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**IMPACT OF THE ENERGY INNOVATION CARBON DIVIDEND ACT ON THE STATE OF PENNSYLVANIA**

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EXECUTIVE SUMMARY

The purpose of this report is to provide data analytics to the client, Citizens’ Climate Lobby, regarding the potential effects of the Energy Innovation and Carbon Dividend Act (H.R. 763) on the Commonwealth of Pennsylvania. The intended audience is the Pennsylvania House of Representatives. Additionally, this project fulfills the requirements of Duquesne University's MBA Sustainable Business Practices’ second semester consulting course.

Citizens’ Climate Lobby (CCL) is a non-partisan volunteer non-profit grassroots organization promoting civic engagement for a livable world. This organization advocates for national policies that address climate change. The Energy Innovation Carbon Dividend Act (EICDA) was presented to the House of Representatives in January of 2019 and is CCL’s primary focus. The bill's purpose is to reduce greenhouse gas emissions by placing an incremental fee on the source of the carbon-emitting fossil fuel. EICDA is a revenue-neutral and market-based bill that returns the revenues generated from the fee to American residents in the form of dividends.

Graduate students of the Duquesne University's MBA Sustainable Business Practice program conducted quantitative and qualitative research to determine the potential impact of the EICDA on Pennsylvanian households and on regional employment creation/loss. Duquesne University, located in Pittsburgh, Pennsylvania, is accredited by the Association to Advance Collegiate Schools of Business International (AACSB). Its MBA Sustainable Business Practice Program has been consistently recognized as a top graduate business program in Corporate Knights’ Better World MBA Rankings. The graduate students worked under the supervision of Dr. Robert Sroufe, Ph.D., Murrin Chair of Global Competitiveness.

The following are the key findings regarding state-specific impacts of the Energy Innovation and Carbon Dividend Act in Pennsylvania:

- An estimated 61% of PA households would experience a net financial benefit as a result of the dividend return.
- PA would benefit from the generation of an estimated 77,000 jobs in 2025 and 97,000 jobs in 2035. Service-providing industries, such as health care services and retail trade, yield the highest job growth resulting from the bill’s implementation and represent 52% of the job created.
- The EICDA would create clean energy jobs through incentivizing investment in energy innovation instead of polluting industries, further strengthening the upward trend in the clean energy job sector.
Research by Duquesne University graduate students included conducting a regional analysis of the impact of rising home energy costs as a result of the fee assessed at the source of carbon emission, in conjunction with the benefit of the dividend distribution. The graduate student-led team modeled 670 scenarios by inputting variables such as zip-codes, household type, and income levels into the CCL’s peer-reviewed Carbon Dividend Calculator. Results indicate that 32% of single-occupant households and 77% of family households will receive dividends that exceed expected increases in household energy costs in year 1 of the policy implementation. Additionally, the team used historical employment data and employment growth forecasts provided by the Pennsylvania Department of Labor and Industry to identify regional employment trends. The team then used data from The Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax Report, a study published by Regional Economic Models, Inc. (REMI) and Synapse Energy Economics in 2014 to determine the impact of the EICDA on Pennsylvania job growth. Analysis suggests that the EICDA will fuel job growth in service-providing industries. The job growth is related to households receiving a dividend, which increases demand in consumer goods and a result of enhancing the attractiveness of investments in innovative businesses that seek to minimize greenhouse gas emissions within their operations, which create additional jobs in the clean energy sectors. The increased demand for clean energy provides Pennsylvania residents with excellent employment opportunities in positions that pay 8% to 19% higher than the current mean hourly wage in the United States. The EICDA serves as an equitable opportunity for both urban and rural areas in Pennsylvania as the clean energy jobs are dispersed throughout the state.
INTRODUCTION

The Citizens’ Climate Lobby is a non-partisan and non-profit grassroots organization promoting civic engagement for a livable world. CCL is a proud supporter of the Energy Innovation and Carbon Dividend Act (EICDA), which also has the endorsement of 531 businesses, 350 civic leaders, including 73 Representatives from both Democratic and Republican parties, 143 non-profits, 89 faith groups, 82 local governments, 20 news publications, and 4 tribes as of December 4, 2019. The EICDA, also known as Bill H.R.763 was sponsored by Representative Deutch (D-FL) and introduced in the House of Representatives in January 2019. This type of policy is necessary because scientific evidence indicates that greenhouse gas emissions are causing the rise in global temperatures. The increase in temperature threatens human health, the natural environment, the economy, and national security. Studies commissioned by CCL demonstrate that this policy could reduce carbon emission to 50% of 1990 levels while adding 2.8 million jobs to the American economy. The EICDA facilitates a market-driven implementation of clean energy technology to reduce pollution by placing a fee on the importers and producers of carbon-emitting fossil fuels. These fuels include crude oil, natural gas, coal, and any other product derived from those fuels that emit greenhouse gases into the atmosphere. The fee starts at $15 in the first year and raises by $10 each following year. This policy is self-extinguishing and the net-threshold happens when the monthly dividend amount falls below $20. The revenue generated from the fee is returned to American residents as a dividend, making the policy revenue neutral. Within the language of the bill, industries such as the armed forces and agriculture are exempt from the fee. Additionally, this policy calls for border adjustments to protect US workers and industries.

EICDA Compared to Similar Bills and RGGI

As of 2019, the EICDA is one of seven bills currently being considered by Congress that would put into place regulations and prices on carbon emissions. Each bill applies emission-associated fees across all energy sectors, calls for border adjustments, and provides protections for low-income households, which are the most impacted by rising energy costs. However, the initial starting rate of the fee, in addition to annual price increases, differs within each bill. The EICDA has one of the most aggressive annual growth in fees, which suggests that this policy will result in a faster reduction in emissions (Appendix A). The EICDA is also one of the few revenue-neutral and market-based policies. Additionally, the EICDA returns revenues resulting from the fee to all American citizens, whereas other bills provide dividends only to low- and middle-income households. Proposals that are not revenue-neutral and market-based provide earmarks towards infrastructure, research and development, payroll tax reductions, and other general funds (Appendix B). It is important to note that the Regional Greenhouse Gas Initiative (RGGI) is a separate strategy focused on reducing emissions from electrical power plants. RGGI is an initiative that is specific to states located in the New England and mid-Atlantic region. States that have implemented RGGI have reduced CO2 47% within the energy sector. While
RGGI is a necessary step towards reducing carbon emissions, it only accounts for one source of carbon emissions and does not provide financial compensation to citizens to offset rising utility costs.

The scope of this project is to analyze the impact of the EICDA on the economy of Pennsylvania, and to present the results to Pennsylvania’s congressional representatives. This report will dive into the effects of the bill’s dividend on Pennsylvanian households, as well as the bill’s potential to create more jobs in the state.

**Conclusion**

Research conducted by a team of graduate students of Duquesne University’s MBA Sustainable Business Practice program concluded that most Pennsylvania residents would benefit from the implementation of the EICDA. Simulations generated, considered variables such as income, location, and the number of adults and children within a household, found that 61% of Pennsylvania households will receive a dividend that is higher than the expected rise in household energy costs. The EICDA also accelerates job growth within service-providing industries. Estimations of job creation resulting from the implementation of the EICDA is 77,000 jobs in 2025 and 97,000 jobs in 2035. Although the policy does negatively impact jobs within fossil fuel industries, these losses are offset by the creation of clean energy jobs in both metropolitan and non-metropolitan areas of Pennsylvania.
EICDA Impact on Pennsylvanian Households

Household Impact Study
The EICDA is a revenue-neutral, market-based policy that returns revenue generated from fees implemented at the source of carbon-emissions to American households in the form of a monthly dividend. The purpose of these dividends is to offset the expected increases in household energy costs through higher utility bills and gasoline expenses. The Household Impact Study led by Kevin Ummel, a Research Scholar at the International Institute for Applied Systems Analysis, found that 87% of the costs associated with a $15 fee per carbon ton is passed onto consumers in the form of higher utility bills.6,7

The Personal Carbon Dividend Calculator
To provide citizens with insight on how the EICDA would specifically impact their household budgets, CCL created a user-friendly online calculator, known as the Personal Carbon Dividend Calculator. Users input variables such as number of occupant adults, number of occupant children, yearly household income, zip-code, dwelling type, number of vehicles, heating fuel type, and average monthly utility bills to simulate their anticipated net gain (or loss) in the first year of policy implementation. The calculator assumes that the pre-tax monthly dividend per adult in the first year of the policy will be $23. It also assumes that utilities are income elastic, which means higher-income households will tend to consume more electricity, natural gas, etc. The CCL Calculator is built on the work of research scholar Kevin Ummel, which is described in detail in his working paper, titled “Impact of CCL’s Proposed Carbon Fee and Dividend Policy: A High-Resolution Analysis of the Financial Effects on U.S. Households.”8

Research conducted by Duquesne University MBA students sought to compare the effects of rising utility costs and dividend distributions by household occupant size, household income, and household location. This research is intended to provide Pennsylvania civic leaders with information on how the implementation of the EICDA would directly impact their constituencies. One zip-code was selected from each of Pennsylvania’s 67 counties to provide district-specific impacts. The number of occupant adults, number of occupant children, and household income inputs were then manipulated to indicate the net financial effect on households in each district.

Variable Assumptions: Household Income and Occupancy Type
The first manipulated variable used to differentiate household type was household income. The five income categories are as follows: (1) Below $35,000; (2) $35,000 to $55,000; (3) $55,000 to $95,000; (4) $95,000 to $160,000; (5) $160,000 to $200,000. According to the 2010 US census data, 95% of Pennsylvania households fall within these five income categories.9 These categories were created to closely align with the first five tax brackets under the US tax code.10

The second manipulated variable used to differentiate household type was the number of adult and children occupants. In 2018, the Census Bureau reported that the percentage of single-occupant
households across the US was 35%; 65% were classified as family households. Additionally, the average number of children per family household in 2018 was 0.89. Based on this information, two household types were simulated: (1) households containing two adults and one child, and (2) single-occupant households, represented by one adult.

**Simulation Results**

A total of 670 different scenarios were simulated by manipulating zip-code, household type, and household income variables. Statistical analysis of these scenarios found that 77% of family households, which have a household income of below $35,000 to $95,000, would experience a net benefit as a result of the EICDA. The average family household, with an income falling between $55,000 to $95,000, would experience a net benefit of $126 in the first year. Conversely, 68% single-occupant households with incomes above $35,000 experienced net loss, meaning the dividend they will receive will not cover the expected rise in household utility costs. The average single-occupant household, with an income of $55,000 to $95,000, would experience a net loss of $172 in the first year or $15 per month. Simulation results by congressional district, household type, and household income category can be reviewed in Appendix C. Overall, 61% of Pennsylvanian households stand to receive a net benefit in the policy’s first year.

A Pennsylvania congressional district map of these results for the middle-income household category of $55,000 to $95,000 is provided in Figure 1 and Figure 2. The household income category of $55,000 to $95,000 was chosen for the report because Pennsylvania’s real median household income (which, in 2018, was reported to be $64,000) exists within this range. The results show that metropolitan districts surrounding Philadelphia, Erie, and Pittsburgh are found to experience a smaller net benefit for family households and a greater net loss for single households in the first year of the policy. Ummel's household impact study explains that these areas do not fare as well due to the higher consumption rates of urban residents, which are linked with higher carbon footprints. Also, households in carbon-intensive energy grids will pay more in fees under the policy, and as southwestern Pennsylvania has a relatively more carbon-intensive grid than the rest of the state, the results show that this area will likely have the smallest net benefit (or greatest net loss). It is important to note that the policy is self-extinguishing and the net-threshold occurs when the monthly dividend falls below $20.
Figure 1: Net Financial Effect on Middle Income Family Households in Policy’s First Year

Family Households
Income: $55,000 to $95,000

Figure 2: Net Financial Effect on Middle Income Single-Occupant Households in Policy’s First Year

Single Households
Income: $55,000 to $95,000
**IMPACT OF EICDA ON PENNSYLVANIA STATE EMPLOYMENT**

*Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax Report*

The purpose of a carbon fee and dividend policy is to combat rising greenhouse gas emissions by providing a predictable price signal that guides investment into innovative industries. In 2014, Regional Economic Models, Inc. (REMI), in conjunction with Synapse Energy Economics, released The Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax Report. In research conducted by Duquesne University graduate students, the REMI report was referenced to determine the policy’s potential impact on Pennsylvania. An update to the 2014 REMI report is anticipated to be released near the end of the year in 2019. Regional Economic Models, Inc. (REMI) and Synapse Energy Economics utilized a proprietary integrated assessment model to simulate changes to the United States economy with the implementation of the EICDA policy. The model simulates the net impact of the policy through considering the costs of implicitly higher energy prices against the benefits of increased consumer spending as a result of the household dividend, investment incentives in the energy market, and the border adjustment protecting US workers and industries. The REMI report details the regional impact on electrical power generation, gross regional product, and employment by industry/occupation. The Duquesne University team analyzed employment impacts within the Mid-Atlantic Region provided by the REMI report to determine the potential impact on Pennsylvania.

*Impact of EICDA on Mid-Atlantic Report Results*

The Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax Report provides insight on policy impacts across nine regions. Pennsylvania is in the Mid-Atlantic region, along with New York and New Jersey. Model results are compared to a “business as usual” baseline that assumes no additional changes to the economy, energy prices, or tax code. The results reported by REMI indicate that the Mid-Atlantic region is to benefit from the creation of 260,000 additional jobs in 2025 and 327,000 additional jobs in 2035, assuming a $10 per metric ton carbon tax starting in 2016 and increasing at $10 per year.
Figure 3 synthesizes the employment impacts by industry super sector. Service-providing industries drive 92% of the employment growth (beyond baseline projections), likely due to the household dividend increasing the demand for consumer staples such as healthcare, food, services, entertainment, and housing. Fees imposed on sources of greenhouse gas pollution lead to higher energy prices and cause a decline in energy production or energy-intensive sectors. In the Mid-Atlantic region, roles within the mining, oil & gas extraction industries would be negatively impacted as rising costs in these industries would likely make its products less price-competitive when compared to renewable energy alternatives. Although the model simulation assumed policy implementation in 2016, the results are believed to be directionally correct as economic and demographic trends have been consistent in the Mid-Atlantic region since the release of the report in 2014.

**Impact of EICDA on Pennsylvania**

In 2018, 16.7 million jobs were located in the tri-state area, 31% of which were located in Pennsylvania. Pennsylvania has experienced consistent employment growth since the jobs-recovery period that followed the 2008 recession. The state’s job count has increased by 468,100 since the most recent jobs low in February 2010, and job-expansion is expected to continue through 2026.

It was assumed that Pennsylvania, New York, and New Jersey would maintain their current share of employment opportunities by industry to determine the impact of the EICDA on Pennsylvania jobs. For example, 31% of construction jobs were located in Pennsylvania in 2018. Based on employment impacts simulated in the Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax Report (Figure 4), it was presumed that 31% of the 18,000
construction jobs created in 2025 would be located in Pennsylvania. Figure 5 demonstrates Pennsylvania’s share of regional employment opportunities based on annual average employment by sector. Figure 6 estimates net employment impacts in the state of Pennsylvania as a result of policy implementation by applying current state employment shares to previous simulation results.

Based on the assumptions outlined, Pennsylvania is expected to benefit from a net increase of 77,000 jobs in 2025 and 97,000 jobs in 2035 with the implementation of the EICDA. Health care services, retail trade, and other services experience the highest job growth and represent 52% of job creation expected as a result of the bill.

Figure 4: Mid-Atlantic Share of Jobs by Industry Sector in 2018

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Pennsylvania</th>
<th>New York</th>
<th>New Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other services</td>
<td>28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leisure and hospitality</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education and health services</td>
<td>32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional and business services</td>
<td>29%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial activities</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade, transportation, and utilities</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>45%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural resources and mining</td>
<td>54%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goods-producing</td>
<td>41%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service-providing</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, all industries</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Figure 5: Pennsylvania Employment by Industry Super Sector with Implementation of EICDA**

(Thousand over baseline)

<table>
<thead>
<tr>
<th>Goods Producing Industries</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry, Fishing &amp; Hunting</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mining, Quarrying &amp; Oil &amp; Gas Extraction</td>
<td>-3.2</td>
<td>-4.9</td>
<td>-4.3</td>
</tr>
<tr>
<td>Construction</td>
<td>5.6</td>
<td>7.1</td>
<td>8.7</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.5</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Utilities</td>
<td>-0.6</td>
<td>-0.3</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Providing Industries</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Trade</td>
<td>1.9</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>9.9</td>
<td>11.8</td>
<td>13.0</td>
</tr>
<tr>
<td>Transportation &amp; Warehousing</td>
<td>0.6</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Information</td>
<td>1.0</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Finance &amp; Insurance</td>
<td>6.3</td>
<td>6.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Real Estate &amp; Rental &amp; Leasing</td>
<td>3.3</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Professional &amp; Technical Services</td>
<td>2.3</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Management of Companies &amp; Enterprises</td>
<td>-0.3</td>
<td>-0.6</td>
<td>-0.9</td>
</tr>
<tr>
<td>Administrative &amp; Waste Services</td>
<td>5.7</td>
<td>6.9</td>
<td>7.8</td>
</tr>
<tr>
<td>Educational Services</td>
<td>4.2</td>
<td>5.1</td>
<td>6.1</td>
</tr>
<tr>
<td>Health Care &amp; Social Assistance</td>
<td>22.4</td>
<td>27.5</td>
<td>31.4</td>
</tr>
<tr>
<td>Arts, Entertainment &amp; Recreation</td>
<td>3.0</td>
<td>3.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Accommodation &amp; Food Services</td>
<td>4.5</td>
<td>4.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Other Services, Ex. Public Admin</td>
<td>7.6</td>
<td>8.7</td>
<td>9.5</td>
</tr>
<tr>
<td>Government</td>
<td>2.2</td>
<td>1.2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

| Total of All Sectors | 77   | 86   | 97   |

**Figure 6: Pennsylvania Employment by Industry Super Sector with Implementation of EICDA in 2030**

(Compared to baseline)
Due to rising energy prices as a result of the fee imposed on sources of greenhouse gas pollution, implementation of the EICDA is expected to lead to a reduction of positions located in the mining and oil & gas extraction sector. In Pennsylvania, the estimated reduction of roles within this field is 3,200 jobs in 2025 and 4,300 jobs in 2035. Considering that the mining, quarrying, oil & gas extraction sector employed 28,700 individuals in 2018, this translates to an 11% to 17% decline in roles between 2025 and 2035. Currently, mining, quarrying, oil & gas extraction positions are heavily concentrated in the south-west portion of the state near Pittsburgh (Figure 7). However, given that the EICDA facilitates the growth of clean energy technology by encouraging investment and creating demand in these sectors, it is expected that these fossil-fuel jobs will be replaced with the generation of opportunities in the clean energy sector.

*Figure 7: Average Employment by County in Mining, Quarrying, Oil & Gas Extraction Sector (2019)*

![Average Employment by County in Mining, Quarrying, Oil & Gas Extraction Sector (2019)](image)

Figure 8 demonstrates the current distribution of clean energy jobs in Pennsylvania as of 2019. It is important to note that while counties, such as Washington County, have a high concentration of mining and oil & gas extraction jobs, these areas also have a high density of clean energy opportunities. With the acceleration of clean energy jobs expected as a result of the EICDA, it is reasonable to expect that job growth within clean energy roles has the potential to offset reductions in mining and oil & gas extraction roles in these counties, minimizing pain points for these communities.
Figure 8: Clean Energy Jobs by Density (2019)

Image Source: E2
EICDA CREATES CLEAN ENERGY JOBS

Pennsylvania Energy Mix

The state of Pennsylvania has historically relied heavily on fossil fuels to support state energy needs. Figure 9 demonstrates PA's historical energy mix between coal, natural gas, petroleum, nuclear energy, and renewable energy. While coal used to be a primary resource, its significance has been decreased by a recent boom in natural gas extraction due to the development of the Marcellus Shale. Due to the abundance of cheap gas, renewable energy has remained a small percentage of the energy mix, contributing roughly 5%. Renewable energy is comprised of wind, hydropower, solar, and biomass. Two-thirds of the state's renewable energy generation comes from wind and hydropower sources. With the enactment of the EICDA, in partnership with the renewable energy targets set by RGGI, renewable energy is expected to become a more substantial part of the PA energy mix, leading to new job opportunities within the clean energy sector.

![Figure 9: Pennsylvania Historical Energy Mix](image)

Clean Energy Job Growth

EICDA leads to the creation of clean energy jobs by using a predictable price signal on carbon usage that guides investments towards innovative industries and away from polluting industries. Studies estimated that between 2014 and 2018, Pennsylvania had increased its workforce in the clean energy sector by 60%. As of 2018, Pennsylvania had 90,772 employees within the clean energy workforce, and the industry is currently adding jobs at 5 times the rate of Pennsylvania's state employment growth rate. Figure 10 provides a breakdown of the allocation of clean energy jobs by sector. Most clean energy jobs are located in the construction (45.9%) and manufacturing (19.8%) sectors.
Clean Energy Job Salary

The growth of clean energy provides Pennsylvania residents with access to good-paying jobs. Figure 11 provides a breakdown of mean hourly wage within three sub-sectors of the clean energy sector: clean energy production, energy efficiency, and environmental management. Clean energy production includes roles in the generation, transmission, and distribution of clean energy; examples include electricians, nuclear technicians, and power plant operators. Energy efficiency includes jobs involved in the manufacturing of energy-efficient products, construction of energy-efficient buildings, and provision of energy efficiency services. Examples of energy efficiency jobs are carpenters, plumbers, and solar photovoltaic installers. Environmental management involves roles concerned with conservation and regulation; examples include conservation scientists, environmental engineers, hazardous material removal workers. Across the three sub-sectors, the mean hourly wages are 8% to 19% higher than the national mean hourly wage. Comparatively, Pennsylvania's mean hourly wage is $23.44. In addition to providing opportunities for higher-paying jobs, clean energy jobs also have lower educational requirements. The Brookings Institute noted that less than 17% of the workers in these sectors had obtained an educational level of bachelor's degree or higher. Instead, the skills needed to operate within these roles are typically gained through the execution of daily routines. Additionally, based on the disbursement of clean energy jobs (Figure 8), the growth of this sector, fostered by the implementation of the EICDA, creates equitable opportunity for urban and rural state residents.
Figure 11: Mean Hourly Wages in the Clean Energy Job Sectors

Mean hourly wages by clean energy economy sector, 2016

Source: Brookings analysis of Occupational Employment Statistics data
**REPORT SUMMARY**

The purpose of this report is to provide analysis of the potential impact of EICDA’s Carbon Fee and Dividend Policy in the state of Pennsylvania. Specifically, the analysis was focused on the bill’s economic effects on household budgets and the potential effects on the state’s various job sectors. The financial impact on households was found to be greatest for low-income and family households, especially those households belonging to the state’s more rural districts. While jobs in fossil fuel dependent industries will be negatively impacted, research also indicates that the clean jobs sector will grow as a result of this bill. Lastly, it was found that the mean hourly wage of these jobs is much higher than the national average.
Appendix A: Proposal Rate Comparison

The graph details the differences in the rising rates of proposed carbon fee bills. The EICDA begins at one of the lowest rates, yet increases faster than other bills which begin higher but remain relatively steady over time.

Figure 12: Rate Comparison
Appendix B: Proposal Fee Distribution Comparison

The comparison examines the different distribution avenues for revenue collected from a carbon fee bill. Each bill has a different way of distributing the funds, with most going straight to the people as a dividend or tax reduction, while others focus on infrastructure and research and development.

Figure 13: Fee Distribution Comparison
Appendix C: Net Financial Effect of Policy on Households under $15 per Ton Fee

The table lists the results of the team’s simulations using CCL’s Carbon Dividend Calculator, consolidated into the 18 congressional districts.

**Figure 14: Total Financial Effect over Year 1 of EICDA**

<table>
<thead>
<tr>
<th>District</th>
<th>Single Households</th>
<th>Family Households</th>
</tr>
</thead>
<tbody>
<tr>
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WORKS CITED

1 “Sponsors”. Energy Innovation and Carbon Dividend Act, energyinnovationact.org/.


**FIGURE CREDITS**

Figure 3: Retrieved from Regional Economic Models, Inc. (REMI), and Synapse Energy Economics, Inc. “The Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax” 9 June 2014.

Figure 4: Retrieved from https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm?type=5&year=2018&qtr=1&own=5&area=42000&supp=0.

Figure 7: Retrieved from https://www.workstats.dli.pa.gov/Research/Pages/default.aspx.

Figure 8: Retrieved from https://www.e2.org/reports/clean-jobs-pennsylvania-2019.

Figure 9: Retrieved from www.eia.gov/state/seds/sep_use/total/pdf_cb/use_tot_PAcb.pdf.

Figure 10: Retrieved from https://www.e2.org/reports/clean-jobs-pennsylvania-2019.


Figure 12: Retrieved from energypolicy.columbia.edu/research/report/assessment-energy-innovation-and-carbon-dividend-act.

Figure 13: Retrieved from energypolicy.columbia.edu/research/report/assessment-energy-innovation-and-carbon-dividend-act.