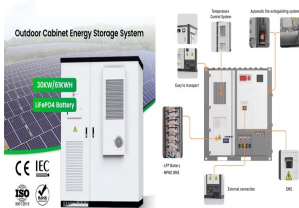


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INTEGRATED DESIGN
EASY TO TRANSPORT AND INSTALL,
FLEXIBLE DEPLOYMENT

Some commentators argue that energy demand will naturally plateau as GDP rises in the future ??? or at least the beta between energy use and GDP will fall dramatically. As evidence, the energy consumption within developed world countries has hardly increased over the past 20-years, even as GDP per capita rose by 25%.



Posted on August 22, 2024 August 23, 2024 by Thunder Said Energy. Oil demand: making millions? What does it take to move global oil demand by 1Mbpd? This 22-page note ranks fifteen themes, based on their costs and possible impacts, to show what drives global oil demand, where risks lie for oil markets, and where opportunities are greatest to



In 2010, before the Fukushima crisis, Japan produced 292 TWh of nuclear electricity, which would have required about 40MTpa of LNG imports if it had all been generated by gas instead.. With all its nuclear plants shut down in 2011-12, LNG imports jumped by around 20MTpa, while the remaining shortfall was covered by ramping oil-fired power back upwards by c600kbpd.



This purchase will enable your email account for the Thunder Said Energy written subscription. This gives you access to all our written content, for one calendar year, covering opportunities and thematic research into the energy transition. This includes all the PDF research posted to our site, but not our data-files or models. Additional terms: All of our written insights can be shared fully



110MTpa of global hydrogen is produced today, emitting 1.3GTpa of CO₂, costing \$0.8/kg. The market grows to 220MTpa by 2050, mostly blue H₂, at \$1.2-1.5/kg, per our hydrogen outlook, which is re-capped on page 2.. But what if gold hydrogen could be recovered from the subsurface of the Earth, analogous to the development of natural gas? Could the ???

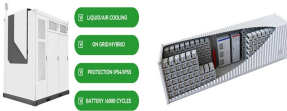
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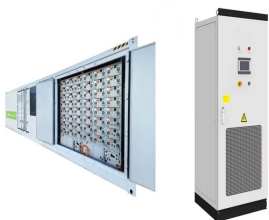
Decarbonizing aviation is challenging because of the requirement for very energy dense fuels. Jet fuel might reach 12,000 Wh/kg, while batteries today are 250 Wh/kg and will at best reach 1,250 Wh/kg (). We have evaluated sustainable aviation fuels, such as renewable jet, biogas-to-liquids, bio-ethanol-to-jet and e-fuels, but generally find them to be very expensive, hard-to-scale and ???



To contextualize the growth that lies ahead, we have compiled data on US power generation installations, year by year, technology by technology, running back to 1950, including implications for turbine manufacturers, on pages 14-16.. The impacts of AI on US gas and power markets sharply accelerate US electricity demand, upgrade our US shale forecasts, especially ???



Solar is the new energy source that excites us most, with potential to abate 11 GTpa of CO2 emissions by 2050 in our roadmap to net zero, ramping 18x from 2022, to supply 25,000 TWH of useful energy in 2050, or 20% of total global useful energy. But how much can solar grow? The answer hinges on relative costs. When global electricity demand is growing, then as a general ???



This data-file aggregates the details of different nature-based CO2 removals projects that we have been supporting at Thunder Said Energy. The average nature-based reforestation initiative that we supported in 2022 scored 70/100 on our framework. Statistical details and distributions are explored. Download



Our modelling framework for the decarbonization of global energy is explained on pages 2-6, looking across 90 thematic research reports and 270 models, which have featured in our work to-date. The aim is to find ???

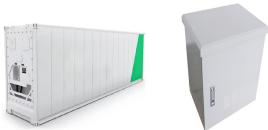
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We have spent much of 2024 writing about the rise of AI, and how it will change the energy industry: unlocking new step-changes in industrial efficiency, next-gen DAC or autonomous vehicles; while re-exciting gas generation, compounding grid bottlenecks, wolfing up grids" spare capacity, boosting fiber-optics, industrial cooling, transformers and harmonic filters.



This is a simple model calculating the economics of a typical rooftop solar water heater, which can save around 1T of CO2 per household per year and lower water heating bills by 50-80%.. Economics are more challenging, due ti high upfront capital costs, which are quantified in the data-file. Under our base case estimates, it would require a CO2 price of around \$130/ton, to ???



This data-file provides an overview of energy economics, across 175 different economic models constructed by Thunder Said Energy, in order to put numbers in context. This helps to compare marginal costs, capex costs, energy intensity, ???



Silicon carbide material is one of the hardest crystalline composites known to mankind, with an enormously high melting point of 2,700°C and very high chemical resistivity. Hence it is used in the steel/metals industry, aerospace, brake pads of high-end automobiles and bullet proof vests. Silicon carbide material is made by super-heating high-grade silica (SiO₂) with petcoke (C) in ???



Human civilization will consume 80,000 TWH of useful energy in 2023. This is equivalent to a kitchen toaster, running 24 hours per day, 365 days per year, for every man, woman and child on the planet. 35% of global energy is used in manufacturing and materials, 30% is used in transportation and shipping, 20% is used in homes as heat and electricity, and 15% is used in ???

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Semiconductors have already changed the entire global energy industry by converting light into clean electricity (i.e., photovoltaic solar) and efficiently converting electricity back into light (i.e., LEDs).. But semiconductors can also convert temperature differences into electricity (the Seebeck Effect) and convert electricity into temperature differences, or in other ???



Thunder Said Energy | 2,631 followers on LinkedIn. The research consultancy for energy technologies | Thunder Said Energy is a research firm focused on energy technologies and energy transition. We publish research reports, data, economic models and patent screens into opportunities that can meet the energy needs of the world, while removing all of the net CO2. ???



Thunder Said Energy is a research firm focused on the energy transition. Our work looks for economic opportunities, which can drive the world towards net zero; across new energies, conventional energy, utilities, capital goods, mining, materials, energy services, semi-conductors, "new technologies" and ESG.



Our methodology for breaking down global energy demand is to look line by line, through all of the economic models, energy intensity models and supply-demand models we have built over the past five years, as explained on pages 2-3. (Note the distinction between primary and useful energy). All of our models are fully auditable for TSE clients.



Included in the file are different oil products, gas markers, coal, wood, nuclear, biofuels, methanol, hydrogen, CO2-EOR products and the US electricity grid for comparison.. Good rules of thumb are that \$60/ton coal equates to thermal energy at 1c/kWh-th, while emitting over 600 kg/boe of CO2 intensity; while \$3/mcf gas also equates to thermal energy at 1c/kWh, while CO2 intensity ???

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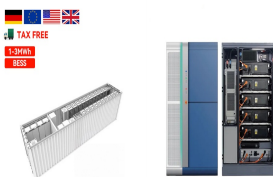
We screen new energy technologies with world-changing potential, including: The Energy Transition. Our work points to an economic decarbonization of the entire energy industry by 2050, with a CO2 price that averages \$40/ton.



The energy demands of AI are the fastest growing component of total global energy demand, which will transform the trajectory of gas and power and even regulated gas pipelines, as recapped on pages 2-3.. These numbers are so material that they deserve some deeper consideration. Hence this 17-page note is an overview of AI computation. Of course, in ???



We screen new energy technologies with world-changing potential, including: The Energy Transition. Our work points to an economic decarbonization of the entire energy industry by 2050, with a CO2 price that averages \$40/ton.. The Ascent of Renewables will deliver an enormous 30,000 TWH of energy by 2050, but this also requires overcoming vast bottlenecks, in metals, ???



Its ambition is to use wood residues to create carbon-negative plastics, cost-competitively with petroleum products and capture a "\$1trn market opportunity" .. Our patent analysis shows Origin has visibly been focused on 5-chloro-methyl furfural as a building block. For example, CMF can be reduced to MF (loss of chlorine), further reduced to DMF (loss of OH) and then combined with ???



25% of global electricity came from burning 150bcfd of natural gas in 2023, generating 6,750 TWH of electricity from a fleet of 1.9 TW of gas turbines. The basic functioning, cost and efficiency of a typical gas turbine are described on pages 2-3.. Our goal in this report is to forecast the market for gas turbines through 2030. To predict the future, however, it is first ???

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1,500 companies have been mentioned 2,500 times in our research since 2019, and our energy transition research now includes over 1,400 research notes, data-files and models. Hence this report is part of a quarterly series summarizing the key conclusions across our work. In 1H24, the #1 theme that has excited the entire energy world has been the rise of AI.



This database contains a record of every company that has ever been mentioned across Thunder Said Energy's energy transition research, as a useful reference for TSE's clients. The database summarizes over 3,000 mentions of 1,400 energy transition companies, their size, focus and a summary of our key conclusions, plus links to further research.