EXECUTIVE SUMMARY

MAPPING THE US ENERGY SECTOR AND RELEVANT ECOSYSTEMS FOR SWEDISH COMPANIES

January 2022

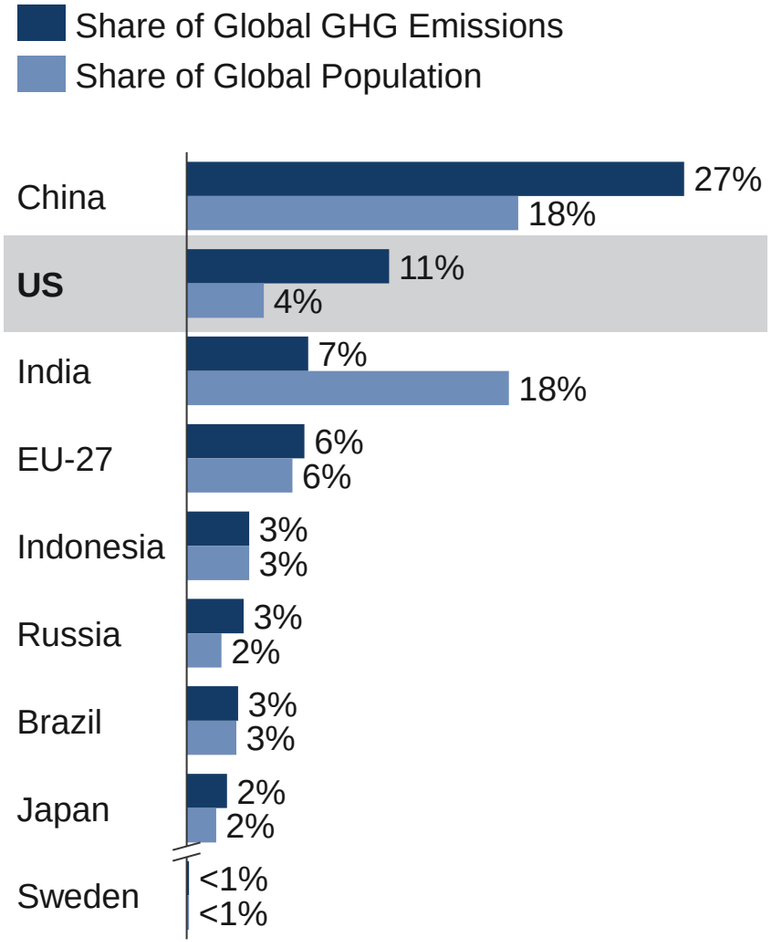
Swedish Energy Agency

BUSINESS SWEDEN
THE SWEDISH TRADE & INVEST COUNCIL

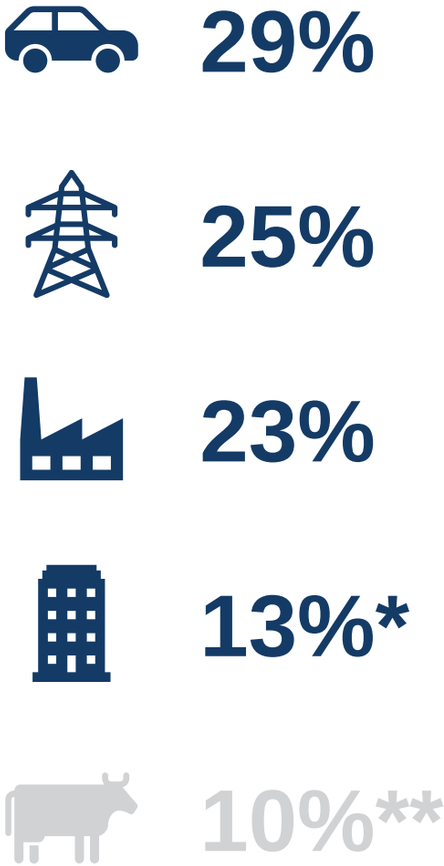
Disclaimer

The US is a major contributor to global GHG emissions across multiple sectors – but also a key market for cleantech solutions

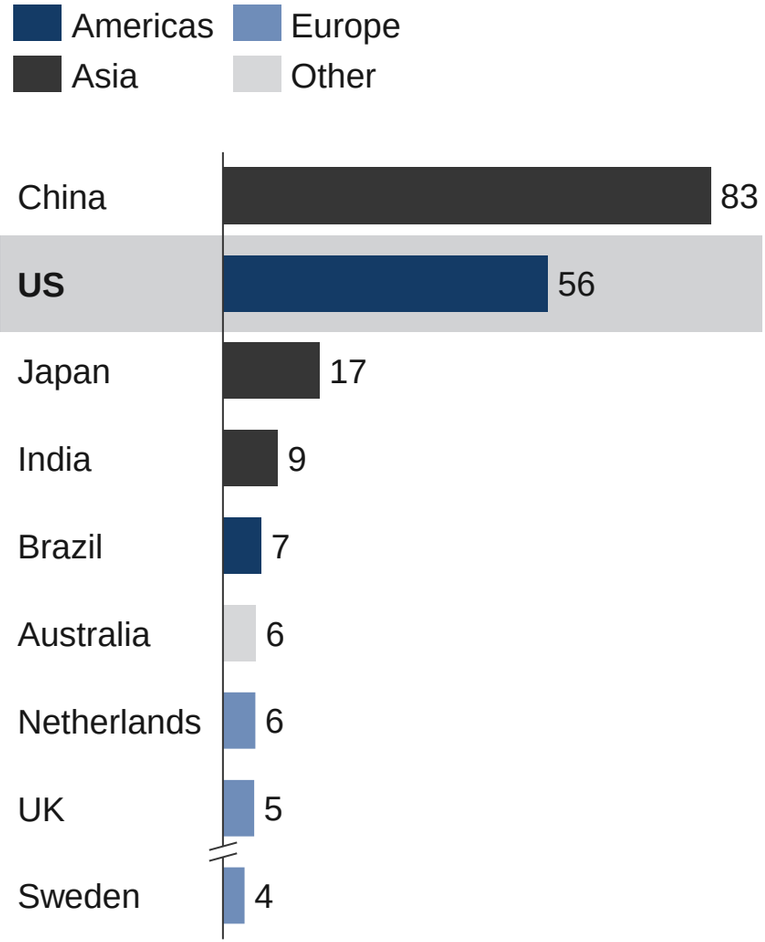
Relative GHG emission impact
Emissions and population share by country, 2019



US GHG emissions
CO_2 equivalents share by sector, 2019



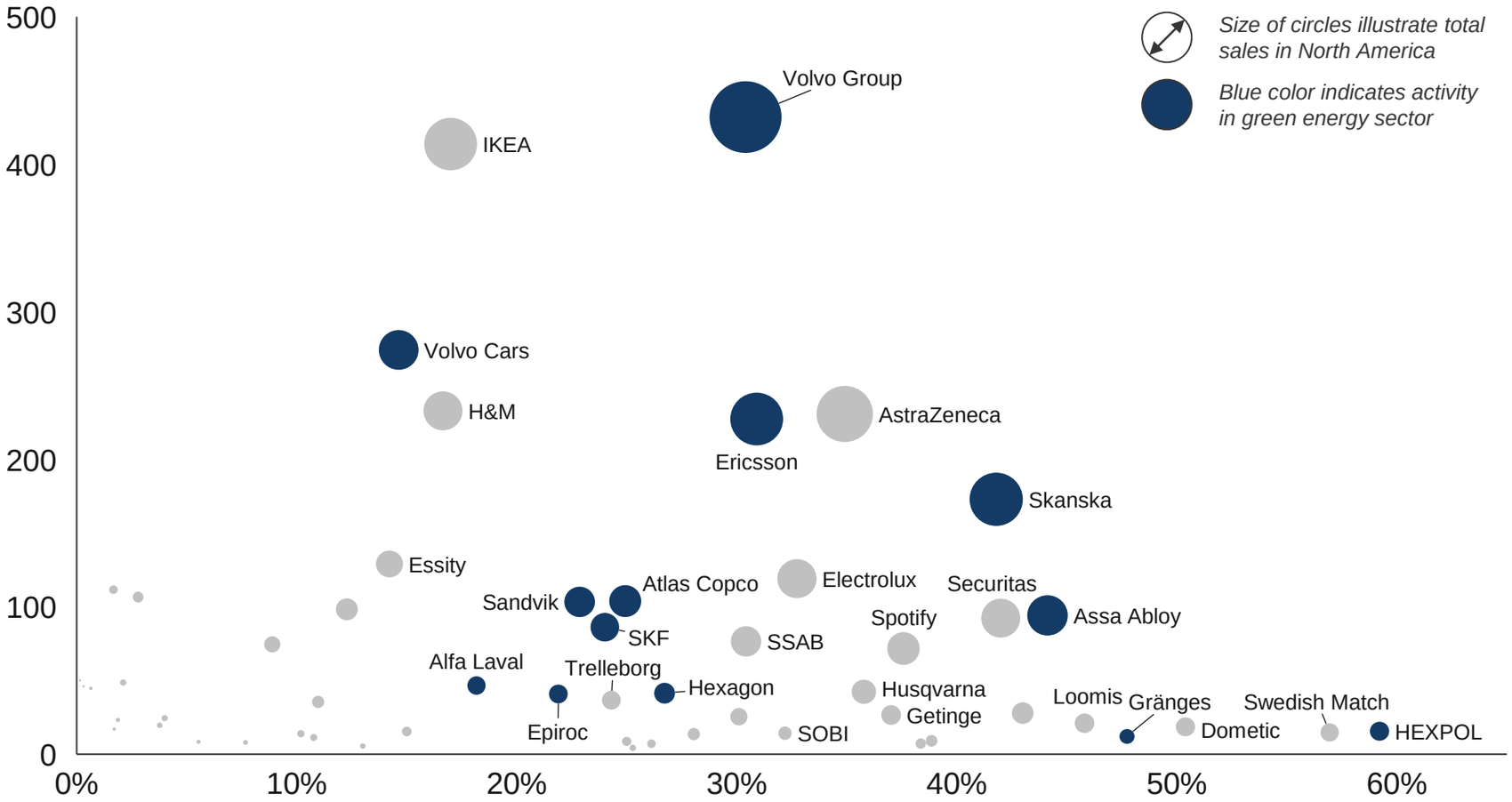
Clean energy investments
Billion dollars by country, 2019



* Includes commercial and residential buildings; ** Agriculture not covered in this report
Source: Rhodium Group, BP, USEPA, World Bank, BloombergNEF, SCB

Many of the largest Swedish companies with green transition solutions already have 20-40% of global sales in the US – and the potential is even greater

Large Swedish companies with solutions and technology for the US green transition
Global sales in billion SEK (y-axis) and share of sales in North America (x-axis), 2019



* Of the 100 largest Swedish companies with international presence
Source: Annual reports of companies, SCB, Business Sweden analysis

Swedish presence in the US

121 bn SEK
2020 Swedish export value to the US

25%
*2019 share of Swedish firms' global revenue from the US**

Top investor
Sweden is the 15th largest investor in the US

~1,600
2020 number of Swedish companies present in the US

Roughly $350 bn of climate-related federal spending passed with the IIJA, but an additional $555 bn has stalled in Congress – BBBA likely to be broken up

Passed climate-relevant bills

Spending and content of IIJA by climate and non-climate provisions

Infrastructure Investment and Jobs Act (IIJA)

$1.2 tn

Climate Provisions

- **$65 bn** to expand the national electric transmission system
- **$50 bn** to improve infrastructure resiliency and mitigate effects of climate change
- **$15 bn** to invest in EV infrastructure, electric school buses, batteries
- **Other provisions**: energy storage, critical minerals, CCUS*, hydrogen, efficiency

Traditional Infrastructure

- Including but not limited to the expansion and maintenance of bridges, railroads, highways, and telecom.

$550 bn in new spending – $700 bn normal annual allocation on federal level

Not passed climate-relevant bills

Spending and content of BBBA by climate and non-climate provisions

Build Back Better Act (BBBA)

$555 bn

Climate Provisions

- In the $1.75 tn bill, stalled due to political roadblocks, **$555 bn** was directed toward climate programs
- These clean energy provisions are likely to pass as the first part of a new, leaner bill
- Includes energy tax credits and federal procurement of cleantech solutions

TBD

Social Infrastructure

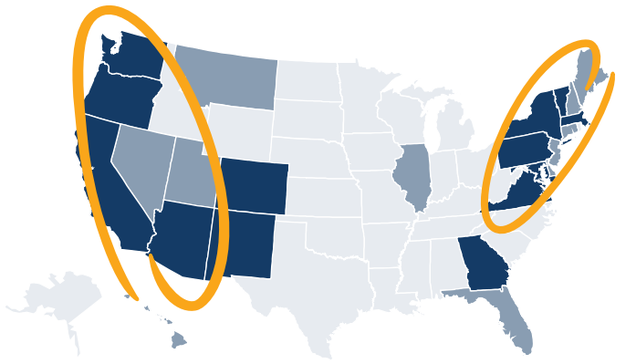
- The debunked $1.75 tn bill included spending for social infrastructure, including universal pre-k and subsidies for childcare
- Unclear if these provisions have support to pass – due to concerns about sustained inflation and a rising debt-to-GDP ratio

* CCUS = Carbon Capture, Utilization and Storage

Source: The White House

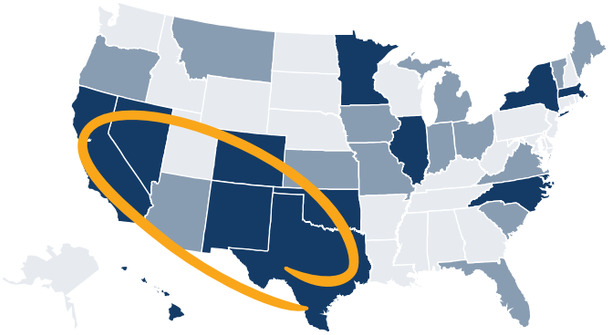
Different states lead the effort to decarbonize different sectors – of which this analysis includes transportation, power, industry, and buildings

Electromobility
Transportation modes based on electricity



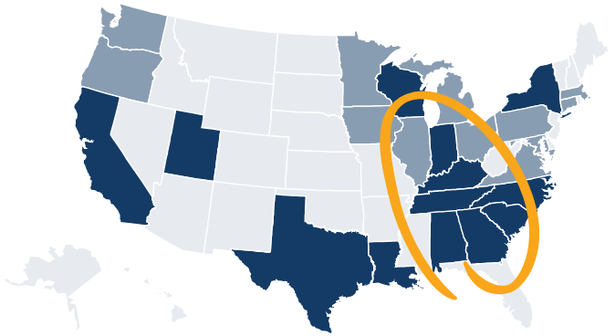
- Opportunities concentrated on the **West and East Coasts**
- Higher per-capita affluence and political incentives

Renewable power
Electricity production from renewable sources



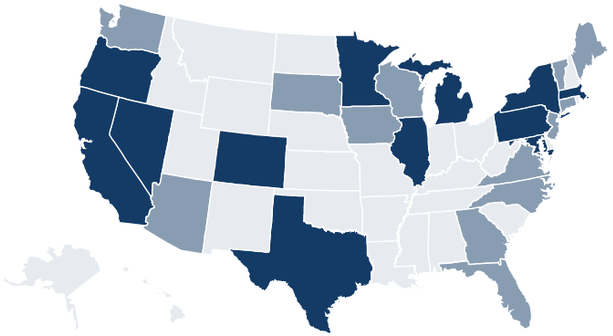
- Opportunities concentrated in the **West** and **Southwest**
- More economical due to abundance of solar and wind

Industrial transformation
Decarbonized and digitalized manufacturing



- Opportunities concentrated in the **South and Midwest**
- Naturally close to competitive industrial hubs
- Varies with subsector

Sustainable buildings
Buildings designed to conserve water, materials and energy

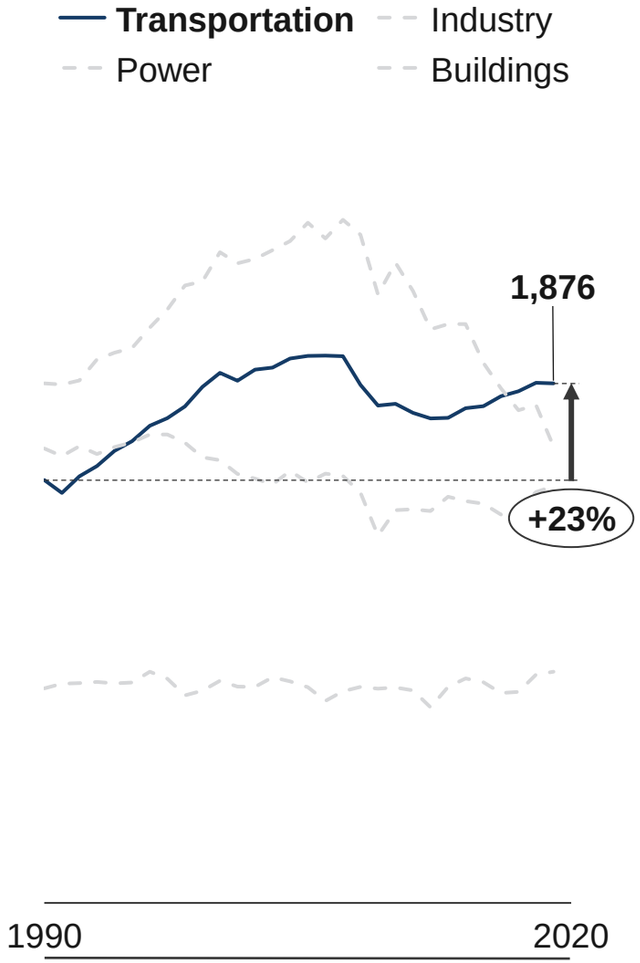


- Opportunities dispersed across the country
- Close to densely populated cities with major heating/cooling needs

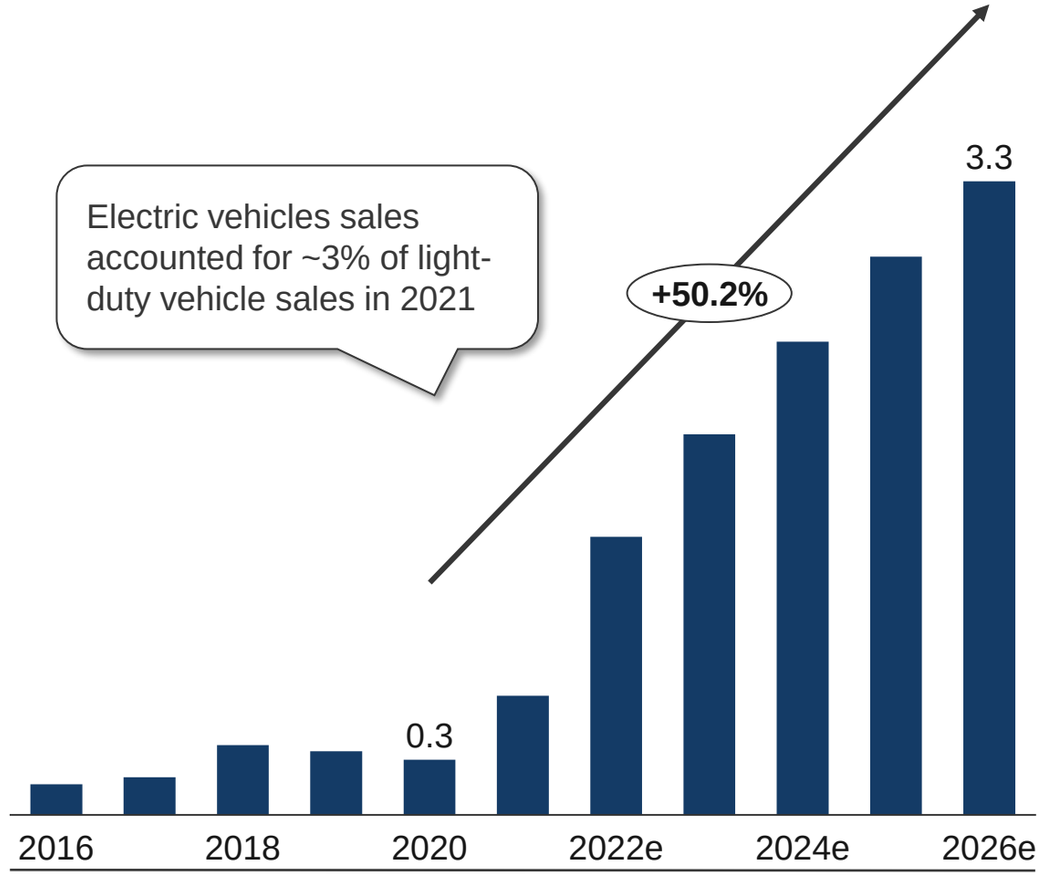
Source: Business Sweden analysis

Transport GHG emissions have increased dramatically with passenger vehicle growth – but EVs are expanding through both public and private investment

US GHG emissions
Million tons CO_2 eq, 1990 – 2020



US electric vehicle* (EV) sales
Million units sold by year, 2016 – 2026e



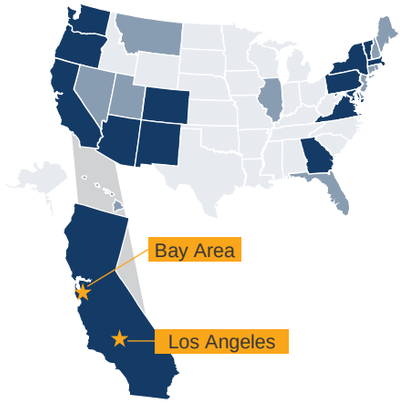
Comments

- **Transportation is the highest CO_2 emitting US sector** accounting for ~30%
- **Transport electrification is largely driven by growth in passenger vehicles**, accelerated by both federal policies (50% of all LD** sales in 2030 to be ZEV) and private investments
- The CV** segment will be driven by the electrification of school buses and the federal gov't fleet (100% by 2030)
- **The deployment rate of charging infrastructure is a barrier to rollout of EVs**– ~100,000 public chargers are available today with a gap of 400,000 to be filled by 2030

***** Includes light-, medium-, and heavy-duty vehicles – medium and heavy make up ~4% of EV stock; LD = Light-duty, CV = Commercial vehicle
Source: USEPA, BMI Fitch Solutions, The White House, Reuters

California keeps leadership role with half of national EV sales – a vast research system and extensive state-level funding create growing EV hubs in SoCal

Green subsector overview
State leadership and key hubs



Why California?

1. **Policy trendsetter –** 1st in US to introduce clean vehicle policies
2. **Highest adoption rate of EVs –** 50% of total national sales in CA
3. **High spending by state agencies** to accelerate development

Opportunity spaces
Key themes for Swedish small-and-medium enterprises to explore

PARTNER WITH STATE AGENCIES

$4 bn

In state-funded electromobility projects

- **California is leading the development** of EV and EVSE* solutions within port electrification, charging and vehicle-to-grid
- Example: **Port of LA looks for partners** to demonstrate new technologies in zero-emission freight zones

LEVERAGE RESEARCH & UNIVERSITY NETWORKS

$2.95 bn

In total federal research awards to University of California

- Regulators drive financing and are used to work with local universities (e.g., **UC Irvine Research Park**)
- Connect with universities to partake in studies/projects at research centers (e.g., **Energy Storage Center at Berkeley Lab**)

POSITION IN NEW EV HUB IN SOUTHERN CALIFORNIA

43%

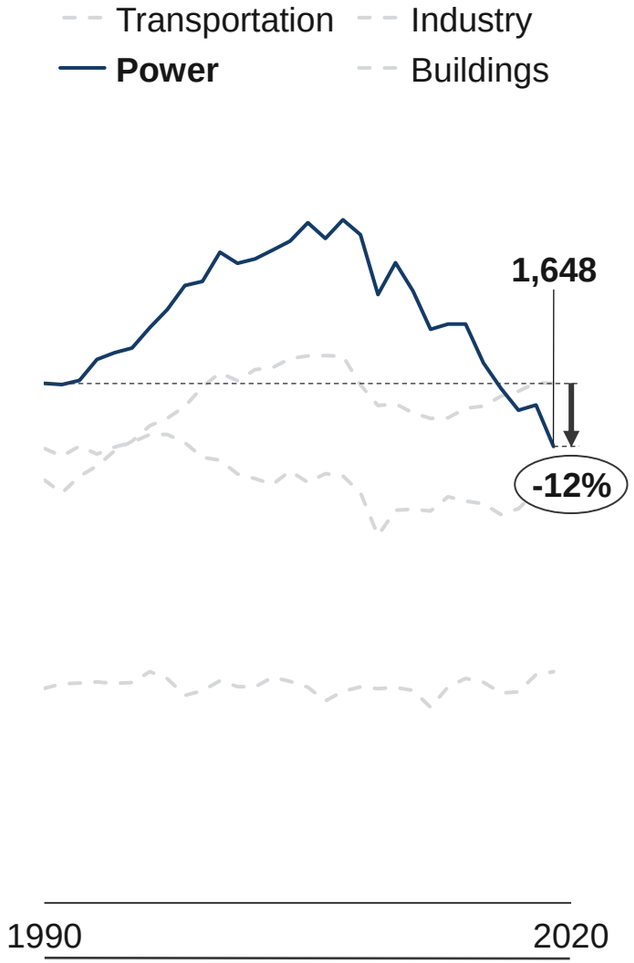
Of Californian EV-related jobs located in SoCal

- **Southern California is a growing hub for EV sector**
- Opportunities along the supply chain when OEMs set up EV/EVSE sites (e.g., **Proterra EV battery plant**)
- Several forums and events for SMEs to position in LA and SoCal

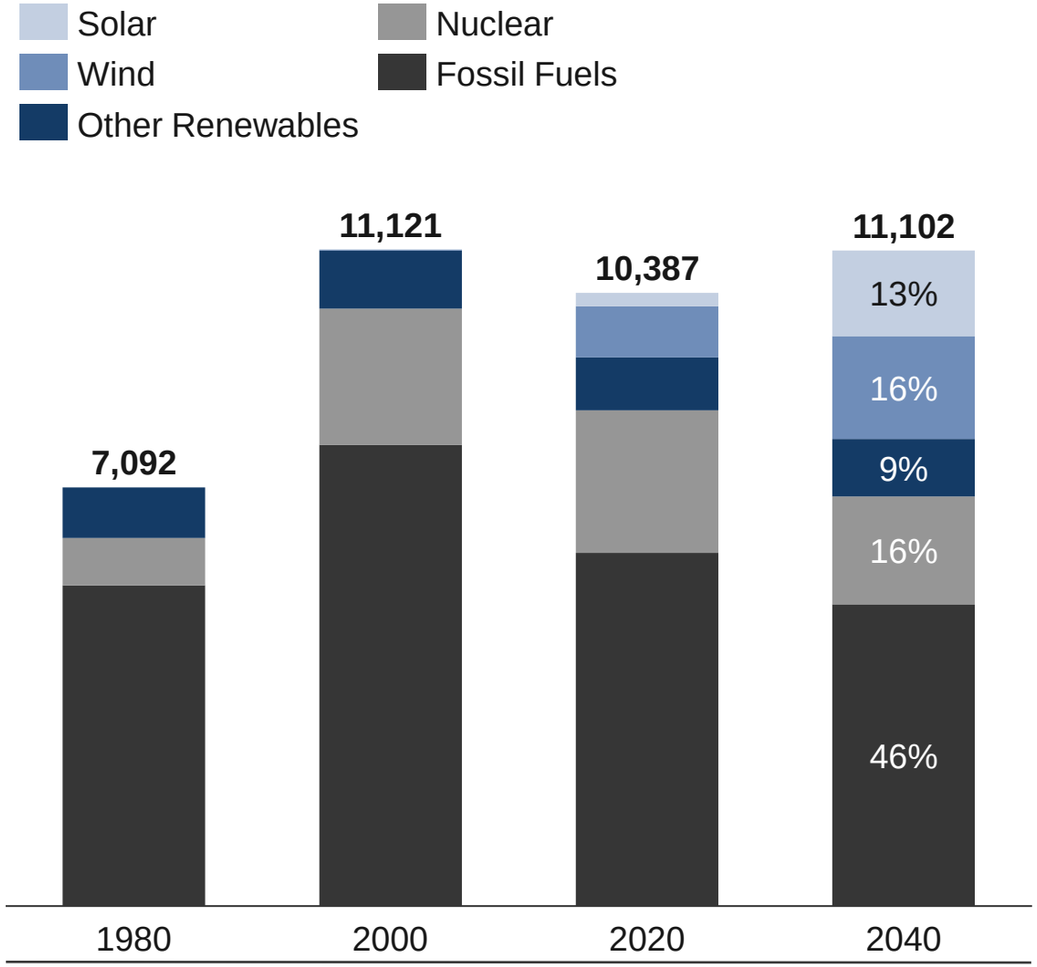
* EVSE = Electric Vehicle Supply Equipment
Source: EERE, LAEDC, CPUC, CEC, ESRI

Power sector GHG emissions have fallen with rapid expansion of solar and wind power – but US electricity generation is still heavily reliant on fossil fuels

US GHG emissions
Million tons CO_2 eq, 1990 – 2020



US power sector energy consumption*
TWh by energy source and year, 1980 – 2040



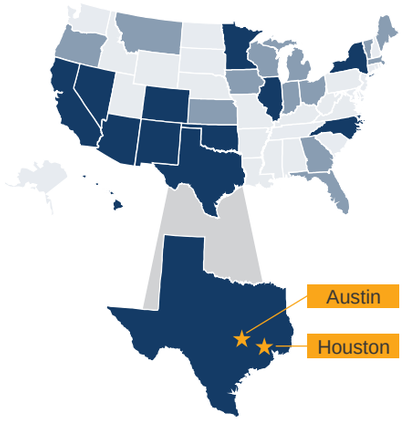
Comments

- **Renewables grew to 19.2% of electricity generation in 2020**, driven by a rapid expansion of wind and solar capacity
- **Projected renewables growth is insufficient to reach net-zero power emissions by 2050**, with unabated natural gas as the main competing source of energy (estimated ~35% of electricity mix)
- **The Biden administration has set ambitious goals for accelerating the clean power shift** – part of which is set in motion through IIJA, but with much still hinging on BBBA content

* Energy consumed by the power sector to generate electricity – the limited energy input growth between 2000-2040 can be explained by expectations of higher conversion and end-use efficiencies
Source: USEPA, USEIA, C2ES

Texas, an energy powerhouse, is transforming from an Oil & Gas hub to a leader in renewables production – with unique private sector opportunities

Green subsector overview
State leadership and key hubs



Why Texas?

1. **Texas is an energy powerhouse** – highest US energy production
2. **Recent renewables growth spurt –** 1st in wind, 2nd in solar output
3. **Strong private sector forces drive transition**

Opportunity spaces
Key themes for Swedish small-and-medium enterprises to explore

LEVERAGE O&G INDUSTRY PRESENCE AND FUNDING

$12.7 bn

2020 Global O&G cleantech investments – 3x 2015 levels

- O&G firms are **increasingly funding cleantech RD&D**
- Engage with O&G to leverage know-how, assets and cleantech ambitions
- Examples: **Halliburton Labs,** the **Shell Accelerator**, and Rice's **Clean Energy Accelerator**

EXPLORE CPPA VALUE CHAIN

28%

2019 share of global corporate PPAs signed in Texas

- Abundant, deregulated and cheap wind and solar drive **corporate power purchasing agreements**
- Corporate pushback stopped anti-renewables legislation after 2021 brownouts
- Potential in servicing large private buyers and providers

INCUBATE IN HOUSTON

130

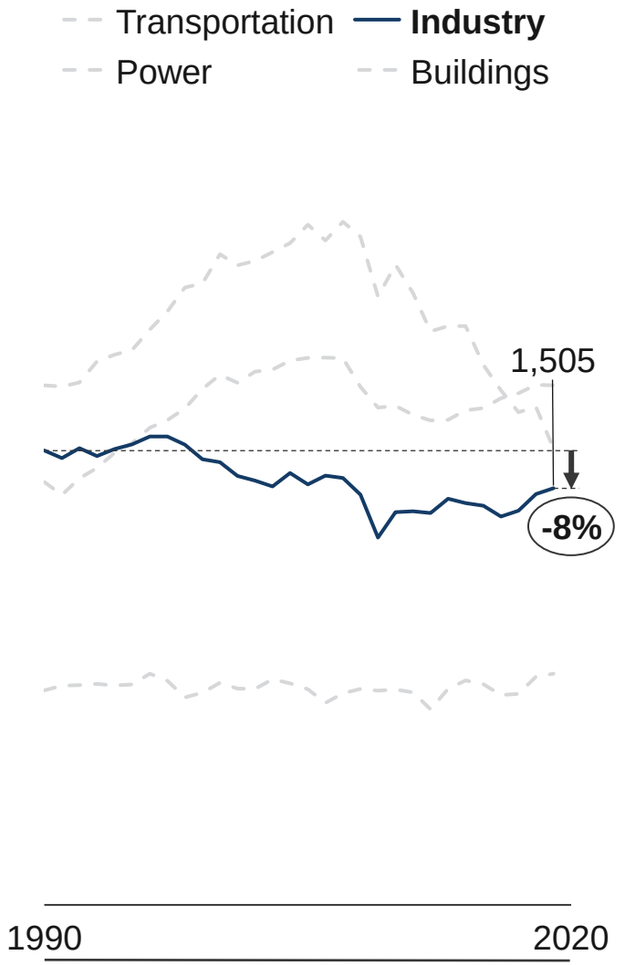
2021 Houston solar/wind firms – highest US concentration

- From O&G to a growing cleantech ecosystem
- First Climate Action Plan in 2020, goal to incubate energy startups
- Examples: **Ion, Greentown Labs, Carbon Hub,** and **Energy Transition Ventures**

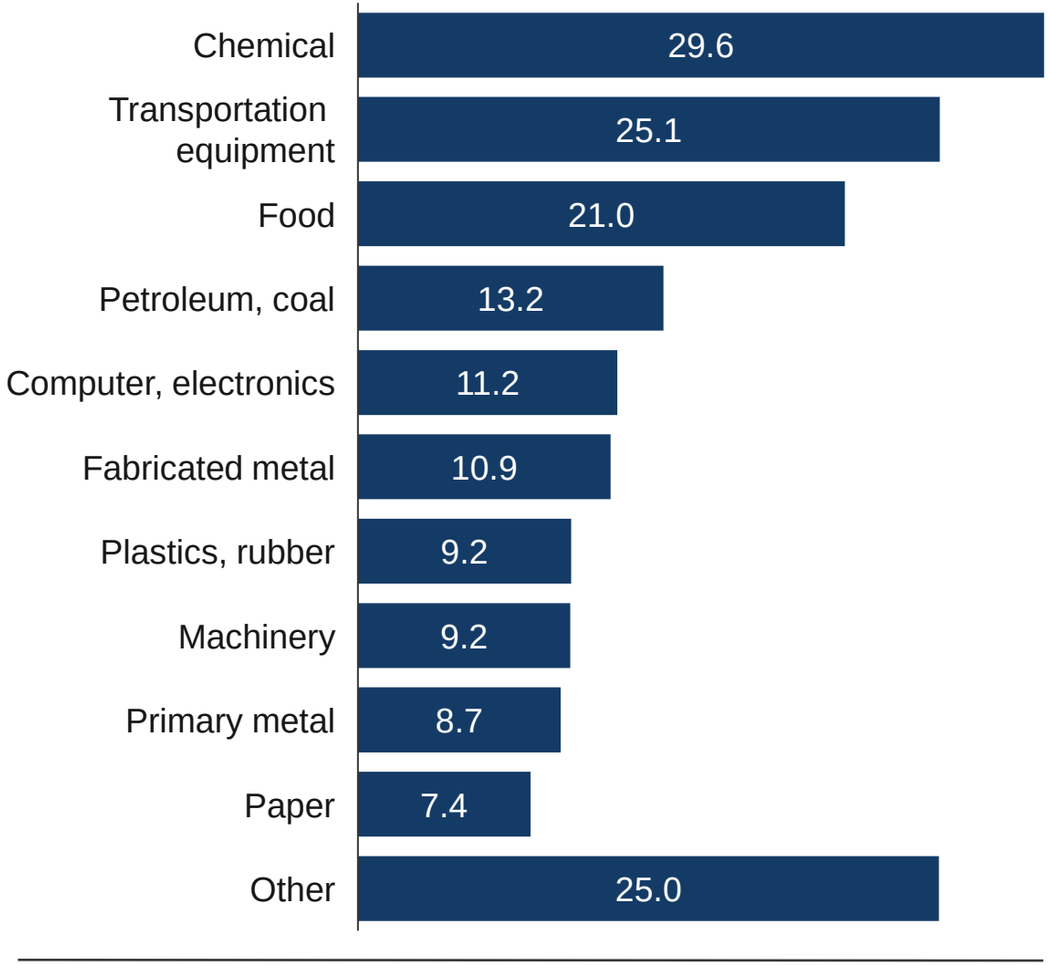
Source: USEIA, SEIA, BloombergNEF, Greentech Media, Greentown Labs

Industrial GHG emissions have decreased with better sourcing, higher efficiency and off-shoring – reindustrialization creates new challenges and opportunities

US GHG emissions
Million tons CO_2 eq, 1990 – 2020



US manufacturing capital expenditure
Billion dollars in new and used capex, 2018-2019 annual average



Comments

- **Better energy sourcing, higher efficiency, and structural shifts in the US economy**, have lowered industrial emissions
- **Manufacturing is the bulk of emissions – most of which are on-site**. Reductions will be driven by fuel switching and digitalization – as well as CCUS, on current trajectory
- **Chemicals, automaking and food** lead capital expenditure
- **Federal polices are fueling reindustrialization efforts for critical industries.** While there is support for a *sustainable transformation* of industry, the political emphasis is on *first* getting industry back on US soil

Source: USEPA, US Census Bureau

The auto industry, a key driver of employment and R&D, is transforming – small and large legacy players will have to electrify and digitalize with outside help

Green subsector overview
State leadership and key hubs

Why automotive?

1. **Rapidly changing –** upstream electrification, downstream EV demand
2. **R&D intensive –** top-ranking in R&D, capex, smart manufacturing
3. **Huge impact on US –** key GDP and jobs driver among subindustries

Opportunity spaces
Key themes for Swedish small-and-medium enterprises to explore

MONITOR SHIFTING INDUSTRIAL POLICY

75%

*2029 domestic content requirement in BAA** update*

- US government is trying to **reindustrialize** the economy
- Higher domestic content in public procurement
- Higher investments: dual-use and critical industries, public R&D and worker upskilling
- Under development, possibly huge trade impact

HELP TRANSFORM LEGACY AUTOMAKERS

41%

2019 share of US-produced vehicles from Tristate Region*

- Shift in Tristate* legacy automaking: EVs estimated to go from 7.3% of 2019 production, to 42% in 2028
- **10 gigafactories** for Li-ion battery cell and pack production operating across the US – **7 more** planned to begin operations by 2023

PARTNER WITH IACs OR MEPs IN KEY REGIONS

19,500

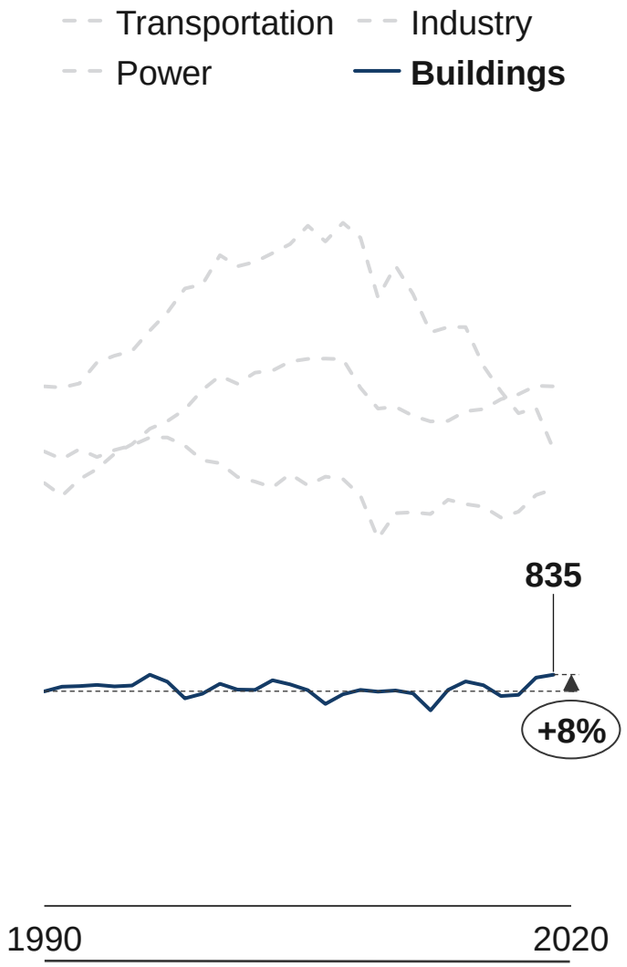
IAC audits of manufacturers to improve plant efficiencies

- US's 35 **Industrial Assessment Centers** or 51 **Manufacturing Extension Partnerships** assist small to large manufacturers with efficiency improvements
- Potential partnerships to access plants of varying size as a recommended vendor

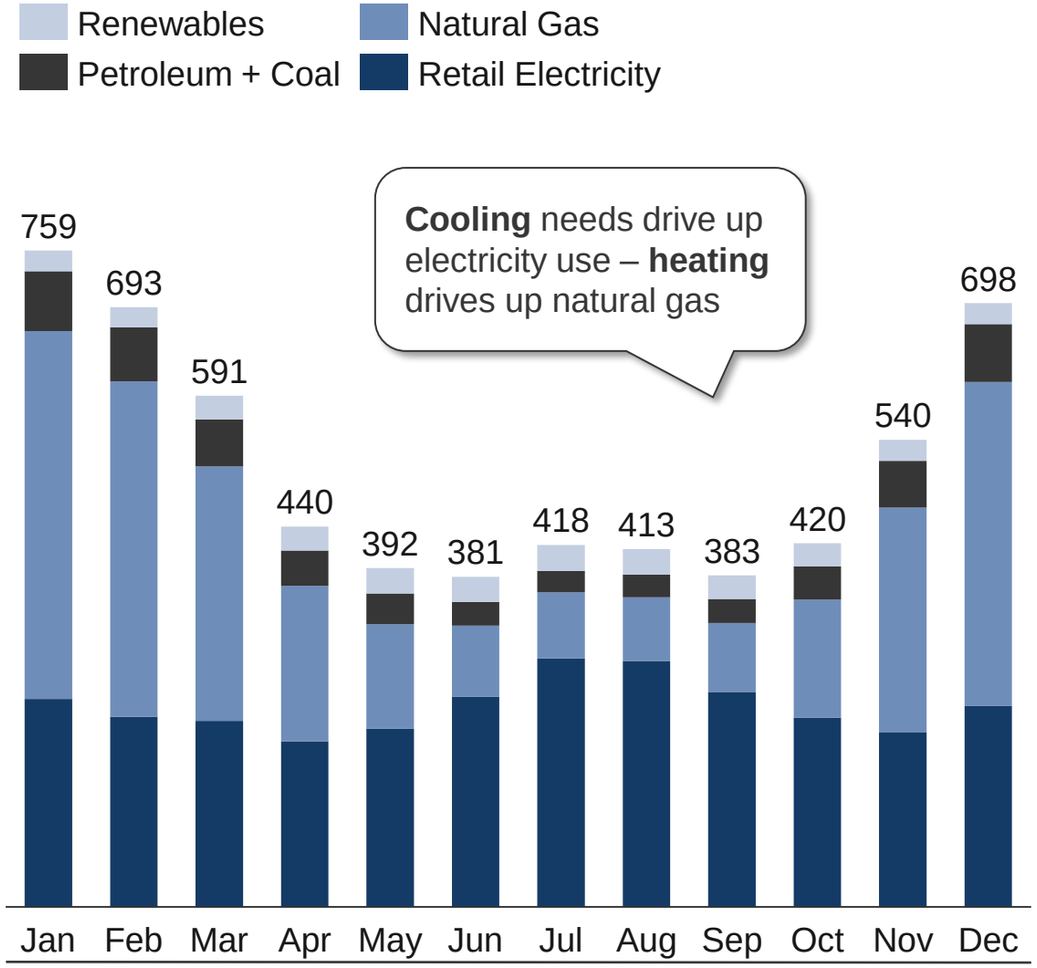
***** The Tristate Region includes Michigan, Indiana, and Ohio; ** The Buy American Act (BAA) sets federal procurement rules
Source: Atlantic Council, The White House, MIT, USDOE, AAPC

Building GHG emissions have increased slightly with population growth and appliance use – with heating and cooking still heavily natural gas-reliant

US GHG emissions
Million tons CO_2 eq, 1990 – 2020



US building sector energy consumption
Average TWh by energy source and month, 2019 – 2021



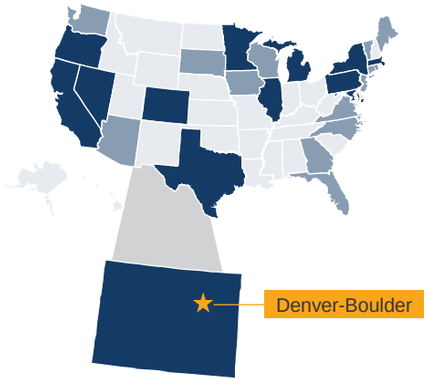
Source: USEPA, USEIA, Swedish Energy Agency

Comments

- **GHG emissions is 13% of total – considerably higher if electricity is distributed across end-use sectors.** Increases since 1990 are mainly attributed to population growth and increased use of appliances
- Both residential and commercial buildings are **still heavily reliant on gas for heating and cooking – which represent 80% of direct emissions**
- **Federal ambitions are less explicit for building efficiency** – standards are incrementally improved

Colorado, a fast-growing leader in green building, is ideal as a foothold in the US market – with a well-developed network of building efficiency players

Green subsector overview
State leadership and key hubs



Why Colorado?

1. **Fast-growing state –** 2nd in 10-year resident growth for large states
2. **Historic green building leadership** – in LEED and efficiency standards
3. **But lags in key metrics –** e.g., smart metering, waste mgmt., air quality

Opportunity spaces
Key themes for Swedish small-and-medium enterprises to explore

BUILD RELATION TO OR PARTNER WITH NREL

1,002

Active NREL partnerships with industry, academia and gov't

- NREL is the spider in Colorado's cleantech web
- Examples: **IN² Incubator** and **Shell GameChanger** (incubators) or **RASEI** and **CRES** (research networks)
- Upcoming business park, "**Glo Park**", next to NREL's facilities

INTEGRATE INTO LOANS AND TECHNICAL AUDITS

$158 mn

Cumulative C-PACE funding for commercial buildings

- Gov't and non-profits support building owners through loans and technical audits for building sustainability
- Becoming a recommended vendor could strengthen sales pipeline and reputation
- Examples: **C-PACE**, **RENU**, **CARE**, or **NEEP**

EXPLOIT DENVER PUSH FOR GREEN BUILDINGS

64%

Share of Denver GHG emissions from building sector

- Denver's climate office **(OCASR)** manages a $40 million/year fund with green buildings a major priority
- Regulatory push for shift in existing (**Energize Denver Hub**) and new buildings (**Net-Zero Buildings and Homes**)

Source: US Census Bureau, USGBC, NREL, C-PACE, Denver Office of Climate Action, Sustainability and Resiliency

For questions about this report please contact:
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