

STAND-ALONE NET ZERO ENERGY CONTAINER HOUSES AS TEMPORARY OFFSITE WORKING/LIVING

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Introduction. This paper is aimed to investigate and briefly analyze the conditions in Kazakhstan to predict the effectiveness of operation of standalone net zero energy container house. The description of Kazakhstani weather conditions as well as container house's characteristics is provided. The comparison was done between the specifications of solar, wind energy transformation technologies with the data collected in all regions of the country to check the feasibility of the project. Additionally, the brief description of stand-alone net zero energy container houses, including both interior-exterior design and energy control system, are provided.

Local Weather Conditions in Kazakhstan. Throughout the territory of Kazakhstan, average annual wind speed values at height of 80 m above ground level range from 5 to 8.5 m/s. Overall, the wind speed values are appropriate for wind generation. Kazakhstan has high solar energy potential on the most of its territory. According to data provided by INOGATE Programme, the number of sunny hours is 2,200–3,000 per year and the energy of the solar radiation is 1,300–1,800 m²/year.

Container House. Container house for two persons, operated with wind and solar power generation technologies and the intelligent energy control system, is comparatively compact (6m x 2.5m), but at the same time it includes everything necessary for full life and efficient work of occupants. Fifteen square meters are conveniently divided into a sleeping area with a comfortable bunk bed and a spacious wardrobe for two occupants; sitting area with a dining table and a coffee table; kitchen with all necessary equipment; and eco-friendly toilet with shower. Additional small space is used for operational equipment, which can be accessed from outside of the house. This space may be arranged with air conditioner, a water tank, water filtering system, sewage compartment, power storage and control system, and additional storage compartments. The house is equipped with ventilation systems and underfloor heating.

Conclusions. Kazakhstan's climatic conditions yield in significant potential for implementation of renewable energy generation technologies, such as those, based on wind and solar energy. Taking into account the current active industrialization and development across the distant regions of Kazakhstan, introduction of container house design principles into market creates new opportunities for enhancement of current development trend. Container house, when equipped with renewable energy generation systems, can be used as temporary working and living facilities without connection to grid. Use of generated renewable energy in an efficient way can be controlled by intelligent energy control systems, thereby not exceeding generation capacity of solar panels and wind turbines. By combining solar and wind power generation systems according to climatic conditions of site, such container houses introduce economically attractive and comfortable way of living and working.