfeng Cihui Palace (488m) <<-- 10Km -->> Miaoli Wutai Mountain Jingyun Temple (124m)



Group	Pair Group Name	Run Status	Timing Records Completed	95% Confidence Interval	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Measured Time (sec)	Relative Precision
All Pairs			880		391.157	15.456	67.568		
	Pair 33 No Group	Finished	110	-0.432 : +0.432	44.95	44.944	65.200	178.880	0.877
	Pair 34 No Group	Finished	110	-0.424 : +0.424	49.305	45.147	67.002	178.481	0.860
	Pair 35 No Group	Finished	110	-0.430 : +0.430	49.317	44.944	67.568	178.437	0.872
	Pair 36 No Group	Finished	111	-0.528 : +0.528	49.560	41.280	67.568	179.178	1.065
	Pair 45 No Group	Finished	110	-0.385 : +0.385	49.311	43.034	57.477	178.458	0.781
	Pair 46 No Group	Finished	108	-1.892 : +1.892	48.034	16.390	53.015	179.873	3.989
	Pair 47 No Group	Finished	111	-0.418 : +0.418	49.357	45.429	67.227	179.913	0.847
	Pair 48 No Group	Finished	110	-1.976 : +1.976	49.101	15.456	55.633	179.223	4.025

Wireless bandwidth traffic: 391Mbps



Advantage 3: Two outdoor wireless devices can easily construct a 『 15Km 350Mbps wireless information highway transmission bandwidth 』

Recently conducted wireless long-distance transmission bandwidth traffic verification tests of 32Km and 10Km (please refer to the attachment), if the distance from the shore to the wind turbine base is controlled at about 15Km, a 15-kilometer long 200-350Mbps can be easily constructed wireless information highway transmission bandwidth; constructing several more point-to-point wireless transmission backbones can form a 『wireless information highway mesh multi-network system』, which can be used for various services such as video surveillance backhaul and Internet connection in wind power generation systems, detection instrument data collection and transmission, remote management and control of fans..., and other various applications ...etc.

Advantage 4: Construct a wireless information highway transmission system 『 250 sea and land power turbines are connected in series 』, using 【multi-point relay hopping technology to achieve】

In response to the dense installation method of power generation windmills, military-grade PTP Mesh wireless transmission equipment has a unique 【multi-point relay wireless backbone transmission technology】, which is particularly suitable for the data serial transmission needs after the installation of sea and land wind turbines. ; Theoretically, it can hop 250 times through multi-point relays. In practice, through multiple wireless modules, multiple wireless devices installed back-to-back, multiple wireless Group ID group partitions, multiple PTP Mesh loops, multiple backup mechanisms... etc. technology, easily solves the serial transmission of data streams for hundreds of windmills in offshore and land-based wind power generation.

Advantage 5: Military-grade 『invisible wireless system, array encryption protection, anti-interference, optimized frequency and more stable 』, suitable for operation in sea and land wind power environments

Professionally designed a unique wireless connection communication mode to avoid interference from general WiFi wireless connection requirements, further making the wireless transmission system invisible and completely eliminating the possibility of being attacked by wireless hackers; 【Software development underlying array encryption】 + 【Core operation Unique encryption】 + 【General wireless WPA2-AES】 three-layer encryption mode to securely protect wireless system operation and wireless data transmission.

PTP Mesh's unique wireless frequency customization method and main frequency designation and bracketed frequency usage of

4920~6100MHz have unique anti-interference advantages and optimized wireless frequency usage. More frequencies can be used in erection planning, allowing the wireless connection of offshore and land-based power generation wind turbines. The transmission is more stable, less interference-free, and more frequencies can be expanded and used.

Advantage 6: Adopts 5.8/2.4GHz dual-band wireless design to solve 『 interference from heavy rain signal attenuation at sea, sea airflow, air pressure, and density changes 』

Will heavy rain affect wireless transmission? The answer is yes!! However, please listen to the next paragraph: Different wireless frequencies will only affect about 2~5dB. Therefore, at a wireless transmission distance of 15Km, disaster-causing hourly rainfall of 100mm/hr, the theoretical impact of 5.8GHz is about 5dB, and the practical impact is about 2dB, which does not affect the stability of wireless transmission and bandwidth traffic at all; in a sea or mountain environment, Even in the face of a larger hourly rainfall of 200mm/hr, although the theoretical impact is about 11dB, practical case experience directly affects about 5dB. Similarly, the impact on wireless transmission stability and bandwidth traffic only decreases by about 10~20Mbps. Ping response time increases by about 2~3ms.

Compared with low-orbit satellite communication wireless or other low-frequency long-wave wireless, 5.8/2.4GHz wireless frequency transmission is more suitable for wireless transmission of sea and land power generation wind turbines.

<< WiFi radio wave signal heavy rain attenuation estimation table ; Unit: dB >>

PtP		2.4GHz Frequency			2.4GHz Frequency			5GHz Frequency			5GHz Frequency		
Rainfall Rate		100mm/hr			200mm/hr			100mm/hr			200mm/hr		
Km	EPD Km	2.4GHz	2.45GHz	2.485GHz	2.4GHz	2.45GHz	2.485GHz	5.25GHz	5.50GHz	5.85GHz	5.25GHz	5.50GHz	5.85GHz
13	6.21	0.61	0.64	0.66	1.43	1.5	1.56	3.98	4.44	5.12	9.24	10.29	11.86
14	6.55	0.64	0.67	0.7	1.51	1.59	1.64	4.2	4.68	5.4	9.75	10.85	12.51
15	6.88	0.67	0.7	0.73	1.58	1.66	1.72	4.4	4.91	5.67	10.23	11.39	13.13
16	7.19	0.7	0.74	0.76	1.65	1.74	1.8	4.6	5.13	5.92	10.69	11.9	13.72
17	7.48	0.73	0.77	0.79	1.72	1.81	1.87	4.79	5.34	6.17	11.13	12.39	14.28

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Advantage 6: Provides two types of wireless connection interruption backup and repair functions: 『 PTP Mesh or STA/AP 』

When wireless transmission is in operation, it is often misunderstood that it is susceptible to interference, prone to disconnection, and prone to operational failures!! With 18 years of practical experience in various wireless transmission operations, a professional outdoor wireless transmission system has been operating in Hsinchu Science Park for more than 10 years. The Presidential Palace or Hualien Port or the Central Science Park or offshore oil drilling platforms, etc., have been in actual operation for 5 to 10 years; the transmission is stable, the failure rate is low, the maintenance cost is low, wireless equipment is continuously expanded every year, and the operation system is gradually completed. Wireless is really misunderstood!!

Faced with the concerns about disconnection of wireless transmission, and the risk consideration of multi-point relay hopping to interrupt a certain connection, two wireless connection interruption backup and recovery functions 『 PTP Mesh and STA/AP 』 are specially proposed. The multi-circuit group's disconnection backup mechanism can easily solve various problems such as video surveillance backhaul of offshore and onshore wind power systems, Internet connection to various services, detection instrument data collection and transmission, remote management and control of wind turbines, etc. The transmission application requires non-interrupted operation.

It is worth reminding that for a long time, customers have used PTP Mesh's loop backup repair and connection function as a backup transmission solution with fiber optic networks, whether it is 10km fiber backup between the head office and production plant, or the presidential The National Security Video Surveillance Optical Fiber Transmission Backup in front of the Presidential Palace Square, with eight years of actual operation verification, is more worthy of adoption by offshore and onshore wind power system owners.

Advantage 7: It has 『 easy construction and convenient expansion mechanism 』 to solve the continuous expansion characteristics of offshore and land-based power generation wind turbines.

Where to install it, where to extend the wireless network, and where to provide transmission services?

Wireless does not need to stretch long wires, does not need to consider rights of way, does not need to climb mountains for installation, does not need to go into the sea to fight against tides, and does not have to worry about high installation costs and difficult maintenance... It is really the best transmission solution for offshore and onshore wind power systems.

The distance from the shore to the wind farm area is within 20Km, which is not a high technical threshold for wireless transmission. The distance between windmill groups in the wind farm area is mainly within 1Km. As long as the distance is 3Km, wireless transmission can reach more than 350Mbps. The transmission bandwidth can easily form a 『wireless information highway meshed multi-network system』 .





Within the scope of the 15Km*15Km wind field, wireless transmission points expand simultaneously with the number of wind turbines, making it easy to extend the 『Wireless Information Highway System』. Similar installation and construction environment and similar erection and transmission architecture make construction and maintenance easier, thus echoing the characteristics of Advantage 1 of this article.

Summarize

It is recommended that owners of offshore and onshore wind power generation systems, electromechanical manufacturers, construction manufacturers, or maintenance and operation manufacturers think about what transmission technologies can be used to perform effective and practical data transmission and collection in the 【pre-construction, mid-term, and maintenance periods】 . This technical system that plays a role in remote monitoring, management and control of wind turbines, maintenance and backup optical fiber networks.

Therefore, industry professionals in offshore and onshore wind power systems are welcome to write or call to inquire about wireless transmission technology and arrange wireless transmission testing and verification!!

Introduction to IP69 military-grade PTP Mesh wireless transmission equipment and outdoor dedicated antennas

No	Equipment photos	Model	Main Functions	Main specifications	System use	Description
1	 <p style="text-align: center;">Outdoor wireless transmission equipment</p>	EBLL4-DAC3P -XXXX	<ul style="list-style-type: none"> -20KM/200Mbps large bandwidth is suitable for fiber optic network backup transmission -Multi-point relay hopping function Suitable for series connection of multiple fans in wind fields -Multiple loops backup repair Suitable for multi-fan backup transmission 	<ul style="list-style-type: none"> -3 wireless radio frequency module architecture -Supports 2.4 and 5.8GHz dual frequencies -Process 10,000 pieces of data per second -Supports 1.2Gbps total bandwidth traffic -20/40/80MHz channel width -IP69 resistant to high temperature, high pressure and corrosion 	<ul style="list-style-type: none"> -WiFi AP -WiFi STA (client) -PTP Mesh -special function 	<ul style="list-style-type: none"> -20Km long distance -1Gbps large bandwidth -Military standard anti-interference -Resistant to harsh environment -Multiple circuit backup
2	 <p style="text-align: center;">Long-distance transmission Dish antenna</p>	IOP-DANFO -5M3000606	<ul style="list-style-type: none"> -Suitable for the first long-distance wind turbine transmission from shore to sea -Suitable for long-distance transmission from the last wind turbine at sea to the shore, forming multiple loop backup operations 	<ul style="list-style-type: none"> -Using frequency: 5150 - 5850MHz -Signal gain value: 30 dBi -Grading direction: 90° / 180° -Vertical/horizontal angle: 6° / 6° -Size/weight:Φ 60cm/6.1Kg -Withstand wind pressure: 241Km/hr 	<ul style="list-style-type: none"> -Use when the point-to-point distance exceeds 5Km -Do not use it further than 35Km 	<ul style="list-style-type: none"> -Dish-shaped low wind resistance -Light weight 6.15Kg -2x2 MIMO antenna -30dBi high gain -20Km @ -55dBm
3	 <p style="text-align: center;">Med-distance transmission Patch antenna</p>	IOP-PANFO -5M2001213 MBAP-PANFO -5M2001213 (All in One)	<p>-Suitable for each windmill in the wind farm area, for multi-point relay hops wireless serial transmission within a distance of 3Km.</p>	<ul style="list-style-type: none"> -Use frequency: 4900 - 6100MHz -Signal gain value: 18-20 dBi -Grading direction: 90° / 180° -Vertical/horizontal angle: 12°/13° -Withstand wind pressure: 250Km/hr~ -IP69 level all-in-one machine is resistant to high temperature and high pressure 	<ul style="list-style-type: none"> -Used within 3~5Km of point-to-point distance 	<ul style="list-style-type: none"> -Frequency offset optimized antenna -High and low spread spectrum antenna -2x2 MIMO antenna -VESA mount -UV/corrosion resistance
4	 <p style="text-align: center;">All in one Outdoor 2.4GHz sector antenna</p>	IOP-SANFO -2M1207525 MBAP-SANFO -2M1207525 (All in One)	<p>-Suitable for wireless signal coverage near the base of each windmill in the wind farm area, and providing data connection transmission for various detection instruments.</p>	<ul style="list-style-type: none"> -Use frequency: 2400 - 2500MHz -Signal gain value: 12 dBi -Grading direction: +45° / -45° -Vertical/horizontal angle: 100°/35° -Withstand wind pressure: 250Km/hr~ -IP69 level all-in-one machine is resistant to high temperature and high pressure 	<ul style="list-style-type: none"> -2.4GHz sector wireless signal coverage distance is 600~1000 meters 	<ul style="list-style-type: none"> -Frequency offset optimized antenna -Sector-shaped large angle -2x2 MIMO antenna -VESA mount -UV/corrosion resistance

Supplementary mechanism: Add offshore solar DC UPS power generation system to solve the problem of wireless transmission system being able to maintain normal operation for 24 hours after power outage!!

9. Solar DC UPS solar uninterruptible power supply voltage stabilization and power outage backup power supply system

■ System equipment power consumption definition

1. Starlight-level 360-degree panoramic network camera: 7W/H
2. EBL4-DAC3P wireless device: 9W/H
3. Outdoor PoE power supply: 1W/H
4. Data detection equipment: 8W/H

Total power consumption of the entire system: 7W/H + 9W/H + 1W/H + 8W/H = 25W/H

■ Solar DC UPS Solar uninterruptible power supply voltage stabilization and power outage backup power supply system

>> Designed to provide backup for more than 24 hours in case of power outage. During power outage, the voltage is stabilized and fully charged at any time!!

>> Designed power outage backup for more than 16 hours: $25W/H * 24H * 120\% = 720W$

>> It is recommended to use IOP-USSS-1256-10B 717WH (56Ah @ 12.8V) = 4302VA (4.3KVA)

1. Product type: Solar outdoor high-power voltage stabilization type
2. IP66 waterproof level / IP68 waterproof cable head / aluminum shell or iron painted shell
3. Supported battery types: Pressure-relief explosion-proof lithium iron phosphate batteries (C-LiFePO4 Lithium Batteries)
4. Built-in battery power capacity: 717WH (56Ah @ 12.8V) = 4302VA (4.3KVA)
5. External load voltage/current available: DC 11.7 ~ 14.2V +-3% 6A Max
6. Battery charging voltage: 14.4V +- 3%
7. Using temperature: - 35°C ~ + 75°C
8. Charge and discharge cycle life: more than 2000 times (about 6 years or more)
9. Warranty period: The whole machine mechanism and accessories are guaranteed for 3 year
10. The battery is guaranteed for 2 years~

