

Zhengzhou Hengling New Energy - Solution

Smart Garden Solution

Zhengzhou Hengling New Energy Technology Co., Ltd.

1. REQUIREMENT ANALYSIS & INVESTIGATION

1.1 Project Background

Residential and commercial gardens require sophisticated lighting solutions that: - Enhance landscape beauty after sunset - Create ambiance for entertainment and relaxation - Provide safety for navigation and security - Operate efficiently with minimal maintenance - Integrate seamlessly with smart home systems

1.2 Client Requirements

- **Aesthetic Excellence:** High CRI lighting to accentuate plant colors
- **Atmosphere Control:** Multiple scene presets for different occasions
- **Energy Efficiency:** Solar-powered with zero electricity costs
- **Smart Automation:** Schedule-based and sensor-activated operation
- **Weather Resistance:** IP66+ rated for year-round outdoor use
- **Smart Home Integration:** Alexa, Google Home, Apple HomeKit compatible

1.3 Site Assessment Parameters

- Garden size: residential (50-500m²), commercial (500-5000m²)
 - Feature types: lawns, flower beds, trees, water features, pathways, patios
 - Plant types: foliage, flowering, specimen trees, shrubs
 - Usage patterns: evening entertaining, quiet relaxation, security
 - Existing infrastructure: power availability, WiFi coverage
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2. SOLUTION DESIGN

2.1 Layered Lighting Architecture

Four-Tier Garden Lighting Approach: - **Ambient Layer:** General illumination for overall visibility - **Task Layer:** Functional lighting for paths, steps, cooking areas - **Accent Layer:** Dramatic lighting for specimen plants and features - **Security Layer:** Motion-activated lighting for perimeter protection

2.2 Core Technologies

- **Tunable White Technology:** 2200K-6500K color temperature range

- **Dynamic Color Scenes:** RGBW for special events and holidays
- **Solar Energy Management:** AI-optimized charging and discharge
- **Weather Adaptation:** Automatic brightness adjustment based on conditions
- **Geo-Fencing:** Welcome lighting when residents arrive home

2.3 Fixture Portfolio

Application	Fixture Type	Power	Beam Angle
Pathways	In-ground Well Light	3W-10W	15°-60°
Trees	Uplight Spotlight	5W-15W	10°-40°
Flower Beds	Low Voltage Spike Light	2W-8W	30°-120°
Water Features	Submersible LED	5W-20W	20°-60°
Patios	String Lights / Pendant	1W-5W per unit	Wide
Perimeter	Wall Wash / Flood	10W-30W	60°-120°

2.4 Control System Features

- Mobile app control from anywhere
- Voice control integration
- Astronomical timer with sunrise/sunset
- Motion and ambient light sensors
- Scene creation and customization
- Group control by zone or fixture type
- Energy monitoring and usage statistics

3. PRODUCT CUSTOMIZATION

3.1 Design Customization

- Fixture finishes: black, bronze, brass, copper, stainless steel
- Lens options: clear, frosted, diffused, colored filters
- Mounting options: spike, surface, recessed, hanging, wall-mounted
- Cable length customization for specific garden layouts
- Custom beam angles for unique landscape features

3.2 Smart Features Customization

- Integration with specific smart home ecosystems
- Custom scene programming for client preferences
- Holiday lighting presets (Christmas, Halloween, etc.)
- Party mode with dynamic color changing
- Security lighting integration with camera systems

3.3 Energy Configuration

- 100% solar with 3-day autonomy backup
 - Low voltage (12V/24V) grid-tied systems
 - Hybrid solar-grid for critical areas
 - Battery capacity sizing based on location
 - Panel optimization for partial shade conditions
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4. PROJECT IMPLEMENTATION

4.1 Project Timeline

Phase	Duration	Activities
Design Consultation	2-3 days	Site visit, photography, client interview
Lighting Design	1 week	CAD layout, photometric simulation, 3D rendering
Proposal & Approval	2-3 days	Cost estimate, material selection, contract
Installation	1-3 days	Professional installation, wiring, testing
Commissioning	4 hours	Scene programming, app setup, client training
Total	2-3 weeks	From consultation to completion

4.2 Installation Methodology

- **Cable Management:** Direct burial rated cables, conduit for high traffic areas
- **Root Protection:** Careful trenching around established root systems
- **Waterproofing:** All connections with heat shrink and waterproof gel
- **Concealment:** Fixture placement to minimize daytime visibility
- **Safety:** GFCI protection, proper grounding, low voltage safety

4.3 Quality Standards

- IP67 waterproof rating for all fixtures
 - IK10 impact resistance for ground fixtures
 - UV stabilized materials for fade resistance
 - Corrosion resistant materials for coastal areas
 - CE, RoHS, FCC certification for all components
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5. SYSTEM COMMISSIONING & TESTING

5.1 Nighttime Focusing

- After-dark aiming and focusing session

- Beam angle adjustment for optimal effect
- Glare elimination and light trespass prevention
- Shadow optimization for dramatic effect
- Client approval of final lighting balance

5.2 Functional Testing

- All fixture operation verification
- Dimming range and color temperature accuracy
- Sensor range and sensitivity calibration
- App and voice control responsiveness
- Solar charging and battery performance

5.3 Performance Validation

- 48-hour continuous operation test
 - Energy consumption measurement
 - WiFi signal strength verification
 - Weather resistance verification (water spray test)
 - User acceptance testing with client
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6. PROJECT DELIVERY

6.1 Deliverables Package

- Complete lighting system installation
- Mobile app setup with client accounts
- Pre-programmed scenes for all occasions
- Customized user guide with garden-specific instructions
- Maintenance schedule and contact information

6.2 Documentation

- As-built lighting layout drawings
- Fixture location map with identification numbers
- Warranty information for all components
- Recommended spare parts list
- Troubleshooting guide for common issues
- Contact information for technical support

6.3 Client Training

- Hands-on app operation demonstration
 - Scene creation and modification training
 - Basic maintenance procedures
 - Seasonal adjustment recommendations
 - Troubleshooting for simple issues
 - 24/7 support hotline introduction
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7. OPERATION & MAINTENANCE

7.1 Maintenance Schedule

Frequency	Activities
Monthly	App system health check, clean solar panels
Quarterly	Visual inspection, fixture cleaning, cable check
Semi-annually	Battery health test, firmware updates
Annually	Full system audit, re-aiming if needed, corrosion check
Seasonally	Leaf debris removal, winter preparation, spring refresh

7.2 Smart Maintenance Alerts

- Low battery voltage notifications
- Fixture failure detection
- Solar panel performance degradation alerts
- Firmware update availability
- Scheduled maintenance reminders

7.3 Seasonal Adjustments

- **Spring:** New plant growth accommodation, extended evening hours
- **Summer:** Party scene optimization, maximum solar utilization
- **Autumn:** Leaf debris management, earlier activation times
- **Winter:** Reduced solar gain compensation, holiday scenes
- **Special Events:** Temporary scene customization support

7.4 Performance Optimization

- Annual photometric assessment
- Energy consumption tracking and optimization
- Scene refinement based on actual usage
- Technology upgrade recommendations
- Expansion planning for garden modifications