

# Smart Grid Monitoring System



### About Us

### 2D Smart Grid Solutions by Way of AI and IoT

We are committed to design, develop, manufacture power-related monitoring equipment to provide full spectrum power system smart solutions.

Our vision is to build a reputation as the global leader in servicing smart grids.



- ✓ High security software
- ✓ Real time data display
- ✓ AI calculation
- ✓ Predictive prevention
- ✓ Rapid development
- ✓ Expert maintenance
- ✓ Strategic planning
- ✓ Training certification
- ✓ Operation support



### About Us

### Advanced Smart Grid Solution Provider Solving Power Problems with Modern Methodology

### Real-time Data Analysis Instant Action in Reducing Potential Loses





### About Us





### Our Smart Solutions

Generation	Transmission	Distribution	Industrial	Service	Residential				
	Transmission lines	Distribution substation	Distribution lines		Padmount transformer				
Wide-area monit	oring and control								
Information and communications technology (ICT) integration									
Renewable and distributed generation integration									
	Transmission enhancement applications								
		Distribution grid management							
		Advanced Metering Infrastructure (AMI)							
		EV charging infrastructure							
			Customer-side Systems (CS)						





#### **Overhead Transmission Capacity Monitoring**

Since 2015

**Clearance Distance Monitoring** 

Since 2017



#### **Tower Safety Monitoring**

Since 2015

#### **Underground Tunnel Capacity & Safety Monitoring**



Since 2017



#### **Inverter Real-time Monitoring**



## Transmission Conductor Monitoring Capsule (TCMC)



#### Functions

- ✓ Line temperature measurement
- ✓ Sag monitoring
- ✓ Fault location
- ✓ Vibration detection
- Features
  - ✓ EMI shielding
  - ✓ Surge protection
  - ✓ Easy clamp design
  - ✓ Self-powered & backup design



### Transmission Conductor Monitoring Gateway (TCMG) Rigorous Testing of Products





## Transmission Conductor Monitoring Gateway (TCMG)



#### Functions

- ✓ Local weather information
- Inclination measurement at tower base
- Data transmission
- Features
  - Detachable design
  - Multi-hop mechanism for data transmission
  - Self-sufficient solar powered & back-up design



## Software Modules

#### ♦ Features

- ✓ Real-time monitoring map
  ✓ Capacity prediction GUI
- Real-time data monitoring
   History record query function

Gateway City		Route no. 1	•		
Wind speed 0 m/s	Wind direction 180	Atmos pressure 1037 hpa	Temperature 27.2	Humidity 43	Rainfall 5.15
		E Search Grande Marc		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
Nodes node 3	•	See travel times, traffic and	I nearby places	1	
Data	Chart				Ren In
Current	Current rating	and the second		arrunan arr	C -
0	0	Family Street			NCOUNTY
	Luc San		MIADLIEDUNTY	3 34	
Line temperature					



Term Memory) in RNN Model





### System Architecture



## System Architecture

### ELLC.com

#### **Dispatch Center**

- Monitor vital information of power lines
- Implement smart dispatch based on the predicting capacity trends
- Display instant anomaly data and notify
- ✓ Set warning threshold to prevent accidents
- ✓ Immediate fault location after an accident





#### **161 kV Light Loading Transmission Lines**

- Date : 2015/12~2017/5
- Current : 200~300A
- Line temperature : 20~30°C





#### **161 kV Heavy Loading Transmission Lines**

- Date : 2017/12~NOW
- Current : 1000~1200A
- Line temperature : 40~50 °C





### **161 kV Heavy Loading Transmission Lines**

- Date : 2019/2~NOW
- Current : 800~1000A
- Line temperature : 35~45 °C









**Clearance Distance Monitoring** 

Since 2017





- ✓ AI video Analysis for Line Clearance
  - The AI video analysis identifies the anomalies using a video camera.
  - If a condition is above or lower than the alert thresholds, different levels of messages can be dispatched to the management.



#### **Obstacles detecting device**







#### **Tower Safety Monitoring**

Since 2015

#### A micro-weather station





- When drastic climate changes, such as heavy rainfall or wind gusts, it may cause damage to the power lines and tower.
- ✓ Real-time monitoring stations
  - Measure current situation of climate change
  - ✓ Even predict the possibility of climate damage to the tower





**Tower Safety Monitoring** 



**Underground Tunnel Capacity & Safety Monitoring** 







### ELLC.com

## Project Showcases

#### **Underground Tunnel Capacity & Safety Monitoring**



- ✓ High temperature alert✓ Harmful gas alert
- Cooling equipment control
  - ✓ Current measure and capacity assessment





Since 2019

 Collects and transmits inverter vital data, as well as voltage and current waveforms to the Inverter Asset Management Analysis Platform to be analyzed and then adjust the inverter devices automatically.





Since 2019

 Inverter abnormal monitoring: three-phase voltage, current waveform, phases, frequency, THD, etc.



Wireless Waveform Monitoring Device



Since 2019

✓ Real-time data recorder





- ✓ Real-time Information and Analysis Platform
- Power plant distribution map management interface
- Real time AI data analysis





### How to build a smart grid?

- Collect and analyze data from the complete power system
- Use sensors and Information Communication technology to control power equipment, operation, capacity and provide reliable energy to the end users.





## Why smart grid?

- Saving energy, reducing losses, and enhancing the reliability of the grid
- Maximize system efficiency, minimize operating costs and environmental impact.





## Why smart grid?



#### **Existing grid**

One-way communication Centralized power generation Passive grid Manual control Manual repair

#### Smart grid

- Two-way communication with wide spread of sensors
- Decentralized power generation
- ✓ Automatic control
- ✓ Automatic repair



## What is the advantage of 2D Smart Grid?

Smart software: modular design and rapid integration Superior hardware:



#### **Sensors Module**

- sound, light, electricity, magnetism and heat
- ADC, I2C, UART, SPI, SMBus Ethernet, USB

#### **Communication Module**

 WiFi, Lora, Zigbee, sigfox, NBIOT, LTE M, Fiber, Satellite

#### **Power Design**

- Solar power, energy storage, wireless power
- Ultra-power-saving technology—application for no power supply: support operation for one to five years using only button batteries.

# THANKS

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