

Solar power generation in aluminum smelters

How much energy does an aluminum smelter use?

The stated aluminum energy intensity of 13.48 kWh/kg Al implies an average power consumption of 4047 MW. For a power plant efficiency of 50%, this translates to a natural gas combustion rate of 27,618 MMBtu/hr. We developed a general model for analyzing smelter cell dynamics with a shell heat exchanger.

Can solar energy be used in aluminum smelters in the Middle East?

While smelters in Australia are considering integrating renewables into their energy supply model as their current energy costs renders them uncompetitive, to date there is no known effort to directly incorporate solar renewables into aluminum smelter operations in the Middle East. Fig. 1.

Where do aluminum smelters get their electricity?

Aluminum smelters in China currently obtain 16% of their electrical power from hydroelectric plants on rivers located primarily in Southwest Yunnan and neighboring Guangxi provinces. Norsk Hydro operates more than 20 hydropower facilities throughout Norway, providing around 10 TWh of clean and renewable energy annually for aluminum production.

Where are aluminum smelters located?

Aluminum smelters are located near low-cost electricity sources, where hydro, coal, and gas are the dominant resources used. The percentage of renewable energy sources used in the primary aluminum smelting power consumption today is a little less than 28% and is almost entirely based on hydro power plants.

What percentage of aluminum smelters use hydro power?

In around 2015, thermal power accounted for around 89% of energy used by aluminum smelters in China, and hydro power about 10%. At present, the percentage for thermal power decreases to around 74%, and that for hydro power has increased to around 19%.

Which power source is used by aluminum smelters in China?

Though thermal power has been the dominant power source for aluminum industry in China, the usage of green power, particularly the hydro power has increased rapidly, Fastmarkets learned. In around 2015, thermal power accounted for around 89% of energy used by aluminum smelters in China, and hydro power about 10%.

Smelters are designed for constant power, but German firm Trimet has transformed some of its furnaces in an aluminum smelter to adapt to variable power. While smelters need to keep materials in a molten state, ...

In the base case, the electricity supplied in the alumina smelting plant in United States in a combination of electricity generated by bituminous coal (0.346 kWh), nuclear power ...

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About 0.2 percent of the state's electricity generation came from solar in 2022, while 6 percent was supplied by hydroelectric dams, mainly in the western part of the state. ...

DOI: 10.1016/j.ecmx.2019.100017 Corpus ID: 203080633; Seasonal energy storage in aluminium for 100 percent solar heat and electricity supply @inproceedings{Haller2020SeasonalES, ...

While this article focuses on quantifying the land use requirements associated with power generation for aluminium smelting, these broader impacts must also be borne in ...

Semantic Scholar extracted view of "Thermoeconomic evaluation of waste heat recovery system in aluminium smelters using a parallel two-stage organic Rankine cycle" by ...

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In Australia, aluminium smelting uses approximately 10% of the country's electricity⁹ and creates 6.5% of total carbon emissions¹⁰ (largely scope 2 emissions¹¹ from the generation of ...

International Aluminium Institute reported that per ton of aluminum production on an average consumes 13.56 to 15.75 MWh of electricity. ⁶ From the aluminum industry, the average world level of GWP in 2009 was 23.96 tons CO₂ per ton ...

Bödeker, J. M., Bauer, M. & Pehnt, M. Aluminium and Renewable Energy Systems--Prospects for the Sustainable Generation of Electricity and Heat (Institut für Energie ...

In an aluminium smelter, electricity both enables the alumina to ... potential to require more than 4000 MW of electricity to replace the thermal generation, on a like for like basis. This would ...

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