research and analysis of community energy consumption and carbon emissions, accurately grasp energy demand, make reasonable use of technologies such as seawater source heat pumps, solar photovoltaic photothermal, wind power generation, photovoltaic direct flexible storage, industrial waste heat, etc., improve system equipment energy efficiency, construct a new energy system with multiple complementary and interconnected energies in the region, fully utilize renewable energy and intelligent management, and promote the zero carbon humanistic concept through zero carbon exhibition halls, cultural activities, educational bases, etc., gradually reducing the direct carbon emission intensity of 200000 square meters of community energy consumption to zero.

2. Seawater source heat pump, tailored to local conditions, with optimized cost and technology.

   By fully utilizing the seawater source heat pump system, the original units of the Olympic Sailing Center Museum and Media Center will be renovated and replaced. Two high-efficiency screw seawater source heat pump units will be used, with a summer COP of 6.2 and a winter COP of 3.6. After the renovation, 61000 kW · h of electricity can be saved annually and 76 tons of carbon can be reduced annually;

3. Light storage is direct and flexible, and zero carbon community power "production, consumption, and storage" are coordinated.

   Reasonably utilizing solar energy, establishing a "photovoltaic storage direct flexible" system for photovoltaic power generation, energy storage and storage, DC microgrid power supply, and flexible access and sale of electricity from external power grids, realizing the "production consumption storage" synergy of zero carbon community electricity, with a cumulative annual power generation of 730000 kWh and an annual carbon reduction of 636 tons;

4. Smart control, creating an energy efficient operation self-control platform.

   Build a smart energy management and control platform to achieve efficient operation of the energy system, clean and low-carbon energy multi energy complementarity, real-time big data analysis and visualization display. Combining BIM technology, build a network version of the human-machine interaction display system to provide a complete image foundation for smart operation and maintenance, demonstration, promotion, science popularization and other needs;

5. Zero carbon exhibition hall, promoting the concept of zero carbon deeply in people's hearts.

   Construct a zero carbon exhibition hall at Qingdao Energy Science and Technology Museum, establish a student practical science popularization education base, with zero carbon as the main line, to provide detailed introductions to zero carbon applications and practices in communities, buildings, energy, data, technology, and other aspects, increase zero carbon interactive space, popularize "zero carbon" knowledge to the public, and promote the concept of "zero carbon".

6. Innovate and demonstrate, take multiple measures to create a zero carbon technology system.

   A zero carbon community construction technology system has been formed, which demonstrates the application of key technologies such as ultra-low energy insulation systems, photovoltaic storage systems, seawater source heat pumps, and big data intelligent management platforms. An evaluation index system for zero carbon community construction and operation has been established, and guidance for zero carbon community construction has been formed. The application mechanism and promotion suggestions for key technologies have been proposed.

Project Impact & Sustainability

The Zero Carbon Community of Olympic Sailing Center promotes the promotion and application of technologies such as light storage, direct and flexible, seawater source heat pump, energy Internet, and intelligent energy control system through the application of new technologies such as building energy conservation, renewable energy, efficient systems, artificial intelligence, innovation of management mechanisms, and centralized demonstration of data analysis tools and methods.

By fully utilizing community space resources, maximizing the development and utilization of renewable energy, introducing financial mechanisms such as carbon reduction insurance and green credit, and upgrading traditional production factors such as talent, land, capital, labor, raw materials, and energy, a technically reliable, economically feasible, and data traceable zero carbon solution can be formed.

By using energy Internet, BIM, smart energy control system, big data analysis and visualization and other technical means, we will build a new type of people friendly community that is "clean, zero carbon, smart and humanistic". We will also build a zero carbon exhibition hall of Qingdao Energy Science and Technology Museum in the Olympic Sailing Museum, establish a base for students to practice popular science education, and popularize zero carbon knowledge and concepts.

Expert Comments

As Qingdao's "International Reception Hall", the Qingdao Olympic Sailing Center Zero-Carbon Community leverages technologies such as the energy internet, Building Information Modeling (BIM), and smart energy control systems to rationally use seawater-source heat pumps, solar photovoltaics and photo-thermal, wind power, PEDF (photovoltaic, energy storage, direct current and flexibility) and industrial waste heat. This approach establishes a new energy system featuring multi-energy complementation and co-supply within the region. Additionally, by introducing financial mechanisms like carbon reduction insurance and green credit, the community upgrades traditional production factors—including talent, land, capital, labor, raw materials, and energy, generating remarkable comprehensive outcomes in energy saving, carbon reduction, livability, and educational outreach. It offers a model for technological, mechanism, and operational innovation in green, low-carbon communities in the context of dual carbon strategy.