

Zhengzhou Hengling New Energy - Solution

Smart Building Solution

Zhengzhou Hengling New Energy Technology Co., Ltd.

1. REQUIREMENT ANALYSIS & INVESTIGATION

1.1 Project Background

Modern commercial buildings require intelligent lighting that: - Enhances occupant comfort and productivity - Achieves LEED/WELL/BREEAM certification goals - Reduces operational energy costs significantly - Integrates seamlessly with BMS and HVAC systems - Provides granular control and space utilization analytics

1.2 Stakeholder Requirements

- **Building Owners:** Energy savings, asset value increase, quick ROI
- **Facility Managers:** Simplified operations, reduced maintenance, automation
- **Tenants:** Personalized lighting, comfort control, healthy environment
- **Designers:** Aesthetic integration, code compliance, design flexibility
- **Sustainability Officers:** Green building certification, carbon reduction

1.3 Building Parameters

- Building types: office, retail, hospitality, healthcare, education
 - Size range: 5,000m² to 100,000m²+ GFA
 - Floor types: open plan, private offices, common areas, special zones
 - Occupancy patterns: 9-5 office, 24/7 critical areas, variable retail
 - Integration points: BMS, HVAC, access control, AV systems
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2. SOLUTION DESIGN

2.1 Human-Centric Lighting Architecture

Integrated Building Lighting Ecosystem: - **Personal Control Layer:** Individual desk lighting preferences - **Space Optimization Layer:** Occupancy-based space utilization - **System Integration Layer:** BMS/HVAC/AV/security convergence - **Analytics Layer:** Space utilization, energy, comfort metrics - **Wellness Layer:** Circadian rhythm optimization, human-centric lighting

2.2 Core Technologies

- **Tunable White HCL:** 2700K-6500K circadian lighting
- **Ubiquitous Sensing:** mmWave + PIR dual technology detection
- **Wireless Control:** Bluetooth Mesh / Zigbee / Thread
- **PoE Lighting:** Single cable for power and data
- **Digital Addressability:** DALI-2 / D4i standard compliance

2.3 Fixture Specifications

Space Type	Fixture Type	Power	Control Protocol
Open Office	Linear Pendant / Recessed	25W-50W	DALI-2 / PoE
Private Office	Round Panel / Downlight	15W-30W	Bluetooth Mesh
Corridors	Linear Strip / Downlight	10W-25W	Sensor Integrated
Conference Rooms	Tunable White Panel	30W-60W	AV System Integrated
Lobby / Atrium	Architectural Pendant	40W-100W	Scene Control
Parking	High-Bay / Canopy	50W-150W	LoRaWAN
Exterior	Facade / Landscape	20W-80W	Astronomical Timer

2.4 System Features

- Individual personalized lighting profiles
 - Circadian rhythm auto-adjustment
 - Space utilization analytics and reporting
 - Demand response and load shedding
 - Automated testing and compliance reporting
 - Integration with desk booking systems
 - Indoor air quality and environmental sensing
 - Energy metering and tenant sub-billing
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3. PRODUCT CUSTOMIZATION

3.1 Aesthetic Customization

- Fixture form factors matching interior design
- Custom color temperatures and CRI values (CRI 90+)
- Lens and diffuser options for specific applications
- Branding and custom finishes for corporate identity
- Integration with architectural ceiling systems

3.2 Integration Customization

- BMS protocol integration (BACnet, Modbus, OPC UA)
- HVAC system coordination for demand-based ventilation
- AV system integration for conference rooms
- Access control and security system sync
- Desk booking and room scheduling integration
- Custom dashboard development for stakeholders

3.3 Certification Customization

- LEED v4.1 credit optimization (EA, EQ credits)
 - WELL Building Standard features (Lighting Concept)
 - BREEAM assessment credits
 - Energy code compliance (ASHRAE 90.1, Title 24)
 - Green building documentation support
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4. PROJECT IMPLEMENTATION

4.1 Project Timeline

Phase	Duration	Activities
Design Phase	2-4 weeks	Photometric design, control narrative, BOM
Engineering	2-3 weeks	Integration schematics, network design
Manufacturing	3-6 weeks	Custom production, pre-configuration
Installation	4-12 weeks	Phased by floor, after-hours where needed
Commissioning	2-4 weeks	System calibration, integration, training
Total	13-29 weeks	End-to-end turnkey delivery

4.2 Installation Standards

- **Network Infrastructure:** CAT6A cabling, PoE switches, redundancy
- **Wireless Coverage:** Mesh network reliability verification
- **Code Compliance:** NEC, local electrical codes, fire safety
- **Project Management:** Gantt chart, weekly progress meetings
- **Quality Assurance:** Stage inspections, factory acceptance testing

4.3 Standards & Certifications

- DALI-2 / D4i compliance (IEC 62386)
- IEEE 802.3af/at PoE standard
- Bluetooth Mesh 1.0 specification
- UL 8750 LED safety standard

- IEC 61000 EMC compliance
 - RoHS and REACH environmental compliance
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5. SYSTEM COMMISSIONING & TESTING

5.1 Integration Testing

- BMS point-to-point communication verification
- HVAC coordination and demand response testing
- Third-party system API integration validation
- Network reliability and failover testing
- Multi-user access and permission testing

5.2 Performance Testing

- Photometric verification per IES standards
- Sensor accuracy and response time testing
- Energy consumption baseline measurement
- Wireless network coverage and latency
- 7-day continuous operation stress test

5.3 Acceptance Process

- Tenant acceptance testing by floor
 - Facilities team sign-off on operations
 - IT department network security approval
 - Energy savings verification protocol
 - Formal handover with documentation package
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6. PROJECT DELIVERY

6.1 Deliverables Package

- Complete lighting system installation
- Central management software with licenses
- Mobile app for personal control
- All required system integrations
- Spare parts inventory and maintenance kit
- Warranty and service agreement

6.2 Documentation Package

- As-built drawings and BIM models
- Control sequence of operations
- Network configuration and security docs
- Operation and maintenance manuals
- Compliance certificates and test reports
- Green building certification documentation

6.3 Training Program

- **Facility Management:** System administration, reporting, troubleshooting
 - **IT Department:** Network management, cybersecurity, integration
 - **Tenant Representatives:** Personal control, app usage, scene creation
 - **Executive Team:** Dashboard navigation, KPI reporting, sustainability
 - **Maintenance Staff:** Component replacement, calibration procedures
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7. OPERATION & MAINTENANCE

7.1 Smart Maintenance

Feature	Capability
Predictive Alerts	LED driver failure prediction 2 weeks in advance
Automated Testing	Monthly emergency lighting functional test
Remote Diagnostics	90% issues resolved remotely
Work Order Integration	Automated ticket generation in CMMS
Performance Benchmarking	Portfolio-wide building comparison

7.2 Maintenance Schedule

Frequency	Activities
Real-time	Automated system health monitoring
Weekly	Alert review and resolution
Monthly	Energy consumption analysis
Quarterly	Sensor calibration, firmware updates
Semi-annually	Full system audit, photometric spot-check
Annually	Comprehensive energy savings report

7.3 Continuous Optimization

- Monthly performance review meetings
- Seasonal schedule adjustments
- Space reconfiguration support
- Tenant changeover reprogramming
- Annual technology roadmap update

7.4 Performance Metrics

- Energy cost reduction (target: 70%+)
- Maintenance cost reduction (target: 50%+)
- Occupant satisfaction score (target: 4.5/5)
- Space utilization improvement (target: 15-25%)
- Green building certification achievement
- ROI achievement (target: 2-3 year payback)

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