Building technology implications from the Inflation Reduction Act of 2022

Roland Berger Perspective Paper

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The newly signed inflation reduction act will increase access to affordable clean energy to many homeowners in the US

Executive summary of the 2022 Inflation reduction act

On August 16, 2022, President Biden signed the USD 737 bn Inflation Reduction Act which includes ~ **USD 384 bn in energy and climate-related spending,** making it the **largest federal investment to combat climate change in US history**

The plan includes spending in:

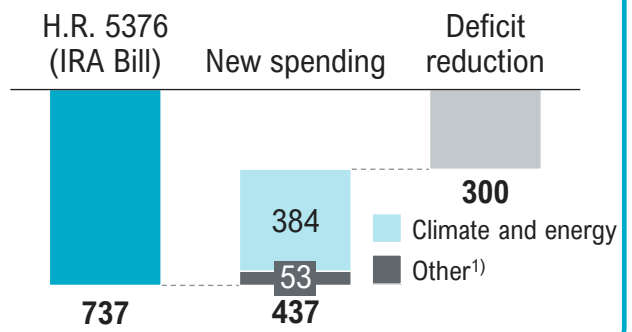
- Clean electricity and energy transmission: **USD 178.2 bn**
- Manufacturing: **USD 67 bn**
- Building and energy efficiency: **USD 48.2 bn**
- Clean transportation: **USD 36 bn**
- Conservation and Agriculture: **USD 30.5 bn**
- Environmental Justice: **USD 23 bn**
- Fossil Fuels: **USD 1.6 bn**

The bill also incentivizes domestic production in clean energy technologies like solar, wind, carbon capture, and clean hydrogen, **setting the United States up to compete in the global clean energy economy and creating millions of clean energy jobs**

This legislation will **lower energy costs for families, combat the climate crisis and reduce the government deficit by ~ USD 300 bn**

However, even though the IRA is signed into law this year, **most changes will not be in effect until early 2023**

IRA spending breakdown [USD bn]



1) Incl. estimated spending on Medicare and the affordable care act extension

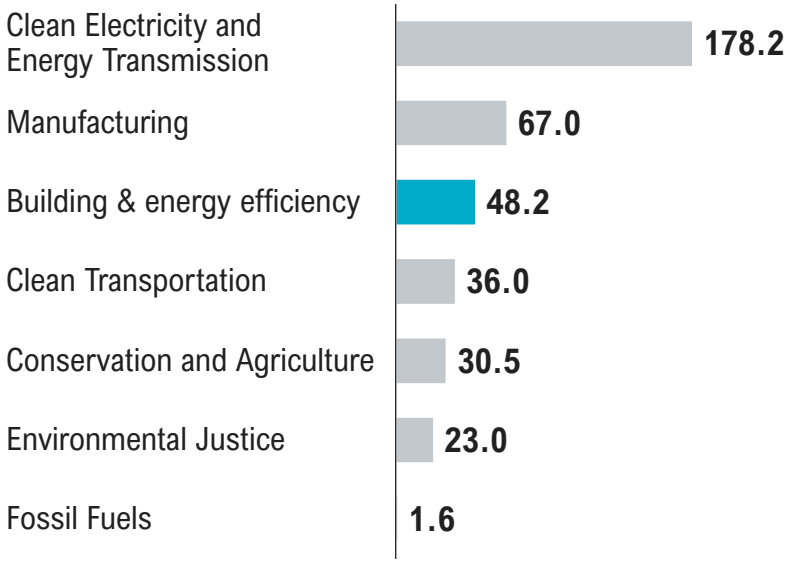
Source: Whitehouse.gov, IRA H.R.5376, CPC Center

Approximately USD 50 bn will be invested in building and energy efficiency through a grant, tax credit or rebate

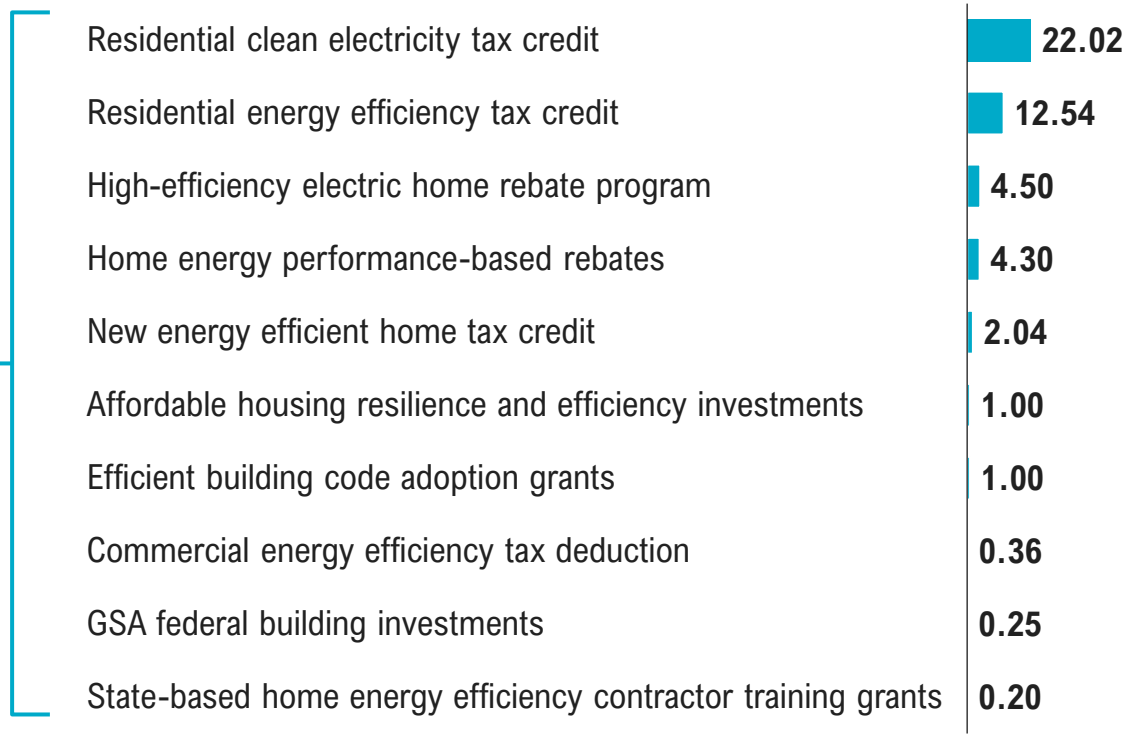
The Inflation Reduction Act spending allocations

IRA climate and energy spending

USD 384 bn



Building and energy efficiency



Total: USD 48.2 bn

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office

HVAC, water heaters and several building tech products are being subsidized by the IRA policies – Heat pump upgrades qualify for nearly all incentives

Building and energy efficiency program effect on the built environment

IRA Programs	Eligible products and technology	HVAC			Water heaters							
		Heat pump	Air conditioner	Boiler	Heat pump water heater	Water heater	Building envelope[1)]	Home appliances[2)]	Building controls[3)]	Electrical circuit or panelboard	Interior lighting systems	Renewable energy (solar/wind)
1	Residential clean electricity tax credit	USD 22 bn	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
2	Residential energy efficiency tax credit	USD 12.54 bn	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗
3	High-efficiency electric home rebate program	USD 4.5 bn	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗
4	Home energy performance-based rebates	USD 4.3 bn	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	New energy efficient home tax credit	USD 2.04 bn	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗
6	Affordable housing resilience & efficiency investments	USD 1 bn	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Efficient building code adoption grants	USD 1 bn	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
8	Commercial energy efficiency tax deduction	USD 362 m	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
9	GSA federal building investments	USD 250 m	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	State-based home energy efficiency contractor training grants	USD 200 m	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

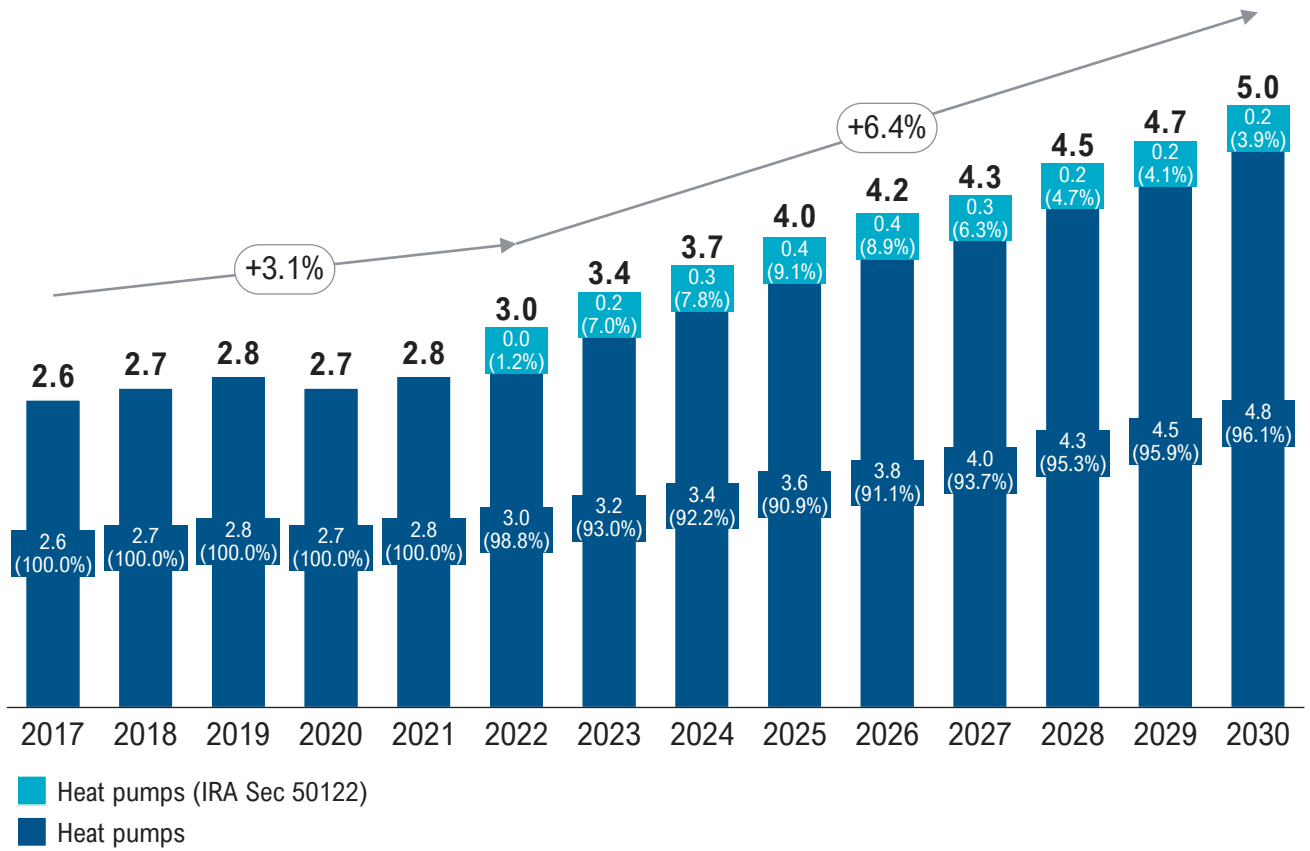
✓ Available rebates or tax credit for qualifying products ✗ No rebates or tax credit available

1) Includes air sealing insulation, doors and windows; 2) Includes biomass stoves ; 3) Includes thermostats and ductwork

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office

Through 2030, we anticipate that the IRA will increase heat pump demand by an average of 6% per year

Heat pumps[1] installed in the US for residential buildings, 2017-2030 [m units per year]



- Across the various sections of the IRA approximately **USD 10.4 bn is estimated to be spent on heat pumps for space heating**
- Assuming 50% of those funds are used to increase overall demand for heat pumps and 50% is used to subsidize existing demand for heat pumps, then the industry could see **a total increase in heat pump demand of USD 5.2 bn over through 2030**
- Underlying heat pump demand growth is **supported by regulations, energy costs and several technological advancements** that are making heat pumps more attractive and functional in lower temperatures:
  – Variable speed compressors and fans
  – New coil designs (e.g., grooved copper tubing)
  – Cold weather refrigerants

Selection of incentives for heat pumps in the IRA

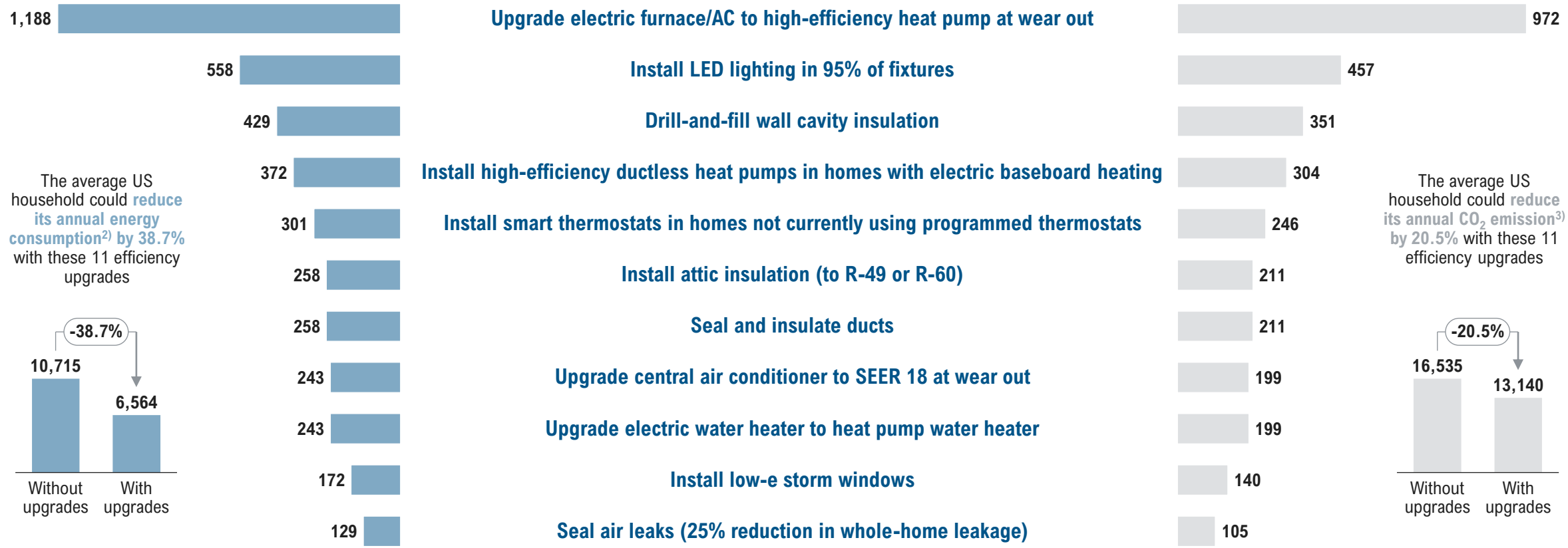
- In August 2022, the U.S. Senate passed the IRA aimed at increasing domestic energy production, promoting clean energy solutions, and lowering prescription drug costs
- The legislation provides ~USD 10.4 bn in total energy rebates and tax credits for energy efficient technologies
- The Energy Efficiency Home Rebate Program (IRA section 50122) includes:
  – USD 8,000 to install **space heating or cooling heat pump**
  – USD 1,750 to install **heat pump water heaters**
  – USD 4,000 to upgrade **electrical panels**
  – USD 2,500 to improve **electrical wiring**
  – USD 1,600 to improve **insulation**
- To qualify, household income needs to be less than 150% of the area median income. Those who do not qualify are able to take a USD 2,000 tax credit to install heat pumps
- These incentives are to be administered by states and available through 2031

1) Only includes heat pumps for heating only (excludes small percentage of dual heating and cooling heat pumps included in split type air conditioning)

Source: BIS, Expert Interviews, IRA H.R.5376, Congressional Budget Office

A fully upgraded SFD household can reduce its annual energy consumption and CO_2 emission by 38.7% and 20.5% respectively – To accelerate the upgrades, the IRA…

Est. Electricity and CO_2 savings potential from top 11 efficiency upgrades for an average SFD[1] household [KWh, lbs]



1) Single family detached (est. 68.86 m units in the US); 2) Based on 10,715 KWh average electricity consumption per household; 3) Based on 7.5 mt (16,535 lbs) annual emission per household

Source: EIA, EPA, Desk research, National renewable energy laboratory

…appropriates USD 1 bn to assist states and local government in adopting the latest and zero energy building codes

Overview of the efficient building code adoption program (IRA Section 50131)

The Push

USD 330 m	**Form:** Assistance to states and local government	**Task:** Strengthen building codes and implement of a plan to achieve full compliance	**Goal:** Push for the adoption of the latest residential and commercial energy building codes in their jurisdictions

The Pull

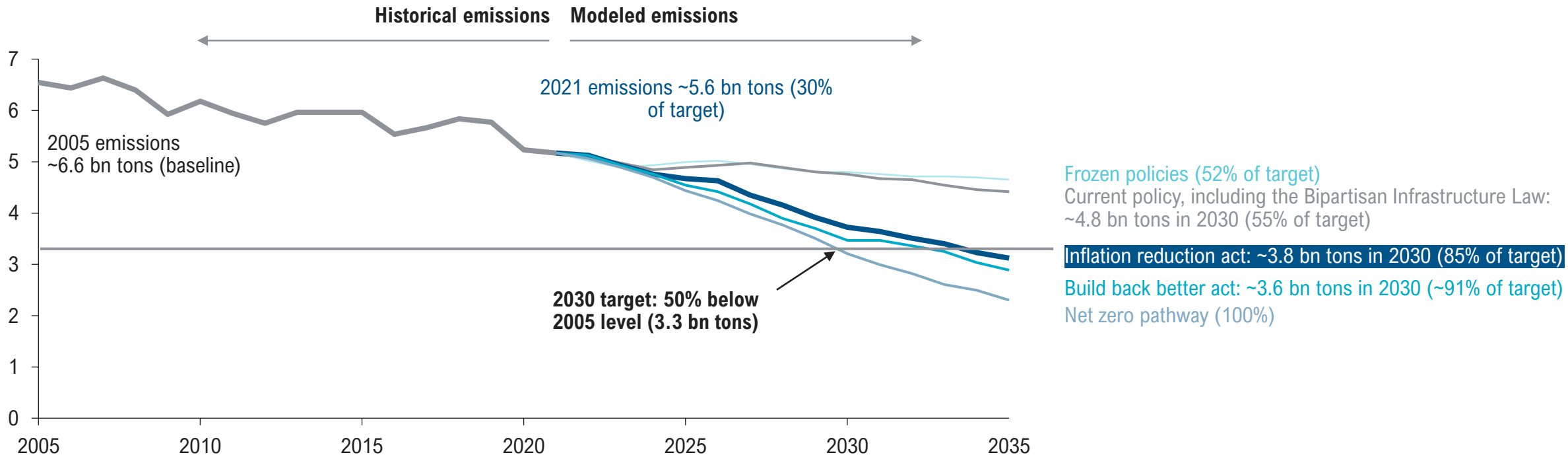
USD 670 m	**Form:** Assistance to states and local government	**Task:** DOE[1] to incentivize compliant states with grants and accelerate the implementation of a plan for full compliance with the zero-energy building code	**Goal:** Push for the adoption of codes that meet or exceed "the zero energy provisions in the 2021 IECC[2] or an equivalent stretch code

1) Department of Energy; 2) International Energy Conservation Code

Source: IRA H.R.5376, Roland Berger

The inflation reduction act will allow the U.S. government to achieve 85% of the 2030 GHG emission reduction goal

2005-2035 Net U.S. greenhouse gas emissions [billion mt]



The Inflation Reduction Act will:

- **Cut annual emissions in 2030 by an additional ~1 bn metric tons** below current policy (including the Bipartisan Infrastructure Law)
- **Get the U.S. to within ~0.5 bn tons of the 2030 climate target**
- **Reduce cumulative GHG emissions by about 6.3 bn tons** over the next decade (through 2032)

Source: Statista, EPA, Rapid Energy Policy Evaluation and Analysis Toolkit

Building tech leaders must therefore prepare for an increased demand for high-efficient building tech systems

Industry implications

Strategy: Seize the opportunity The IRA has been signed into law and spending will go into effect in 2023 – Prepare your growth strategy for a spike in demand in highly efficient HVAC and building controls systems

Sales: Train your team Train your sales and marketing team on how to educate customers on how to access the ~USD 48 bn in grants, rebates and tax credits

Product development: Shift to energy efficiency Shift your product development focus to energy efficient products and technologies (e.g., heat pumps)

Production: Ramp up capacity Prepare to quickly ramp up production capacity and workforce to meet the expected spike in demand driven by the IRA for energy efficient products

Supply chain: Fortify your supply chain Identify where your supply chain is may be vulnerable and notify suppliers of the expected increase in demand for key components

ESG: Emphasize sustainability and equitability: The Biden Administration has made environmental sustainability and equitability key themes of its plans and legislation – Make sure these elements are present in your government project bids

Source: Roland Berger

IRA building and energy efficiency programs overview

The IRA provides USD 22 bn in funding for the residential clean electricity program

Residential clean electricity tax credit (IRA section 13302)

Overview of the residential clean electricity tax program

Description

- Extends the tax credit under Section 25D of the Internal revenue code to Dec 31, 2034, which provides federal income tax credits for investments in residential clean energy (e.g., solar, wind, fuel cell)
- Adds qualified battery storage technology to the list of eligible property investment

Tax credit and available rebates

- The credit rate is applied to the cost of such investments at the rate of :
  - 30% for property placed in service between 2022 to 2032
  - 26% for property placed in service in 2033
  - 22% for property placed in service in 2034

Eligible products and technology

- Renewable energy
  - solar electric property
  - solar water heating property
  - fuel cells
  - small wind energy property
  - qualified biomass fuel property
- Battery storage technology
- Geothermal heat pump property

Target population

- Residential property (owner)

Program requirement

- **Qualified battery storage:** must have a capacity that is ≥ 3KWh and be installed in connection with a dwelling unit located in the United States and used as a residence by the taxpayer
- **Geothermal heat pump:** must meet the requirements of the Energy Star program in effect at the time the taxpayer purchases the property

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 12.5 bn in funding for the residential energy efficiency program

Residential energy efficiency tax credit (IRA section 13301)

Overview of the residential energy efficiency program

Description

- Extends tax credit for qualified energy-efficiency improvements and expenditures for residential energy property on a **taxpayer's primary residence** through Dec 2032
- **Increases the tax credit from 10% to 30%**
- Qualifying building envelope components would no longer include roofs, but would include air sealing insulation

Tax credit and available rebates

- USD 1,200 annual credit limit per-taxpayer (USD 600 max per item)
- USD 2,000 annual credit limit for heat pumps (geothermal, air source) and biomass stoves
- 30% tax credit (up to USD 150) for home energy audits

Eligible products and technology

- Heat pump (electric or NG)
- Heat pump water heater (electric or NG)
- Biomass stoves
- Central AC
- Water heater (NG, propane or oil)
- Boiler (NG, propane, oil furnace or hot water)
- Windows and doors
- Air sealing insulation
- Electrical branch circuits and panelboard

Target population

- Residential property (owner)

Program requirement

- **HP[1], HPWH[2], Central AC, water heater and boilers:** must meet or exceed the highest efficiency tier established by the Consortium for Energy Efficiency
- **Biomass stove or boiler:** must have a min thermal efficiency of 75%
- **Oil furnace or hot water boiler:**
  - If in service after Dec 31, 2022, and before Jan 1, 2027
    - must meets or exceeds 2021 Energy Star efficiency criteria
    - must be rated for use with fuel blends at least 20% of the volume of which consists of an eligible fuel
  - If service after Dec 31, 2026
    - must achieve a min fuel utilization efficiency rate of 90% annually
    - rated for use with fuel blends at least 50% of the volume of which consists of an eligible fuel
- **Panelboard:** must have a 200 amps min load capacity
- **Exterior window and doors:** must meet Energy star certification

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 4.5 bn in funding for the high-efficiency electric home rebate program

High-efficiency electric home rebate program (IRA section 50122)

	Overview of the high-efficiency electric home rebate program	Program requirement
Description	• The HEEHRA[1] program awards USD 4.275 bn to states and USD 225 m to tribal governments through Sep 30, 2031 to create electrification rebate programs for single-family homes and multi-family buildings	• Only low-to-moderate income households are eligible for rebates under this section. This is defined as less than 150% of an area's local median income • To be eligible, upgrades must be for new construction, replace an existing appliance, or installing an appliance that did not exist before • Applicants[2] must present a plan to verify income eligibility for those seeking a rebate, ensure that those seeking a rebate will not receive multiple rebates for the same project and any additional information required by the Department of Energy (DOE) • This rebate program may not be combined with the home energy performance-based (whole-house) rebates under Section 50121 for the same home improvement project
Tax credit and available rebates	• Available point-of-sale rebates for Energy Star certified appliances are up to: – $8,000 for a space heating or cooling heat pump – $1,750 for a heat pump water heater – $840 for electric stove, range, oven, or heat pump clothes dryer • Available point-of-sale rebates for non-appliances are up to: – $4,000 for electric load service center upgrade – $1,600 for insulation, air sealing, and ventilation – $2,500 for electric wiring • Up to $500 to cover installation costs • The total aggregated rebate amount may not exceed USD 14,000 and is limited to: – 50% of costs for households earning 80% to 150% of local median income – 100% of costs for households below 80% of local median income	
Eligible products and technology	• Heat pump (electric or NG) • Heat pump water heater (electric or NG) • Biomass stoves • Central AC • Water heater (NG, propane or oil) • Electric load service center (panelboard) • Insulation • Ventilation systems	
Target population	• Tribal governments • Residential property (owner)	

1) High-Efficiency Electric Home Rebate Act; 2) State energy offices and tribal governments

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 4.3 bn in funding for the home electrification and energy efficiency program

Home energy performance-based rebates (IRA section 50121)

	Overview of the home electrification and energy efficiency program	Program requirement
Description	• Appropriates USD 4.3 bn to establish a program that extends grants, up to USD 4,000 or 50% of the cost of a project, to a HOMES rebate program to provide homeowners and aggregators rebates for house energy saving retrofits	• State energy office seeking a grant must submit to the Secretary an application including their plan to implement a HOMES rebate program: – the plan must outline reductions in home energy use, comparisons in monthly and hourly weather-normalized energy use before and after the retrofit, value savings and quality monitoring – Energy savings must also be consistent with BPI 2400 • A State energy office that receives a grant may use not more than 20% of the grant amount for planning, administration, or technical assistance related to a HOMES rebate program • This rebate program may not be combined with the high-efficiency electric home rebate under Section 50122 for the same home improvement project
Tax credit and available rebates	• HOMES rebate program carried out by a state energy office receiving a grant pursuant to this section shall provide the following rebates to homeowners through Sep 30, 2031: – 50% of a residential project cost, up to $2,000 for proven energy savings of 20% to 34% (capped at $200,000 for multi-family buildings) – 50% of a residential project cost, up to $4,000 for proven energy savings of 35% or more (capped at $400,000 for multi-family buildings) – For savings between 15% and 19%, the rebate is based on per kilowatt or equivalent savings (calculated using the $2,000 for 20% formula) • Higher rebates are offered to households with less than 80% of local median income (and multi-family buildings at least 50% occupied by such households): – 80% of the residential project cost, up to $4,000 for proven energy savings of 20% to 34% for each home or dwelling unit – 80% of the residential project cost, up to $8,000 for proven energy savings of 35% or more for each home or dwelling unit – For savings between 15% and 19%, the rebate is based on per kw or equivalent savings (calculated using the $4,000 for 20% formula)	
Eligible products and technology	• Any new product or retrofit that can generate energy saving	
Target population	• State energy offices	

1) Homeowner Managing Energy Savings program established by a State energy office as part of an approved State energy conservation plan under the State Energy Program

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 2 bn in funding for the new energy efficient home tax program

New energy efficient home tax credit (IRA section 13304)

Overview of the new energy efficient home tax program

Description

- This provision extends and increases the energy efficiency home tax credits through Dec 31, 2032

Tax credit and available rebates

- For home acquired after 2021:
- a $2,500 credit would be available for new homes that meet certain Energy Star efficiency standards
- a $5,000 credit would be available for new homes that are certified as zero-energy ready homes
- For multifamily dwellings:
- a $500 (up to $2,500) max credit would be available per unit, for homes that meet certain Energy Star efficiency standards
- a $1,000 (up to $5,000) max credit would be available per unit, for homes that are certified as zero-energy ready homes

Eligible products and technology

- Heat pump
- Furnaces
- Boiler
- Air conditioner
- Envelope, Windows and doors
- Water heater
- Thermostat & ductwork
- Lighting & appliances

Target population

- Residential property (owner)

Program requirement

- New homes must meet **Energy star efficiency standards or zero-energy ready** requirements under the zero-energy ready home program of the Department of Energy in effect January 1, 2023
  - To ensure that a home or apartment meets ENERGY STAR program requirements, third–party verification by an Energy Rating Company (i.e., home energy rater or rating provider) is required
- The multifamily dwelling credits would be increased to $2,500 (Energy Star) and $5,000 (Zero-energy) if the taxpayer ensures that the laborers and mechanics employed by contractors and subcontractors in the construction of the residence are paid **prevailing wages**[1)]

1) In government contracting, a prevailing wage is defined as the hourly wage, usual benefits and overtime, paid to most workers, laborers, and mechanics within a particular area. This is usually the union wage

Source: Energystar, Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 1 bn in funding for the affordable housing resilience and efficiency program

Affordable housing resilience and efficiency investments (IRA section 30002)

	Overview of the affordable housing resilience & efficiency program	Program requirement
Description	• The affordable housing resilience & efficiency program appropriates: – **USD 837.5 m** (available until Sep 30, 2028) to the Department of Housing and Urban Development (HUD) for the cost of **providing direct loans and grants to fund projects that improve energy efficiency, water efficiency, indoor air quality or sustainability** – **USD 60 m** (available until Sep 30, 2030) for the Secretary **to administer and oversee the implementation of the program** – **USD 60 m** available until Sep 30, 2029 for **expenses of contracts** administered by the HUD Secretary – **USD 42.5 m** available until Sep 30, 2028 for **energy and water benchmarking**, and the associated data analysis and evaluation, of properties eligible to receive grants or loans	• Amounts made available under this section shall be for direct loans, grants, or direct loans that can be converted to grants • Eligible recipients must agree to an extended period of affordability for the property • The approved projects must implement low-emission technologies, materials or processes and address climate resilience
Tax credit and available rebates	• Principal loan amount must not exceed USD 4 m	
Eligible products and technology	• Any products that improve energy efficiency, water efficiency, indoor air quality or sustainability	
Target population	• Residential property (owner) • Sponsors of low-income housing and housing for the elderly or disabled	

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 1 bn in funding for the efficient building code adoption program

Efficient building code adoption grants (IRA section 50131)

	Overview of the efficient building code adoption program	Program requirement
Description	• The efficient building code adoption grants appropriates **USD 1 bn** (available through Sep 30, 2029) to **assist states and units of local government in adopting latest and zero energy building codes**	• Of the amounts made available under this section, the Secretary shall reserve not more than 5% for administrative costs necessary to carry out this section
Tax credit and available rebates	• **USD 330 m are provided to states** to help adopt **residential building energy codes** that meet or exceed the 2021 International Energy Conservation Code (IECC) or **commercial building energy codes** that meet or exceed ANSI/ASHRAE/IES Standard 90.1–2019, or to fund a plan to ensure full compliance with these codes • **USD 670 m is to be used by the DOE** to provide grants to states and local governments that adopt zero energy codes that meet or exceed zero energy provisions in the 2021 IECC or **to ensure full compliance with these codes**	
Eligible products and technology	• Not applicable	
Target population	• Local and states governments	

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 362 m in funding for the commercial energy efficiency program

Commercial energy efficiency tax deduction (IRA section 13303)

Overview of the commercial energy efficiency program

Description

- Effective Jan 1, 2023, this program **updates and increases the tax deduction** for energy efficient commercial buildings **from $1.88 per sq ft up to a total of $5 per sq ft**

Tax credit and available rebates

- Building owners can deduct:
  - $0.50 per sq ft by demonstrating a 25% energy savings
  - $0.02 per sq ft for every 1% over 25%, up to a maximum $1 per sq ft
- For projects that meet prevailing wage and registered apprenticeship requirements, the base amount is $2.50, which would be increased by $0.10 for each percentage point increase in energy efficiency, with a maximum amount of $5.00 per sq ft

Eligible products and technology

- Energy savings can come from:
  - Interior lighting systems
  - Heating, cooling, ventilation and hot water systems
  - Building envelope

Target population

- Commercial buildings owners

Program requirement

- The **maximum deduction amount** would be the total deduction a building can claim less deductions claimed with respect to the building in the **preceding 3 years**
- **Qualified buildings** must be in the US and placed in service not less than 5 years before the establishment of the qualified retrofit plan with respect to such building
- **Qualifying retrofits projects** must increase its efficiency relative to a reference building by 25%. To do so:
  - Building owners must have an energy efficiency savings plan that is designed by a licensed architect, engineer, or other qualified professional
- Any laborers and mechanics employed by the taxpayer or any contractor or subcontractor in the installation of any property **shall be paid prevailing wages**[1)]

1) In government contracting, a prevailing wage is defined as the hourly wage, usual benefits and overtime, paid to most workers, laborers, and mechanics within a particular area. This is usually the union wage

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 250 m in funding for the GSA federal building investments program

GSA federal building investments (IRA section 60502)

	Overview of the GSA federal building investments program	Program requirement
Description	• Allocates a sum of USD 250 m (made available until September 2031) for the conversion of federal facilities to high-performance green buildings	• None specified
Tax credit and available rebates	• Not applicable	
Eligible products and technology	• Any products that improve energy efficiency, water efficiency, indoor air quality or sustainability	
Target population	• Government buildings	

1) General Services Administration

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

The IRA provides USD 200 m in funding for the state-based home energy efficiency contractor training program

State-based home energy efficiency contractor training grants (IRA section 50123)

	Overview of the energy efficiency contractor training program	Program requirement
Description	• This program allocates USD 200 m (made available until September 2031) to states in order to implement programs that train and educate contractors in the installation of home energy efficiency and electrification improvements, including projects eligible for rebates under the HOMES or high-efficiency electric home rebate programs	• This section allows states to use funds to: – partner with nonprofit organizations to develop contracting training program – provide testing and certification of contractors – reduce the cost of training contractor employee • Of the amounts made available under this section, a state shall not use more than 10% for administrative expenses to develop and implement the program
Tax credit and available rebates	• Not applicable	
Eligible products and technology	• Not applicable	
Target population	• State government • Construction contractors	

Source: Whitehouse.gov, IRA H.R.5376, Congressional budget office, Roland Berger

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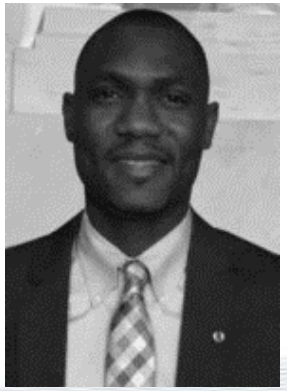

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