MEMORANDUM FROM REWIRING AMERICA TO ALL INTERESTED PARTIES

Electrify for Peace Policy Plan

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Summary

The Electrify for Peace Policy Plan is a three-part market transformation plan that bolsters American manufacturing and labor capacity to: 1) help Europe reduce its reliance on Russian oil and gas in the medium term, and 2) support lasting energy security in the U.S.

Part	Description	Cost	Impacts
I: Industrial Policy	- Build U.S. manufacturing capacity for hydronic, air-to-air mini-split, and variable refrigerant flow heat pumps and key components. - Support manufacturers with public-private cost sharing (20/80), low cost financing, and grants for technical assistance. - Use DOD to place a Foreign Military Sale to procure heat pumps for sale to E.U. Member States and U.K.	$600M over 5 years[1]	- Strengthen E.U. and U.K. energy independence. - Bolster U.S. manufacturing capacity and supply chain security: - 30 manufacturing plants - 3M heat pumps annual output by 2025. - Reduce demand for Russian gas and associated CO2e emissions: - 2022: 2bcm / 8MMT - 2025: 11 bcm / 44 MMT - 2027: 23 bcm / 92 MMT.
II: Workforce Development	- Send civilian volunteers to train and install heat pumps in E.U. and U.K., returning to U.S. with valuable skills and experience for rapidly growing U.S. heat pump market.	$675M over 3 years	- Support workforce in the U.S. and overseas: - 30,000 U.S. workers trained - 4.5 million additional heat pumps installed
III: Domestic Energy Independence	- Congress enacts full climate package proposed in budget reconciliation.	$555B over 10 years	- Reduce inflation. - Save U.S. families money on their monthly energy bills. - Enhance consumer choice for clean technology, spurring demand for heat pumps.

[1] Projected costs for Part I of the Electrify for Peace Plan does not include the wholesale purchase costs by the DOD to procure the machines as these costs should be recouped in sale to the governments of the E.U. Member States and the U.K.

Background

In its illegal invasion of Ukraine, Russia has used its dominance in supplying natural gas to the E.U. and its role in global oil and gas markets as a key strategic tool. Russia's manipulation of oil and gas markets spiked prices and helped it to amass a war chest used to fund its invasion. Moreover, Russia continues to leverage its role as a major exporter to E.U. Member States as a buffer against retaliation. In response the E.U. and U.K. are taking action to reduce demand for Russian oil and gas as a matter of national security and energy security. Indeed, the International Energy Agency (IEA) included the accelerated replacement of gas boilers with electric heat pumps as a critical component of their ten point plan for the E.U. to reduce its reliance on Russian gas. The E.U. also announced its plans to accelerate electrification and "roll out 10 million heat pumps in the next five years to help European families reduce their dependence on gas and lower their energy bills."[2] Russian gas is used in home heating and there are more than 76 million homes in the E.U. and U.K. with gas boilers today.[3] It is imperative to accelerate the introduction of highly efficient electric heating products across the E.U. and U.K. beginning next winter to reduce demand for Russian gas and help tilt the scales on this issue in favor of our allies.

The U.S. should mobilize its manufacturing and skilled labor capacity to support E.U. and U.K. efforts to scale up the supply and installation of efficient electric heat pumps for household heating and cooling. Ideally, these efforts could accelerate the pace of building retrofits as early as next winter, helping reduce energy costs for households and reduce demand for Russian gas. The benefits will last for generations to come, simultaneously enhancing energy security and independence, providing households with clean and affordable heating and cooling, building manufacturing capacity, enhancing supply chains, and training a new skilled workforce of installers, electricians, plumbers, and more.

[2] https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_1512.
[3] Overall, the U.K. is not as dependent on Russian gas as the E.U. — it only accounts for 6-7% of total imports in the U.K.

Impacts

In its recent report, *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas*, the IEA charts a path to reduce Russian gas imports by over a third. The IEA report rightly highlights temporary solutions like turning down all thermostats in homes and commercial buildings, which will have an immediate short-term impact on gas demand. Yet we must also look to lasting solutions that can deliver long-term reductions in gas use and thereby put Europe on the path to energy independence and greenhouse gas emissions reductions.

The IEA projects that one such solution, increased deployment of electric heat pumps to replace gas-fired boilers, can reduce Russian gas use by 2 bcm (billion cubic meters) in the first year, while turning down thermostats would add another 10 bcm reduction. But because increasing heat pump deployment permanently transforms the market, the market will continue to grow year over year as more heat pumps are installed. Thus, the destruction of gas demand and emissions not only stacks over time, it also compounds as heat pumps continue to deliver benefits for years to come in homes across Europe. In contrast, the effects of turning down thermostats are neither accelerating nor cumulative.

To quantify the benefits of accelerated heat pump deployment, we take historical sales data from the EU-21[4] and fit a Bass diffusion model.[5] As validation, we cross reference against industry market reports.[6] We follow the IEA assumption that heat pump sales in the EU could double with appropriate stimulus. The results of this model are shown below, where heat pump sales increase to 9 million units per year by 2025, compared to a baseline of 1.6 million sales per year in 2020.

[4] https://www.ehpa.org/fileadmin/documents/MR_Executive_summary_2021.pdf.
[5] https://www.tandfonline.com/doi/abs/10.1198/073500104000000604?casa_token=LASMBk_PZkcAAAAA:9eIX6C_zGFFKoCTxLP2_TzuO-wLJfStOZzA0Rmvf-cgsFrMx_-lDlUt7aCtDTTELdQ0MpAT3sApX.
[6] E.g., https://www.prnewswire.com/news-releases/heat-pump-market-revenue-to-cross-84-billion-by-2028-says-global-market-insights-inc-301429756.html.

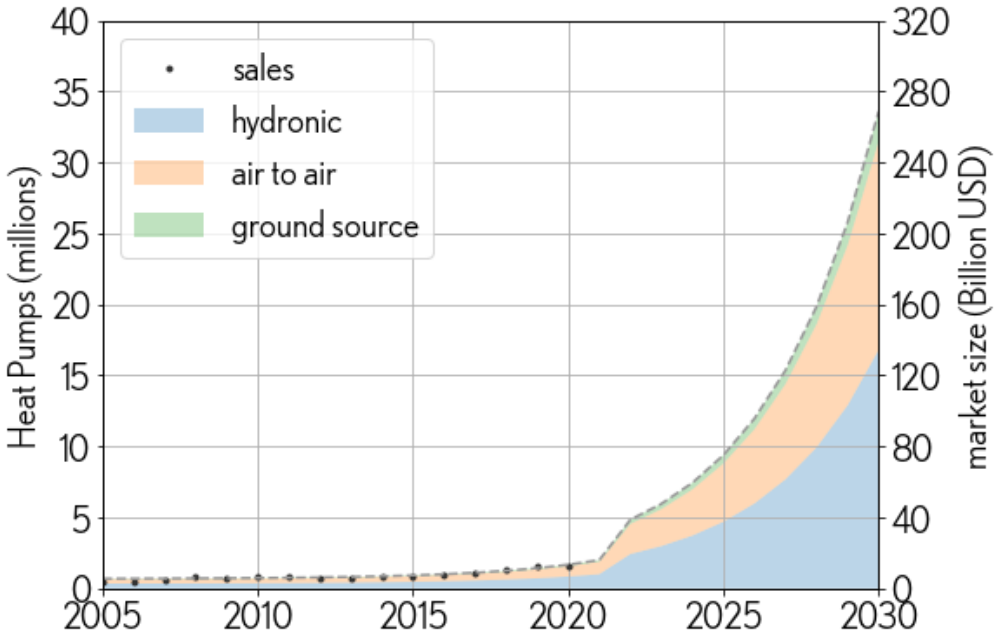

Figure 1: Projected heat pump sales in Europe assuming accelerated heat pump development.

Assuming a standard equipment lifetime of approximately 20 years, we can estimate the effects of this intervention on the make-up of residential heating stock, as shown below. As reported by the European Heat Pump Association,[7] heat pump stock in the EU was approximately 15 million in 2020, and is expected to exceed 40 million by 2025. In the first year, doubling heat pump deployment reduces demand for Russian gas by 2 bcm, as reported by the IEA. After just three years, the reduction in gas demand grows to 11 bcm, more than five times the first year impact and greater than that of turning down thermostats. By 2027, the reduction in gas has doubled again to 23 bcm, and still has room to grow as heat pumps cover only 28% of the European residential market. When the effects of heat pump deployment in commercial buildings are included, the reductions in gas demand are even greater. In terms of GHG emissions reductions, approximately 8 MMT are avoided in 2022, 44 MMT by 2025, and 92 MMT by 2027.[8]

[7] https://www.ehpa.org/fileadmin/documents/MR_Executive_summary_2021.pdf.
[8] These estimates use the combustion content of about 2 kg carbon dioxide equivalent per cubic meter of gas, along with the industry-wide average leakage rate of 3% and the 20-year global warming potential of methane of 85.

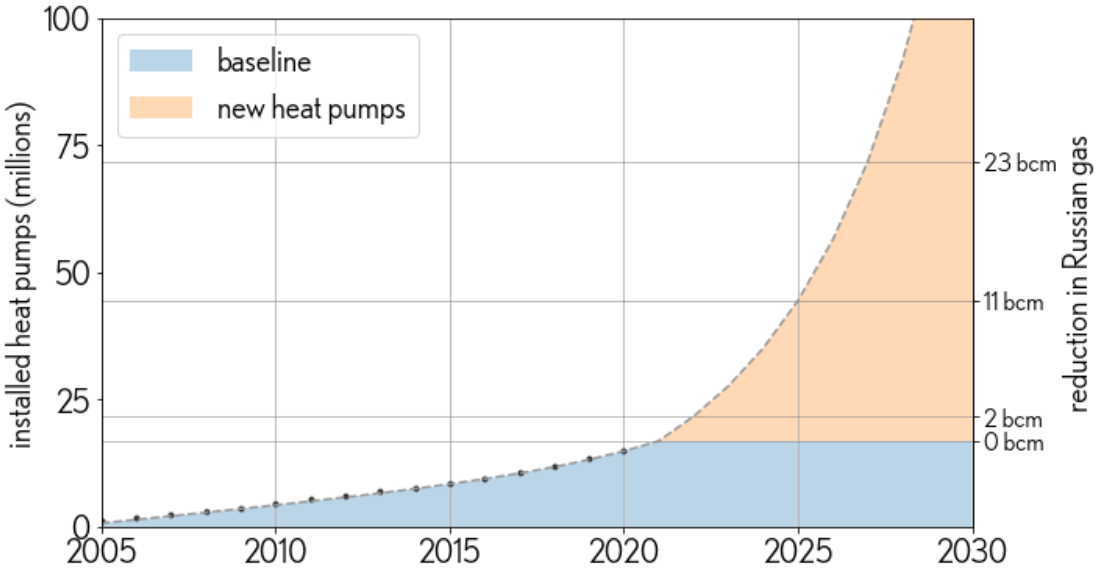

Figure 2: Projected reduction in Russian gas imports to Eurrope from accelerated heat pump deployment.

The U.S. can aid Europe in this effort to reduce dependence on Russian gas, and the potential upside for U.S. companies is large. As shown above, by 2025 the proposed market for heat pumps is valued at roughly $80B USD, which represents a $70B market gap waiting to be filled by U.S. goods in the next three years. Assuming existing European manufacturers, as well as Asian and U.S. firms compete, American companies might expect to win approximately one third of the new market. This equates to roughly $23B in annual sales and 3 million heat pumps per year by 2025, which is equivalent to the total size of the U.S. domestic heat pump market in 2020.[9]

How can the U.S. meet this moment? Based on feedback from industrial partners, both manufacturing resources and workforce development are critical. We propose a three-pronged effort to ramp up domestic manufacturing capacity, invest in training qualified installers of this equipment, and spur the U.S. heat pump market so this new manufacturing and labor capacity can later meet the needs of U.S. families and businesses.

[9] https://www.ahrinet.org/resources/statistics/historical-data/central-air-conditioners-and-air-source-heat-pumps.

Electrify for Peace Policy Plan

The Electrify for Peace Policy Plan aims to accelerate the rapid deployment and installation of high-quality efficient heat pumps or key components in E.U. Member States and the U.K. **Part I** of the plan achieves this goal by maximizing U.S. domestic industrial capacity to produce machines, making them available for the U.S. market in the future.
Part II sends U.S. workers to the E.U. and the U.K. to train and install the heat pumps within the region, skills which will in turn create a trained workforce for the U.S. market for years to come. **Part III** involves the U.S. Congress enacting energy investments to drive the deployment and adoption of clean technologies, securing lasting domestic energy independence and enabling American families to choose efficient, electric, and cost-saving products.

Part I: Building America's Productive Manufacturing Capacity

The Electrify for Peace Policy Plan would direct the U.S. Department of Defense (DOD) to announce a series of Foreign Military Sales (FMS) through its Defense Security Cooperation Agency (potentially its Office of Business Operations (OBO) or International Operations (IOPS)) to procure U.S.-made heat pump products and key components for the governments of E.U. Member States, as well as the U.K. The purpose of these sales would be to rapidly accelerate the deployment of efficient electric heating systems in the region. In the process, these orders would launch a competitive process, jumpstarting a new and vibrant U.S. heat pump industry.

- "Heat pump products" for this effort may include air-to-water, split-system air-to-air, or variable refrigerant flow (VRF) heat pump systems intended for residential or commercial retrofit applications. These product types are suitable for installation across much of the building stock in the E.U. and the U.K., while split-system air-to-air and VRF systems are also in high demand in the U.S. market.
- "Key components" for this effort may include compressors, heat exchangers, refrigerants, electronic components like circuit boards, and other high value items required for heat pump manufacturing in factories in the U.S. and overseas. The development of new U.S. manufacturing capacity for these components will drive down prices and enhance the security and competitiveness of supplies worldwide.

The IEA has called for a doubling of current deployment rates for heat pumps. For reference, the year-over-year growth rate in 2021 was around 25 percent—increasing the

pace will take significant support, but will result in a $80B market. This figure drives home the importance of U.S. support in helping the E.U. meet this need.

The U.S. has a strong and diverse manufacturing sector that could be mobilized to deliver on this opportunity with sufficient financial and technical support as early as next winter. For example, U.S. air conditioner manufacturing facilities could be expanded to build split-system air-to-air and VRF heat pumps, while U.S. hydronic boiler manufacturers could transition to produce high-technology air-to-water heat pump products.

In this effort we can simultaneously support our allies in their efforts to gain energy independence, strengthen American industrial competitiveness, and establish U.S. firms as market leaders as the world increasingly transitions to efficient electric heating and cooling systems. These orders will result in greater resiliency and security for the U.S. by bringing critical manufacturing skills, technical expertise, and supply chains back within our shores. Moreover, these orders will support good-paying jobs, including union jobs, all across the country.

Funding
In response to the Ukrainian crisis, the DOD could fund these orders via appropriations that support our allies' efforts to gain independence from Russian gas. The orders could be placed through Foreign Military Sales contracts through the DOD's Defense Security Cooperation Agency. The DOD, likely in coordination with the U.S. State Department, would negotiate terms of sale with the governments of the E.U. Member States and the U.K., focusing on where the heat pumps would make the largest impact on reducing Russian gas. Alternatively, the DOD could use Defense Production Act funds to help secure these orders. The appropriations should also provide grants to help manufacturers stand up new facilities, where applicable. Additional grants may be provided for heat pumps that utilize ultra-low- and low-global warming potential (GWP) refrigerants. All of these options require swift action by Congress and the Administration.

Part II: Training America's Workforce to Achieve A Secure Energy Future
Rapidly installing heat pumps will require thousands of skilled electricians and HVAC technicians to meet anticipated demand. The U.S. can help supplement E.U. and U.K. workforce development efforts by launching an apprenticeship program that would send our workforce overseas for specialized training and temporary employment with electrical and HVAC firms. At the end of their overseas rotations, these trained and experienced

workers would then return to the U.S., equipped to fulfill the labor gap that we, too, anticipate as efforts to electrify the U.S. building stock continue to pick up speed. Agencies or programs that could stand up the workforce program include USAID, the Department of Energy, the State Department via an exchange program, or the proposed Civilian Climate Corps, should it receive Congressional authorization.

Funding
In addition to appropriations to the above agencies, the Export-Import Bank of the U.S. Government or the Development Finance Corporation (DFC) may play an important role in supporting these services abroad. Alternatively, the DFC may be able to send funds to E.U. Member States to support their own workforce training programs.

Part III: Enabling American Families to Choose Efficient, Electric, Cost-Saving Products
The U.S. Congress must enact a comprehensive climate package that will enable American families to choose efficient, electric appliances and products, including heat pumps, to support lasting domestic energy independence. Proposed climate investments include consumer rebates, clean technology tax credits, and community grants that will increase the supply and demand of renewable energy and clean technologies in the U.S. Efficient, electric heat pumps, in particular, will help tackle short-term inflation effects on energy bills, saving Americans money every month. Moreover, these policies will also help insulate Americans that adopt such technologies from long-term energy-driven inflation and reduce America's reliance on volatile global oil and gas markets.

In addition, this climate package will act as a strong political and market signaler to the world's businesses and governments. And thus, the U.S. will lead the shifting of global markets, making it easier for governments around the world to take complementary actions. See Appendix A for a list of essential policies that are part of this climate package.

In addition, the U.S. Government can take several steps that would benefit these efforts:

- *U.S. Federal Agency Joins the International Clean Heat Forum:* At the 26th Conference of Parties, the United Nations Environment Program, along with its partners, launched the Clean Heat Forum, which is an international network of governments, non-governmental organizations, and businesses. Its aim is to share the best practices and technical resources required for the development and deployment of clean heating all around the globe. The U.S.'s official involvement, perhaps through

the Department of Energy's Office of International Affairs, would strengthen this new initiative. Given there are minimal requirements to join, this is a relatively easy step in helping reduce reliance on fossil fuels.

- *Eliminate Import Taxes on Efficient Electric Heat Pumps and other Clean Technologies:* The U.S. should work with its trans-Atlantic allies to reduce or eliminate import taxes on efficient electric heat pumps and other clean technologies in the short and medium term to accelerate their installation in the E.U. and U.K. This will further improve supply chains and provide greater resilience and insulation from supply shocks. In addition, it will bolster the national security of our allies from both political and climate change-related threats.

- *Align U.S. Heat Pump Regulations and Standards with Global Norms:* U.S. manufacturers would benefit from aligned regulations and standards regarding testing procedures, building codes for lower-GWP HFCs, and manufacturing standards, among other items, between major markets. This way, U.S. made products could be sold both domestically and internationally, opening up market share opportunities.

Costs

How much would it cost to develop new manufacturing capacity for heat pumps and key components in the U.S.? Based on historical costs,[10] we estimate $100M to build a new heat pump or component manufacturing line. These costs should be supported by government grants[11] and preferential financing, but will pay back in terms of thousands of jobs and local economic benefits in communities across the U.S. Assuming 30 new manufacturing facilities, each producing approximately 100,000 products per year,[12] this manufacturing effort would require total public and private investment of approximately $3B. We assume total government financial support and other technical assistance could provide 20 percent of this total, or $600M.

[10] GE invested $60M in a water heater manufacturing plant in South Carolina, and $118 million at a cooking products plant in Georgia. Schneider Electric invested $100 million in an electronic products plant.
[11] For instance, Mitsubishi HVAC invested £15.3M ($20M US) to expand a heat pump factory in Scotland, using a £1.8M government grant.
[12] Based on estimates from industrial partners.

For workforce development, we envision a program comparable to the Peace Corps or Civilian Climate Corps, where a workforce of up to 10 thousand Americans per year would receive training and perform installations abroad in 12 month rotations, coming home with the needed skills to install heat pumps in the U.S. A heat pump installation takes about two person-days,[13] so the program could lead to an additional 1.5 million new heat pump installations per year in the E.U. and U.K., and 4.5 million installations in total. Over 3 years this program would train up to 30 thousand new highly-skilled U.S. HVAC technicians. We assume that the US would cover 25 percent of the wages, benefits, and allowances for these workers. Based on the costs of similar programs, we project a cost of $675M over 3 years.[14]

Altogether, this plan could cost the U.S. government $1.275B**.** The benefits, however, are much greater. This investment would critically aid Europe in reducing dependence on Russian gas and make a major step in climate mitigation. Second, it would serve to bolster U.S. manufacturing of heat pumps, secure domestic supply chains, and build critical infrastructure for decarbonization and resilience domestically. Finally, it would create tens of thousands of highly skilled jobs at home, and tens of billions of dollars of new market opportunity for American companies.

Next Steps

The DOD has $750M of non-defense DPA-related funding at its disposal. In addition, Congress will likely appropriate over $10B of new defense and aid spending in response to the Ukrainian crisis in an omnibus spending bill by March 11th. Depending on the investment need, both funding sources may need to be utilized to support the FMSs of Part I and the omnibus appropriations should also be applicable to Part II. The Administration should closely coordinate with U.S. manufacturers and our E.U. and U.K. allies to ensure that the FMSs and any workforce apprenticeship programs appropriately fill the gaps required to ensure an accelerated energy independence push.

[13] https://www.homewyse.com/services/cost_to_install_heat_pump.html.
[14] We assume an annual cost of $90,000 per worker. This includes a starting salary of $45,000 per annum, (a typical starting salary for this labor category (per https://www.bls.gov/oes/current/oes499021.htm and https://www.servicetitan.com/blog/hvac-technician-salary) and an additional $45,000 per annum to cover benefits and international detail allowances (see https://www.pwc.se/sv/managing-people/assets/measuring-value-international-assignments.pdf).

Appendix A
Key Climate Provisions[15]

Key Non-Tax Policies

- Direct Loans and Grants for Energy or Water Efficiency or Climate Resilience of Affordable Housing - $2B in direct grant funding with $4B in additional lending authority. Eligible activities include building electrification and efficiency improvements for affordable housing units.

- High-Efficiency Electric Home Rebates - $6.25B for point-of-sale rebates for efficient electric appliances and home building efficiency, as well as contractor incentives. Eligibility is exclusive to low- and moderate-income households and disadvantaged communities.

- Home Energy Performance-Based, Whole-House Rebates - $5.937B for home efficiency and electrification improvements that reduce whole-home energy use.

- State-Based Home Energy Efficiency Contractor Training Grants - $312.5M for efficiency and electrification training program grants.

- Public Housing Investments - $64.2B for improvements, including efficiency and climate improvements, to public housing, as well as to affordable housing overseen by the Department of Housing and Urban Development.

- Greenhouse Gas Reduction Fund - $7B for zero-emission technologies for low-income households, $3B for zero-emission vehicle supply equipment, and $11.97B, $8B of which is set aside for low-income and disadvantaged communities, for greenhouse gas reduction activities. Funding can be in the form of grants or subsidized loans.

- Healthy Housing Funding - $5B in grants for lead-based paint and other home health hazard remediation, which are critical in enabling electrification in older substandard homes.

[15] Excerpted from *What's at Stake: Digging into the Climate Provisions of the Build Back Better Act*, Rewiring America, 2022.

Key Tax Policies

- 25C. Energy Efficient Home Credit - A non-refundable 30 percent tax credit for eligible homeowners with sufficient tax liability who install efficient electric heat pumps, and a 30 percent credit for insulation and upgraded electrical circuit panels up to $1,200.

- 25D. Residential Clean Energy Credit - A refundable 30 percent tax credit for individual taxpayers with or without a tax liability for geothermal heating systems, rooftop and community solar, among other items.

- 45L. New Energy Efficient Home Credit - Up to $5,000 for housing developers or builders who build a Department of Energy Zero-Energy Ready Home. Eligible for both new construction and substantial renovations.

- 36D. Refundable New Qualified Plug-In Electric Drive Motor Vehicle Credit for Individuals - A refundable $7,500 credit for individual taxpayers with or without a tax liability for a new electric vehicle purchase with at least 40kWh in battery capacity. The credit increases to $12,500 for EVs that are domestically assembled in a union factory and powered by domestically manufactured battery cells.

- 36E. Previously-Owned Qualified Electric Drive Motor Vehicles - A non-refundable $2,000 credit for individual taxpayers with previously owned electric vehicles and hybrid vehicles. The credit increases for LMI taxpayers and doubles for certain vehicles.

- 30C. Alternative Fuel Refueling Property Credit - A 30 percent tax credit - capped at $100,000 for publicly available commercial charging locations and $3,333.33 for home charging equipment—for electric vehicle charging infrastructure, including bidirectional charging equipment, that is available to the public.

- 45(d). Extension and Modification of Credit for Electricity Produced from Certain Renewable Resources - A tax credit for solar and other renewable energy producers with a bonus for solar and geothermal that is placed in low-income or environmental justice communities.

- 48(a). Extension and Modification of Credit for Investments in Certain Renewable Resources - A 30 percent investment tax credit for solar and other renewable energy developers and commercial purchasers, which can be passed through to residential solar customers through lease agreements.

- 48C. Advanced Energy Project Credit - A tax credit for businesses that establish facilities for advanced energy projects tied to prevailing wage and labor provisions. Significant amounts set aside for facilities placed in automotive or energy communities.

- 45Y. Labor Costs of Installing Mechanical Insulation Property - A tax credit for businesses of up to 10 percent of labor costs for installing insulation paired with mechanical property, including heat pumps for commercial heating and cooling. The base credit is 2 percent, while projects that meet wage and apprenticeship requirements are eligible for the bonus 10 percent credit.